

#### 4.9 Components of the Program

The previous *Perfil* Study for the Program proposed three (3) 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 works, 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 communities and district municipalities.

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<sup>19</sup>.

On the basis all above considerations, the present Feasibility Study proposes that the Program should consist of the following two (2) components, as well as the activities of Program Administration:-

- 1) Component-1: Projects Implementation for Conglomerate-1
- 2) Component-2: Projects Implementation for Conglomerate-2
- 3) Component-3: Administration Activities of the Program

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.

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<sup>19</sup> 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 Consultant, as this is a part of their role during Program implementation in the localities.

Capacity-building activities aim, but not limited to, the followings:

- 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 a part of Component-1 and Component-2 for the implementation of the Program. This includes management capacity building for the PAPT and the rural Amazon PMU. Capacity building will include (but is not limited to):

(1) Through the Operating Consultant:

- 1) To prepare pre-investment studies at the *Perfil* level for the Program's projects. The perfil study will include capacity building (mainly for project promotion) to the municipalities, community organizations and communities; and hygiene education programs as a part of project promotion.
- 2) To prepare The project files that include the technical aspects (detailed designs) and the social aspects including the design for the strengthening of capacity-building in the areas of organization, planning, development, community management, administration operation and maintenance, as well as the hygiene education programs. The capacity building will be provided to the three levels: municipalities, community organizations and populations.
- 3) To supervise the construction works of potable water supply and sanitation in Conglomerates-1 and -2
- 4) To prepare/review the Operations Manual of Program for the PMU-PAPT, as the guideline for the execution of the Program. The purposes of such program are to design or standardise the processes of programming, monitoring, and follow-up of the Program; and to improve its current internal processes, including the plan for technical capacity building of technical and professional personnel in the PMU.
- 5) To provide technical assistance to the PMU in the process of procuring contractors for the works in Conglomerates 1 and 2; as well as in the handing over of the facilities to the municipalities and community organizations, entities that will assume the operation and maintenance of the systems.

(2) Through the Supervising Consultant (SC):

- 1) To evaluate the pre-investment studies at the *Perfil* level to be prepared by the Operating Consultant.
- 2) To evaluate the detailed design studies (project files) which include the technical aspects (detailed designs) and the social aspects including the design for the strengthening of capacity-building in the areas of organization, planning, development, community management, administration operation and maintenance, as well as the hygiene education programs. The capacity building will be provided to the three levels: municipalities, community organizations and populations.

#### 4.9.4 Administration of the Program (Component 3)

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

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.

For the strengthening of the management capacity of the PMU for the Rural Amazon Area, the capacity-building activities for the staff of the PMU and for their support staff will be included in the terms of reference of the Consultant, who will act as the Operator, as part of its obligations.

## 4.10 Costs

### 4.10.1 Methodology for the calculation of Program costs.<sup>1</sup>

The investment costs and operation and maintenance costs for the Program have been estimated based on the costs actually budgeted in the *Perfil* studies of each project of the sample localities. Thereafter, the projects (localities) representing a variety of characteristics were adequately 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 methodology shall be simple so that the Program costs can be calculated based on the costs of said *Perfils*.

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, conveyance 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

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<sup>1</sup> The costs have been calculated in *Nuevos Soles* with prices current for May 2009. The exchange rate used is 1 USD = S/ 3.00 = 97.5 Yen

optimization of the existing systems is not feasible in all of the 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 (diarrhetic 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 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 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<sup>2</sup>

The main components of the costs of investment in potable water are: water intake (including wells), conveyance 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.

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<sup>2</sup> 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<sup>3</sup>, 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 N° 4.10.2-1, Table N° 4.10.2-2, Table N° 4.10.2-3 and Table N° 4.10.2-4.

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<sup>3</sup> Meeting Notes for work meeting with MVCS, BID, BIRF y JICA (06.03.2009)



**Table N° 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 Intervention Cost (Nuevos Soles)			Total Cost of Water Investment (Infra. Cost + Social Int. Cost)
			Year 1	Year 20			System Type	Intervention 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 Martín de Mojaral*	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 Puritania	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 N° 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	Conglomerate	Technical System		Total Infrastructure Cost (Nuevos Soles)						Social Intervention Cost (Nuevos Soles)			Total Cost of Water Investment (Infra. Cost + Social Int. Cost)
			Year 1	Year 20			System Type	Intervention 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 Olivos	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 N° 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	Conglo- merate	Technical System		Total Infrastructure Cost (Nuevos Soles)						Social Intervention Cost (Nuevos Soles)			Total Cost of Water Investment (Infra. Cost + Social Int. Cost)
			Year 1			System Type	Intervention Type	Direct Cost of Works (D.C.)	Genl. Expendi- tures & 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	Curica	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 N° 4.10.2-4: Investment Costs for Sanitation in the Localities of Conglomerate C-2  
(Nuevos Soles, May 2009)**

N°	Region	Locality	Population to be Served (inhab.)		Natural Region	Conglomerate	Technical System		Total Infrastructure Cost (Nuevos Soles)						Social Intervention Cost (Nuevos Soles)			Total Cost of Water Investment (Infra. Cost + Social Int. Cost)
			Year 1	Year 20			System Type	Intervention 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

Source: 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.

Table N° 4.10.2-5 and Table N° 4.10.2-6 show the costs of operation and maintenance by system type for the 50 sample localities, representing as market prices, obtained in the *Perfils* studies of the projects of the sample localities.

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

N°	Region	Locality	Water				Sanitation			
			Technical System		Without Project	With Project	Technical System		Without Project	With Project
			System Type	Intervention Type	O&M Cost (\$/ Year)	O&M Cost (\$/ Year)	System Type	Intervention Type	O&M Cost (\$/ Year)	O&M Cost (\$/ 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	Yacuatina	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

Source: JICA Study Team (2010)

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

N°	Region	Locality	Water				Sanitation			
			Technical System		Without Project	With Project	Technical System		Without Project	With Project
			System Type	Intervention Type	O&M Cost (\$/Year)	O&M Cost (\$/Year)	System Type	Intervention Type	O&M Cost (\$/Year)	O&M Cost (\$/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 Water and Sanitation Program for the Rural Amazon 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 DNS were applied; these are attached in Appendix 5: 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 5- 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), conveyance and/or riser pipe, treatment, reservoir, distribution network, house connections (including a sink inside the house and a percolation pit and/or public taps).

To calculate the per capita cost, indirect costs (overheads and profit), intangibles (technical and supervision) and the costs of social intervention 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 20<sup>th</sup> 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), conveyance and/or riser pipe, treatment, reservoir, distribution network: benefitted population by the 20<sup>th</sup> 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 1), 63.4% in the High Forest and Front Forest (Conglomerate 2), and an average of 68.9% for both conglomerates (C1 + C2), as shown in Table N° 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 proper the 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 per-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 : Potorized 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, conveyance 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 N° 4.10.3-1 and Table N° 4.10.3-2 the average direct per-capita costs are shown for each system type and intervention 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 conveyance 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 conveyance 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 N° 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	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		
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
				Amazonas	Cielachi	200	234	318	
				San Martin	La Florida	254	291	533	
			Improvement and Expansion	Amazonas	Misquiyacu Bajo	257	308	591	459
				San Martin	Barranquita	358	520	396	
				Amazonas	Lonya Chico	458	478	281	
		430 < inhab < 2000	Improvement and Expansion	Amazonas	Olto	658	686	285	325
				Amazonas	Puerto Naranjitos	663	864	399	
				San Martin	Lahuarpia	944	1377	440	
				Amazonas	Naranjitos	926	1131	222	
				San Martin	Misquiyacu	490	495	537	
Gravity without Treatment (GWOT)	C-1	430 < inhab < 2000	Improvement and Expansion	San Martin	Rumisapa	898	1,072	240	388
				San Martin	Sapotillo	254	353	594	
	C-2	200 < inhab <= 430	Improvement and Expansion	San Martin	Monte de los Olivos	267	402	260	260
				San Martin	Sta Rosillo	478	534	685	685
			New	San Martin	Pacchilla	537	607	366	366

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

**Table N° 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 Anexo 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. Thereafter, a proportional number (quantity) out of 1,500 localities was allocated to each group in accordance to the percentage obtained from the grouping of the sample localities.

- 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 than 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 N° 4.10.3-3 and Table N° 4.10.3-4.

**Table N° 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) <sup>2</sup>		493,946 hab.		
										Population (<430 inhab.)		157,181 hab.		
										Population (>430 inhab.)		336,765 hab.		
Type of System	Sample Localities = 22 <sup>1</sup>					All localities (Program)					Direct Investment Cost for Population Size <sup>2</sup> (Nuevos Soles)			
	N° of Localities				Average per-capita-cost (soles/capita) <sup>3</sup>		N° 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.	Total	
GWOT-New	-	0%	-	0%	-	-	-	-	-	-	-	-	-	
GWOT-Imp/Exp	-	0%	2	18%	-	388	-	73	321	836	-	23,757,240	23,757,240	
GWT-New	-	0%	-	0%	-	0	-	-			-	-	-	-
GWT-Imp/Exp	2	18%	1	9%	663	481	89	37			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	
<b>Total</b>	<b>11</b>	<b>100%</b>	<b>11</b>	<b>100%</b>	-	-	<b>489</b>	<b>403</b>			-	-	<b>116,485,410</b>	<b>184,179,840</b>
<b>Average Direct Per-capita-cost (PCC) (Soles/inhabitant)</b>										<b>741</b>	<b>547</b>	<b>609</b>		

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 N° 4.10.3-1 and Table N° 4.10-2

**Table N° 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) <sup>2</sup>		367,829 hab.
											Population (<430 inhab.)		81,064 hab.
											Population (>430 inhab.)		286,765 hab.
Type of System	Sample Localities = 15 <sup>1</sup>					All localities (Program)					Direct Investment Cost for Population Size <sup>2</sup> (Nuevos Soles)		
	N° of Localities				Average per-capita-cost (soles/capita) <sup>3</sup>		N° 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.		Total
GWOT-New	1	14%	1	13%	594	685	37	42	311	861	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			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%	-	-	-	-			-	-	-
<b>Total</b>	<b>7</b>	<b>100%</b>	<b>8</b>	<b>100%</b>	<b>-</b>	<b>-</b>	<b>261</b>	<b>332</b>	<b>-</b>	<b>-</b>	<b>48,927,914</b>	<b>104,095,695</b>	<b>153,023,609</b>
<b>Average Direct Per-capita-cost (PCC) (Soles/inhabitant)</b>											<b>604</b>	<b>363</b>	<b>416</b>

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 N° 4.10.3-1 and Table N° 4.10-2

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

Summaries of the direct per-capita cost calculations are shown below in Table N° 4.10.3-5. The per-capita-costs varied from 228 to 1,535 soles/capita. The maximum per-capita-cost (1,535 soles)<sup>4</sup> 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 N° 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
<b>GWOT-New</b>	-	-	594	685
<b>GWOT-Imp/Exp</b>	-	388	260	366
<b>GWT-New</b>	-	-	1,535	-
<b>GWT-Imp/Exp</b>	663	481	459	325
<b>PWOT-New</b>	886	614	-	-
<b>PWOT-Imp/Exp</b>	574	341	-	228
<b>MP</b>	677	654	-	-

Note: The per-capita costs are based on the Tables N° 4 .10.3-1 and N° 4.10.3-2.

In Table N° 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 5.

In Table N° 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 Pumping Without Treatment (45%) and Manual Pumps (32%), these most often being new works (68%), while the most frequently-used system in Conglomerate C-2 were Gravity With Treatment (68%).

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.

<sup>4</sup> This cost is from the Casual locality, whose system has a conveyance pipe of 4.7 km.



**Table N° 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
<b>Per-capita cost</b>	<b>741</b>	<b>547</b>	<b>604</b>	<b>363</b>
<b>(Soles/capita)</b>	(134%)	(100%)	(166%)	(100%)

1/: These averages are based on Tables N° 4.10.3-1 y N° 4.10.3-2.

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 represent 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 N° 4.10.3-7.

**Table N° 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
<b>Per-Capita Cost</b>	<b>609</b>	<b>416</b>
<b>(Soles/inhabitant)</b>	146%	100%

1/: These averages are based on Tables N° 4.10.3-3y N° 4.10.3-4 and Appendix 5.

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-groupe 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 groupe (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 N° 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 N° 4.10.3-7.

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

Conglomerate	Incremental population to be served by the program in 2030 <sup>1/</sup> (inhab.)	Direct Per-capita-cost (Soles/capita) <sup>3/</sup>	Total (Thousands of Nuevos Soles)
C-1	409,300 <sup>1/</sup>	493	200,148
	344,900 <sup>2/</sup>	116	41,388
C-2	294,800 <sup>1/</sup>	314	92,606
	230,100 <sup>2/</sup>	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 N° 4.1.3-7

(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<sup>th</sup> (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 N° 4.10.3-9, Table N° 4.10.3-10, Table N° 4.10.3-11 and Table N° 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 N° 4.10.3-9: Calculation of the Direct Per-capita Cost for Sanitation – Latrines  
Conglomerate C-1**  
(Nuevos Soles as of May 2009)

Conglom-erate	Pop. Size (inhab.)	Latrine Type	Region	Sample Locality	Benefitted 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		
	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 N° 4.10.3-10: Calculation of the Direct Per-capita Cost for Sanitation – Latrines  
Conglomerate C-2**  
(Nuevos Soles as of May 2009)

Conglom-erate	Pop. size (inhab.)	Latrine Type	Region	Sample Locality	Benefitted 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	
	Compost-ing 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	
Compost-ing 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 N° 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)

Conglom-erate	Pop. size (inhab.)	Latrine Type	Region	Sample Locality	Benefitted 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 N° 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)

Conglom-erate	Pop. Size (inhab.)	Inter-vention Type	Region	Sample Locality	Benefitted 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 <sup>1</sup>
			Amazonas	Naranjitos	822	984	671	
		Improve-ment and Expansion'	Amazonas	Lonya Chico	458	478	602	597 <sup>1</sup>
			Amazonas	Olto	540	686	517	
			San Martin	Posic	1,440	2,715	672	

<sup>1</sup>/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 N° 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) Direct 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 N° 4.10.3-13: 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) <sup>2</sup> = 397,443 (inhab.)	
Latrine Type	Sample Localities <sup>1</sup>			Target Localities		Direct Cost (for pop=2011)  (Nuevos Soles)
	Number of Localities		Direct Per- capita Cost <sup>3</sup> (Nuevos Soles)	Locality	Average Pop/loc (inhab.)	
	N°	(%)		N°		
Dry- pit latrine	10	45%	179	398	455	32,337,401
Pour-flush Latrine	0	0%	0	0		-
Composting Latrine	12	55%	375	477		81,295,143
<b>Total</b>	<b>22</b>	<b>100%</b>	<b>-</b>	<b>875</b>	<b>455</b>	<b>113,632,544</b>
<b>Average Direct Per-capita Cost</b>						<b>286</b>

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 from Table N° 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 N° 4.10.3-14.

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

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 from Table N° 4.10.3-10

Source: JICA Study Team (2010)

In case the benefited population of some localities of the Program is reluctant to accept ventilated dry-pit latrines a second technical option would be the installation of pour-flush latrines with septic tanks and percolation pit for the final disposal of the waste waters. As it can be observed in Table N° 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 N° 4.10.3-9) and for Conglomerate C-2 (Table N° 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 N° 4.10.3-15 and Table N° 4.10.3-16.

As can be seen, these average direct per-capita costs are higher by 23% for Conglomerate C-1 and 38 % for Conglomerate C-2 in relation to the average direct per-capita costs that do not include 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 5)



**Table N° 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) <sup>2</sup> : 397,443 hab.
Latrine Type	Sample Localities <sup>1</sup>		Localities of the Program		Direct Cost (for pop=2011)  (Nuevos Soles)
	Number of Localities		Locality	Average Pop/loc (inhab.)	
	N°	(%)	(Nuevos Soles)		N°
Dry-pit latrine	6	27%	179	239	19,402,441
Pour-flush Latrine	4	18%	543	159	39,238,456
Composting Latrine	12	55%	375	477	81,295,143
<b>Total</b>	<b>22</b>	<b>100%</b>	<b>-</b>	<b>875</b>	<b>139,936,039</b>
<b>Costo Directo Per cápita Promedio (CPC) (Soles/habitante)</b>					<b>352</b>

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 N° 4.10.3-9 and Table 4.10.3-10

Source: JICA Study Team (2010)

**Table N° 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					Población (2011) 2/= 257,767 hab.
Latrine Type	Sample Localities <sup>1</sup>		Localities of the Program		Direct Cost (for pop=2011)  (Nuevos Soles)
	Number of Localities		Locality	Average Pop/loc (hab.)	
	N°	(%)	(Soles/inhab.)		N°
Dry-pit latrine	9	75%	153	423	29,578,798
Pour-flush Latrine	2	17%	546	94	23,456,824
Composting Latrine	1	8%	404	47	8,678,166
<b>Total</b>	<b>12</b>	<b>100%</b>	<b>-</b>	<b>564</b>	<b>61,713,788</b>
<b>Average Direct Per-capita Cost</b>					<b>239</b>

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 N° 4.10.3-10 and Table N° 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 simple 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 N° 4.10.3-12 of this the present 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 N° 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	352	116,803
	Sewerage (main facilities) 1/	8,013	516	4,135
	Sewerage (Connections)	6,772	95	643
C-2	Latrines	193,434	239	46,231
	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 projects (localities) of water supply and sanitation, is attached in Appendix 5.

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

The implementation of the soft-component borne by the the Executing Contractor, will be carried out based on the social file that the Operating Consultant (OC) will design, whose details are described in item 4.19.3 this activities will be executed in parallel to the construction works of the investment stage of the Program and during a year period in the post-execution stage, in an intermittent manner, for the follow-up and monitoring specially of the community organizations and the management units of the municipalities. The soft-component costs (implementation stage) consist of the following:

- i) Professional fees and charges for the experts and administrative support staff expressed in man/months (M/M), which include the basic salary of the personnel, the general expenses of the executing contractor (financial expenses, social security expenses and other social benefits such as vacation time, illness leave, insurance).
- ii) The Direct Costs for the soft-component activities include local staff services for social promotion activities, assistance to community organizations and management units, as well as the costs for hygiene education campaigns for the population, materials and inputs for capacity-building, hygiene education and promotion workshops. Likewise, these costs include airfare, communication/transportation costs, per diem, accommodation, vehicles, office supplies, stationary, office rental, and other costs related to the preparation of the soft-component reports, manuals, guidelines and documents in general.

The soft-component implementation costs for the investment and post-investment stage of each conglomerate are presented in Table N° 4.10.3-18 and Table N° 4.10.3-19.

**Table N° 4.10.3-18: Soft-component Costs for Conglomerate C-1**  
(Thousands Nuevos Soles as of May 2009 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	371	1,112	1,511	4,534	1,614	4,842	3,496	10,488
B-1. Direct and Indirect Costs	1,208	3,624	4,907	14,720	5,242	15,727	11,357	34,071
B-2. Direct Costs (work in the localities)	1,288	3,864	5,460	16,380	5,852	17,556	12,600	37,800
<b>Total (A)+(B1)+(B2)1 /</b>	<b>2,867</b>	<b>8,600</b>	<b>11,878</b>	<b>35,634</b>	<b>12,708</b>	<b>38,125</b>	<b>27,453</b>	<b>82,359</b>

1/ VAT is not included

Source: JICA

Study Team (2010)- Detailed Budget for soft-component implementation in Appendix 5-

**Table N° 4.10.3-19: Soft-component Costs for Conglomerate C-2**  
(Thousands Nuevos Soles as of May 2009 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	157	470	1,331	3,994	882	2,646	2,370	7,111
B-1. Direct and Indirect Costs	540	1,621	4,723	14,168	3,108	9,323	8,371	25,112
B-2. Direct Costs (work in the localities)	532	1,596	4,788	14,364	3,080	9,240	8,400	25,200
<b>Total (A)+(B1)+(B2) 1/</b>	<b>1,229</b>	<b>3,687</b>	<b>10,842</b>	<b>32,526</b>	<b>7,070</b>	<b>21,210</b>	<b>19,141</b>	<b>57,423</b>

1/ VAT is not included

Source: JICA Study Team (2010)- Detailed Budget for soft-component implementation in Appendix 5-

(5) Program Consultancy Costs (Operating Consultant) for conglomerates C-1 and C-2

The details regarding the Program's consultancy services activities are specified in Item 4.19.3; the activities are summarized by stage as follows:

- 1) Pre-investment Stage: Preparation of the individual *Perfils*
  - Formulation and evaluation of the projects including the soft-component (Capacity Building)
- 2) Investment Stage: Preparation of the Detailed Design
  - Engineering (detailed design and tendering documents)
  - Soft-component Design (Capacity building)
- 3) Investment Stage: Advice Tendering and Supervision of Works
  - Advice in the tendering of works
  - Supervision of works
  - Supervision of the Soft-component implementation
- 4) Post-Execution Stage (Twelve months)
  - Supervision of the Soft-component in an intermittent manner (Capacity building, follow-up)

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 Consultant and Supervising Consultant).
- 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. 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 local rent.

Table N° 4.10.3-20, Table N° 4.10.3-21 and Table N° 4.10.3-22 show the costs of services of the Operative Consultant.

**Table N° 4.10.3-20: Cost of the Preparation of the *Perfils* of the Program's Projects in Conglomerate C-1 and C-2**

(Thousands Nuevos Soles as of May 2009 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	143	429	693	2,079	597	1,792	1,433	4,300
B-1. Direct and Indirect Costs	392	1,176	1,796	5,389	1,572	4,716	3,761	11,282
B-2. Direct Costs (field work)	1,859	5,577	10,110	30,330	8,766	26,298	20,735	62,205
<b>Total (A)+(B1)+(B2) 1/</b>	<b>2,394</b>	<b>7,182</b>	<b>12,599</b>	<b>37,798</b>	<b>10,935</b>	<b>32,806</b>	<b>25,929</b>	<b>77,787</b>

1/ VAT is not included

Source: JICA Study Team (2010)- Detailed Budget for *Perfils* Preparation in Appendix 5

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

(Thousands Nuevos Soles as of May 2009 exchange rate)

Componentes	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and charges	380	1,140	2,008	6,025	1,754	5,263	4,143	12,428
B-1. Direct and Indirect Costs	774	2,322	3,834	11,501	3,359	10,076	7,966	23,899
B-2. Direct Costs (field work)	2,541	7,623	14,508	43,523	12,666	37,998	29,714	89,143
<b>Total (A)+(B1)+(B2) 1/</b>	<b>3,695</b>	<b>11,086</b>	<b>20,350</b>	<b>61,049</b>	<b>17,779</b>	<b>53,336</b>	<b>41,824</b>	<b>125,471</b>

1/ VAT is not included

Source: JICA Study Team (2010)- Detailed Budget for Project Files Preparation in Appendix 5

**Table N° 4.10.3-22: Costs Advising, Supervision of Works and Soft-component Implementation of the Program's Projects in Conglomerates C-1 and C-2**  
(Thousands Nuevos Soles as of May 2009 exchange rate)

Componentes	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and charges	1,214	3,641	6,633	19,898	5,780	17,340	13,626	40,878
B-1. Direct and Indirect Costs	2,069	6,207	10,911	32,733	9,516	28,549	22,496	67,489
B-2. Direct Costs (field supervision work)	1,144	3,432	6,442	19,325	5,614	16,843	13,200	39,600
<b>Total (A)+(B1)+(B2) 1/</b>	<b>4,427</b>	<b>13,280</b>	<b>23,985</b>	<b>71,956</b>	<b>20,911</b>	<b>62,732</b>	<b>49,322</b>	<b>147,967</b>

1/ VAT is not included

Source: JICA Study Team (2010)- Detailed Budget for Advising, Supervision of Works and Soft-component Implementation in Appendix 5

(6) Costs of Consultancy of the Program (Supervising Consultant) 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).

The cost of the services of the Supervising Consultant to carry out the supervision of the *Perfils* and project files (social and engineering designs) is shown in Table N° 4.10.3-23.

**Table N° 4.10.3-23: Costs of the Supervising Consultant – Project *Perfils* for Program Conglomerates C-1 and C-2**  
(Thousands Nuevos Soles as of May 2009 exchange rate)

Componentes	1st Phase		2nd Phase		3rd Phase		Total	
	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles	USD	Nuevos Soles
A. Professional Fees and charges	246	737	527	1,582	527	1,582	1,300	3,901
B-1. Direct and Indirect Costs	407	1,221	865	2,595	865	2,595	2,137	6,410
<b>Total (A)+(B1)+(B2)</b>	<b>653</b>	<b>1,958</b>	<b>1,392</b>	<b>4,177</b>	<b>1,392</b>	<b>4,177</b>	<b>3,437</b>	<b>10,311</b>
<b>Project File: detailed design of works and soft-component implementation plan</b>								
A. Professional Fees and charges	340	1,021	949	2,846	949	2,846	2,238	6,714
B-1. Direct and Indirect Costs	564	1,693	1,553	4,658	1,553	4,658	3,670	11,009
<b>Total (A)+(B1)+(B2)</b>	<b>905</b>	<b>2,714</b>	<b>2,501</b>	<b>7,504</b>	<b>2,501</b>	<b>7,504</b>	<b>5,908</b>	<b>17,723</b>

1/ VAT is not included

Source: JICA Study Team (2010)- Detailed Budget for the Supervising Consultant in Appendix 5

(7) Administration Costs for the Program PMU – PAPT – Component 3

This cost item includes costs for management, monitoring, and evaluation of the Program in all of the phases of the project cycle and the execution phases carried out by the PMU-PAPT. The following were also considered: elaboration of designs and implementation of the

program processes, follow-up and monitoring for the execution of Program components, capacity-building workshops for the PMU personnel, equipping of the PMU-PAPT (acquisition of vehicles, computing equipment, and other); and contracting of Program auditors.

The estimated cost is 5% of the costs of water and sanitation infrastructure, soft-component implementation, and consultant services (*Perfils*, detailed design, supervision of works and soft-component).

#### 4.10.4 Total Program Cost

The total cost of the Water and Sanitation Program for the Rural Amazon Area, including all components and line items described in the preceding sections, amounts to 1.52 billion Nuevos Soles (49.45 billion Japanese Yen = USD 507.2 million); this is presented in Table N° 4.10.3-17. 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 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 is related to the number of Program localities be included in the projects. Accordingly, the costs are distributed as follows: 9% for the first phase (130 localities), 49% for the second phase (732 localities) and 42% for the third phase (638 localities).

Table N° 4.10.4-1 shows a summary of the Program costs, which are made up of the following:

- Component 1 (Conglomerate C-1): : 53.7 % (USD 272,267 thousand)
- Component 2 (Conglomerate C-2): : 26.4% (USD 133,647 thousand)
- Component 3: : 4.0% (20,296 thousand thousand)
- VAT (19%): : 16.0% (80,980 thousand 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: 54.4%
- Soft-component: 10.9%
- *Perfil* Development: 6.2%
- Detailed Design Development: 9.8%
- Tendering Advice and Supervision of Works: 11.6%
- Supervision of *Perfils* and Detailed Designs: 2.3%
- Program Administration: 4.8%

**Table N° 4.10.4-1: Total Cost of Water and Sanitation Program for the Rural Amazon**  
(Thousands Price Units at May 2009 exchange rate)

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

Source: JICA Study Team (2010); 1/ Includes Capacity-building of PMU-PAPT



**Table N° 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)

Item	Description	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
<b>1)</b>	<b>Component 1 – Conglomerate C-1</b>	<b>816,735</b>	<b>26,543,890</b>	<b>272,245</b>	<b>85,346</b>	<b>2,773,741</b>	<b>28,449</b>	<b>354,904</b>	<b>11,534,382</b>	<b>118,301</b>	<b>376,485</b>	<b>12,235,768</b>	<b>125,495</b>
1.1	Water Infrastructure	316,783	10,295,449	105,594	32,382	1,052,424	10,794	137,273	4,461,361	45,758	147,128	4,781,664	49,043
1.2	Sanitation Infrastructure	159,272	5,176,333	53,091	16,281	529,136	5,427	69,018	2,243,077	23,006	73,973	2,404,119	24,658
1.3	Soft-component implementation (implementation stage)	82,359	2,676,652	27,453	8,600	279,502	2,867	35,634	1,158,097	11,878	38,125	1,239,053	12,708
1.4	Perfils (Water and Sanitation)	52,930	1,720,223	17,643	5,569	180,981	1,856	23,402	760,561	7,801	23,959	778,681	7,986
1.5	Detailed Design of Works and Soft-component (Water and Sanitation)	85,345	2,773,723	28,448	8,595	279,342	2,865	37,797	1,228,391	12,599	38,954	1,265,990	12,985
1.6	Advisory and Supervision of Works and Soft-component implementation (Water and Sanitation)	100,661	3,271,478	33,554	10,296	334,627	3,432	44,549	1,447,853	14,850	45,815	1,488,998	15,272
1.7	Supervision de Perfils (Water and Sanitation)	7,154	232,510	2,385	1,518	49,333	506	2,586	84,040	862	3,050	99,137	1,017
1.8	Supervision of Design (Water and Sanitation)	12,231	397,523	4,077	2,104	68,396	701	4,646	151,001	1,549	5,481	178,127	1,827
<b>2)</b>	<b>Component 2 – Conglomerate C-2</b>	<b>401,005</b>	<b>13,032,665</b>	<b>133,668</b>	<b>25,925</b>	<b>842,564</b>	<b>8,642</b>	<b>228,938</b>	<b>7,440,488</b>	<b>76,313</b>	<b>146,142</b>	<b>4,749,613</b>	<b>48,714</b>
2.1	Water Infrastructure	152,026	4,940,847	50,675	9,628	312,920	3,209	86,655	2,816,283	28,885	55,743	1,811,644	18,581
2.2	Sanitation Infrastructure	70,619	2,295,126	23,540	4,473	145,358	1,491	40,253	1,308,222	13,418	25,894	841,546	8,631
2.3	Soft-component implementation (implementation stage)	57,423	1,866,244	19,141	3,687	119,825	1,229	32,526	1,057,098	10,842	21,210	689,321	7,070
2.4	Perfils (Water and Sanitation)	24,857	807,842	8,286	1,614	52,442	538	14,397	467,890	4,799	8,846	287,511	2,949
2.5	Detailed Design of Works and Soft-component (Water and Sanitation)	40,125	1,304,076	13,375	2,491	80,943	830	23,252	755,694	7,751	14,383	467,438	4,794
2.6	Advisory and Supervision of Works and Soft-component implementation (Water and Sanitation)	47,306	1,537,447	15,769	2,983	96,963	994	27,406	890,705	9,135	16,916	549,779	5,639
2.7	Supervision de Perfils (Water and Sanitation)	3,157	102,600	1,052	440	14,295	147	1,591	51,701	530	1,126	36,604	375
2.8	Supervision of Design (Water and Sanitation)	5,492	178,482	1,831	610	19,819	203	2,858	92,895	953	2,024	65,769	675
<b>3)</b>	<b>Component 3</b>	<b>60,887</b>	<b>1,978,828</b>	<b>20,296</b>	<b>5,564</b>	<b>180,815</b>	<b>1,855</b>	<b>29,192</b>	<b>948,743</b>	<b>9,731</b>	<b>26,131</b>	<b>849,269</b>	<b>8,710</b>
3.1	Program Administration 1/	60,887	1,978,828	20,296	5,564	180,815	1,855	29,192	948,743	9,731	26,131	849,269	8,710
<b>4)</b>	<b>VAT (19%)</b>	<b>242,939</b>	<b>7,895,523</b>	<b>80,980</b>	<b>22,199</b>	<b>721,453</b>	<b>7,400</b>	<b>116,477</b>	<b>3,785,486</b>	<b>38,826</b>	<b>104,264</b>	<b>3,388,583</b>	<b>34,755</b>
<b>Total</b>		<b>1,521,566</b>	<b>49,450,905</b>	<b>507,189</b>	<b>139,033</b>	<b>4,518,573</b>	<b>46,344</b>	<b>729,511</b>	<b>23,709,099</b>	<b>243,170</b>	<b>653,023</b>	<b>21,223,233</b>	<b>217,674</b>

Source: JICA Study Team (2010); 1/ Includes Capacity-building of PMU-PAPT

## **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 704,200 inhabitants through the provision of clean water and 563,500 inhabitants with 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 communal 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 for an approximation in monetary terms because of 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, due to the fact that the execution of water systems is not foreseeable, nor is the improvement of service quality.

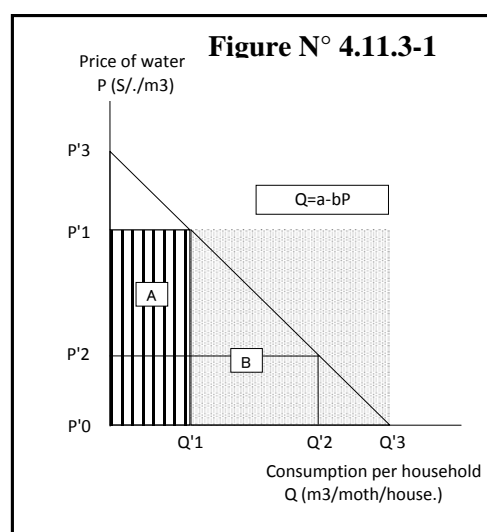
##### (2) Benefits in “with-project” situation

###### 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.



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 leaves 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<sup>1</sup> 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 N° 4.11.3-1.

**Table N° 4.11.3-1: Prevalence of Diarrhea in children under 5 years old**

Department/Natural Region	Percentage with Diarrhea (%)	Treatment		
		Health Provider (%)	ORT* (%)	No Treatment (%)
<b>Amazonia Region</b>				
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
<b>Natural Region</b>				
Lima Metropolitana	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
<b>Total</b>				
National	14.7	41.4	71.3	10.2

ORT\*: Oral Rehydration Therapy

Source: JICA Study Team (2010)- ENDES Continua 2004-2006

<sup>1</sup> 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.

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 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 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 (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<sup>1</sup>.

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 26.6 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 proposed adopting an average of the determined costs per ADD episode 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 Study will use the frequency of four (4) 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 N° 4.11.3-1, and it is deduced that the frequency of ADD episodes is greater than the MINSA average at the national level.

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<sup>2</sup> Economic Faculty Magazine from the National University of San Marcos (Spanish: *Universidad Nacional Mayor de San Marcos, UNMSM*), Year X, N° 28, October – December 2005.

**Table N° 4.11.3-2: Calculation of Cost-saving Health Benefits**

Total Population in Year 1 of Project Operation (inhab.)	
Population of children under 5 years of age (%)	
Population of children under 5 years of age (inhab., year 1) 1/	A
Number of diarrheic episodes in one year	4
<b>Total cost per ADD episode (Soles 2009) *1</b>	<b>Cost (S/.)</b>
on the part of the family	20.8
on the part of the State	5.5
<b>Total cost per ADD episode (Soles/case)</b>	<b>26.30</b>
<b>Total Annual Cost of ADD's (Soles)</b>	<b>Ax4x26.30</b>

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 shown in Table N° 4.11.3-3 y 4.11.3-4.

**Table N° 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(inh ab.)	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	30,660	79,259	95,728	115,546	26,352	113,014	103,140	134,406	79,363	128,283
2	30,660	81,071	96,917	119,964	27,932	113,014	103,140	139,904	79,363	130,410
3	30,660	82,884	98,106	124,382	29,512	113,014	104,711	145,402	80,100	131,474
4	30,660	84,696	99,889	128,800	31,091	113,014	104,711	150,351	80,837	132,538
5	31,622	86,509	101,078	134,322	32,671	113,014	106,282	155,849	81,573	133,602
6	31,622	88,321	102,267	138,740	34,251	113,014	107,852	161,347	81,573	134,665
7	31,622	90,133	103,456	143,158	35,831	113,014	107,852	166,296	82,310	135,729
8	32,583	91,946	105,239	148,681	37,411	114,637	109,423	171,794	83,046	137,857
9	32,583	93,758	106,428	153,099	38,990	114,637	109,423	177,292	83,783	138,921
10	32,583	93,758	107,617	157,517	40,570	114,637	109,423	182,790	84,519	139,984
11	32,583	95,571	109,401	161,935	43,730	114,637	110,994	187,739	84,519	141,048
12	33,544	97,383	110,590	166,353	45,309	114,637	110,994	193,237	85,256	142,112
13	33,544	99,196	111,779	170,771	46,889	114,637	112,565	198,735	85,993	143,176
14	33,544	101,008	112,968	175,189	48,469	114,637	114,136	203,683	86,729	145,303
15	33,544	102,821	114,751	179,607	50,049	114,637	114,136	209,182	86,729	146,367
16	34,505	104,633	115,940	185,129	51,628	114,637	115,706	214,680	87,466	147,431
17	34,505	106,446	117,129	189,547	53,208	114,637	115,706	219,628	87,466	148,494
18	34,505	108,258	118,912	195,070	54,788	114,637	117,277	225,126	87,466	149,558
19	34,505	110,071	120,101	198,383	56,368	114,637	117,277	230,624	87,466	150,622
20	35,466	111,883	121,290	203,906	57,948	114,637	117,277	235,573	87,466	152,749

Source: JICA Study Team (2010)

Table N° 4.11.3-3: Gross Economic Benefits of the Projects of Conglomerate C-1 / (2/2)

Locality	Cahuite	San Juan de Puritana	Amazonas	20 de Enero	San Pablo de Cuyana	Tarapoto	Panguana	Lupuna	Apayacu	Buen Jesus de Paz	Huanta	Santa Amelia
Average Population (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	91,063	83,513	60,242	44,362	64,457	69,813	68,158	59,340	37,543	70,774	141,123	56,884
2	91,703	83,513	60,826	44,984	64,457	69,813	68,158	59,965	38,015	70,774	142,484	57,703
3	92,343	84,353	61,409	44,984	65,417	69,813	68,803	59,965	38,486	71,545	143,846	57,703
4	92,343	85,192	61,993	45,607	65,417	70,810	68,803	60,589	38,958	72,316	145,208	58,521
5	92,982	86,032	61,993	45,607	65,417	70,810	68,803	60,589	38,958	73,087	146,569	59,340
6	93,622	86,871	62,577	46,230	66,378	71,807	69,448	61,213	39,430	73,858	147,931	59,340
7	93,622	86,871	63,160	46,230	66,378	71,807	69,448	61,213	39,902	74,629	149,293	60,159
8	94,261	87,710	63,744	46,852	66,378	71,807	69,448	61,213	40,373	74,629	150,655	60,978
9	94,901	88,550	63,744	46,852	67,338	71,807	70,093	61,837	40,373	75,400	152,016	60,978
10	95,540	89,389	64,327	47,475	67,338	72,804	70,093	61,837	40,845	76,171	153,378	61,796
11	95,540	90,229	64,911	47,475	67,338	72,804	70,093	62,462	41,317	76,942	154,740	62,615
12	96,180	90,229	65,494	48,097	68,299	72,804	70,737	62,462	41,789	77,713	156,101	62,615
13	96,180	91,068	65,494	48,097	68,299	73,802	70,737	63,086	41,789	77,713	157,463	63,434
14	96,820	91,908	66,078	48,720	68,299	73,802	71,382	63,086	42,260	78,484	158,825	64,253
15	97,459	92,747	66,662	48,720	69,260	73,802	71,382	63,710	42,732	79,255	160,186	64,253
16	98,099	93,587	66,662	49,343	69,260	74,799	71,382	63,710	42,732	80,027	161,548	65,071
17	98,099	93,587	66,662	49,343	69,260	74,799	71,382	63,710	43,204	80,798	162,910	65,890
18	98,738	94,426	66,662	49,965	70,220	75,796	72,027	63,710	43,675	81,569	164,271	65,890
19	98,738	95,266	66,662	49,965	70,220	75,796	72,027	63,710	44,147	81,569	165,633	66,709
20	99,378	96,105	66,662	50,588	70,220	75,796	72,672	63,710	44,147	82,340	166,995	67,527

Source: JICA Study Team (2010)



**Table N° 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	Barranquita	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	108,368	175,882	43,594	114,718	26,503	94,973	113,571	119,082	100,840	16,827	37,568	31,093	65,510	61,630	78,521
2	110,525	178,581	46,257	116,649	27,396	96,025	113,571	127,032	116,228	18,495	37,568	33,261	67,464	62,425	78,521
3	112,681	182,631	48,921	118,581	27,396	96,025	113,571	136,572	130,517	19,330	38,815	34,344	67,464	63,219	79,377
4	114,838	185,330	51,585	118,581	27,396	96,025	114,491	144,522	142,608	20,998	38,815	35,428	68,441	64,014	80,234
5	116,995	188,030	51,585	120,512	28,289	96,025	114,491	155,652	157,996	22,667	40,062	36,512	68,441	65,604	80,234
6	128,856	197,479	54,248	122,443	30,075	97,077	115,411	163,602	172,285	24,336	40,062	38,679	70,395	66,399	81,090
7	132,091	200,178	56,912	124,375	30,075	97,077	115,411	171,552	192,069	25,170	40,062	39,763	71,372	67,194	81,946
8	134,247	204,228	59,576	124,375	30,968	97,077	115,411	179,502	207,458	26,839	41,308	40,847	71,372	67,989	81,946
9	136,404	206,927	59,576	126,306	30,968	97,077	116,331	189,042	225,044	29,342	41,308	41,931	72,349	69,579	82,803
10	138,561	209,627	62,240	128,238	30,968	98,129	116,331	196,992	241,531	31,011	42,555	44,098	73,326	70,374	83,659
11	140,717	213,676	64,903	128,238	31,861	98,129	117,250	206,532	259,118	32,679	42,555	45,182	74,302	71,169	84,516
12	143,952	216,376	67,567	130,169	31,861	98,129	117,250	216,072	278,902	34,348	43,801	46,266	75,279	71,964	84,516
13	146,109	219,075	67,567	132,100	31,861	99,181	117,250	224,022	297,588	35,183	43,801	47,349	75,279	73,554	85,372
14	148,265	221,775	70,231	134,032	32,754	99,181	118,170	231,972	319,571	36,851	43,801	49,517	77,233	74,348	86,229
15	150,422	225,824	72,894	134,032	32,754	99,181	118,170	239,922	339,356	38,520	45,048	50,601	77,233	75,143	86,229
16	152,579	228,524	72,894	135,963	32,754	100,233	118,170	247,872	360,240	40,189	45,048	51,684	78,210	75,938	87,085
17	155,813	231,223	75,558	137,895	33,647	100,233	119,090	257,412	383,322	41,023	46,295	52,768	78,210	77,528	87,941
18	157,970	233,923	78,222	137,895	33,647	100,233	119,090	266,952	405,305	42,692	46,295	53,852	80,164	78,323	87,941
19	160,127	237,972	78,222	139,826	33,647	100,233	120,009	274,902	428,387	45,195	46,295	56,020	81,141	79,118	88,798
20	162,283	240,672	80,885	141,757	34,539	101,285	120,009	284,442	452,568	46,864	47,541	57,103	81,141	79,913	89,654

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

Cost-Benefit analysis is 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 and the non-incremental and incremental benefits
- 3) The conversion of the costs and benefits from market prices to social prices

Through this process, a social cash flow is established in each sample locality to identify the net social benefits for each project evaluation period.

#### (2) Sanitation projects

The Cost-Effectiveness analysis will be 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 in the Program with the goal of evaluating the economic viability of each one.
- 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 are shown in Appendix 7.

#### 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 N° 4.12.3-1 and Table N° 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 22 sample localities in Conglomerate C-1 at the social discount rate of 11.0% is positive 3.4 million Soles, and the IRR is 15.4%. For Conglomerate C-2, which has 15 sample localities, the NPV is positive 5.6 million Soles while the IRR is 19.1%.

**Table N° 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	30,220	27,228	78,632	70,848	94,744	85,365	111,564	100,519	25,166	22,675	111,905	100,827	100,618	90,657
2	30,219	24,538	79,666	64,689	94,111	76,418	109,130	88,614	25,300	20,543	111,905	90,867	100,618	81,702
3	30,218	22,120	81,478	59,642	95,292	69,754	114,861	84,078	26,800	19,618	111,905	81,915	102,187	74,801
4	30,218	19,913	83,291	54,889	96,156	63,367	119,148	78,519	28,317	18,661	111,897	73,740	102,187	67,341
5	30,324	18,012	85,103	50,551	98,244	58,357	123,087	73,114	29,833	17,721	111,897	66,467	98,090	58,266
6	31,177	16,680	86,916	46,500	99,424	53,192	128,818	68,917	31,350	16,772	111,897	59,865	103,583	55,417
7	31,177	15,027	88,728	42,767	100,605	48,492	130,723	63,008	32,866	15,842	111,897	53,934	105,325	50,767
8	31,282	13,576	90,540	39,295	101,469	44,038	137,044	59,477	34,383	14,922	110,854	48,111	105,152	45,636
9	32,136	12,565	92,353	36,110	103,557	40,491	142,784	55,828	35,899	14,037	113,512	44,383	106,894	41,796
10	32,135	11,312	93,132	32,782	104,737	36,868	147,062	51,766	15,531	5,467	113,512	39,956	102,971	36,246
11	32,134	10,187	94,165	29,850	105,602	33,476	151,349	47,978	39,113	12,399	113,504	35,981	106,721	33,831
12	32,241	9,221	95,978	27,450	107,689	30,799	155,636	44,512	42,013	12,016	113,504	32,462	108,464	31,021
13	33,094	8,538	97,790	25,230	108,870	28,088	158,471	40,885	43,529	11,231	113,504	29,284	108,291	27,939
14	33,093	7,678	99,603	23,108	110,050	25,532	164,201	38,095	45,046	10,451	113,495	26,331	109,860	25,487
15	33,093	6,916	101,415	21,196	110,915	23,181	168,488	35,214	46,562	9,732	113,495	23,721	107,678	22,505
16	33,199	6,241	103,228	19,407	113,002	21,244	172,437	32,418	48,079	9,039	113,495	21,337	111,429	20,949
17	34,052	5,755	105,040	17,752	114,183	19,297	178,158	30,109	49,595	8,382	113,495	19,181	113,171	19,126
18	34,052	5,176	106,853	16,242	115,047	17,487	181,299	27,557	51,112	7,769	113,495	17,251	112,998	17,176
19	34,051	4,665	108,665	14,887	117,134	16,047	187,933	25,747	52,613	7,208	113,495	15,549	114,740	15,719
20	34,157	4,201	110,478	13,589	118,315	14,553	190,135	23,387	54,129	6,658	113,495	13,960	114,740	14,113
<b>IRR/NPV</b>	13.1%	31,548	12.7%	77,986	21.3%	352,774	15.6%	283,983	8.6%	-56,201	22.8%	410,484	22.9%	388,745

Source: JICA Study Team (2010)

**Table N° 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	69,934	63,011	120,327	108,415	89,052	80,236	79,694	71,804	56,454	50,865	41,859	37,715	61,654	55,550
2	124,178	100,832	69,934	56,786	121,728	98,844	88,789	72,097	79,694	64,712	56,985	46,271	42,447	34,467	61,654	50,063
3	129,076	94,483	70,278	51,443	122,988	90,027	89,410	65,448	79,478	58,178	57,515	42,101	42,412	31,046	61,648	45,126
4	133,763	88,150	70,901	46,724	123,968	81,695	90,294	59,504	80,271	52,898	58,046	38,253	43,000	28,337	62,565	41,230
5	138,382	82,199	71,524	42,485	124,948	74,219	90,031	53,478	81,064	48,152	58,046	34,480	43,000	25,542	62,565	37,164
6	143,280	76,655	71,803	38,415	125,927	67,371	90,652	48,499	81,857	43,793	58,577	31,339	43,588	23,320	62,559	33,469
7	147,968	71,320	72,148	34,775	126,908	61,170	91,536	44,120	82,866	39,941	59,108	28,490	43,553	20,993	63,477	30,596
8	152,587	66,223	72,771	31,582	128,589	55,808	91,273	39,612	82,650	35,870	59,639	25,883	44,141	19,157	63,477	27,549
9	157,485	61,577	73,394	28,697	129,848	50,770	91,893	35,930	83,443	32,626	59,639	23,319	44,141	17,259	63,471	24,817
10	162,383	57,159	74,017	26,054	130,827	46,051	92,514	32,565	84,236	29,651	60,170	21,180	44,729	15,745	64,388	22,665
11	161,328	51,141	54,827	17,380	110,979	35,180	65,983	20,917	55,796	17,687	4,122	1,307	1,041	330	37,617	11,924
12	171,689	49,103	74,641	21,347	132,788	37,977	93,135	26,637	86,038	24,607	61,232	17,512	45,282	12,951	64,382	18,413
13	176,587	45,560	75,264	19,418	133,768	34,512	94,019	24,257	85,822	22,142	61,232	15,798	45,282	11,683	65,299	16,847
14	181,274	42,056	75,887	17,606	135,449	31,424	93,756	21,751	86,615	20,095	61,763	14,329	45,870	10,642	65,299	15,149
15	185,894	38,852	76,166	15,919	136,708	28,572	94,377	19,725	87,408	18,268	62,294	13,019	45,835	9,580	65,294	13,646
16	190,792	35,869	76,510	14,384	137,688	25,885	94,998	17,860	88,201	16,582	62,294	11,711	38,066	7,156	66,211	12,448
17	195,479	33,036	76,510	12,930	138,668	23,435	95,882	16,204	89,210	15,076	62,294	10,528	46,423	7,846	66,211	11,190
18	200,098	30,415	76,510	11,629	139,648	21,227	95,619	14,534	88,994	13,527	62,294	9,469	47,011	7,146	66,205	10,063
19	204,996	28,085	76,510	10,482	140,628	19,266	96,503	13,221	89,786	12,301	62,294	8,534	46,976	6,436	67,122	9,196
20	209,683	25,791	76,789	9,445	142,308	17,504	96,240	11,837	90,579	11,141	62,294	7,662	47,599	5,855	67,122	8,256
<b>IRR/ NPV</b>	18.4%	442,158	12.1%	38,933	20.9%	425,876	12.6%	70,178	11.8%	31,946	12.8%	49,195	13.4%	46,472	13.6%	75,351

Source: JICA Study Team (2010)

**Table N° 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 (Muestra)	
	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	66,447	59,869	65,139	58,690	57,402	51,719	35,747	32,208	68,452	61,675	134,635	121,306	53,862	48,529	1,675,576	1,509,694
2	66,447	53,955	65,139	52,893	58,001	47,097	36,196	29,391	68,423	55,559	134,355	109,096	54,641	44,369	1,679,560	1,363,802
3	66,447	48,639	65,746	48,126	58,001	42,457	36,645	26,824	69,165	50,629	135,632	99,283	54,602	39,969	1,701,785	1,245,706
4	66,439	43,783	65,746	43,326	58,600	38,617	37,095	24,445	69,907	46,069	136,909	90,223	55,381	36,496	1,724,097	1,136,180
5	67,386	40,027	65,746	39,053	58,600	34,808	37,072	22,021	70,649	41,965	138,186	82,083	56,161	33,359	1,739,937	1,033,523
6	67,377	36,047	66,353	35,499	59,199	31,671	37,521	20,074	71,391	38,194	139,463	74,613	56,121	30,025	1,768,834	946,326
7	68,325	32,932	66,353	31,982	59,199	28,534	37,970	18,302	72,133	34,768	140,741	67,837	56,901	27,426	1,790,505	863,023
8	68,325	29,653	66,353	28,797	59,199	25,692	38,419	16,674	72,104	31,293	142,018	61,636	57,680	25,033	1,809,947	785,517
9	68,325	26,715	66,959	26,181	59,798	23,381	38,397	15,013	72,846	28,483	143,295	56,028	57,641	22,538	1,837,708	718,544
10	68,316	24,047	66,959	23,570	59,798	21,049	38,846	13,674	73,588	25,903	144,572	50,889	58,420	20,564	1,832,843	645,161
11	69,263	21,956	66,959	21,226	60,397	19,146	-4,559	-1,445	26,342	8,351	91,803	29,101	22,523	7,140	1,467,010	465,042
12	69,263	19,809	67,566	19,324	60,397	17,274	39,744	11,367	75,072	21,471	147,126	42,078	59,160	16,920	1,903,039	544,269
13	69,255	17,868	67,566	17,432	19,739	5,093	39,721	10,248	75,043	19,361	148,403	38,288	59,939	15,464	1,880,489	485,166
14	70,202	16,287	68,173	15,816	60,996	14,151	40,171	9,320	75,785	17,582	149,680	34,726	60,719	14,087	1,946,988	451,701
15	70,202	14,672	68,173	14,248	61,595	12,873	40,620	8,490	76,527	15,994	150,958	31,550	60,680	12,682	1,964,376	410,554
16	70,194	13,196	68,173	12,817	61,595	11,580	34,736	6,530	68,908	12,955	152,235	28,620	54,118	10,174	1,959,584	368,402
17	71,141	12,023	68,173	11,521	61,570	10,405	41,046	6,937	78,011	13,184	153,512	25,944	62,238	10,518	2,014,062	340,377
18	71,132	10,812	68,780	10,455	57,535	8,745	41,495	6,307	78,753	11,970	154,789	23,528	62,199	9,454	2,025,917	307,939
19	72,080	9,875	68,780	9,423	61,544	8,432	41,944	5,746	78,724	10,785	156,066	21,381	62,978	8,628	2,055,563	281,612
20	72,080	8,866	69,387	8,535	61,544	7,570	41,922	5,156	79,466	9,774	157,343	19,353	63,758	7,842	2,073,564	255,048
<b>IRR/ NPV</b>	11.9%	31,772	12.7%	54,871	13.3%	61,280	11.4%	7,533	17.0%	165,493	15.4%	259,430	15.8%	111,391	15.4%	3,361,198

Source: JICA Study Team (2010)

**Table N° 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	108,061	97,363	175,508	158,133	43,103	38,836	113,109	101,911	25,255	22,754	93,806	84,519	113,512	102,274	110,245	99,331
2	108,482	88,087	176,818	143,576	44,726	36,318	114,254	92,774	25,674	20,847	93,981	76,313	113,511	92,171	116,939	94,954
3	110,629	80,981	180,166	131,881	47,388	34,688	116,184	85,046	26,146	19,139	94,856	69,435	113,509	83,088	127,716	93,488
4	112,775	74,319	183,544	120,956	50,051	32,983	116,967	77,081	26,145	17,230	94,855	62,509	113,687	74,920	133,155	87,749
5	114,923	68,264	186,234	110,623	51,088	30,346	118,111	70,158	26,564	15,779	94,854	56,343	114,425	67,969	146,767	87,179
6	118,968	63,648	192,200	102,827	53,749	28,756	120,042	64,222	27,872	14,911	95,029	50,840	114,603	61,313	154,708	82,769
7	129,097	62,225	198,340	95,600	56,411	27,190	121,971	58,790	28,817	13,890	95,904	46,225	115,342	55,595	162,649	78,397
8	132,107	57,334	201,688	87,533	59,074	25,638	122,755	53,275	29,236	12,688	95,902	41,622	115,341	50,058	169,344	73,495
9	134,253	52,493	205,067	80,181	59,072	23,097	123,899	48,444	29,708	11,616	95,901	37,497	115,518	45,167	180,120	70,427
10	136,400	48,013	207,755	73,130	61,735	21,731	125,829	44,292	29,707	10,457	96,076	33,819	116,257	40,922	186,806	65,756
11	138,547	43,919	211,103	66,920	64,396	20,414	126,612	40,136	30,126	9,550	96,951	30,733	116,434	36,910	196,336	62,239
12	140,908	40,300	214,483	61,342	67,058	19,179	127,757	36,538	30,598	8,751	96,950	27,728	117,173	33,512	207,113	59,234
13	143,918	37,131	217,172	56,030	67,056	17,300	129,686	33,459	30,598	7,894	97,124	25,058	117,171	30,230	215,054	55,484
14	146,064	33,887	219,860	51,008	68,680	15,934	131,616	30,535	31,016	7,196	97,999	22,736	117,349	27,225	222,995	51,735
15	148,211	30,976	223,208	46,651	71,341	14,910	132,400	27,672	31,489	6,581	97,997	20,481	118,088	24,680	230,937	48,266
16	150,358	28,267	226,587	42,598	72,379	13,607	133,544	25,106	31,488	5,920	98,172	18,456	118,087	22,200	237,641	44,677
17	152,719	25,810	229,277	38,748	74,002	12,506	135,474	22,895	31,907	5,392	99,047	16,739	118,264	19,987	247,182	41,774
18	155,728	23,671	231,965	35,259	76,664	11,653	136,257	20,711	32,379	4,922	99,046	15,055	119,003	18,088	257,967	39,211
19	157,876	21,629	235,313	32,238	77,702	10,645	137,402	18,824	32,378	4,436	99,045	13,569	119,180	16,328	264,672	36,260
20	160,022	19,683	238,692	29,359	79,324	9,757	139,331	17,138	32,797	4,034	99,220	12,204	119,919	14,750	275,457	33,881
<b>IRR/ NPV</b>	20.3%	421,696	47.0%	1,177,993	14.3%	91,335	16.4%	270,215	13.5%	33,581	32.5%	471,874	34.3%	585,270	17.6%	475,266

Source: JICA Study Team (2010)



**Table N° 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 (Muestra)	
	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	93,334	84,094	11,812	10,643	37,400	33,697	28,778	25,929	63,795	57,479	59,518	53,625	76,596	69,013	1,153,832	995,598
2	96,870	78,659	11,855	9,626	37,400	30,369	29,800	24,198	63,304	51,403	59,138	48,020	75,929	61,655	1,168,682	922,960
3	111,950	81,947	13,499	9,881	38,013	27,826	31,361	22,957	65,749	48,128	59,901	43,847	76,770	56,195	1,213,836	877,028
4	125,682	82,824	14,352	9,458	38,644	25,466	32,398	21,351	65,504	43,167	60,663	39,977	77,610	51,145	1,246,033	825,120
5	138,487	82,261	16,017	9,514	39,257	23,319	33,435	19,861	66,726	39,635	61,085	36,285	78,244	46,477	1,286,217	780,945
6	153,566	82,158	17,682	9,460	39,887	21,340	34,981	18,715	66,235	35,436	62,984	33,696	78,434	41,962	1,330,941	742,377
7	169,006	81,461	19,326	9,315	39,887	19,226	36,544	17,614	68,435	32,986	63,747	30,726	79,274	38,210	1,384,750	708,549
8	187,708	81,465	20,180	8,758	40,501	17,577	37,581	16,310	69,657	30,231	64,503	27,994	79,258	34,398	1,424,833	669,515
9	203,546	79,586	21,866	8,550	41,131	16,082	38,618	15,100	69,412	27,140	64,925	25,386	80,098	31,318	1,463,134	633,264
10	220,816	77,727	24,343	8,569	41,744	14,694	40,164	14,138	70,389	24,777	66,823	23,522	80,938	28,490	1,505,783	601,008
11	237,496	75,286	26,008	8,245	42,375	13,433	41,727	13,228	71,365	22,623	67,586	21,425	81,779	25,924	1,548,842	570,376
12	255,523	73,080	27,673	7,914	42,988	12,295	42,764	12,231	72,342	20,690	68,349	19,548	81,762	23,384	1,593,442	542,214
13	274,983	70,946	29,317	7,564	43,618	11,254	43,800	11,301	73,564	18,980	68,771	17,743	82,603	21,311	1,634,435	515,024
14	294,300	68,278	30,171	7,000	43,618	10,119	45,347	10,521	73,073	16,953	70,663	16,394	83,443	19,359	1,676,194	490,277
15	315,698	65,981	31,836	6,654	44,232	9,244	46,910	9,804	75,518	15,783	71,425	14,928	83,427	17,436	1,722,718	466,753
16	335,664	63,105	33,501	6,298	44,862	8,434	47,946	9,014	75,273	14,151	72,188	13,571	84,267	15,842	1,761,957	444,138
17	356,976	60,329	35,145	5,939	45,476	7,685	48,983	8,278	76,495	12,928	72,610	12,271	85,107	14,383	1,808,662	423,799
18	379,722	57,718	35,998	5,472	46,106	7,008	50,067	7,610	76,004	11,553	74,509	11,325	85,746	13,033	1,857,161	406,632
19	401,878	55,057	37,682	5,162	46,106	6,317	51,708	7,084	78,204	10,714	75,271	10,312	85,937	11,773	1,900,353	388,757
20	425,129	52,291	40,158	4,939	46,719	5,746	53,318	6,558	79,426	9,769	76,028	9,351	86,777	10,674	1,952,318	373,145
<b>IRR/ NPV</b>	19.3%	674,384	3.5%	-169,554	11.1%	1,218	15.6%	77,566	15.1%	123,676	17.4%	164,129	10.4%	-27,250	19.1%	5,649,629

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 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.

**Table N° 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
<b>PCV</b>	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
<b>APS</b>	273	1,668	377	561	418	338	266	804	274	408	262	379	6,026
<b>Density (inhab./household)</b>	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
<b>CEI (Soles/inhab.)</b>	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 N° 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 N° 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							Total 1/	Total 2/
	Puerto Naranjitos	Naranjitos	Lonya Chico	Olto	Posic	Misquiyacu			
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	
<b>PCV (Nuevos Soles)</b>	425,946	697,555	193,806.24	218,977	485,231	190,193	1,123,501	1,029,823	
<b>APS (inhab.)</b>	555	903	315	384	890	465	1,458	2,054	
<b>CEI (Soles/inhab.)</b>	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
<b>PCV (Nuevos Soles)</b>	183,838	337,049	161,149	176,555	374,436	207,935	1,066,526	1,440,962
<b>APS (inhab.)</b>	781	1,038	468	672	2,187	519	3,478	5,665
<b>CEI (Soles/inhab.)</b>	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

##### (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, which result from the product of these per-capita benefits and the incremental population served, including the existing population served, which 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.

For some localities where the projects will be implemented in the last phases of the Program, the benefits will remain constant after the year 2030 (the last year in the Program evaluation period), until culmination of the evaluation period of said projects, which is fixed at 20 years.

Cash flows for each Conglomerate have been produced with the information previously described for the purpose of making an economic evaluation at the Program level. Table N° 4.12.4-1 and Table N° 4.12.4-2 show cash flow for Conglomerate C-1 and Conglomerate C-2, respectively.

**Table N° 4.12.4-1: Cash Flow for Conglomerate C-1**  
(Monetary units at May 2009 exchange rates)

Año	Flujo Neto de 23 Muestras (S/.)	Flujo Neto de Beneficios per Capita (S/.)	Costo de Inversión (S/.)			Beneficios Netos (Beneficios Brutos Total - Costos de Operación y Mantenimiento)										Flujo Neto (S/.)	Valor Actual del Flujo Neto (S/.)			
			Fase 1	Fase 2	Fase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020					
						Población Beneficiada Incremental (hab.)														
			-54,919,645	-228,229,734	-242,021,839	52,824	17,041	17,414	17,789	18,164	48,613	53,986	50,723	56,192	48,351					
0	2010																			
1	2011	139	-13,729,911			7,324,074											-6,405,837	-5,771,659		
2	2012	140	-13,729,911			7,413,506	2,362,763										-3,953,642	-3,210,357		
3	2013	142	-13,729,911			7,512,767	2,391,614	2,414,501									-1,411,029	-1,032,873		
4	2014	144	-13,729,911	-34,234,460		7,609,307	2,423,636	2,443,984	2,466,405								-33,021,040	-21,760,865		
5	2015	146		-64,665,091		7,710,337	2,454,780	2,476,707	2,496,521	2,518,451							-47,008,296	-27,922,928		
6	2016	148		-64,665,091		7,816,378	2,487,372	2,508,533	2,529,948	2,549,203	6,740,133						-40,033,525	-21,417,936		
7	2017	150		-64,665,091		7,897,478	2,521,581	2,541,839	2,562,458	2,583,335	6,822,435	7,485,171					-68,554,071	-33,043,062		
8	2018	152			-36,303,276	8,016,001	2,547,744	2,576,797	2,596,480	2,616,531	6,913,782	7,576,570	7,032,729				-28,696,220	-12,454,159		
9	2019	153			-68,572,854	8,106,894	2,585,980	2,603,533	2,632,189	2,651,271	7,002,625	7,678,014	7,118,604	7,791,049			-20,402,694	-7,977,454		
10	2020	155			-68,572,854	8,195,170	2,615,302	2,642,606	2,659,500	2,687,734	7,095,600	7,776,678	7,213,916	7,886,183	6,703,860		-13,096,305	-4,609,899		
11	2021	157				8,295,858	2,643,780	2,672,571	2,699,413	2,715,621	7,193,186	7,879,930	7,306,616	7,991,773	6,785,719		56,184,466	17,810,476		
12	2022	159				8,391,789	2,676,263	2,701,672	2,730,022	2,756,376	7,267,820	7,988,303	7,403,627	8,094,468	6,876,574		56,886,914	16,269,657		
13	2023	161				8,484,423	2,707,210	2,734,866	2,759,749	2,787,631	7,376,894	8,071,187	7,505,449	8,201,940	6,964,939		57,594,286	14,859,326		
14	2024	163				8,588,177	2,737,094	2,766,491	2,793,656	2,817,985	7,460,540	8,192,317	7,583,323	8,314,742	7,057,413		58,311,738	13,528,323		
15	2025	164				8,680,464	2,770,565	2,797,029	2,825,961	2,852,608	7,541,777	8,285,210	7,697,132	8,401,012	7,154,474		59,006,233	12,332,303		
16	2026	165				8,719,722	2,800,337	2,831,233	2,857,156	2,885,594	7,634,438	8,375,427	7,784,409	8,527,093	7,228,707		59,644,116	11,213,094		
17	2027	168				8,864,252	2,813,002	2,861,657	2,892,095	2,917,447	7,722,720	8,478,330	7,869,173	8,623,781	7,337,194		60,379,652	10,204,161		
18	2028	170				8,973,338	2,859,628	2,874,599	2,923,173	2,953,124	7,807,969	8,576,371	7,965,856	8,717,685	7,420,390		61,072,133	9,282,964		
19	2029	171				9,047,183	2,894,819	2,922,246	2,936,393	2,984,858	7,903,450	8,671,042	8,057,971	8,824,793	7,501,190		61,743,946	8,458,921		
20	2030	173				9,146,754	2,918,642	2,958,208	2,985,064	2,998,357	7,988,380	8,777,078	8,146,920	8,926,841	7,593,351		62,439,594	7,680,070		
																VAN Social	23,389,441	*3		
																TIR Social	14.1%	*4		
1	2031						2,950,763	2,982,552	3,021,799	3,048,055	8,024,507	8,871,395	8,246,547	9,025,380	7,681,159		53,852,159	5,977,590		
2	2032							3,015,377	3,046,667	3,085,566	8,157,514	8,911,516	8,335,163	9,135,749	7,765,948		51,453,501	5,145,350		
3	2033								3,080,198	3,110,958	8,257,903	9,059,226	8,372,859	9,233,921	7,860,916		48,975,980	4,407,838		
4	2034									3,145,196	8,325,861	9,170,711	8,511,640	9,275,682	7,945,388		46,374,478	3,756,333		
5	2035										8,417,493	9,246,181	8,616,387	9,429,427	7,981,322		43,690,809	3,189,429		
6	2036											9,347,941	8,687,295	9,545,469	8,113,613		35,694,317	2,355,825		
7	2037												8,782,904	9,624,022	8,213,462		26,620,388	1,570,603		
8	2038													9,729,941	8,281,053		18,010,994	954,583		
9	2039														8,372,192		8,372,192	401,865		
																Beneficios Residuales del Futuro	333,044,818	*5	27,759,415	*6

VAN Social (\*3) calculado por agregar \*2 y \*6 (actualizado al año 2030)

TIR Social (\*4) calculado despues de agregar \*1 y \*5 (actualizado al año 2030)

Source: JICA Study Team (2010)

**Table N° 4.12.4-2: Cash Flow for Conglomerate C-2**  
(Monetary units at May 2009 exchange rates)

Año	Flujo Neto de 16 Muestras (S/.)	Flujo Neto de Beneficios per Cápita (S/.)	Costo de Inversión (S/.)			Beneficios Netos (Beneficios Brutos Total - Costos de Operación y Mantenimiento)										Flujo Neto (S/.)	Valor Actual del Flujo Neto (S/.)			
			Fase 1	Fase 2	Fase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020					
						Población Beneficiada Incremental (hab.)														
0	2010		-17,145,025	-151,310,608	-96,564,277	49,025	11,865	12,238	12,620	13,011	31,123	35,107	33,165	37,295	35,301					
1	2011	1,160,059	122.7	-4,286,256			6,014,027										1,727,771	1,556,722		
2	2012	1,200,082	126.9	-4,286,256			6,221,517	1,455,522									3,390,783	2,753,316		
3	2013	1,239,864	131.1	-4,286,256			6,427,755	1,505,739	1,501,277								5,148,514	3,768,712		
4	2014	1,273,534	134.7	-4,286,256	-22,696,591		6,602,310	1,555,653	1,553,072	1,548,091							-15,723,722	-10,361,933		
5	2015	1,313,128	138.9		-42,871,339		6,807,577	1,597,899	1,604,555	1,601,502	1,596,093						-29,663,713	-17,620,246		
6	2016	1,371,646	145.0		-42,871,339		7,110,947	1,647,578	1,648,129	1,654,590	1,651,160	3,817,898					-25,341,037	-13,557,455		
7	2017	1,414,717	149.6		-42,871,339	-14,484,642	7,334,236	1,721,000	1,699,370	1,699,523	1,705,894	3,949,619	4,306,679				-34,939,658	-16,840,915		
8	2018	1,452,409	153.6			-27,359,878	7,529,641	1,775,041	1,775,100	1,752,361	1,752,220	4,080,546	4,455,264	4,068,406			-171,299	-74,344		
9	2019	1,494,050	158.0			-27,359,878	7,745,521	1,822,333	1,830,839	1,830,453	1,806,697	4,191,358	4,602,952	4,208,770	4,575,064		5,254,109	2,054,357		
10	2020	1,535,921	162.4			-27,359,878	7,962,588	1,874,580	1,879,618	1,887,931	1,887,210	4,321,669	4,727,952	4,348,287	4,732,908	4,330,429	10,593,294	3,728,839		
11	2021	1,579,434	167.0				8,188,173	1,927,115	1,933,508	1,938,230	1,946,470	4,514,258	4,874,945	4,466,371	4,889,800	4,479,833	39,158,703	12,413,309		
12	2022	1,624,850	171.8				8,423,616	1,981,711	1,987,694	1,993,801	1,998,330	4,656,009	5,092,190	4,605,232	5,022,589	4,628,335	40,389,508	11,551,399		
13	2023	1,663,486	175.9				8,623,914	2,038,694	2,044,007	2,049,677	2,055,623	4,780,058	5,252,089	4,810,457	5,178,743	4,754,024	41,587,286	10,729,520		
14	2024	1,711,269	181.0				8,871,635	2,087,170	2,102,780	2,107,745	2,113,232	4,917,106	5,392,019	4,961,510	5,409,526	4,901,828	42,864,550	9,944,576		
15	2025	1,752,984	185.4				9,087,896	2,147,123	2,152,781	2,168,352	2,173,101	5,054,907	5,546,612	5,093,698	5,579,389	5,120,271	44,124,130	9,221,943		
16	2026	1,794,835	189.8				9,304,862	2,199,463	2,214,619	2,219,911	2,235,586	5,198,116	5,702,055	5,239,738	5,728,040	5,281,052	45,323,441	8,520,807		
17	2027	1,845,198	195.1				9,565,954	2,251,974	2,268,604	2,283,678	2,288,744	5,347,583	5,863,598	5,386,581	5,892,266	5,421,754	46,570,734	7,870,454		
18	2028	1,889,587	199.8				9,796,081	2,315,163	2,322,765	2,339,346	2,354,488	5,474,738	6,032,200	5,539,186	6,057,397	5,577,199	47,808,563	7,266,902		
19	2029	1,936,282	204.8				10,038,156	2,370,859	2,387,941	2,395,196	2,411,883	5,631,999	6,175,634	5,698,460	6,229,006	5,733,500	49,072,634	6,722,951		
20	2030	1,987,399	210.2				10,303,159	2,429,446	2,445,387	2,462,405	2,469,464	5,769,288	6,353,028	5,833,959	6,408,116	5,895,933	50,370,186	6,195,533		
																VAN Social	78,044,292	*3		
																TIR Social	24.3%	*4		
1	2031						2,493,583	2,505,817	2,521,642	2,538,757	5,907,026	6,507,894	6,001,538	6,560,489	6,065,465	41,102,210	4,562,345			
2	2032							2,571,969	2,583,956	2,599,831	6,072,775	6,663,265	6,147,836	6,748,937	6,209,690	39,598,260	3,959,826			
3	2033								2,652,171	2,664,077	6,218,867	6,850,234	6,294,611	6,913,454	6,388,063	37,981,477	3,418,333			
4	2034									2,734,407	6,372,544	7,015,029	6,471,235	7,078,507	6,543,782	36,215,507	2,933,456			
5	2035										6,540,777	7,188,381	6,626,913	7,277,128	6,700,010	34,333,209	2,506,324			
6	2036											7,378,151	6,790,674	7,452,193	6,888,010	28,509,028	1,881,596			
7	2037												6,969,945	7,636,348	7,053,714	21,660,007	1,277,940			
8	2038													7,837,944	7,228,022	15,065,966	798,496			
9	2039														7,418,838	7,418,838	356,104			
																Beneficios Residuales del Futuro	261,884,502	*5	21,694,421	*6

VAN Social (\*3) calculado por agregar \*2 y \*6 (actualizado al año 2030)  
TIR Social (\*4) calculado después de agregar \*1 y \*5 (actualizado al año 2030)  
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 23.4 million Soles, and the IRR is 14.1%. For Conglomerate C-2, the NPV is 78.1 million Soles while the IRR is 24.3%.

Adding the total benefits and costs of the two conglomerates into a single cash flow shows that the Water and Sanitation Project for the Rural Amazon is viable from the social point of view, reflecting the value that the families assign to the costs of said Program. In this sense, the NPV of the Program is positive 86.5 million Soles and the IRR is 16.4%, as shown in Table N° 4.12.4-3.

**Table N° 4.12.4-3: Cash Flow Chart for All of Program: Conglomerates C-1 and C-2**  
(Monetary units at May 2009 exchange rates)

Año	Costo de Inversión (S/.)			Beneficios Netos (Beneficios Brutos Total - Costos de Operación y Mantenimiento)										Flujo Neto (S/.)	Valor Actual del Flujo Neto (S/.)		
	Fase 1	Fase 2	Fase 3	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020				
	Población Beneficiada Incremental (hab.)																
0	2010	-76,092,850	-400,762,083	-338,605,057	101,849	28,906	29,652	30,408	31,175	79,735	89,093	83,888	93,487	83,652	0	0	
1	2011	-19,023,213			13,338,102										-5,685,111	-5,122,285	
2	2012	-19,023,213			13,635,023	3,818,285									-1,569,904	-1,274,762	
3	2013	-19,023,213			13,940,522	3,897,353	3,915,778								2,730,440	1,998,682	
4	2014	-19,023,213	-60,114,312		14,211,617	3,979,289	3,997,056	4,014,496							-52,935,068	-34,884,210	
5	2015		-113,549,257		14,517,914	4,052,678	4,081,262	4,098,023	4,114,544						-82,684,835	-49,114,792	
6	2016		-113,549,257		14,927,325	4,134,950	4,156,662	4,184,538	4,200,363	10,558,031					-71,387,388	-38,192,253	
7	2017		-113,549,257	-50,790,759	15,231,714	4,242,581	4,241,209	4,261,981	4,289,229	10,772,054	11,791,850				-109,509,397	-52,783,530	
8	2018			-95,938,100	15,545,642	4,322,785	4,351,897	4,348,841	4,368,751	10,994,328	12,031,834	11,101,135			-28,872,886	-12,530,832	
9	2019			-95,938,100	15,852,415	4,408,313	4,434,372	4,462,642	4,457,968	11,193,984	12,280,966	11,327,374	12,366,113		-15,153,952	-5,925,195	
10	2020			-95,938,100	16,157,758	4,489,882	4,522,224	4,547,431	4,574,944	11,417,269	12,504,629	11,562,204	12,619,091	11,034,289	-2,508,378	-882,949	
11	2021				16,484,031	4,570,895	4,606,079	4,637,644	4,662,091	11,707,444	12,754,874	11,772,987	12,881,573	11,265,552	95,343,170	30,223,785	
12	2022				16,815,406	4,657,974	4,689,367	4,723,822	4,754,706	11,923,829	13,080,493	12,008,858	13,117,057	11,504,910	97,276,422	27,821,057	
13	2023				17,108,337	4,745,904	4,778,873	4,809,426	4,843,254	12,156,952	13,323,275	12,315,907	13,380,682	11,718,963	99,181,572	25,588,846	
14	2024				17,459,811	4,824,264	4,869,271	4,901,401	4,931,217	12,377,646	13,584,336	12,544,833	13,724,267	11,959,241	101,176,288	23,472,899	
15	2025				17,768,360	4,917,689	4,949,810	4,994,313	5,025,708	12,596,685	13,831,821	12,790,830	13,980,402	12,274,746	103,130,362	21,554,246	
16	2026				18,024,584	4,999,801	5,045,852	5,077,067	5,121,181	12,832,553	14,077,482	13,024,147	14,255,133	12,509,758	104,967,557	19,733,901	
17	2027				18,430,206	5,064,976	5,130,261	5,175,773	5,206,192	13,070,303	14,341,927	13,255,754	14,516,048	12,758,947	106,950,386	18,074,615	
18	2028				18,769,419	5,174,791	5,197,364	5,262,519	5,307,612	13,282,707	14,608,571	13,505,042	14,775,082	12,997,589	108,880,695	16,549,866	
19	2029				19,085,339	5,265,678	5,310,187	5,331,589	5,396,741	13,535,449	14,846,676	13,756,431	15,053,799	13,234,689	110,816,580	15,181,871	
20	2030				19,449,913	5,348,088	5,403,596	5,447,469	5,467,822	13,757,668	15,130,106	13,980,879	15,334,956	13,489,284	112,809,780 *1	13,875,603 *2	
															VAN Social	86,515,746 *3	
															TIR Social	16.4% *4	
1	2031				5,444,346	5,488,369	5,543,442	5,586,812	13,931,533	15,379,289	14,248,085	15,585,869	13,746,624	94,954,369	10,539,935		
2	2032					5,587,346	5,630,623	5,685,397	14,230,289	15,574,781	14,482,999	15,884,687	13,975,639	91,051,761	9,105,176		
3	2033						5,732,369	5,775,035	14,476,770	15,909,460	14,667,469	16,147,375	14,248,979	86,957,457	7,826,171		
4	2034							5,879,604	14,698,405	16,185,741	14,982,875	16,354,189	14,489,171	82,589,985	6,689,789		
5	2035								14,958,269	16,434,562	15,243,300	16,706,555	14,681,332	78,024,018	5,695,753		
6	2036									16,726,092	15,477,968	16,997,662	15,001,623	64,203,346	4,237,421		
7	2037										15,752,849	17,260,370	15,267,176	48,280,394	2,848,543		
8	2038											17,567,885	15,509,075	33,076,960	1,753,079		
9	2039												15,791,030	15,791,030	757,969		
															Beneficios Residuales del Futuro	594,929,320 *5	49,453,837 *6

VAN Social (\*3) calculado por agregar \*2 y \*6 (actualizado al año 2030)  
TIR Social (\*4) calculado después de agregar \*1 y \*5 (actualizado al año 2030)  
Source: JICA Study Team (2010)

Table N° 4.10.4-4 shows the summary of the results of the economic evaluation at both the sample level and the Program level for the water projects.

**Table N° 4.12.4-4: Summary of the Economic Evaluation of Water Projects at Sample and Program Levels**  
(Monetary units at May 2009 exchange rates)

Indicators	Sample			Program		
	Water Projects					
	Conglom. C-1	Conglom. C-2	Total	Conglom. C-1	Conglom. C-2	Total
NPV (S/.)	3,361,198	5,649,629	9,010,827	23,389,441	78,044,292	86,515,746
IRR (%)	15.4	19.1	16.9	14.1	24.3	16.4

Source: JICA Study Team (2010)

(2) Sanitation Projects

The average CEI values at social prices for different types of sanitation facilities and Conglomerates are calculated based on the sample localities. These CEI's at private prices, excluding the soft-component intervention costs, would have to be compared with referential per-capita cost values or previously-calculated cut-off lines for different types of facilities in the Program.

**Table N° 4.12.4-5: Average Sanitation CEI Values for Sanitation Program**  
(Monetary units at May 2009 exchange rates)

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

Source: JICA Study Team (2010)

### 4.13 Sensitivity Analysis

For *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 from Conglomerate C-1 maintain their profitability with a 8% increase in the investment costs while the projects from Conglomerate C-2 is economically viable with an increase in investment costs of up to 58%. For the variation of benefits, the projects in Conglomerate C-1 maintain their profitability with a 8.5% decrease in net benefits per capita, and those in Conglomerate C-2 maintain project profitability with a decrease in benefits of up to 36%.

A similar behavior is seen for the Program (the sum of the two conglomerates); in other words, the profitability is maintained up to a 19% increase in investment costs and a 17.5% decrease in benefits. The results of the sensitivity analysis are shown in Table N° 4.13-1 and Table N° 4.13-2:

**Table N° 4.13-1: Variation 1- Increases in Investment Costs**  
(Monetary units at May 2009 exchange rates)

Conglomerate C-1		Conglomerate C-2		Program	
Increase	NPV (S/.)	Increase	NPV (S/.)	Increase	NPV (S/.)
Base	23,389,441	Base	78,044,292	Base	86,515,746
2%	18,038,200	5%	71,218,717	5%	65,566,169
4%	12,686,959	10%	64,393,142	10%	44,616,593
6%	7,335,718	15%	57,567,568	15%	23,667,017
8%	1,984,477	25%	43,916,418	18%	11,097,271
9%	-691,143	35%	30,265,269	19%	2,717,440
10%		55%	2,962,970	21%	-1,472,475
11%		58%	-1,132,375		

**Table N° 4.13-2: Variation 2- Decreases in Benefits**  
(Monetary units at May 2009 exchange rates)

Conglomerate C-1		Conglomerate C-2		Program	
Decrease	NPV (S/.)	Decrease	NPV (S/.)	Decrease	NPV (S/.)
Base	Base	23,389,441	Base	78,044,292	Base
5%	5%	8,841,867	5%	67,316,503	5%
7%	7%	3,022,837	10%	56,588,713	7%
8%	8%	113,322	15%	45,860,924	10%
9%	9%	-2,796,193	25%	24,405,345	15%
10%			35%	2,949,767	17%
			37%	-1,341,349	18%

#### 4.14 Risk Analysis

The program is made up of two Conglomerates (Components) and one Activity, and each conglomerate by the respective water and sanitation projects. Once the Program's viability has been declared, the respective pre-investment studies will take place at the *Perfil* level for each water and sanitation project in each conglomerate, before starting the pre-investment stage of the Program.

Therefore, a risk analysis is proposed in the present Feasibility Study for the social evaluation of the behavior of the net present value (NPV) of each Conglomerate, under the variations of the investment costs and economic benefits in the case of the water projects, and the investment cost increases in the case of the sanitation projects.

These variations in costs and benefits are linked to the type of technical option that is selected for water storage through connections or public taps, and to the solution accepted by the inhabitants for the sanitation projects in each of the localities in the Conglomerates.

For this, it is proposed that the types of risks are assigned in a conservative, non-random manner, based on the results of the sensitivity analysis of the evaluation indicators for the water projects in the Conglomerates, and based on the average direct per-capita cost values for the sanitation projects. In this sense the proposal to assign the types of risks in order to make a decision on the basis of the results obtained is as follows:

- **High Risk:** For water projects, when the NPV results in a value close to, equal to or less than zero, a 8% decrease in benefits or 9% increase in costs in the sanitation projects would cause an increase in investment costs of over 30%, a consequence of changing the technical option for sanitation because of the reluctance or non-acceptance by the benefitted population.
- **Moderate Risk:** For water projects, when the NPV results in a value close to, equal to or less than zero, a 20% decrease in benefits or a 20% increase in costs in the sanitation projects would cause an increase in investment costs of up to 30%, a consequence of changing the technical option for sanitation because of the reluctance or non-acceptance by the benefitted population.

From this proposal, Table N° 4.14-1 shows the results obtained for the NPV and the assignment of the type of risk assumed by each of the Conglomerates. The conclusion is that the water projects in Conglomerate C-1 have high risk due the fact for a decrease in benefits (consumption and health benefits) of greater than 8% the NPV is negative, and in the same way for an increase in costs of greater than 10%, the NPV is also negative. The water projects in Conglomerate C-2 have moderate risks, due to the fact that for a 20% decrease in benefits and a 20% increase in costs the NPV remains positive.

**Table N° 4.14-1: Risk Assignment for the Conglomerates – Water Projects**

Conglomerate	Type of Risk		
	High Risk: 8.5% Decrease of Benefits or 9% Increase in Costs NPV<0	Moderate Risk: 20 % in Benefits -NPV < 0	Moderate Risk: 20 % Increase in Costs - NPV < 0
C-1	Yes	No	No
C-2	No	Yes	Yes

Source: JICA Study Team

**Table N° 4.14-2: Risk Assignment for the Conglomerates – Sanitation Projects**

Conglomerate	Type of Risk	
	High Risk, >30% Increase in Costs	Moderate Risk, < 30% Increase in Costs
C-1	No	Yes
C-2	Yes	No

Source: JICA Study Team

In the sanitation projects in Conglomerate C-2, there is a high risk of an increase in the average direct per-capita costs caused by a change in the type of latrines, especially from dry pit latrines to pour-flush latrines with septic tanks, in the case that the benefitted population rejects the application of the former in more of 50% of the localities; in Conglomerate C-1, this risk is only moderate, since most of the localities are foreseen to have composting latrines installed, whose direct per-capita cost is 40% lower. In that sense a change in the type of latrines from dry pit latrines to pour-flush latrines in 25% of the localities the total sanitation project cost would not go up by 30% (see Table N° 4.14-2).

#### 4.15 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<sup>7</sup>.

##### (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 must be administrated as such.
- 2) Water must be administrated at the lowest appropriate level, with the users' intervention 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

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<sup>7</sup> 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.



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.<sup>8</sup>

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:

#### 4.15.1 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 communal organizations. These arrangements involve the participation of the following entities 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 must be implemented to support the tasks of coordination, monitoring and administration of contracts that the execution of the Program will demand, since by delegation of powers it is the PAPT's duty to declare the Viability of the projects so they may pass to the stage of execution or investment. Although its internal organization is their own responsibility, it must create a team to perform as a specific Management Unit for the Program, which includes as one of its objectives to support the creation of such unit. 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 three (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

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<sup>8</sup> "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.

local municipalities and beneficiaries. Moreover, JICA has financed the Program's Perfil Study 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 a Management Unit with this specific task and this Unit should be in charge of its accounts in an independent way.
- 5) Community Organizations: They will be in charge of the administration, operation and maintenance of the sanitation services.

#### 4.15.2 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 N° 184-2008-EF*) and its regulations (*Decreto Supremo N° 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<sup>9</sup>, which establish that in the rural ambit, 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 must 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 Organic Law (*Ley Organica de Municipalidades, Ley N° 27972*), in its article 80° defines as one of the functions of the provincial municipalities, the provision of rural sanitation services when these cannot be

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<sup>9</sup> Art. 169° de la Ley N° 26338, TUO de la Ley General de Servicios de Saneamiento, por DS 023-2005-VIVIENDA, y Arts. 4° y 183-A° de la Ley N° 26338, modificada por DS 031-2008-VIVIENDA

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.

#### 4.15.3 Management Capacity

*“A system will be sustainable when the capacities at a communal 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”<sup>10</sup>.*

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 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 intervention program that seeks to support the local governments, the community organizations, and the community's population, in the creation and strengthening of capacities in communal 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 communal participation where the importance and valuation of water will be emphasized
- Organization for communal self-management; and
- A sanitary education program from the pre-execution stage throughout the execution and post-execution stages.

The component of social intervention for sustainability is transversal to the whole project cycle, and must 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-

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<sup>10</sup> Sustainability analysis of 43 water systems in the rural area of Honduras. Rural Aqueducts Studies 2004 (PAS, COSUDE)

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, beliefs 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.

#### 4.15.4 Coverage of the administration, operation and maintenance costs

The legal norms indicate that the family fees to be paid in retribution for the services must 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<sup>11</sup>.

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:

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<sup>11</sup> 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 must 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.

Applying 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 N° 4.15.4-1 and 4.15.4-2 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 1, which are all in the Low Forest Region and whose proposed water supply systems are mostly by pumping, with electric-mechanic gear that work with electricity, power generators or manual pumps, the proposed family fees for the water service vary from S/ 3.0 a S/ 11.5 per month and the percentage relation with the family income varies between 0.5 y 3.4%.

C1	Fee	Income	Relation
<b>Maximum</b>	11.5	860.0	3.4%
<b>Minimum</b>	3.0	175.0	0.5%

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/ 2.3 a S/ 16.3 per month and the percentage relation with the family income varies between 0.4 and 3.5%.

<b>C2</b>	<b>Fee</b>	<b>Income</b>	<b>Relation</b>
<b>Maximum</b>	16.3	701.0	3.5%
<b>Minimum</b>	2.3	248.0	0.4%

**Table N° 4.15.4 -1: Potable Water Administration, Operation and Maintenance Costs – Conglomerate C-1**

N°	Locality	Average Population (Yr 1 to Yr 20)	Type of Sytem	Type of Work	Cost of O&M Water (Soles)	Cost of O&M Sewerage (Soles)	Number of Users	Family Fee (Soles/month)	Family Income (Nuevos Soles)	Relation Fee/ Income
1	Tutumberos	226	GWT	R – I	2,768		55	4.05	662	0,6%
2	Guadalupe	378	GWT	R – I	3,445		77	4.19	995	0,4%
3	Rumisapa	985	GWOT	I – E	6,873		225	4.93	527	0,9%
4	Churuzapa y la Marginal	814	GWT	I – E	8,153		159	3.01	408	0,7%
6	Palestina	276	PWOT	I – E	4,271		60	5.27	671	0,8%
7	Misquiyacu	519	GWOT	I – E	4,480	3.943,0	121	9.66	309	3,1%
8	Yacucatina	202	PWOT	I – E	3,039		38	6.48	422	1,5%
9	Tres Islas	276	PWOT	C	5,904		57	6.11	503	1,2%
10	Sudadero	305	PWOT	I	6,734		52	11.03	403	2,7%
11	Monterrey	175	PWOT	I	11,172	3.625,0	47	30.5	472	6,5%
12	San Martin de Mojarral	122	PWOT	I	2,715		28	10.95	477	2,3%
13	San Francisco	2,228	PWOT	R – E	19,312		267	4.34	860	0,5%
14	10 de Julio	99	MP	C	1,644		21	5.96	670	0,9%
15	San Pedro	162	MP	C	4,589		32	14.51	441	3,3%
16	Sharara	395	PWOT	C	11,647		77	10.84	417	2,6%
17	Curiaca	597	PWOT	C	7,462		85	8.07	363	2,2%
18	Cahuide	558	PWOT	C	7,712		100	3.44	591	0,6%
19	San Juan de Puritana	522	PWOT	C	8,963		77	4.49	305	1,5%
20	Amazonas	428	MP	C	2,684		70	6.93	230	3,0%
21	20 de Enero	269	MP	C	3,659		53	7.29	213	3,4%
22	San Pablo	224	MP	C	5,228		57	5.34	235	2,3%
23	Tarapoto	257	MP	C	2,370		51	11.48	476	2,4%
24	Panguana	428	MP	C	2,407		75	6.47	303	2,1%
25	Lupuna	349	MP	C	2,388		70	4.84	175	2,8%
26	Apayacu	283	MP	C	2,628		56	4.05	532	0,8%
27	Buen Jesus de Paz	403	MP	C	8,985		66	5.5	522	1,1%
28	Huanta	855	PWOT	C	11,339		152	4.12	570	0,7%
29	Santa Amelia	291	MP	C	6,975		52	9.06	542	1,7%

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

**Table N° 4.15.4-2: Potable Water Administration, Operation and Maintenance Costs – Conglomerate C-2**

N°	Localitiy	Average Population (Year 1 to Year 20)	Type of Sytem	Type of Work	Cost of O&M Water (Soles)	Cost of O&M Sewarage. (Soles)	Users Number	Family Fee (Soles/month)	Family Income (Nuevos Soles)	Relation Fee/Income
1	Miraflores	206	GWOT	I – E	2,316		48	3.94	479	0,8%
2	Puerto Naranjitos	781	GWT	I – E	6,128	4.494,4	166	5.72	481	1,2%
3	Naranjitos	1,038	GWT	I – E	10,344	6.739,0	215	6.6	465	1,4%
4	Misquiyacu Bajo	283	GWT	I – E	4,756		69	5.64	444	1,3%
5	San Jose Bajo	411	GWOT	I – E	2,458		99	2.3	528	0,4%
6	Casual	250	GWT	C	2,738		57	3.8	491	0,8%
7	El Balcon	157	GWT	C	1,775		26	3.74	558	0,7%
8	Ubillon	195	GWT	R – I	2,876	2.026,7	44	8.6	701	1,2%
9	Cielachi	222	GWT	I – E	2,750		51	4.5	583	0,8%
10	Lonya Chico	468	GWT	I – E	5,686	2.443,2	117	3	542	0,6%
11	San Juan	187	GWT	I – E	2,749		48	4.63	248	1,9%
12	Olto	672	GWT	I – E	6,037	5.214,0	169	5.8	349	1,7%
13	La Huarpia	1,161	GWT	I – E	6,257		211	4.67	478	1,0%
14	Perla de Cascazunga	210	GWOT	C	4,841		43	8.14	446	1,8%
15	Posic	2,188	PWOT	I – E	37,393	14.340,0	344	8.14	660	1,2%
16	Barranquita	492	GWT	I – E	6,779		76	16.32	468	3,5%
17	La Florida	272	GWT	I – E	3,283		54	8.21	601	1,4%
18	Monte de Los Olivos	335	GWOT	I – E	3,631		46	7.98	436	1,8%
19	Pacchilla	572	GWOT	I – E	6,277		121	3.72	446	0,8%
20	Sapotillo	304	GWOT	C	2,670		59	2.49	468	0,5%
21	Sta Rosillo	506	GWOT	I – E	7,160		113	3.81	431	0,9%

G-W-T: Gravity with Treatment  
G-WO-T: Gravity without Treatment

P-WO-T: Pumping without Treatment  
MP: Manual Pump

R: Rehabilitation  
M: Improvement

E: Expansion  
C: Construction

Source: JICA Study Team



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 N° 4.15.4-3 and N° 4.15.4-4.

**Table N° 4.15.4-3: Conglomerate C-1 AOM Average Costs**

Type of Sytem	Average Cost of O&M Water (Soles)	Average Cost of O&M Sewarage (Soles)	Average Number of Users	Average of Family Fee (Soles/month)	Average of Family Income (Soles)	Relation Fee/ Income
MP	4,368	0.0	61.1	6.77	359	2.2%
PWOT	8,072		103.0	6.41	520	1.4%
GWT	5,249	0.0	107.0	3.53	535	0.7%
GWOT	6,841	3,943.0	173.0	7.30	418	2.0%

Source: JICA Study Team (2010)

**Table N° 4.15.4-4: 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	344	8.1	660	1.23%
GWT	5,720	4,722	118	6.2	493	1.33%
GWOT	3,367	-	88	4.6	462	1.02%

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, wich as a whole represent more than US\$ 4,800 million or US\$12 per capita per year, according to the study.

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/CPF14GTE90>



The access to sanitation, good hygiene practices and potable water could save the life of 1,5 million of children per year.

#### 4.15.5 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 communal 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 N° 3.3.1- 22.

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 consultancy, and if necessary it could even contribute with their funds in cases of an emergency.

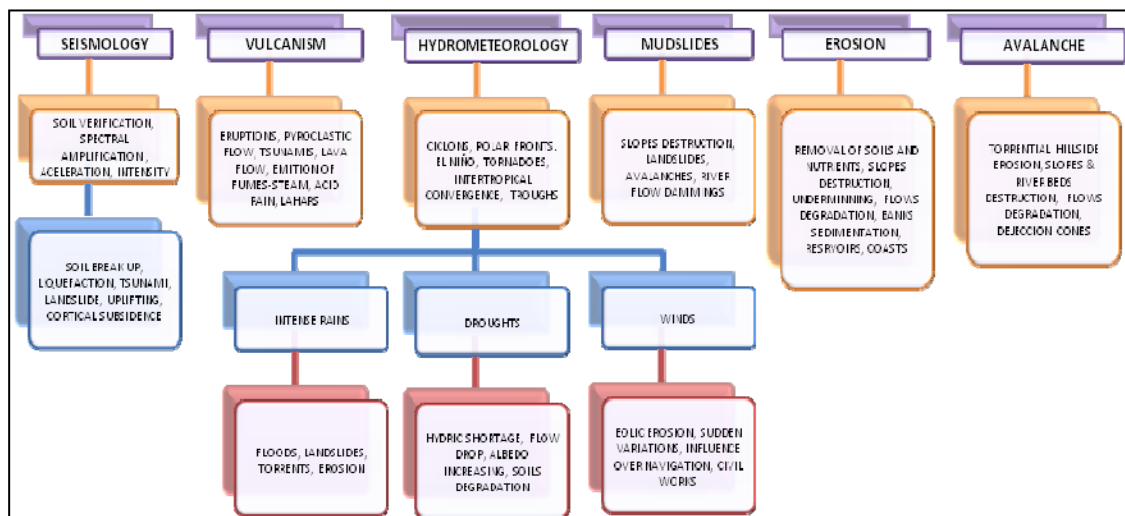
The strengthening and capacity building to the Community Organization and the community is also planned for the different stages of the Program, as well as the Hygiene Education Component, as it is describe in each *Perfil* study of each locality's project,

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

#### 4.15.6 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 intervention 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.<sup>12</sup>

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 intervention 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 must 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

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<sup>12</sup> Basic Manual for the Risk Estimation, INDECI

environmental degradation. In the rural areas, poverty promotes deforestation and unsustainable agricultural practices. Poor people have less access to resources that can help them recover from material losses 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.<sup>13</sup>

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<sup>13</sup> Indu Abraham, 2005, "Vulnerability of the Most Vulnerable", Interamerican Bank of Development.

## 4.16 Initial Environmental Examination

### 4.16.1 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 favourable 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 must 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).

#### 4.16.2 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.

#### 4.16.3 Institutional Aspect

The Office of Environment (OMA: *Oficina del Medio Ambiente*) has been formed under the Vice-Ministry of Housing and Sanitation of the Ministry of Housing (Housing). This office has been created by the Vice- Ministry of Housing and Sanitation of the 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 Sector; and to formulate and implement policy guidelines, standards, plans, programs, projects, research and environmental initiatives of the Sector.

The final proposal of the Guideline to Environmental Assessment is in the process of validation and is awaiting approval by Ministerial Resolution.

#### 4.16.4 Procedures of Environmental Impact Assessment

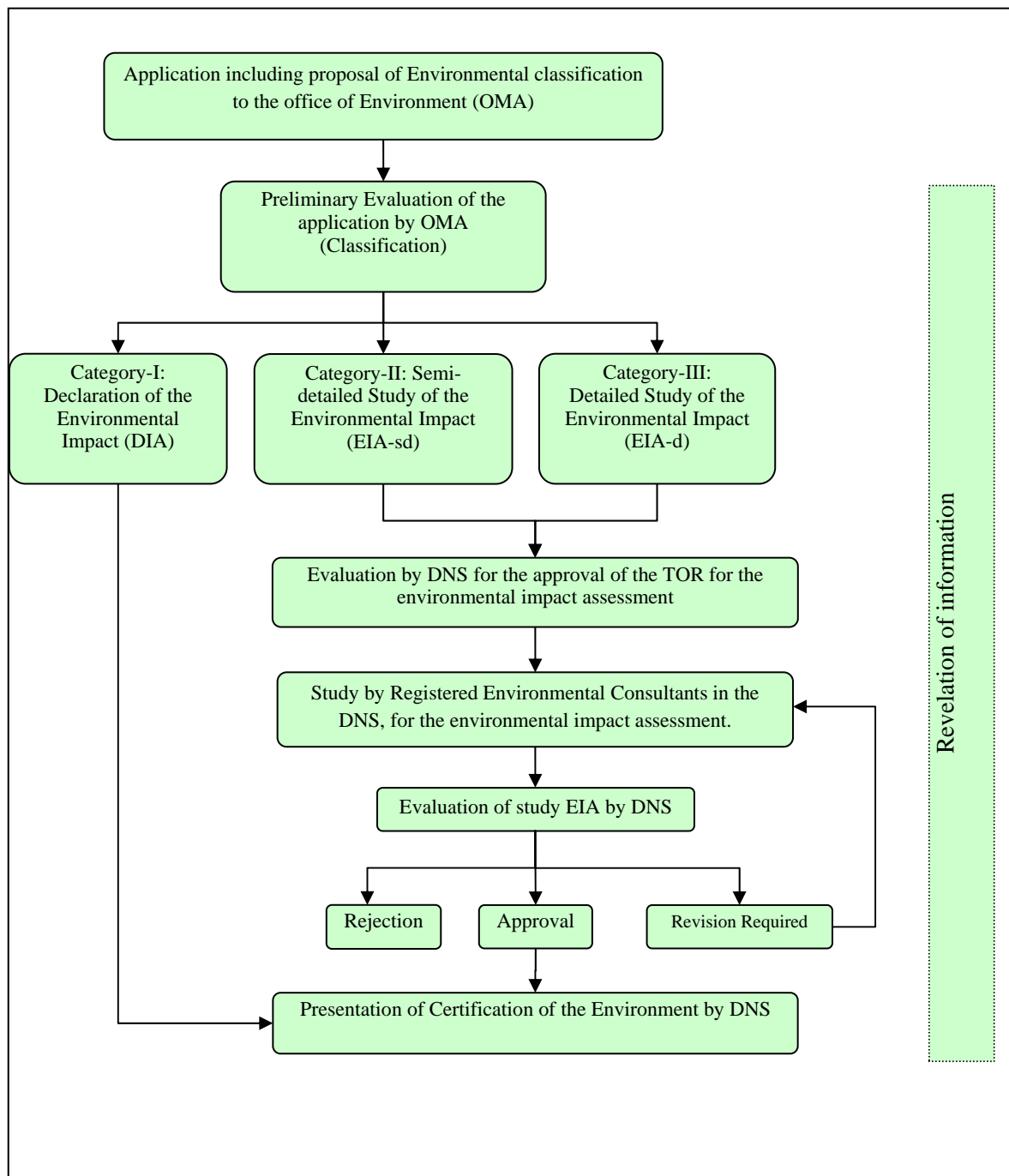
According to the information from the OMA, the outline of the procedures of the environmental impact assessments is as follows. However, because the guidelines are currently in the process of formulation, the environmental impact assessment procedures have not yet been formally defined.

- 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° 4.16.4-1.



**Figure N° 4.16.4-1: Evaluation Procedure for Environmental Impact**



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

#### 4.16.5 Initial Environmental Examination (IEE)

The initial environmental examination will be described hereafter based on the guideline designated by JICA <sup>14</sup> (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 N° 4.16.5-1: Categories**

<p><b>Category-A:</b></p> <p>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.</p> <p>Borrowers and related parties must submit Environmental Impact Assessment (EIA) reports for Category A projects.</p>
<p><b>Category-B:</b></p> <p>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.</p> <p>If an EIA procedure has been conducted, the EIA report may be referred to, but this is not a mandatory requirement.</p>
<p><b>Category-C:</b></p> <p>If it is likely to have minimal or non-adverse environmental impact, a proposed project is classified as Category-C.</p> <p>For projects in this category, environmental reviews will not proceed beyond screening.</p>
<p>Source: Guidelines for Confirmation of Environmental and Social Considerations (JBIC, April 2002)</p>

##### (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 N° 4.16.5-2.

<sup>14</sup> The JICA guideline is referred because this project (Program) is meant to be implemented with funding from JICA.

**Table N° 4.16.5-2: 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, 13<sup>th</sup> of the current year 2009 as attached, “that under the protection of the article 32° of the Environmental Impact National System Law Regulations; the Ministry of Housing, Construction and Sanitation could consider the preparation of only one Environmental Impact Assessment” would be required, in the understanding that significant environmental impacts will not be generated, not being necessary the elaboration of an Strategic Environmental Impact.

(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 N° 4.16.5-3 below.

**Table N° 4.16.5-3: 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 study; 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

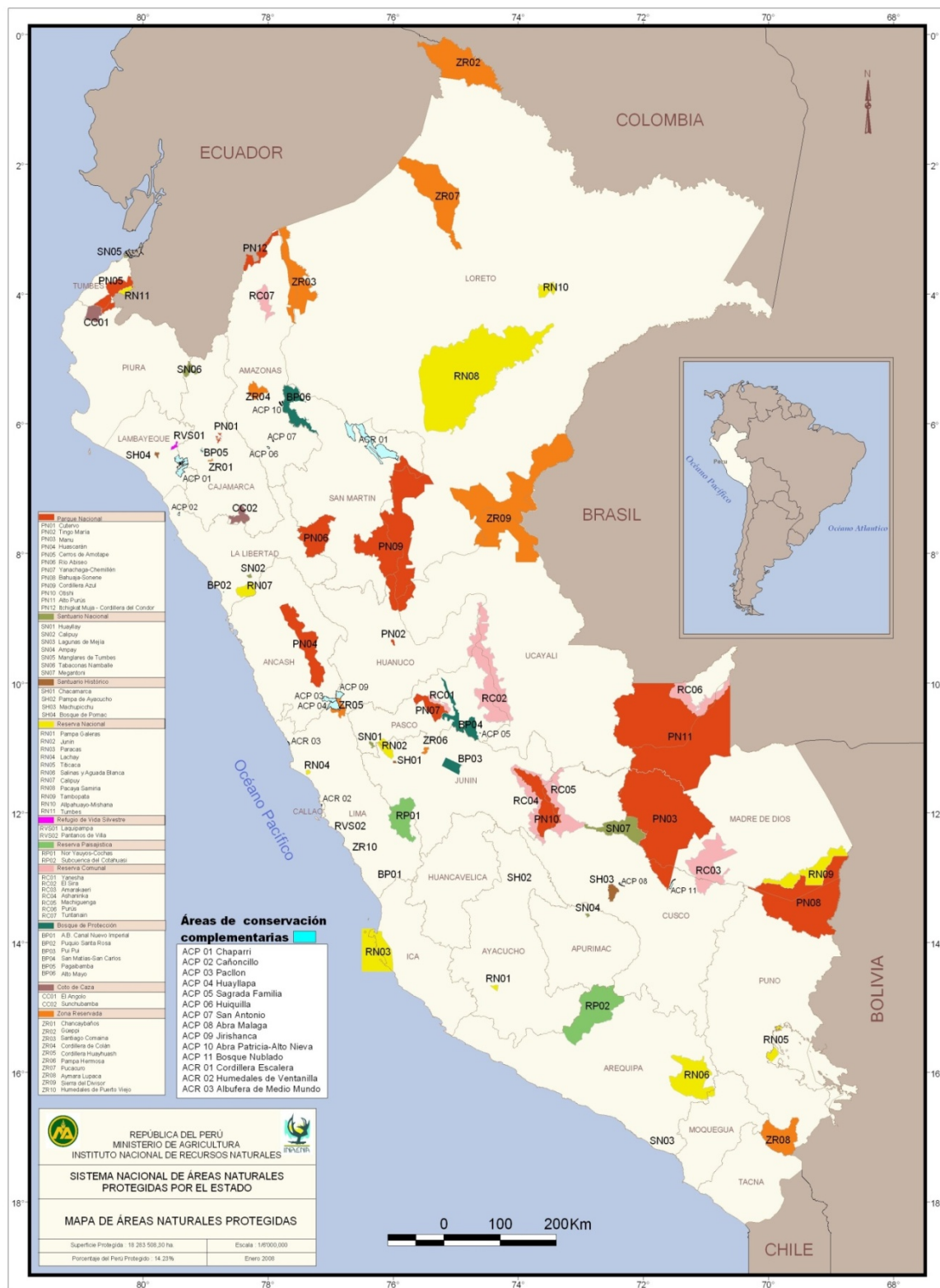
Availability of clean and potable water is of paramount importance. There will be no other options other than constructing or rehabilitating water supply and sanitation facilities in localities where clean and potable water is not sufficient or even not available. Therefore, the implementation of this 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 must be taken for the environmental consideration; not only when the Perfil studies are conducted, but also throughout the project cycle.

Figure N° 4.16.5-2: Map of Protected Natural Areas




Source: National Institute of Natural Resources (Instituto Nacional de Recursos Naturales)

Table N° 4.16.5-4: National System of Natural Areas protected by the Government



MINISTERIO DE AGRICULTURA  
INSTITUTO NACIONAL DE RECURSOS NATURALES  
INTENDENCIA DE AREAS NATURALES PROTEGIDAS

**SISTEMA NACIONAL DE AREAS NATURALES PROTEGIDAS POR EL ESTADO - SINANPE**



CATEGORIAS	BASE LEGAL	FECHA	UBICACION POLITICA	EXTENSION ha/ha / CATEGORIA	
<b>PARQUES NACIONALES (12)</b>					<b>7967119.02</b>
CUTERVO	LEY N°28860	05.08.06	CAJAMARCA	8214.23	
TINGO MARIA	LEY N°15574	14.05.65	HUANUCO	4777.00	
MANU	D.S.N°644-73-AG	29.05.73	CUSCO y MADRE DE DIOS	1716295.22	
HUASCARAN	D.S.N°0622-75-AG	01.07.75	ANCASH	340000.00	
CERROS DE AMOTAPE	D.S.N°0800-75-AG	22.07.75	TUMBES y PIURA	151561.27	
RIO ABISEO	D.S.N°054-83-AG	11.08.83	SAN MARTIN	274520.00	
YANACHAGA CHEMILLEN	D.S.N°068-86-AG	29.08.86	PASCO	122000.00	
BAHUAJA SONESE	D.S.N°048-2000-AG	04.09.00	MADRE DE DIOS y PUNO	1091416.00	
CORDILLERA AZUL	D.S.N°031-2001-AG	21.05.01	SAN MARTIN, LORETO, UCAYALI y HUANUCO	1353190.84	
OTISHI	D.S.N°003-2003-AG	14.01.03	JUNIN Y CUSCO	305973.06	
ALTO PURUS	D.S.N°040-2004-AG	20.11.04	UCAYALI Y MADRE DE DIOS	2510694.41	
ICHIGKAT MUJA - CORDILLERA DEL CONDOR	D.S.N° 023-2007-AG	10.08.07	AMAZONAS	88477.00	
<b>SANTUARIOS NACIONALES (7)</b>					<b>263982.06</b>
HUAYLLAY	D.S.N°0750-74-AG	07.08.74	PASCO	6815.00	
CALIPUY	D.S.N°004-81-AA	08.01.81	LA LIBERTAD	4500.00	
LAGUNAS DE MEJIA	D.S.N°015-84-AG	24.02.84	AREQUIPA	690.60	
AMPAY	D.S.N°042-87-AG	23.07.87	APURIMAC	3635.50	
MANGLARES DE TUMBES	D.S.N°018-88-AG	02.03.88	TUMBES	2972.00	
TABACONAS NAMBALLE	D.S.N°051-88-AG	20.05.88	CAJAMARCA	29500.00	
MEGANTON	D.S.N°030-2004-AG	18.08.04	CUSCO	215969.96	
<b>SANTUARIOS HISTORICOS (4)</b>					<b>41279.38</b>
CHACAMARCA	D.S.N°0750-74-AG	07.08.74	JUNIN	2500.00	
PAMPA DE AYACUCHO	D.S.N°119-80-AA	14.08.80	AYACUCHO	300.00	
MACHUPICHU	D.S.N°001-81-AA	08.01.81	CUSCO	32592.00	
BOSQUE DE POMAC	D.S.N°034-2001-AG	01.06.01	LAMBAYEQUE	5887.38	
<b>RESERVAS NACIONALES (11)</b>					<b>3298711.97</b>
PAMPA GALERAS BARBARA D'ACHILLE	R.S.N°157-A	18.05.67	AYACUCHO	6500.00	
JUNIN	D.S.N°0750-74-AG	07.08.74	JUNIN y PASCO	53000.00	
PARACAS	D.S.N°1281-75-AG	25.09.75	ICA	335000.00	
LACHAY	D.S.N°310-77-AG	21.06.77	LIMA	5070.00	
TITICACA	D.S.N°185-78-AA	31.10.78	PUNO	36180.00	
SALINAS Y AGUADA BLANCA	D.S.N°070-79-AA	09.08.79	AREQUIPA y MOQUEGUA	366936.00	
CALIPUY	D.S.N°004-81-AA	08.01.81	LA LIBERTAD	64000.00	
PACAYSA SAMIRIA	D.S.N°016-82-AG	04.02.82	LORETO	2080000.00	
TAMBOPATA	D.S.N°048-2000-AG	04.09.00	MADRE DE DIOS	274690.00	
ALLPAHUAYO MISHANA	D.S.N°002-2004-AG	16.01.04	LORETO	58069.26	
TUMBES	D.S.N°046-2006-AG	11.07.06	TUMBES	19266.72	
<b>REFUGIO DE VIDA SILVESTRE (2)</b>					<b>8591.91</b>
LAQUIPAMPA	D.S.N°045-2006-AG	11.07.06	LAMBAYEQUE	8328.64	
LOS PANTANOS DE VILLA	D.S.N°055-2006-AG	1.09.06	LIMA	263.27	
<b>RESERVA PAISAJISTICA (2)</b>					<b>651818.48</b>
NOR YAUYES COCHAS	D.S.N°033-2001-AG	01.05.01	LIMA y JUNIN	221266.48	
SUB CUENCA DEL COTAHUASI	D.S.N°027-2005-AG	27.05.05	AREQUIPA	430550.00	
<b>RESERVAS COMUNALES (7)</b>					<b>1753868.63</b>
YANESHA	R.S.N°0193-88-AG-DGFF	28.04.88	PASCO	34744.70	
EL SIRA	D.S.N°037-2001-AG	22.06.01	HUANUCO, PASCO y UCAYALI	616413.41	
AMARAKAERI	D.S.N°031-2002-AG	09.05.02	MADRE DE DIOS y CUSCO	402335.62	
MACHIGUENGA	D.S.N°003-2003-AG	14.01.03	CUSCO	218905.63	
ASHANINKA	D.S.N°003-2003-AG	14.01.03	JUNIN y CUSCO	184468.36	
PURUS	D.S.N°040-2004-AG	20.11.04	UCAYALI Y MADRE DE DIOS	202033.21	
TUNTANAIN	D.S.N° 023-2007-AG	10.08.07	AMAZONAS	94967.68	
<b>BOSQUES DE PROTECCION (6)</b>					<b>399986.99</b>
A.B. CANAL NUEVO IMPERIAL	R.S.N°0007-80-AA/DGFF	19.05.80	LIMA	18.11	
PUQUIO SANTA ROSA	R.S.N°0434-82-AG/DGFF	02.09.82	LA LIBERTAD	72.50	
PUI PUI	R.S.N°0042-85-AG/DGFF	31.01.85	JUNIN	60000.00	
SAN MATAIS SAN CARLOS	R.S.N°0101-87-AG/DGFF	20.03.87	PASCO	145818.00	
PAGAIBAMBA	R.S.N°0222-87-AG/DGFF	19.06.87	CAJAMARCA	2078.38	
ALTO MAYO	R.S.N°0293-87-AG/DGFF	23.07.87	SAN MARTIN	182000.00	
<b>COTOS DE CAZA (2)</b>					<b>124735.00</b>
EL ANGOLO	R.S.N°0264-75-AG	01.07.75	PIURA	65000.00	
SUNCHUBAMBA	R.M.N°00462-77-AG	22.04.77	CAJAMARCA	59735.00	
<b>ZONAS RESERVADAS (10)</b>					<b>3543286.40</b>
CHANCAYBANOS	D.S.N°001 96-AG	14.02.96	CAJAMARCA	2628.00	
GÜEPI	D.S.N°003-97-AG	03.04.97	LORETO	625971.00	
SANTIAGO COMAINA	D.S.N° 023-2007-AG	10.08.07	AMAZONAS y LORETO	398449.44	
CORDILLERA DE COLAN	R.M.N°0213-2002-AG	01.03.02	AMAZONAS	64114.74	
CORDILLERA HUAYHUASH	R.M.N°1173-2002-AG	24.12.02	ANCASH, HUANUCO Y LIMA	67589.76	
PAMPA HERMOSA	R.M.N°0275-2005-AG	12.03.05	JUNIN	9575.09	
PUCACURO	R.M.N°0411-2005-AG	21.04.05	LORETO	637918.80	
AYMARA LUPACA	D.S.N°003-2006-AG	21.01.06	PUNO	258452.37	
SIERRA DEL DIVISOR	R.M.N°283-2006-AG	11.04.06	LORETO Y UCAYALI	1478311.39	
HUMEDALES DE PUERTO VIEJO	R.M.N° 064-2008-AG	31.01.08	LIMA	275.81	
<b>AREAS NATURALES PROTEGIDAS (63)</b>				<b>18043379.84</b>	<b>18043379.84</b>
<b>SUPERFICIE DEL PERU (ha)</b>				<b>128521560.00</b>	<b>128521560.00</b>
<b>% DEL PERU PROTEGIDO</b>				<b>14.04</b>	<b>14.04</b>
<b>AREAS DE CONSERVACION REGIONAL (3)</b>					<b>150833.16</b>
ACR CORDILLERA ESCALERA	D.S.N° 045-2005-AG	25.12.05	SAN MARTIN	149870.00	
ACR HUMEDALES DE VENTANILLA	D.S.N° 074-2006-AG	20.12.06	LIMA	275.45	
ACR ALBUFERA DE MEDIO MUNDO	D.S.N° 006-2007-AG	25.01.07	LIMA	687.71	
<b>AREAS DE CONSERVACION PRIVADA (11)</b>					<b>89295.30</b>
ACP CHAPARRI	R.M.N° 134-2001-AG	27.12.01	LAMBAYEQUE	34412.00	
ACP CAÑONCILLO	R.M.N° 0804-2004-AG	22.09.04	LA LIBERTAD	1310.90	
ACP PACLLON	R.M.N° 908-2005-AG	15.12.05	ANCASH	12896.56	
ACP HUAYLLAPA	R.M.N° 909-2005-AG	15.12.05	LIMA	21106.57	
ACP SAGRADA FAMILIA	R.M.N° 1437-2006-AG	25.11.06	PASCO	75.80	
ACP HUIQUILLA	R.M.N° 1458-2006-AG	01.12.06	AMAZONAS	1140.54	
ACP SAN ANTONIO	R.M.N° 227-2007-AG	10.03.07	AMAZONAS	357.39	
ACP ABRA MALAGA	R.M.N° 229-2007-AG	10.03.07	CUSCO	1053.00	
ACP JIRISHANCA	R.M.N° 346-2007-AG	25.03.07	HUANUCO	12172.91	
ACP ABRA PATRICIA - ALTO NIEVA	R.M.N° 621-2007-AG	16.10.07	AMAZONAS	1415.74	
ACP BOSQUE NUBLADO	R.M.N° 032-2008-AG	17.01.08	CUSCO	3353.83	
<b>SUPERFICIE TOTAL ANPS</b>				<b>18283508.30</b>	<b>18283508.30</b>
<b>% PERU PROTEGIDO TOTAL</b>				<b>14.23</b>	<b>14.23</b>

Actualizado a enero 2008

Source: National Institute of Natural Resources (Instituto Nacional de Recursos Naturales)



## 4.17 Implementation Policies, Approach and Strategy

### 4.17.1 Policies and Principles for Implementation

#### (1) Financial Policy: Co-financing by Localities and Municipalities

##### i) Precedents

The National Sanitation Plan (2006 – 2015) considers that the localities and district municipalities should contribute with, at least, 20% of the total project costs. It has been considered and accepted that this co-financing is essential for the sustainability of the sanitation services. PRONASAR applies such agreed proportions as 20% for construction of new installations and 40% for rehabilitation works.

However, it is also accepted that the capacity for co-financing of the communities and the municipalities should vary depending on the financial capacity of each municipality. This becomes evident when various communities within the jurisdiction of a municipality are going to participate in the Program. The municipality will not be able to co-finance all of the communities that are interested in participating in the Program.

Having acknowledged that, although co-financing from the district municipalities is necessary and required, this crucial matter could become a factor of delay of implementation of a project in a locality, due to insufficient financial capability of the municipality.

Several proposals and/or suggestions were made regarding Policies and Strategy in Small Localities and Rural Area<sup>15</sup>: i) for the district municipality to request support from the Regional government or the Provincial government in order to cover its percentage; ii) for poor local governments to use the loan system provided by FONCOMUN<sup>16</sup> through the *Banco de la Nación* (National Bank); and iii) for the sector to consider the possibility of reducing the contribution per project in those municipalities that have a number of projects within their territories.

On the other hand, the “Criteria for Eligibility and Prioritization (RM.690-2008-VIVIENDA, November 2008) defines the form of contribution of localities and municipalities as an indicator for the prioritization criteria . The indicator shows the level of ‘sustainability’, according to the contribution proportion, compared with the total project cost.

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<sup>15</sup> Aide-Memoiré of the Work Meeting held between the MVCS and the Cooperation Agencies (BID, BIRF and JICA) on March 3<sup>rd</sup>, 2009

<sup>16</sup> Direct Debit through FONCOMUN: The Peruvian Government deposits subsidies in the each municipality’s bank account at “Banco de la Nación”, through the FONCOMUN’s mechanism for financial support to local municipalities. The Banco de la Nación pays out from the bank account designated to settle local municipalities’ debts, according to pre-established priorities. (Direct Debit). FONCOMUN has runned out of most subsidies due to previous debts. More expenditures can’t be coordinated through FONCOMUN to pay out a new program/project. Also, because of documentation and procedures are very complicated to do and time is not enough, the PRONASAR is not applying this option.

Keeping in mind all of the preceding, the Feasibility Study believes that a firm and concrete financial mechanism on the part of the actors will be the fundamental and essential pre-requisite for the timely implementation and successful completion of the Program.

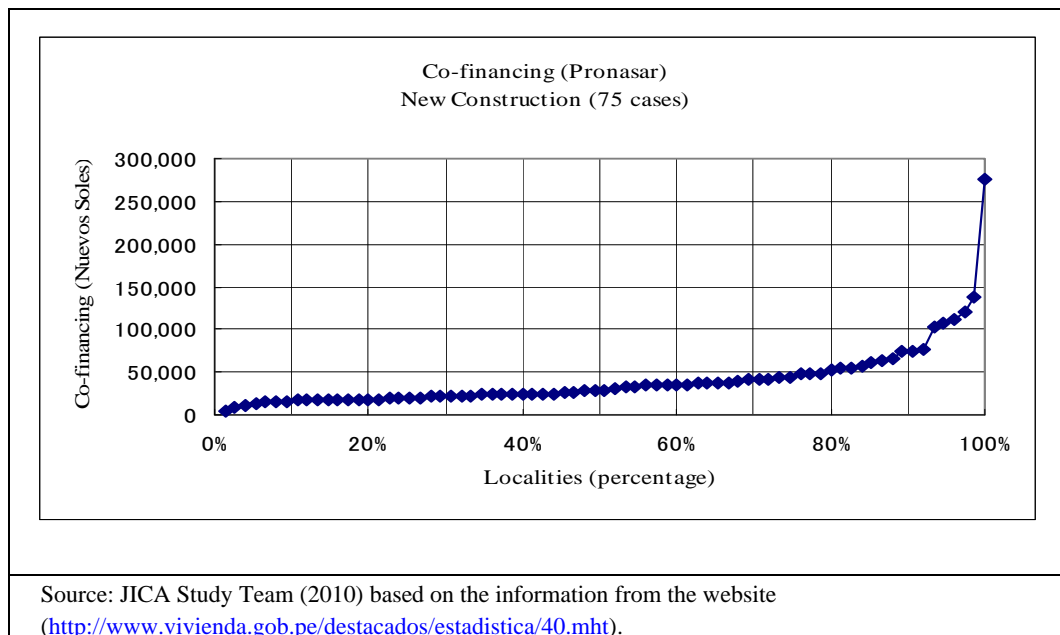
ii) Analysis of the Financial Conditions of District Municipalities

Similar projects to the ones being studied, with the obligation of co-financing of the localities and district governments through PRONASAR, have been implemented in eight (8) administrative regions, including Huancavelica Region, where the Deficiency rate is the worst among the twenty-five (25) administrative regions. Information is available for 492 localities on the web-site:

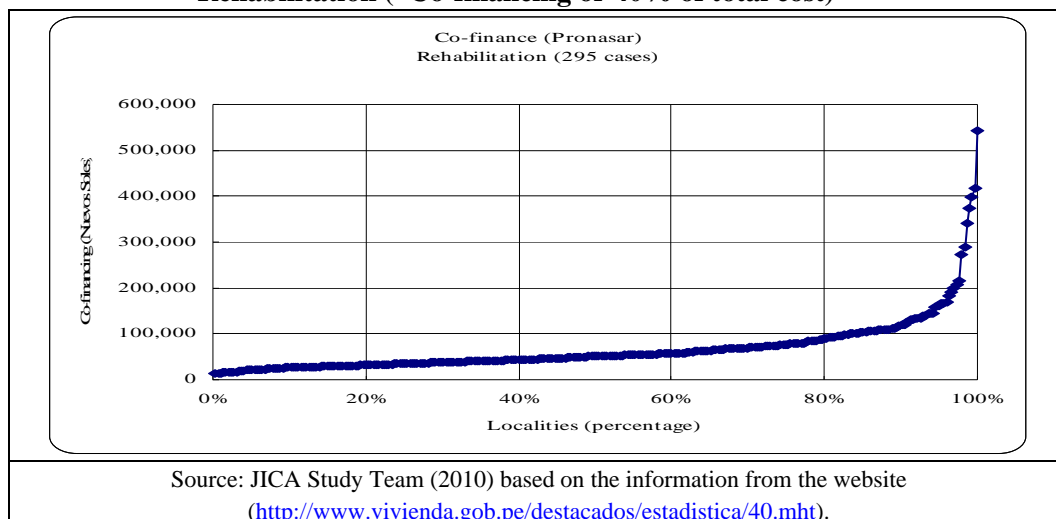
<http://www.vivienda.gob.pe/destacados/estadistica/40.mht>

Figures N° 4.17.1-1 and N° 4.17.1-2 show an analysis of the co-financing status for the 75 cases of new construction and 295 cases of rehabilitation. These figures show that about 80% of the localities co-financed no more than S/. 50,000 for new construction projects; and S/. 100,000 for rehabilitation projects.

**Figure N° 4.17.1-1:**  
**New Construction (co-financing of 20% of total cost)**



**Figure N° 4.17.1-2: Local Co-financing  
 Rehabilitation (“Co-financing or 40% of total cost)**



On the other hand the present targets the 199 districts in the five (5) administrative regions (Amazonas, San Martín, Madre de Dios, Ucayali and Loreto). On the basis of budget execution closures of the accounts of 2007 and 2008, it is understood that most municipalities are in critical financial conditions. Indeed, more than 60% of these municipalities spent less than an average of S/ 100,000 per year during 2007-2008 in the sanitation sector, as shown in Figure N° 4.17.1-3.

**Figure N° 4.17.1-3: Average Spending in Sanitation Services  
 From 2007 to 2008, in 199 Target Districts**

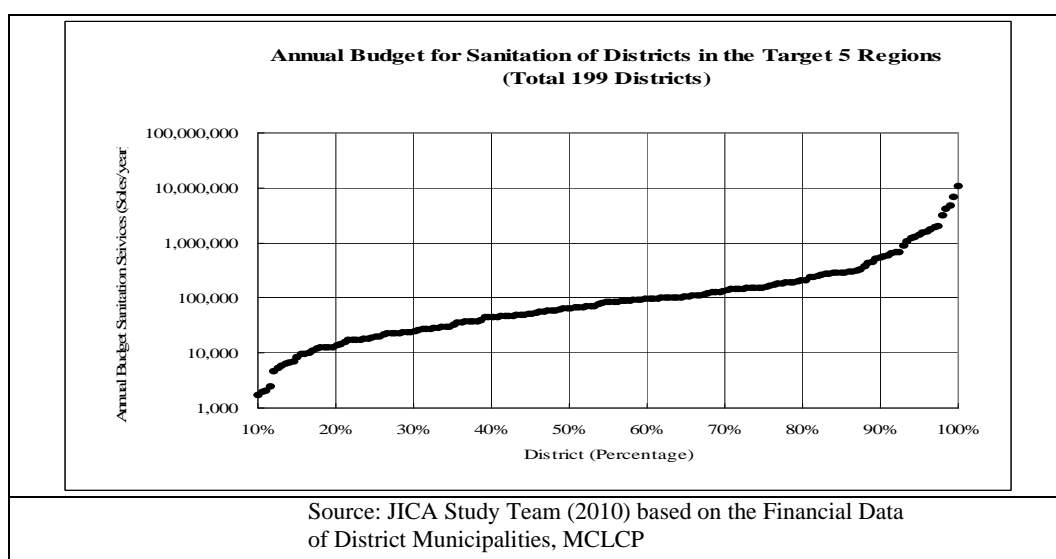


Figure N° 4.17.1-3 also shows that about 35% of districts have a sanitation budget of no more than S/.50,000 per year; and that about 20% of them have a budget of no more than about S/. 12,000 per year.

When the cases of Figures N° 4.17.1-2 and N° 4.17.1-3 are compared, the analysis may be an indicator that a fixed rate of co-financing may lead to a possibility that projects may not be implemented in poor localities that have insufficient budgets for co-financing, even though they should have an acute need for water supply and sanitation facilities. This could be the case of most of the poorest localities.

### iii) General Principles for Co-financing

The National Sanitation Plan 2006 – 2015 (NSP 2006-2015) establishes among the principles of its sanitation policies that subsidies must be directed to the poorest and those subsidies directed to investments must be carried out with efficiency in the rendering of services. As regards to the financing, the NSP (2006-2015) declares that, in the rural area, the investments in rehabilitation, capacity building to the Community Organization and hygiene education to population will be priorities; and that the MVCS must strengthen the participation of the community, the municipalities and the regional governments in the financing of its investments.

Among the strategies to achieve sustainable services in the rural area, the NSP (2006-2015) establishes a structure of co-financing, both by the municipality and the by the population, as well as the option to provide different service levels and technical options, according to the implementation feasibility.

Among the activities for the rural area, the NSP (2006 – 2015) proposes that the local contributions of municipalities and communities cover, at least, 20% of the requested investments<sup>17</sup>.

However, as it was mentioned above, with their present budgets, the district municipalities will not be capable to fulfill that percentage. Therefore, the strict implementation of this criterion would cause poorest localities to be excluded from the Program or could affect on the smooth progress of the Program.

On the other hand, non-monetary contribution such as unskilled labor works (without payment), instead monetary contribution, are being recommended as a mean of co-financing. However, it has been reported that construction progresses were sometime hampered because expected unskilled labor forces were not available as against the agreement with the locality. Such discomfort would create contractual problems between

<sup>17</sup> Bajo 2.7.3 “ Acciones Propuestas para el Ámbito Rural,” Plan Nacional de Saneamiento 2006-2015

the contractors and the PAPT, because the construction works have to be executed under contractual agreements between the mentioned parties.

From this point of view, the Feasibility Study Report considers that unskilled labor works as a mean of co-financing, though it is recommended, shall be assigned to such works that should not affect/interfere the work progress by the contractor.

a) District Municipalities Co-financing

The contribution of district municipalities to the projects in the villages or localities of their jurisdiction will be made through their participation in the projects' administration.

Therefore, the responsibility to execute relevant activities necessary for the projects in their district will be assumed by the municipality, by assigning at least one person who shall be responsible for all the administrative works in the Pre-cycle.

These people will act as the counterparts of the consultant group at the district level, from the pre-investment and throughout the investment stage and the post-execution stage, by organizing, facilitating, taking part in the communal works for the capacity-building programs, jointly with the consultant groups and all the other administrative subjects at the district level. When the consultant groups are not in their district, these municipal agents shall monitor the contractor's activities, the contribution of the local man-power, as a link with the consultant group. The municipality will cover all the expenses for the activities of those people, including their fees, travel and transportation expenses and others. In that way, the district municipalities will co-finance the projects in their districts.

The percentage of the costs incurred for those activities, in relation to the works cost will vary depending on the type of facility, which will be decided in the *Perfil* preparation stage.

b) Community Co-financing

The community shall co-finance the Project by contributing with their labor in the required works which shall not affect the progress of the construction works by the contractor under contractual obligation with PAPT. The works in which the community will participate could be: trench excavation for house-connections, pipe works in house-connections, filling works within the house area, latrine construction, weed cleaning, transportation of materials within the work area or providing places for accommodation or rest and others. The necessary materials for construction and the technical direction shall be provided by the contractor.

The specific points of works and the work volume shall be determined during the *Perfil* preparation and the project file, which will be the base for the agreements among the three parties (PAPT, municipalities and community).

c) Integral Implementation Policy

The Program will give equal importance to the infrastructure execution works (design and facility construction) and to the Component of strengthening and/or creation of capacities for organization, planning, promotion, development and administration of the sanitation services; as well as hygiene education in each one of the localities and municipalities.

The activities for both components shall be implemented in an integral and simultaneous manner. The implementation shall respond to the physical, economic, social and cultural characteristics of each one of the Program's localities.

#### 4.17.2 Implementation Approach

(1) Induced –demand-driven approach

Under this approach, the Project implementation in a locality shall be the result of the informed decision of the community through an appropriate social promotion that accomplishes the participation population and the municipality, through consultations and discussion of the Program. First, the inhabitants shall make a decision about Project acceptance, knowing the technical options as well as the selection of the type of facility and technology, taking into consideration their technical and financial capacity (for co-financing through unskilled labor and/or materials), the responsibility and capacity-building for the administration, operation and maintenance (AOM) and their participation in the construction works. This “demand-driven approach” can be sustainable through:

- 1) The availability of mechanisms that permit the flow of adequate information to the community and the municipality, and procedures that facilitate the collective decision-making process between members and leaders.
- 2) The inhabitants' full awareness about the fact that the availability of safe or potable water shall have positive effects in their health, especially in the reduction of waterborne diseases like diarrhetic and parasitic diseases, and therefore that the services will have an economic value, which must be paid through family fees.

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The Program requires the followings from the inhabitants of each locality, as the tools of this demand-inducing approach:

- 1) Participatory decisions: the community of each locality shall be sufficiently informed about the benefits of the project so they may choose a service level that will result convenient for their needs and expectations, through the comparison or benefit-cost assessment of the alternatives pre-established as sustainable.
- 2) The acceptance of co-financing the works: the users will contribute with their own resources (unskilled labor and materials).
- 3) The acceptance of responsibility for AOM: the users will take the responsibility for the service administration, through the creation and/or strengthening of the Community Organization, such as the Sanitation Services Administrative Board (JASS).

#### (2) Gender equity Approach

This is a pre-requirement for the sustainable development of the rural villages; to recognize the dignity of peoples that are differenced by gender, generation and ethnic group. A sanitation and water project will comply with the following requirements:

- 1) The technical options and services levels will respond to the needs of both women and men, favoring the life conditions of both genders.
- 2) The decisions and agreements will include the opinion and interest of both men and women. Both men and women will have the same opportunities to access the training programs for AOM and sanitation and hygiene education which will be directed by the project in the locality.
- 3) Both men and women will also have the same access to participate in any administrative area of the Community Organization.

#### (3) Inter-cultural Approach

In the Amazon area, where the Program shall be implemented, there are people with different ethnical and cultural background.

Most of the population of the villages situated in the High Forest (Amazonas, San Martín) comes from different places of the country, specifically from the coast and the northern highlands. In some cases, these villages are relatively new in their formation and, therefore, they can be defined as “colonist’s village”, with different customs than the native inhabitants of our Amazon.

In the communities situated in the Front Forest, most of the population is native from the Peruvian Amazon area, but within time and due to its geographic location, they have adopted experiential customs from the migrants that have settled in the nearby villages, as well as in the same villages. Therefore, such villages are defined as communities with a cultural mixture,

which have both native customs from the Amazon area and also customs from people recently settled established in there.

In the Low Forest (specifically in Ucayali, Loreto and Madre de Dios) there are native communities from various ethnic groups (shipibos, conibos, yaneshas, etc.), that preserve their ancient customs (clothing, vessels, and some weapon for fishing and hunting) and organization (they have a chief called Apu, who is the maximum authority recognized, respected and obeyed by the community)

The Program will recognize and accept the reciprocity and diversity of such cultures; and it shall:

- 1) Know and understand the community cultures regarding water and sanitation
- 2) Value, respect and strengthen positive aspects of this culture
- 3) Promote new knowledge and practices to assure the best planning, administration, develop and impact of the services
- 4) Facilitate opportunities for mutual learning between the actors of the Project and the population within the context of relationships of respect.

(4) Environmental Sustainability Approach

The Program will take into consideration that during the implementation stage of the projects in each locality, the execution of the works of water and sanitation will have negative impacts to the environment that, although little, should be controlled and mitigated with suitable measures for the geographic place, type of infrastructure, season, time and the executed activity.

#### 4.17.3 Implementation Strategy

(1) Participants

i) Program Management Unit (PMU)

The Program Management Unit (PMU) will be created by the MVCS, with the purpose of being responsible for the promotion, programming, execution, assessment and monitoring of the Program throughout all stages of the Program cycle in the five (5) political regions in the rural Amazon area.

ii) Regional Government

The Regional Government shall participate in the Program; therefore it shall have updated information regarding the Program's activities. It is expected that Regional Governments support the district municipalities in the co-financing of the projects, if required, in order to help these municipalities achieve their responsibilities, established by the Program according to the policies of the Sanitation Sector. Likewise, it is expected that the Regional Governments give technical assistance to the municipalities even in



AOM aspects, with the purpose of facilitating the achievement of their responsibilities with water and sanitation.

iii) District Municipality

The district municipalities will be the main party involved in the Program. They will participate in the Program from the beginning and will be involved beyond the project's implementation period. In general, they will be co-responsible for the administration of the facilities, through technical assistance and supervision of the Community Organizations throughout the life-time of the facilities that will be improved or built. Either the Operating Consultants or the Executing Contractors, depending on the project phase, will provide capacity-building programs for the planning, promotion, and development of the services under their respective jurisdictions. Capacitated in this manner, the municipalities will be able to provide the technical assistance and supervision necessary to the Community Organizations (JASS or other type of organization), with the goal of watching over the sustainability of the sanitation services. These activities will be planned and implemented during the work at the site (on-the-job-training). The district municipalities will assign the personnel that will participate in the Program.

iv) Community

The community will be involved throughout the Project cycle: from the decision-making process for the acceptance of its project, in the selection of a technical option, in the commitment to carry out the AOM, in payments for the services, in the election of the JASS or other type of community organization and participating in the training for AOM and hygiene education. Likewise, the community will continue to be involved during the post-implementation stage, on the base of the agreement that the active participation of the organized population is the best way to assure the sustainability of the services.

The Sanitation Services Administration Boards (JASS), or any other type of organization whose members have been chosen voluntarily by the community, will be established as responsible for the AOM (administration, operation and maintenance) of the services in one or more villages (if it is the case) and they shall control the payment of the family fee by the users and others incomes that can be generated.

During the implementation stage, the Community Organization must be involved, with the population, through the district municipalities' coordination, in the training process for the sanitation services administration and hygiene education, which will be conducted by the Consultant.

v) Private Sector

The present Feasibility Study advises the involvement of specialized private companies or firms that have the necessary capacity and experience related to the implementation of the Program. This involvement shall be realized taking into account the technical options,

local, social and environmental conditions, and the limited time of period for the Program execution.

For the Program implementation, three (3) types of companies, organizations or firms from the private sector will be considered, which will be involved in all or in each one of the Program's implementation stages:

- 1) "Operating Consultant": A consultant firm or specialized organization made up of teams of specialists in aspects of engineering as well as in aspects of planning, promotion, and management of sanitation services and in hygiene education for the population. This firm will be responsible for Program promotion, the qualification of localities, the development of pre-investment studies at the *Perfil* level, development of detailed design files, as well as the supervision of works. The *Perfiles* and detailed designs should include technical engineering aspects for the project, as well as capacity-building and/or capacity-strengthening activities of organizations, planning, promotion, and management of sanitation services and hygiene education for the benefitted population.

Due to the necessity of coordinating the engineering aspects with aspects of strengthening, it is expected that participating consultant firms will have both types of capacities, whether independently or in associations of other works consultants with specialties in these areas of work, preferably in the rural setting, that may be non-governmental organizations (NGO's). From these, the future "Operating Consult" shall be selected.

- 2) "Supervising Consultant": A consultant firm or specialized organization hereafter known as the Supervising Consultant (SC) will be in charge of the evaluation of the *Perfil* study and technical and soft-component files of each project; this firm should grant its prior approval so that the PAPT shall approve and issue the viability declaration of the projects, as well as the approval of each project file (technical and soft-component) before the commencement of the works.
- 3) "Contractor": The executing contractor companies for the investment stage, which includes the instruction of works and commencement of constructed infrastructure, as well as the activities of promotion and capacity-strengthening for the administration of said constructions, hereafter known as the "Executing Contractor." Participation is expected by contracting firms that have experience in works, preferably in the rural setting, and in the promotion and capacitation, either themselves or through the inclusion of other teams of specialists, or by means of an association of firms specialized in said work areas, that may be non-governmental organizations (NGO's).

(2) Soft-component (capacity-building) Strategy

i) Soft-component (capacity-building) Basis

The Program takes into consideration the characteristics, conditions and needs of the socioeconomic and cultural reality of the rural Amazon communities; and acknowledges that the population has primitive knowledge, believes and values regarding water and sanitation. Fortification and/or renewal of such knowledge on water through soft-component (capacity Building) will become communal development instruments to improve the life quality of the population. The soft-component (capacity Building) in water and sanitation will take into consideration the inter-cultural approach as it has been developed in above paragraphs.

Based on methodologies that promote an active, democratic and participatory learning, it is sought that the capacity building in water and sanitation provide opportunities where both, men and women, can exercise their right to participate in the decision-making process and share responsibilities regarding water and sanitation services, as well as those concerning the development of their capacities to assume such responsibilities.

ii) Key Activities in the project cycle

The participatory approach for defining and implementing the management model of the sanitation services in each locality involves the execution of activities by the consultant (Operating Consultant) beginning in the pre-investment stage, which shall, first of all, approach the community and obtain their acceptance for the project's execution.

a) Project initial promotion

Firstly, the Operating Consultant shall gather the main leaders of the community and municipality to explain and hand out information about the importance and effects of the good use of the water and sanitation services: health promotion, service-management and environmental responsibilities, the need for hygiene and sanitary education, service development and supervision, and its effects in the development of the community.

With the support of the Operating Consultant and an appropriate diffusion of the information, it is expected to make the community aware of their current situation regarding public health and to confront the community with the healthy dilemma between what they have now and what they will have with the Program, through the implementation of the water and sanitation project. With this information, the Operating Consultant and the community shall jointly propose an agreed work strategy.

The existence of this consensus should simplify the communal participation and consolidate the service sustainability, since the strategies to seek the common well-

being will have been determined in advance. In this case, the work of the consultant will be focused in connecting this development plan and its contribution to the sanitation and potable water services, to the community development and the improvement of the population's life quality

b) Demand generation

The second moment of the capacity building refers to the definition of expectations and shared vision of the sanitation. The required mechanisms will be chosen in a participatory manner and the specific aspirations regarding the service level that the community expects to have, will be defined. The consultant shall provide information and technical assistance to the population and local governments so that the population, made aware of their rights and responsibilities, makes an informed decision regarding the different viable technical options, organizational models and financing structure the may adopt to assure the project's sustainability.

c) Preparation of the *Perfil* Study and base line survey

In this stage, the *Perfiles* and base line studies will be developed for each locality, as well as the diagnosis for the implementation of the soft-component (capacity Building) component, in order to achieve the sustainability of the projects in three levels: Municipal, Community Organization and community (hygiene education). Meetings with authorities from the district municipality will be held in order to schedule the commencement of activities, as well as awareness-raising workshops with the community leaders and assemblies with the population to determine the service levels and raise a sense of ownership in them. Meetings and surveys will also be carried out to determine the baselines that measure the capacities of the population to manage the services, and those of the municipality to support and strengthen the Community Organizations; and to obtain the socio-economic and cultural diagnosis of the community.

d) Activities in Investment Stage

In the investment execution stage, the responsibility of implementing the soft-component of the project belongs to the the Executing Contractor, and includes activities such as the execution of

The implementation of the social component for the sustainability of the project, includes the execution of awareness-raising workshops for authorities, for representatives of the civil society, and for the population in general, regarding their active participation in the project's cycle, as well as general assemblies for the ratification of agreements concerning the project and its soft-component in the three levels of intervention (Municipality, Community Organization and capacity-building

plans in hygiene education for the population). This stage requires communal and municipal training workshops and monitoring of changes in the families' habits.

The Operating Consultant shall be in charge of supervising these activities, and will verify the quality of the works execution, the development of capacity-building and hygiene education activities, and the impact measurements.

e) Activities in Post Investment

During a period subsequent to the investment stage, the Executing Consultant shall execute the Program's activities aimed at the reinforcement of the training given in previous stages, through communal workshops of self-assessment and reinforcement, home visits, interviews, surveys. The OC will make reports about changes in habits, attitudes and hygiene practices, development of acquired capacities, indicators and a Final Report.

The consultant himself will be in charge of supervising these activities, and will verify the fulfillment of responsibilities in the post-investment stage on the part of the Executing Contractor.

iii) Principles for the Soft-component (capacity-building)

Beside the planned approaches for the implementation, the strategy of soft-component (capacity Building), developed in the in the paragraph 4.17.1, it must be considered the following essential principles:

a) Community participation and co-financing

The participation of the population will be a constant along the useful lifetime of the project. This not only will assure the fulfillment of the counterpart's responsibilities (contributions that could be financial, in voluntary labor, materials, etc.), but will also permit the OC to know the expectations and preferences of the population, regarding the subject. The OC will provide information and technical assistance to the population and local governments, so that the population makes an informed decision, regarding the different technological options, organizational models and financing structure to assure the project's sustainability.

b) Use of suitable technologies

The application of suitable technologies, of low cost, simple to operate and maintain, with intensive use of labor and local resources, will be promoted. The nature, area and success conditions of the technologies will be widely discussed with the community and the municipality. Although the technology component that the community will choose is crucial, the soft-component (capacity Building) will seek to reinforce all the aspects that affect the project's sustainability (training, education and motivation, strengthening of organizational capacities, financing, environmental impact and

coordination with participatory plans of local/regional socioeconomic development and others).

c) Strengthening of local capacities

The strengthening of local capacities will be carried out in a transverse manner and during all the project cycle and will promote the sense of ownership, a culture of preservation of the improved or built facilities, 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, will be promoted in all the cycle of the project, as well as health and environmental care.

Three (3) inter-related aspects will be tackled:

1) Training on the project's technical aspects:

It will be centered in the aspects of organization, planning and communal management, construction and supervision of work, administration, operation and maintenance of the services.

2) Hygiene Education

It seeks to promote healthy hygiene practices in families for diseases prevention and health promotion, valuing and suitable use of the services, as well as the preservation of water as a resource and environmental care.

3) Transverse training

It tackles the subjects that must be presented during the entire educational process to favor the empowerment process: communal commitment and participation, communal leadership and strengthening, civic rights exercise, gender equity and environmental care. This covers the strengthening of Base Social Organizations (OSB) in their role of 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 in water sanitation and projects. The water and sanitation investments have been proven to have a high cost but a limited impact in people's health, if they are not accompanied with hygiene education programs. Moreover, the consensus about the 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 connected to the sanitation services from the pre-cycle stage and 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 rationed use of the resource, the protection of the infrastructure, the suitable management of the services and awareness of the importance of the drinkable water quality, among others.

e) Pedagogical Approach

The pedagogical approach for 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 generation by 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 with the help of instruments of easy handling and understanding, designed accordingly with the socioeconomic and cultural reality of the community.

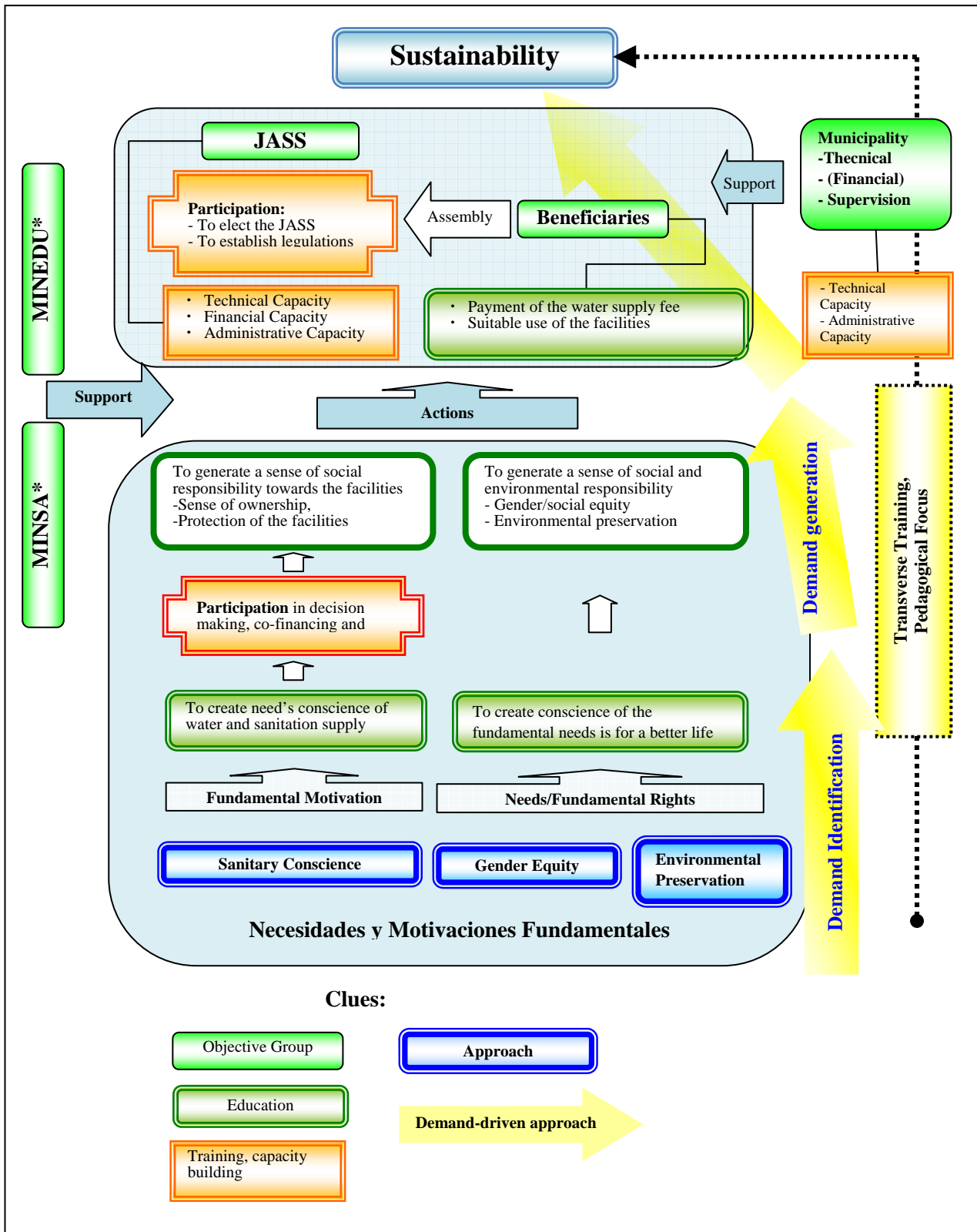
The communal training process seeks that participants achieve the development of capacities to manage their projects and to administer, operate and maintain the improved or built facility, with the purpose of improving their hygiene habits, to value, use and take care of the services and to protect the environment.

The pedagogical approach of communal training promotes the participants to be the causers of their own process through the development of organized practical activities with the support of either the OC or the Executing Contractor, depending on the project stage.

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 the resources will be promoted so that these can be also be used by future generations. This will produce and impact on the environment, whose positive effect will be promoted and the negative effect will be avoided or controlled, in order to protect the sustainability of the natural resources.

Figure N° 4.17.3-1: Soft-component (Capacity-Building) for Sustainability



Source: JICA Study Team (2010)



### Prioritization for Implementation

#### i) Prioritization of Target Areas (Administrative Regions)

The program includes five (5) administrative regions that are located in the vast Rain Forest (*Selva*) geographical region, consisting of three sub-geographical regions: Front Forest, High Forest and Low Forest.

The natural conditions of the Low Forest are quite different from the other two geographical regions and are not necessarily favourable for the implementation of the Program, due to the difficult access to many localities, flood prone topographic conditions in rainy season, and areas considered to be poor on the Poverty Map<sup>18</sup>, especially in the region of Loreto. A 60% of the total Program localities are located in the Low Forest.

There has not been as many projects implemented in past in the Low Forest as the ones to be implemented under the Program. There is not sufficient sectorial experience regarding the execution of investment programs for potable water and sanitation in this zone; in that sense, the Low Forest is prioritized for Program implementation for the previously mentioned reasons. The implementation strategy of the Program in the Low Forest and in the other two (2) geographical regions should take into account the following aspects:

- 1) A step-by-step implementation approach should be considered, taking into consideration 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 regions. The Program shall not be implemented simultaneously in the five (5) administrative regions, which render the project administration extremely difficult.
- 3) The projects will be selected in order of priority, according to the eligibility criteria, which should correspond to economic, financial and technical criteria.
- 4) At the same time, such project shall be prioritized as those with access roads being available, conventional technical solutions to be applied and easy AOM to be implemented and strong demands being recognized from the beneficiaries.

#### ii) Guideline for selection of Localities

At the pre-cycle stage, the Program information will be diffused by the PMU to the relevant district municipalities and localities in the area, according to the area's prioritization. At this stage, interested localities shall express their interest to the district municipality. The district municipality, on receipt of such application from the localities, shall pre-select the localities for the program.

The guidelines for the selection in the pre-cycle stage are as follows:

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<sup>18</sup> FONCODES 2006 Poverty Map and Technical Report "Poverty in Peru" Technical Report by the INEI

a) Selection of municipalities. The municipality shall:

- 1) Express its involvement in the Program by means of an agreement of the municipal council, which shall address local agreement by means of a participatory process involving the community.
- 2) Express their commitment to participating throughout the effective lifetime of the project by assigning personnel and/or economic resources and/or materials to be used for the Project. In that way, they will undertake their role and field of work in the administration and improvement or installation of the water and sanitation services.
- 3) Be willing to co-finance the project works with their own resources (including budget) or from another financial source. Assignment of personnel to be exclusively in charge of the project shall be accepted. The co-financing scale will be decided by the *Perfil* Study through a participatory approach.

b) Selection of Localities

The following guideline 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 the population that is poor, according to the FONCODES Poverty Map and the INEI Technical Report
- 3) Localities whose potable water services are not incorporated to urban areas, administrated by a service provider
- 4) Localities that are not included in other investments programs with international cooperation financing or that have investments projects to be implemented in the short term with regional or local financing
- 5) Community's willingness or agreement to participate in the co-financing of the project by means money or materials, or through unskilled manpower
- 6) Localities with agreements to assume responsibility of the AOM of the sanitation services by means of a Communal Organization voluntarily elected by the community.

c) Formation of the projects packages

For the process of implementation of the work's execution contracts, the PMU shall group most of the pre-selected localities, according to the parameters that determine the realization of the scale economies; such as the ease of access to common pathways, the fact that they may belong to the same district or province or the existence of micro basins that could make them depend on the same water source. The OC could promote the participation of additional localities that are in the same

area and that could contribute to the scale economies, because of its joint execution, as part of the project package.

#### 4.17.4 Project Implementation Methodology

##### (1) Description of the Project Cycle

The project cycle of the Program of potable water and Sanitation in the Rural Amazon is divided into four stages: (1) pre-cycle, (2) pre-investment, (3) investment or execution, and (4) post-execution.

##### i) Pre-cycle Stage

At this stage the responsibility lies on the DNS of the MVCS and on the PAPT, through the PMU for Rural Amazon Areas, with the participation of regional governments and local governments.

During this stage:

- 1) The PMU will prioritize and select the districts/localities, based on the criteria of eligibility in the administrative regions for the implementation of the Program in accordance with the principles and policies of the Water and Sanitation sector established in the National Sanitation Plan; as well as the soft-component strategies for small localities in the rural area<sup>19</sup>, agreed between the MVCS/DNS and the cooperation agencies.
- 2) The PMU will disseminate the information of the Program to the respective regional governments, district municipalities and the localities.
- 3) Localities will express their demands to their local district governments.
- 4) The local district governments will inform the PMU of their interest to participate, through expressing their needs of attention in writing, together with the list of preliminarily selected localities.

On the other hand, the PMU will begin the process of tendering to select and employ the Operating Consultant and Supervising Consultant, for them to be in charge of the activities for the implementation of the Program, as it has been described in item 4.17.3, paragraph 5.

##### ii) Pre-investment Stage

At this stage of the project cycle, the Operating Consultant (OC) will verify and select the areas of implementation; it will also undertake the promotion of development programs and elaborate the projects' *Perfiles* of the selected localities, including the baseline and the

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<sup>19</sup> Minutes from Work Meeting with VMVCS, DNS, BID, BIRF y JICA (06.03.2009)

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 the type of facility and the commitment for AOM. Also, the OC will provide technical assistance to the locality for the creation and/or proposal of strengthening of the Community Organization and the capacities for management in the involved district municipalities.

The Supervising Consultant (SC) will evaluate the *Perfils* that the OC elaborates and will give technical approval of the technical files to be declared “viable” by the PAPT. The projects declared “viable” must be endorsed by the locality and the municipality as a sign of conformity and acceptance.

Following the statement of the “Viability” by the PAPT, the profiles are to 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 foresee the correspondent budget for the implementation of the project. The regional government is encouraged to participate in the agreements, in case the regional government should support the municipalities in co-financing.

### iii) Investment or Execution Stage

At this stage, the Operating Consultant (OC) will develop the technical and training plan of the projects, adhering to the parameters with which the viability of each one of them was granted. This technical project file will include the design for capacity building for the organization, planning, development, community management, administration, operation and maintenance of the potable water and sanitation services; as well as for hygiene education. Capacity building in these areas shall be applied at the three levels: municipality, Community Organization and community.

The Supervising Consultant (SC) will evaluate the technical project file, the design for the capacity-building to the municipality and Community Organization in organization and administration and the design for hygiene education; and these shall be approved by the PMU. An environmental certification (DIA) of the projects will be granted by the National Directorate of Sanitation.

After the approval of the Detailed Design files and the correspondent budget assignments, a Convention of Co-financing Addenda will be endorsed (Tripartite Agreement agreed upon by the locality, district municipality, and PAPT) with the goal of coming to a final agreement for the execution of works and the implementation of the aforementioned capacity-building and management activities for the municipality, the Community Organizations, and hygiene education.

With the budget and the technical project file, the tendering process will begin and contractors will be procured for the construction of water and sanitation project works in the localities. Once the contractors and the PMU have signed the contracts, the construction works will commence under the supervision of the technical team of the OC. The OC will coordinate with the locality and the contractor to optimize the community's contribution of unskilled labor and materials agreed upon for the project.

At the same time, the soft-component (capacity Building) and administration team of the OC will initiate the implementation activities for capacity building for organization, planning and community administration, AOM of the potable water and sanitation services and hygiene education. Training in these areas shall be applied at the three levels: municipality, Community Organization and the benefitted population.

iv) Post-investment

At this stage, follow-up activities in localities and community organizations will be undertaken by the Operating Consultant (OC), together with the municipality, for re-strengthening of capacities for AOM (administration, operation and maintenance) of the Community Organization. The OC will also evaluate the application of operational and administrative management in these locality organizations and the actions of supervision on the part of the municipality, with the aim of assuring the sustainability of recently improved or constructed services.

In the same way, evaluation and strengthening of the actions of hygiene education to the benefitted population will take place, with the purpose of corroborating the adequate use of the sanitation services and to strengthen a payment culture in the population, as well as to assure the good use of potable water and environmental responsibility

(2) Project working process

The Program will be implemented under the administration of the Program Management Unit for Rural Amazon Area (*UGP – Amazonía Rural*) to be formed within the *Program Agua Para Todos* (PAPT) of the Vice Ministry of Construction and Sanitation (VMCS: *Vice Ministerio de Construcción y Saneamiento*), under the Ministry of Housing, Construction and Sanitation (MVCS: *Ministerios de Vivienda, Construcción y Saneamiento*).

The practical operations of the Program will be carried out through the employment of an Operating Consultant (OC) that has an engineering group and a group of social specialists. In the pre-investment stage, the Operating Consultant shall conduct social promotion, *Perfil* studies and Detail Design (technical files) and shall provide technical assistance to the PMU for the procurement of executing contractors who shall be in charge of facility construction works and monitoring of capacity-building and education labours. In the investment stage, the Operating Consultant shall direct; (i) the supervisor of the construction works, (ii) the monitoring of labours in capacity-building and education, and (iii) the management of field

activities in the regions. In the post-investment stage, the team of Operating Consultant shall monitor and provide follow-up the capacity-building and education to localities and municipalities.

The technical evaluation of *Perfils* and detail designs (technical files) elaborated by the Operating Consultant will be conducted by the Operating Consultant to be separately procured by the PMU, so that transparency and accountability of the designs will be maintained.

A flow chart of the working procedure (preliminary) is attached in Figures 4.17.4-1 (5 parts).

Figure N° 4.17.4-1 (1/5): Flow Chart of Working Procedure

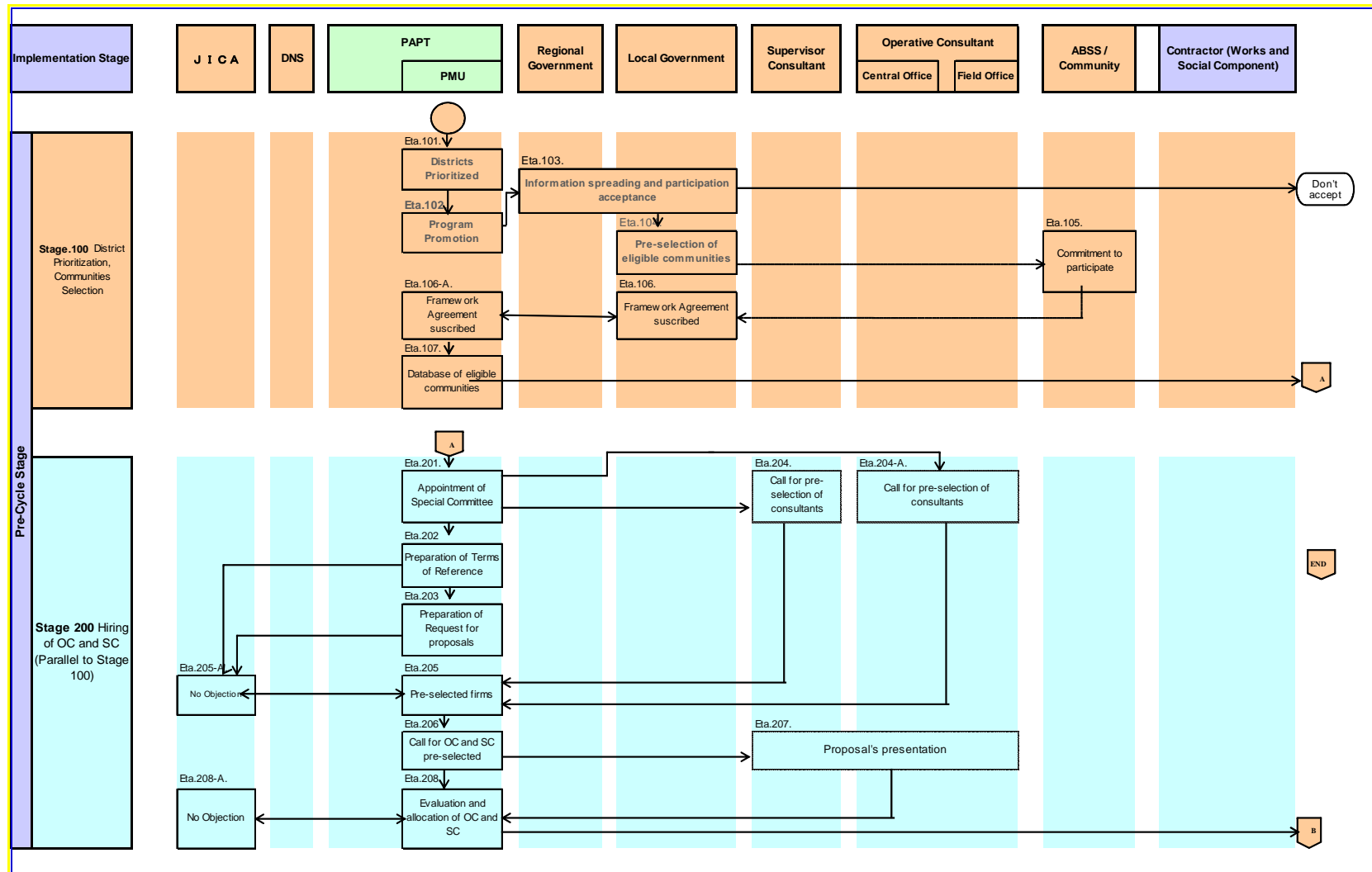


Figure N° 4.17.4-1 (2/5): Flow Chart of Working Procedure

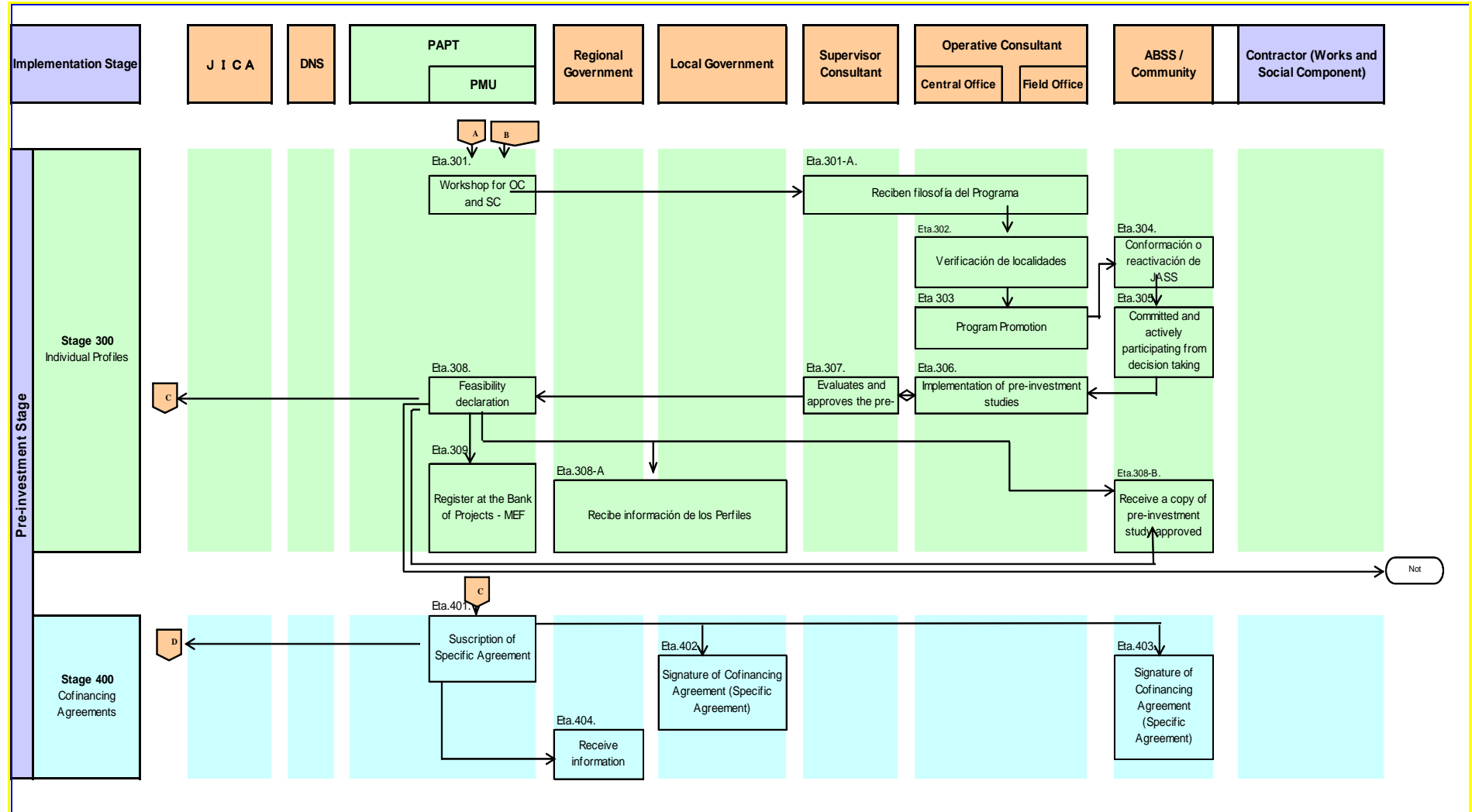




Figure N° 4.17.4-1 (3/5): Flow Chart of Working Procedure

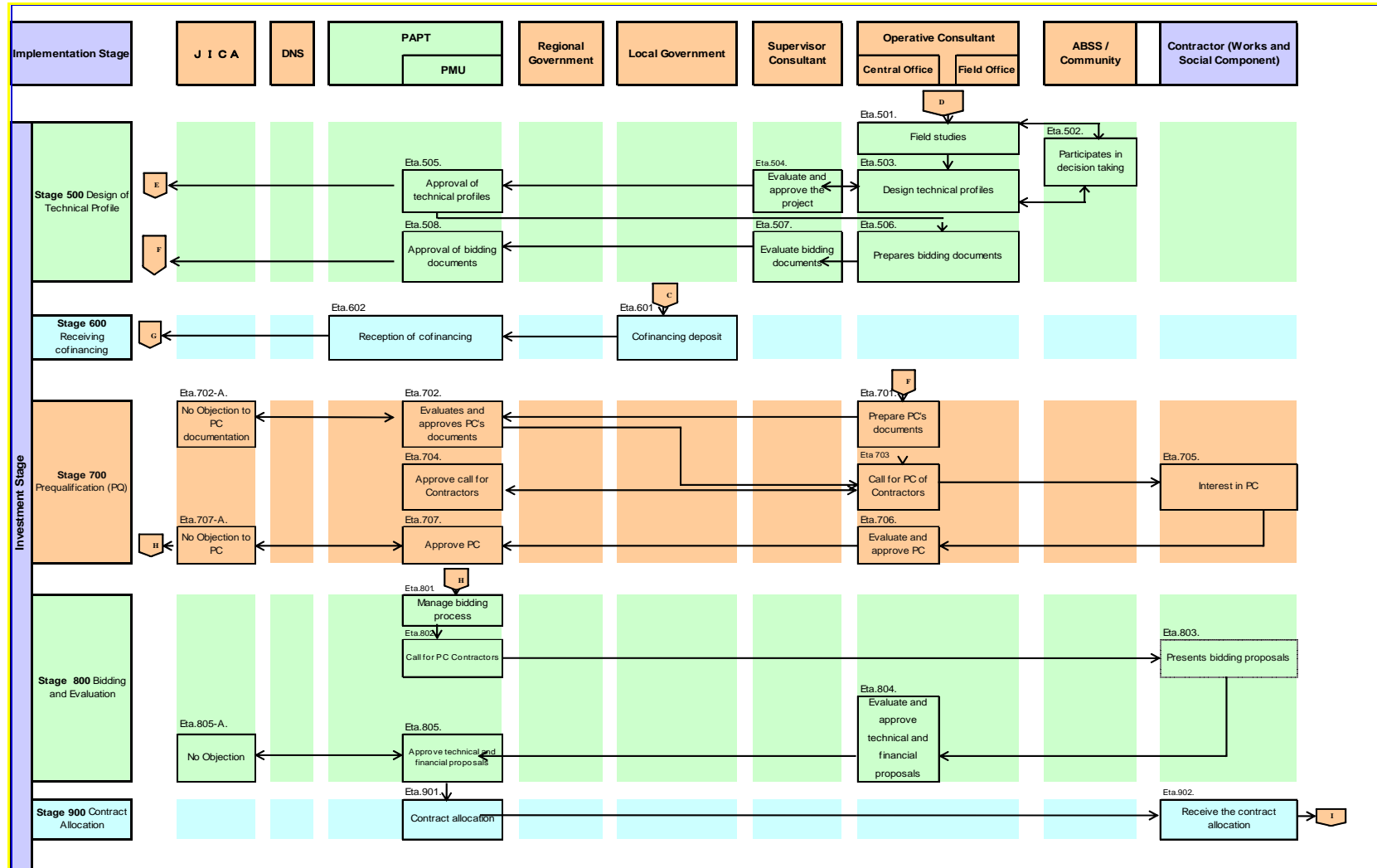


Figure N° 4.17.4-1 (4/5): Flow Chart of Working Procedure

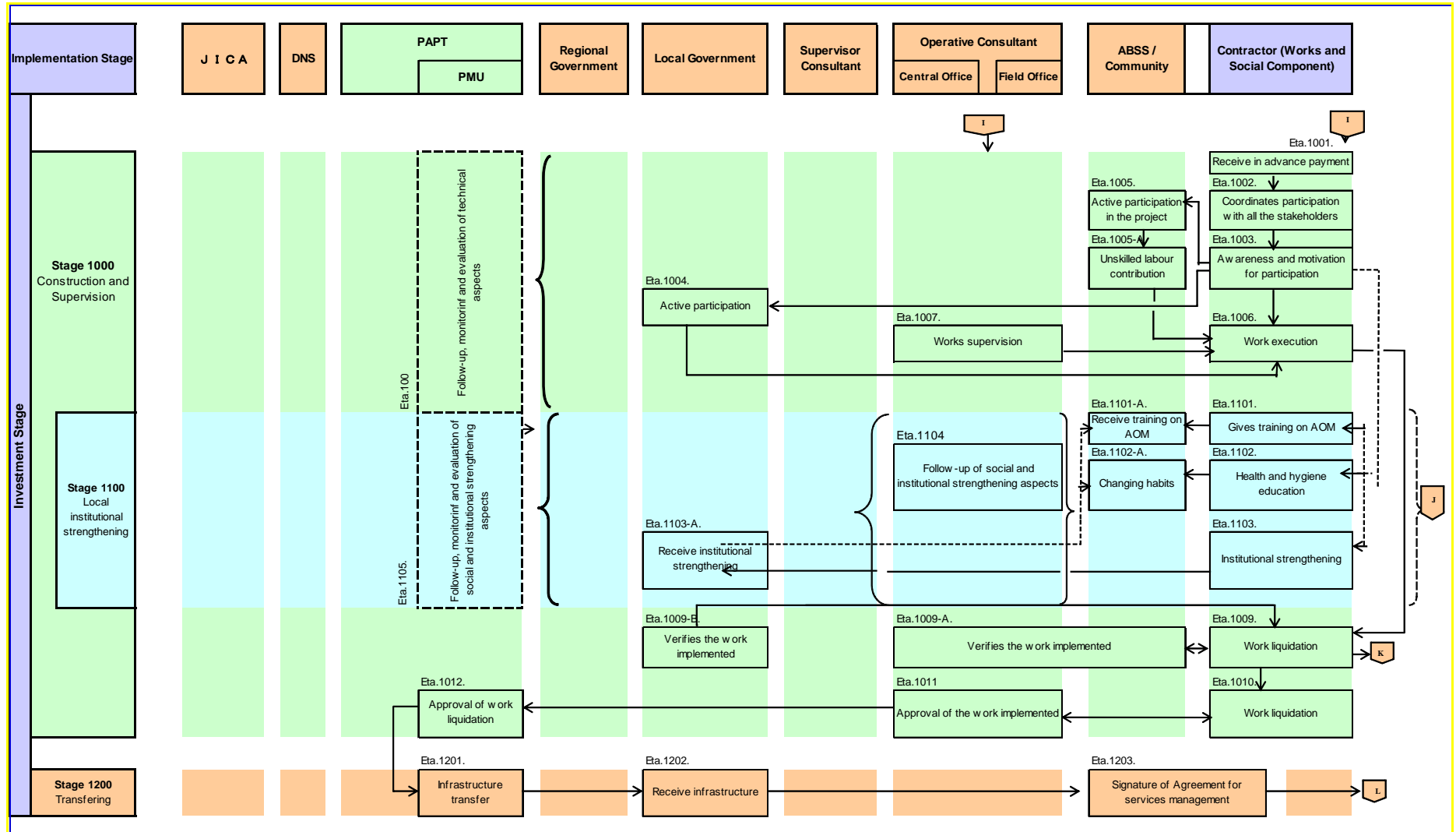
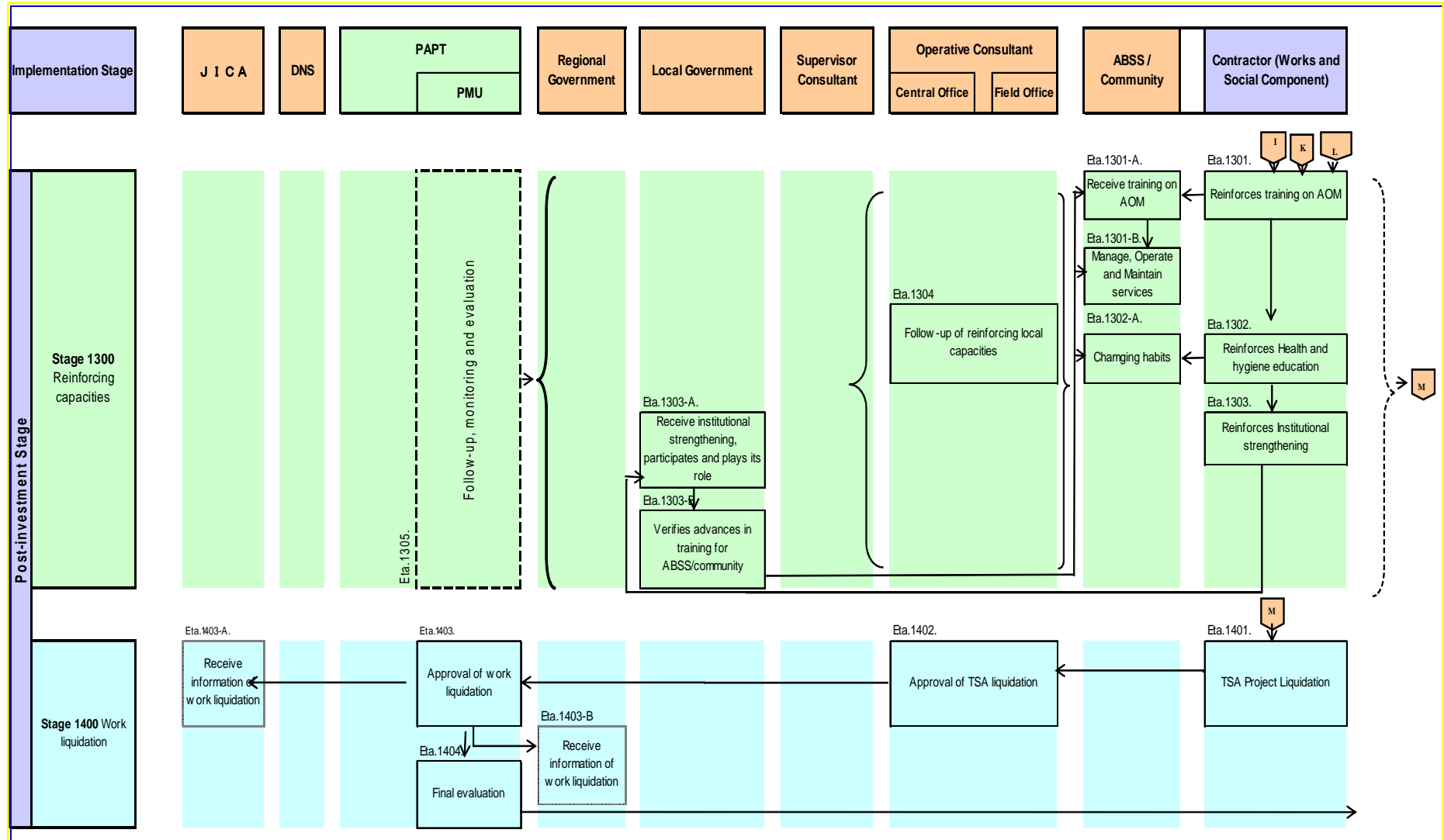


Figure N° 4.17.4-1 (5/5): Flow Chart of Working Procedure



## 4.18 Organization and Management for Implementation

### 4.18.1 Lessons learned from PRONASAR

The PRONASAR (PRONASAR: *Programa Nacional de Agua y Saneamiento* or The National Program for Rural Water and Sanitation) is a program that intends to improve water and sanitation conditions in a large number of rural localities in the country with populations smaller than 2,000 inhabitants. The Feasibility Study considers it essential to learn lessons from the experiences of the PRONASAR..

#### (1) Background- Lessons learned from experiences before PRONASAR

Efforts in the past were mainly focused on construction of facilities for the improvement of water supply and sanitation in rural communities and that attention to sustainability after the construction had not been seriously considered (supply-driven approach). It is also been reported that such projects were implemented in ‘Supply-Driven-Mechanism’, where designs and construction of facilities were made without consultation of rural users who were to use the facilities after construction. As a result, users of rural communities were not well motivated to use or maintain the facilities constructed for them; and, therefore, many of these facilities have deteriorated or even been left un-operational, due to insufficient attention/activities for operation and maintenance of the facilities.

#### (2) Direct Operation (*Intervencion Directa*)

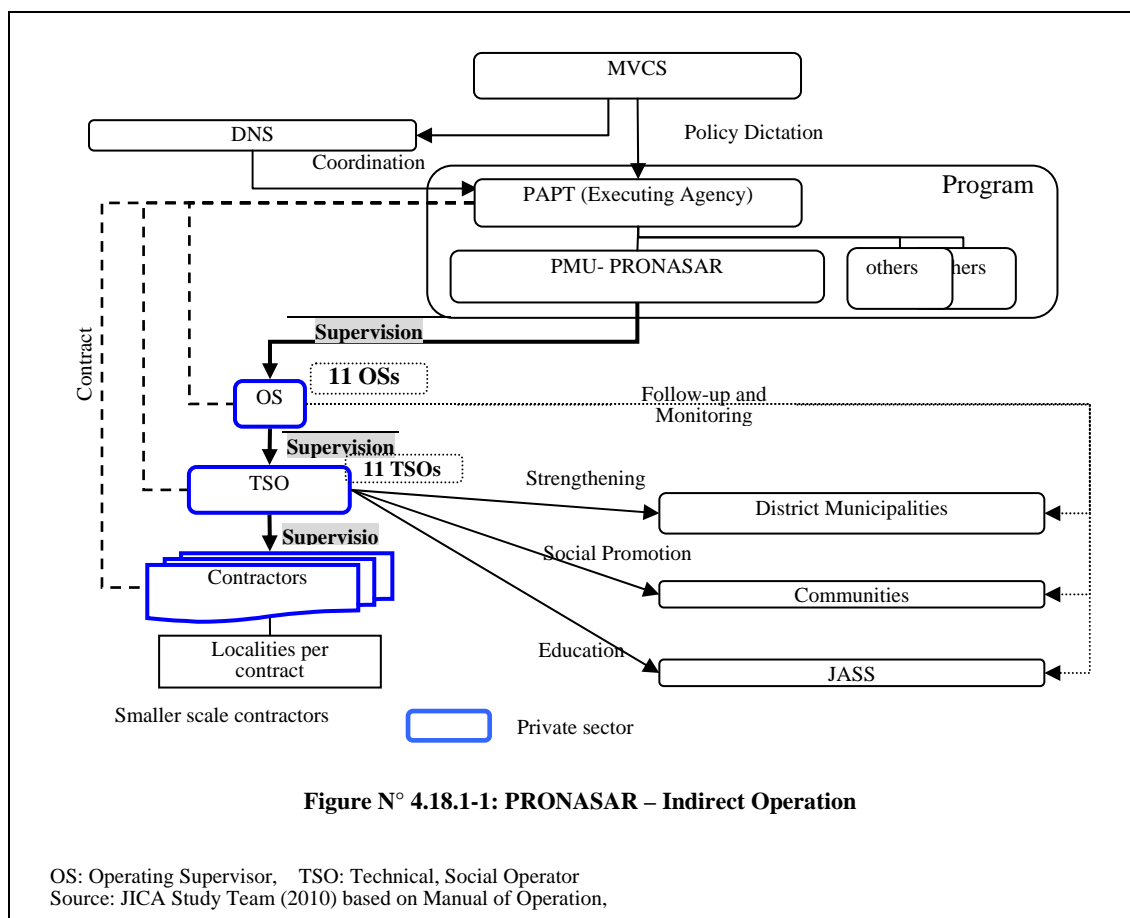
Having learned from such experiences in the past, the PRONASAR proposed the model of ‘*Intervención Directa*’ (Direct Operation) in the Feasibility Study (re-evaluation of the Program) of November 2005. The main features of the model of Direct Operation are summarized as follows:

- 1) To promote projects in Demand-Driven-mechanism, 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, designing and implementation stages, throughout the O&M stage.
- 3) To assign users and the corresponding municipality contributions for the project’s implementation, in the form of money, materials and/or manpower for labour 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 OM through the Community Organizaton.

(3) Experiences

The PMU-PRONASAR has decided to shift the “direct operation” method to “indirect operation” method where contractors for the construction works were employed through tendering processes. While procuring the contractors, the PMU-PRONASAR also has 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.

The current organization for the PMU-PRONASAR is as shown in the Figure N° 4.18.1-1 below.



(4) Observations

i) Observation -1: Three-steps supervision between the PMU and contractors

- Originally the project in each locality was meant to be implemented through In the “direct operation” model the responsibilities of the OTS (Technical-social Operator and the OS (Supervisign Operator) area as follows: The TSO is responsible for elaborating the *Perfils* and Project Files (detailed design), for

acquiring materials, and for technically advising and supervising the community. Supervising Operators (SO's) were hired in order to be able to supervise the work of the TSO's. In the beginning, each SO was assigned to a TSO.

- It is understood that this field organization—one SO per TSO—was maintained after the change from the "Direct Intervention Model" to the "Indirect Intervention Model;" as a result, the responsibilities of the TSO and SO were left as follows:
- The TSO is responsible for (a) elaborating *Perfils* and detailed designs; (b) supervising the Contractors; and (c) carrying out the capacity-building activities in the municipalities, communities, and Community Organizations.
- While the SO is responsible for supervising the TSO and evaluating *Perfils* and detailed designs.

As a result, a three-step supervision process was undertaken during construction stage; i.e: the PMU (1<sup>st</sup> step supervision) → the OS (2<sup>nd</sup> step supervision) → the TSO (3<sup>rd</sup> step supervision) → the Contractors. This seems to be different from an organizational structure commonly accepted for construction supervision, where such a two-step supervision structure may be implemented as PMU (1<sup>st</sup> step supervision) → Supervisory consultants (2<sup>nd</sup> step) → Contractors.

ii) Observation-2: many contracts under the direct supervision of the PMU

It is informed that one TSO supervised four (4) - five (5) contractors, and each contractor undertook six (6) to seven (7) facility construction works under one contract. It is also informed through interview surveys that a maximum of eleven (11) pairs of the OS and TSO were being deployed at the same time, during which period the PMU was responsible for direct supervisions of eleven (11) OS as a maximum. Since the PMU is meant to be organized as the coordinating and managing unit of the project, at the executing agency level; this large scale of direct supervisions by the PMU (too many contracts under the PMU) is not recommendable for the organization of the present Program.

iii) Observation-3: Employing the local-city based contractors

The PMU procured local-city based contractors, possibly due to budgetary limitations. Such contractors have the capacity to deal with a maximum of six or seven construction works under one contract. The present Program will have 1,500 projects which will demand the Program to deploy a great number of small scale contractors if local-based contractors were to be employed. This will necessitate the corresponding numbers of contractual procedures and supervising arrangement, which will also impose a considerably large volume of direct supervisory works to be undertaken by the PMU. The processes of contractors' procurement and direct supervision by the PMU shall be

minimized because the PMU shall be meant to be organized to be responsible for management of the Program at a higher level.

iv) Observation-4: Two Consultant in one line of the Implementation organization

The activities undertaken by the PRONASAR were categorized in accordance to the following criteria and shown in the Table N° 4.18.1-1

- 1) Category-1 [Ex]: Tasks by the parties of the executing agency- Policy making such as final approval, procurement of OS and TSO.
- 2) Category-2 [Ev]: Tasks by an engineering professional; Evaluation of Perfils and detail desgins
- 3) Category-3 [Csl]: Tasks by a consultants group such as preparation of Perfil and project files and construction supervision, implementation of soft-component.
- 4) Category-4 [Wk]: Construction works

**Table N° 4.18.1-1: Allocation of Activities/Responsibilities  
(PRONASAR - Indirect Operation)**

Actions	Activities/Responsibilities	MVCS	PAPT	PRONASAR	OS: Operating Supervisor	TSO: Technical, Social Operator	Contractors	Community	JASS	District Municipality
1	To define strategy and policies	Ex								
2	To defuse information			Ex						
3	To show the will to participate							Prt		Prt
4	To contract OS and TSO			Ex						
5	To supervise OS and TSO (act-6 to act-23)			Ex						
6	To verify and select community,					Csl		Prt		Prt
7	To form/activate JASS					Csl		Prt	Prt	Prt
8	To elaborate Perfil, Detailed Design					Csl		Prt	Prt	Prt
9	To evaluate Perfil, Detailed Design				Ev					
10	To declare viability of Perfil		Ex							
11	To approve project file			Ex						
12	To supervise TSO (act-13 to act-18)				Csl					
13	To supervise the Contractor (act-13, -17)					Csl				
14	Execution of the Works including material procurement						Wk	Prt	Prt	Prt
15										
16										
17	To inform the completion of the work						Wk			
18	To give training to Municipality, Community, JASS					Csl		Prt	Prt	Prt
19	To Approve of the completion of the work				Csl					
20	To supervise OS (act-21, -22)				Csl					
21	To give follow-up training					Csl		Prt	Prt	Prt
22	To settle the project					Csl				
23	To approve the settlement of the projects (Act-2)				Csl					
24	To conduct final evaluation			Ex						
Activity Categories (categorized by the F/S); Category-1 [Ex]: tasks by the parties of executing agency- Policy, Procurement of OS and TSO ; Category-2 [Ev]: Evaluation of Perfils and Project Files (Detailed Design) Category-3 [Csl]: Preparation of Perfil and Project files; and construction supervision, social promotions Category-4 [Wk]: Construction works Prt: Participation										

Source: JICA Study Team (2010) base on Manual of Operation, PRONASAR(2008)

As shown in the table above, the OS (Operating Supervisor) acts as the supervisor of the activities of TSO (Technical, Social Operator) as well as an engineering professional for evaluation; whereas the TSO acts as an engineering consultant for elaborating Perfil study and supervising the contractors; and as a social promoter for implementing soft-component. There seems to be two engineering-oriented consultants (the OS and OTS) on one line in one organizational structure for implementation, which needs to be given considerations.



#### 4.18.2 Proposed Organization for Implementation

Having learned from the programs executed in the rural areas in recent years, the proposal of the implementation model for the Water and Sanitation Program in the Rural Amazon has an other vision than project execution in the urban scope, because the rural scope has special characteristics, such as:

- (i) The community itself is in charge of the administration, operation and management of sanitation services, through the community people who for the most part has no past experiences;
- (ii) The localities for the Program are widely dispersed, and accessibility to the the localities will be the main logistical issues to be solved by the entities in charge of project implementation of these services;
- (iii) Consultant firms rarely have experiences of this type of work, and for this reason there is not enough qualified personnel in the country for the implementation of a program of massive execution like the present one, where the construction of the infrastructure is as important as the soft-component (capacity-building of the population and local governments); and
- (iv) The technical applications should be appropriate to the characteristics of the rural area; true participation of the community in activities starting from project promotion through project implementation to monitoring should be an indispensable requirement for the sustainability of services.

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

Core Actors – Regular organizations/group (in order of involvement):

1. Ministry of Housing, Construction and Sanitation
2. District Municipalities
3. Community
4. Regional Governments and Provincial Municipalities

Contracted Actors:

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

The following matrix summarizes the participation model for each actor:

**Implementation Model for Water and Sanitation Program for the Rural Amazon**

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

Program implementation will take place in stages, which will be organized depending on the availability of resources that the Ministry of Economy and Finances makes available through/after coordinating with JICA. It is recommended that the Contracted Actors be contracted for a period that covers the implementation stage of the Program, taking into consideration the following factors:

- an adequate scale of each phase (number of localities) that allows the Operating Consultant to optimize their resources, aiming at achieving efficient implementation of the Program
- When possible, work areas should be sought out to reduce the distances between localities, grouping the localities by an optimal access route or by shared basin, with the objective of optimizing the resources of all of the Program actors.

The implementation model described above has been so designed that the model requires minimal procedures for the PMU to handle contractual matters, by grouping the TORs (work items) to the one for design and supervision: -(preparation of *Perfil* and detailed design; and supervision of contractors); and the other for execution of field work (construction works, hygiene education, capacity-building in management and capacity-strengthening in the district municipalities). Consequently, it was proposed that the design and supervision be undertaken by the Operating Consultant, and that the execution of field work by the Contractors. In addition, the Supervising Consultant has been proposed to supervise the Operating Consultant.

Because the Program consists of a large number of projects, the complexity of the processes of contracting and administering consultants justifies that the number of contracts with the contracted actors shall be kept minimal.

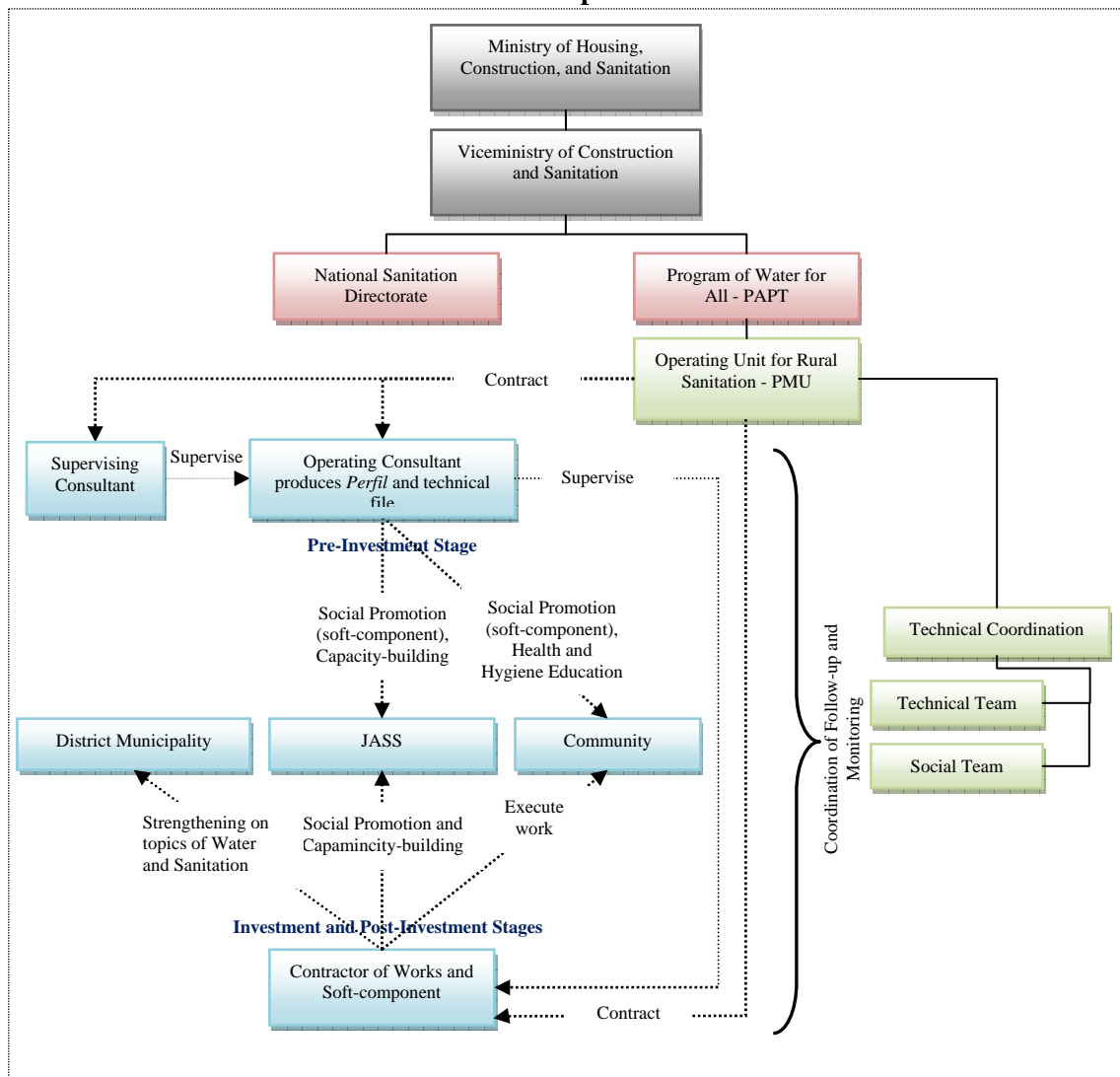
### 4.18.3 Intervention and Responsibilities Model

Among the principal functions of the actors that participate in Program intervention are:

#### (1) National Sanitation Directorate (DNS)

The Ministry of Housing, Construction, and Sanitation (MVCS), by means of the National Sanitation Directorate (DNS) establishes the Sector's policies and strategies.

**Figure N° 4.18.3-1:  
 Intervention and Responsibilities Model**



#### (2) Program of Water for All (PAPT)

The PAPT depends on the Viceministry of Construction and Sanitation; it is the executing body for actions of investment for the implementation of MVCS sanitation policies at the national level. The general objective of the PAPT is to contribute to an increase 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 is the Executing Unit of the Program by means of the Program Management Unit (PMU).

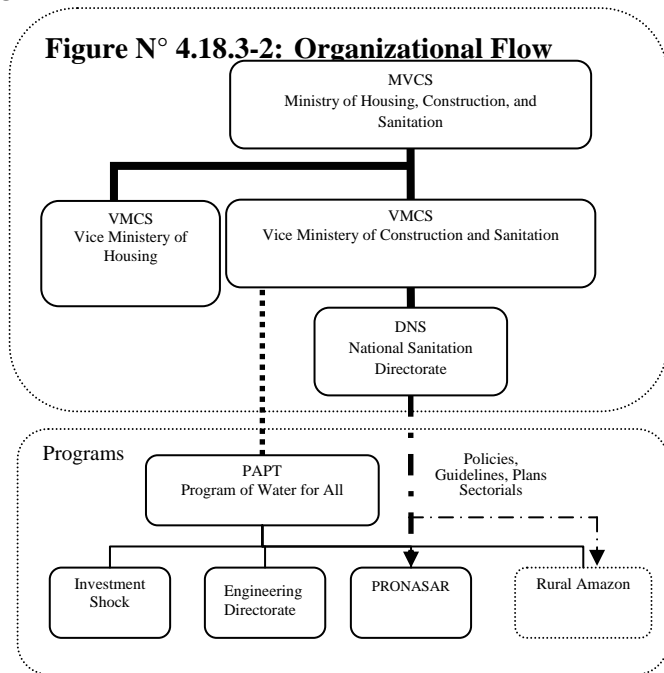
**(3) PMU Water and Sanitation Project for the Rural Amazon**

It is requested that the PAPT be in charge of the conduction of the Water and Sanitation Program in the Rural Amazon. The PMU shall take on the role of the Rural Sanitation Operating Unit, a unit that will form part of the organic structure of the Program of Water for All (PAPT). Among its principal functions are: (i) Execute and conduct the Program; (ii) Report to the DNS, PAPT, VMCS and JICA about Program advances; (iii) Evaluate and monitor the execution of all Program components and supervise the execution of soft-component and capacity-building activities.

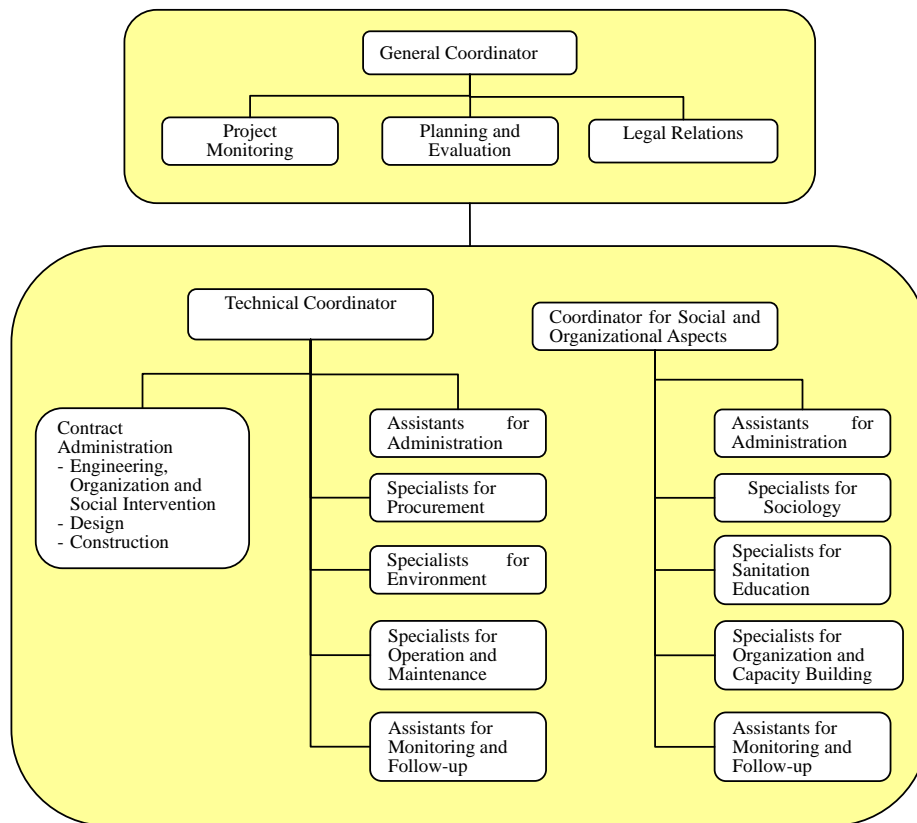
The PMU is responsible for the implementation of the intervention

diagram, and consequently for the assurance of its viability, therefore it should have sufficient autonomy to be able to edorse the contracts necessary for representing the MVCS and the PAPT, in addition to the respective contracts with the Operating Consultant, the Supervising Consultant, and the Executing Contractors.

The PMU is in charge of the follow-up, monitoring, and evaluation of the work of the Operating Consultant, the Supervising Consultant, and the Executing Agent(s) in charge of works and soft-component implementation. Even when the PMU Technical Team is the one to approve and give final consent for the *Perfils* and the project files and the execution and liquidation of works, the firms that represent the contracted actors have civil and penal responsibility, where it corresponds; when the technical documents that support the investments (*Perfils*, project files, and executed works) have hidden faults, the PMU should make the corresponding denunciations and execute the penalties considered in the contract.



**Figure N° 4.18.3-3: Organization of the PMU –Rural Amazon**



Source: JICA Study Team (2010)

Given that the contracted actors will be responsible for Program execution in a determined geographic scope, the PMU will be responsible for following up with the participation of all Program actors (Municipality, COMMUNITY ORGANIZATIONS, community) and motivating the Program actors to participate in an opportune manner according to the programming and agreements made.

In this framework the PMU develops the follow-up and monitoring of the Program processes and activities in the scopes selected by the Program, for which it will have the necessary quantity of suitable personnel with acceptable experience and qualifications for the Program.

The PMU shall be made up of units of General Coordination, Technical Coordination, and Coordination of Soft-Component and Management, as shown in Figure N° 4.18.3-3.

1) General Coordination

The General Coordination shall be responsible for the administrative aspects of the Program and shall have the obligation to plan, direct, and supervise the execution of all Program components.

2) Technical Coordination

The Technical Coordination shall be in charge of supervising Program works and activities and giving approval for all technical aspects relating to the construction of the Program's infrastructure. This area will also be responsible for administering contracts with the Operating Consultants, Supervising Consultants, and Contractors.

3) Coordination of Soft-Components and Management

The Coordination of Soft-Components and Management shall be in charge of supervising the Program works and activities executed by the OC and by the Executing Contractor, according to each project stage, relative to social promotion, community hygiene education, and capacity-building for the strengthening of the community and the municipal authorities in the management of services.

**(4) Operating Consultant**

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

There are two main activities to be carried out. The first includes: (i) Program promotion in each locality, (ii) development of Project *Perfils*, (iii) development of Detailed Design (which includes technical files with the project designs and the capacity-building plan), and (iv) prequalification, notification, evaluation, and preparation of the allocation of contractors to execute works and soft-component implementation. In the second part of his contract, the OC shall supervise the phases of investment and post-investment, including: (i) technical supervision of works; (ii) supervision of implementation of soft-component activities: plans for capacity-building and hygiene education for the community, Community Organizations, and municipalities; and (iii) supervision of the post-execution, the reinforcement of capacity-building activities, hygiene education and capacity-strengthening of the municipalities during execution.

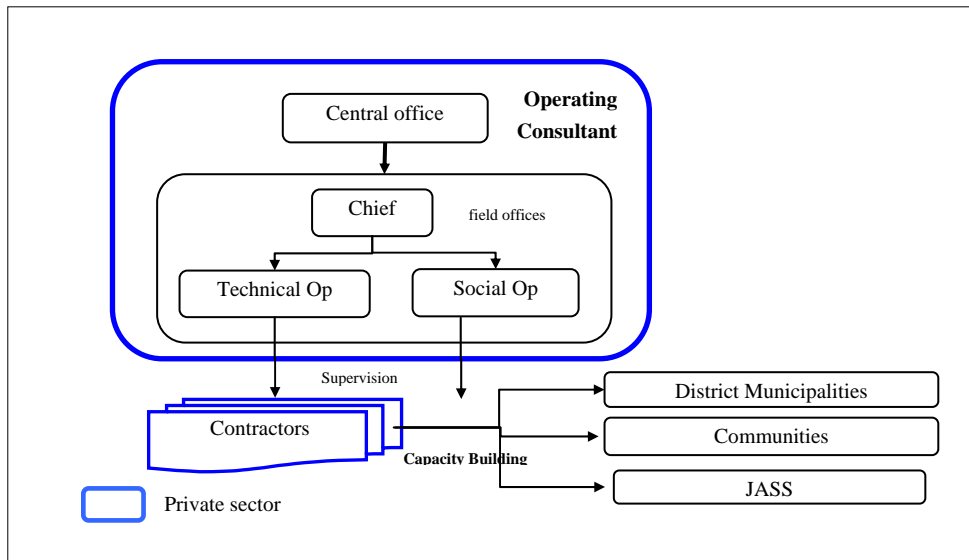
Experience indicates that this type of contract should be carefully constructed and well annotated, and should consist of the two parts described above. Optimally, they should be more concentrated on supervising the quality of the products than on supervising the process.

The Operating Consultant (OC) shall have a Central Office in Lima and a field office in each political region, with a maximum total of five offices.

The Central Office shall be responsible for assisting the PMU with the process of contracting the contractors, planning projects, and establishing an implementation timeline. It shall also be responsible for making the design for the infrastructure of the projects (*Perfils* and Project Files, that include the technical and soft-component elements), basing this on the information obtained by the local offices by means of an integrated intervention model and participative focus. In addition, it shall be responsible for the general supervision of the field activities conducted by

the local offices, including soft-component and capacity-building activities for the municipalities and communities and for the creation and/or strengthening of the community organizations.

**Figure N° 4.18.3-4: Operating Consultant**



Source: JICA Study Team (2010)

### **(5) Supervising Consultant**

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

The Supervising Consultant shall be responsible for the evaluation of the *Perfils* and Project Files, which should include: (i) Detailed design of infrastructure and (ii) creation and/or strengthening of capacities for organization, planning, and community administration, management of sanitation services by community organizations, strengthening of municipalities and hygiene education for the benefitting population.

### **(6) Executing Contractor of Works and Soft-Component**

For the hiring of this contractor, the Operating Consultant shall prepare the tender file for the tendering, a process which will be carried out by the PMU with the participation of the Technical Team that administers the contract, who shall sign the contract with the winning bidder. It is recommended that contractors be selected that have the capacity to administrate the construction of between 20 and 50 works under a single contract, with the goal of carrying out a fluid implementation and fulfillment of the Program within a reasonable period of time.

This contractor shall be responsible for the implementation of the two important Program components. First, he shall participate as executor of works, part of his responsibilities being to manage and promote community participation through the contribution of unskilled labor.

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

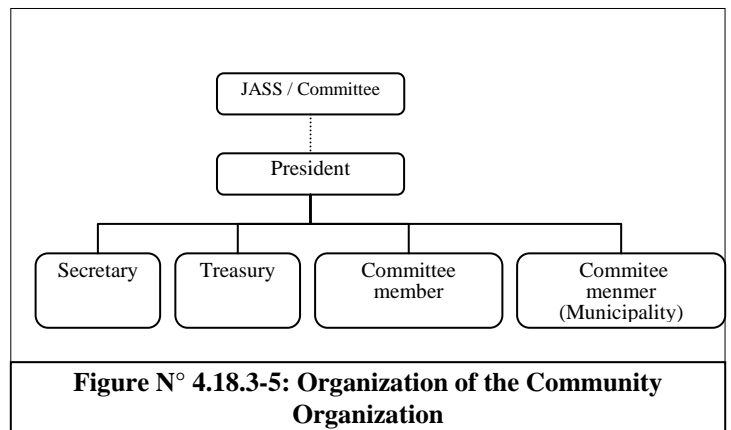
**(7) Local Governments**

The local governments should plan, prioritize, co-finance (as the case may be) and participate in the execution of rural water and sanitation projects throughout the entire project cycle, specifically during the pre-execution, execution, and post-execution stages, and should participate in capacity-strengthening so that it may always provide technical advice and supervise sanitation systems within its jurisdiction, assuming its role and responsibility for services through a Council Agreement.

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

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

This board is the local organization that represents the community and is in charge of the administration, operation, and maintenance (AOM) of the sanitation services in its locality. It may be a JASS or any other form of organization, and it shall be made up of five (5) members. The board’s general functions are to administrate, operate, and maintain the water supply and sanitation system. It is also responsible



for proposing the family water and sanitation fee to be approved by the community, which will be collected from users monthly, in addition to other contributions that can be generated and that constitute additional income for the financing of its activities as administrator of services in the community. The Community Organizations participates during the Program intervention together with the population in coordination with the district municipalities in the capacity-building processes for the management of sanitation services and hygiene education.



**(9) Community**

The community participates in the co-financing of the work through the contribution of unskilled labor, and then during operation of the water and sanitation system by contributing a cash contribution that shall be called a "family fee," which will cover at least the operation, maintenance, and administration costs of the services.

In relation to its participation throughout the project cycle: (i) the community should be informed in order to promote demand and to have knowledge and obtain acceptance of the technical option and the level of service that shall be obtained, in such a way that there is a correlation between the proposed technology, its capacity and willingness to pay the family fee for the administration, operation, and maintenance of services (AOM), (ii) the community should proceed the selection of the administrative board, (iii) participate during the execution and contribute unskilled labor, (iv) attend to the capacity-building and hygiene education activities; until the post-execution phase, with the understanding that the active participation of the population is the best way of assuring sustainability of services.

**Table N° 4.18.3-1: Implementation Organization – Actors and Responsibilities**

<b>PAPT (The Executing Agency)</b>	
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
<b>PMU- Rural Amazon Area</b>	
General Functions	
	To manage the execution of the Program. To fulfill the strategies and procedures to be established in the Operations Manual To evaluate and to monitor the execution of all the components of the Program To approve the payment and to issue the 'Payment Authorization' to the PAPT To report the progress of the Program to JICA and DNS, through the PAPT
<b>General Coordination</b>	
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 fulfil the smooth execution of the Program
7.	To fulfil the contractual conditions in the Loan Agreement with JICA in executing the Program
8.	To represent the Program to public and private organizations
9.	To delegate and to attend to the opportunities involving the diffusion of the Program
<b>Technical Coordination</b>	
<b>(Procurement of SC and OC)</b> To conduct the procurement process of Supervising Consultants (SC) and Operation Consultant (OC), By preparing the technical documentation (engineering, management and social), By conducting the tender calls, and By reviewing the proposals to be submitted by the bidders	
<b>(Preparation of Program)</b> 1. To approve the studies, information of consultancy, conformities of service, conformities of acquisition of materials, equipment and all the necessary one for the implementation of the Program, to be reviewed and evaluated by the OC 2. To approve the plan of all components to be formulated by OC	
<b>(Procurement of Contractor for facility construction)</b> 1. To conduct, with assistance of OC, the process of procurement of Contractors a. By reviewing the technical specification (of engineering, social and management) to be prepared by the OC b. By ordering the submission of Proposals c. By reviewing the evaluation of proposals, evaluation to be conducted by the OC	
<b>(Approval technical documents)</b> 1. To approve the technical documentation (Field Manual: engineering, social and of management), to be prepared by the OC and required for: (1) supervision of the Contractors and for (2) social development, to be carried out in various locations at constant level of quality. The Field Manual is to be reviewed by SC 2. To approve the evaluation of <i>Perfils</i> to be prepared by OC and evaluated by the SC 3. To approve project files (detailed design)	
<b>(Supervision of the technical aspects of the work)</b> 1. To supervise the technical aspects of the works executed by Contractors, supervised and approved by the OC 2. To emit the conformity to products of the Contractors after the technical approval of the OC	

**Table N° 4.18.3-1: Implementation Organization – Actors and Responsibilities**

<b>(Administration)</b>	
<ol style="list-style-type: none"> <li>1. To coordinate all components of the Program at the official governmental level</li> <li>3. To administer contracts of OC, SC and Contractors</li> <li>4. To elaborate the “Operation Plan” and Annual Budget of the Program of component 1 and 2</li> <li>5. To propose adjustments to the Manual of Operations of the Program</li> <li>6. To prepare and to send the reports of physical progress and information required by the General Coordinators and/or the PAPT</li> <li>7. To review and to approve the progress of the works and consultancy services and all evidences of payment.</li> </ol>	
<b>Supervising Consultant</b>	
<ol style="list-style-type: none"> <li>1. To evaluate the Perfil to be prepared by the OC</li> <li>2. To evaluate Detailed Design of the Project to be prepared by OC</li> <li>3. To review and the Field Manual to be prepared by OC</li> </ol>	
<b>Operating Consultant</b>	
<b>(Project Preparation)</b>	
<ol style="list-style-type: none"> <li>1. To review and to evaluate the studies, information of consultancy, conformities of service, conformities of acquisition of materials, equipment and all others necessary for the implementation of the Program; and to report them with recommendations to PMU</li> <li>2. To elaborate and propose to PMU the plan of all components</li> </ol>	
<b>(Assistance to PMU for Procurement of Contractors)</b>	
<ol style="list-style-type: none"> <li>1. To assist PMU in conducting the process of procurement of Contractors: <ol style="list-style-type: none"> <li>a. By elaborating the tender documents including technical specification (of engineering, social and management) for the approval of PMU</li> <li>b. By evaluating of proposals for the approval of PMU</li> </ol> </li> <li>2. To assist PMU conforming Special Board of Evaluation</li> </ol>	
<b>(Preparation of Field Manual)</b>	
<ol style="list-style-type: none"> <li>1. To prepare the technical documentation (Field Manual: engineering, social and of management), to be required for: (1) supervision of the Contractors and (2) social development, to be carried out in various locations at constant level of quality. The Field Manual is to be reviewed by SC.</li> </ol>	
<b>(Community mobilization: preparation of <i>Perfils</i> and Project files)</b>	
<b>Technical Operator</b>	<b>Social Operator</b>
<b>(Pre-construction – Design)</b>	<b>(Pre-construction – people mobilization)</b>
<ol style="list-style-type: none"> <li>1. To verify and select localities.</li> <li>2. To prepare the <i>Perfils</i> through communities’ participation and the <i>Perfils</i> to be evaluated by SC, to be approved by PMU. and to be declared viable by PAPT,</li> <li>3. To prepare the detailed design of works (DD) to be evaluated by SC and to be approved by PMU.</li> </ol>	<ol style="list-style-type: none"> <li>1. To verify and select localities.</li> <li>2. To promote projects in localities.</li> <li>3. To form the community organizations and to create the design to strengthen them.</li> <li>4. To facilitate the participation of the Community/Community Organization in the Perfil preparation.</li> <li>5. Design for the strengthening of organization, promotion, development and management of the sanitation services for municipalities.</li> <li>6. Formulation of a hygiene education Program,</li> </ol>
<b>(Construction – Supervision Stage)</b>	<b>(Construction stage – people participation)</b>
<ol style="list-style-type: none"> <li>1. To supervise the technical aspects (quality and progress control) of works under Comptone1, to be implemented by Contractor, based on the Field Operation Manual and the project files (DD) to be prepared by OC, to be evaluated by SC and to be approved by PMU, in representation of PMU.</li> </ol>	<ol style="list-style-type: none"> <li>1. To facilitate the participation of the Community/Community Organization in the construction works.</li> <li>2. To facilitate the participation of the Community/Community Organization in the hygiene education and administration, Operation and Maintenance (AOM) capacity building programs</li> <li>3. To capacity-build municipalities in organization, planning and management of the sanitation services.</li> </ol>

**Table N° 4.18.3-1: Implementation Organization – Actors and Responsibilities**

(Post-Construction - ) 1. To monitor the initial operation of the built facilities.	(Post – Construction – follow-up) 1. To follow-up the social development, through the evaluation of the instruments application of operational management in these community organizations; and through the supervision actions from the municipalities, in order to secure the sustainability of the recently improved or built services. To make an evaluation and reinforcement of the actions for hygiene education to the benefited population.
(Administration) 1. To coordinate the Program at the field level- 2. To prepare and to send the reports of physical progress and information required by PMU.	
<b>Regional Government</b>	
1. To receive progress information on major stages of projects. 2. To be expected to provide necessary assistance to the local government.	
<b>District Government</b>	
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 tri-parties agreement of co-financing of the works through assigning officer/s to the project. 4. To assign resources for the prioritized water projects and sanitation as a part of co-financing. 5. To organize the Community Organization with the consultant, to promote its the 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, 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 with sanitation.	
<b>Locality</b>	
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 will 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 communal qualification and sanitary education, until the post-execution stage. 5. To pay water family fee throughout the life-time of the facility.	
<b>Community Organization</b>	
1. To participate in the decision making process of the Project. 2. To sign a Tri-parties Agreement of co-financing of the work, between the VMCS and the Municipality. 3. To facilitate the community to co-financing, through providing unskilled works, free-accommodation, free-land-lot for temporary stock yard and/or whatever they can voluntarily provide. 4. To fulfill the status and regulations the norms to be imposed. 5. To lead the management of the services; administering the economic resources, goods and infrastructure. 6. To operate and to maintain the system in suitable manner, applying the manual of operation and maintenance to be given by the consultant during the execution of the project. 7. To propose and to justify family water fees before the General Assembly of Users and after its approval, to subscribe agreement and to contract to services of third parties for the best fulfilment of its objectives and functions.	
<b>Contractors</b>	
1. To undertake the facility construction and soft-component implementation.	

Source: JICA Study Team (2010)

#### 4.18.4 Relevant Issues on Implementation Organization

[Community Organization]: The implementation will be executed considering the community organization as the main actor. The community organization can be any form, but a Sanitation Services Administration Board (JASS) is recommended. The JASS is a co-executor of the Program, along with the district municipality as a local authority and the MVCS by means of the PMU as a governing body. Thus, they (JASS) have rights and responsibilities to comply with for successful Program execution. The agreements to be agreed and signed among the actors shall clearly indicate the said rights and responsibilities.

[Perfil and Technical Files]: Before the execution of the works in localities, the Contractors that will execute construction works and soft-component, shall be given the viable *Perfil* and a complete project file (detailed design report that includes necessary technical and soft-component information), which have been approved by the PMU.

[Responsible Organization for Soft-component]: The Operating Consultant and the Contractor shall have shared responsibility, because the Operating Consultant is responsible in the Pre-Investment Stage and the Contractors are responsible in the Investment and Post-Investment Stages. Both actors shall fulfil the requirements that are described in their Terms of Reference. The PMU, which is in charge of contract administration, will be in charge of evaluating and monitoring the said activities by means of the Social Team. The Terms of Reference for the Operating Consultant and the Executing Contractor shall have an exclusive appendix where soft-component and capacity-building activities are determined in detail, along with their corresponding checkpoints.

[Application of the Field Strategy]: The application of the field strategy and of the techniques, instruments, and tools of soft-component intervention, shall be in agreement with the proposals from the Operating Consultant and the Executing Contractor; they will be made based on experience and knowledge, and they will be presented and evaluated in their technical offer, which forms part of the respective contracts.

[Special Care for the Contract Designing]: Special care should be taken in designing the contract for the Contracted Actors, so that they have adequate mechanisms of penalty and responsibility with respect to the quality of the *Perfil* and the project files, rendering them solely responsible for the technical suitability of the designs proposed for the execution of works.

## 4.19 Implementation Plan

### 4.19.1 Sequence of the Loan Program

Figure N° 4.19.1-1 shows a standard sequence of a loan program implementation. The processes are divided into four (4) 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 giving its authorization for conglomerates. Thereafter, a loan application has to be prepared for JICA. 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 should dispatch an appraisal mission to assess the necessity, feasibility, readiness conditions and so on. It will also examine the Program from the viewpoint of whether the proposed program is suitable as a Japanese-assisted loan program, in accordance to the policy set forth by the Government of Japan. After the confirmation of all of these subjects, a loan negotiation will be conducted between the donor (JICA) and MEF, along with PAPT, that will be the executing agency of the Program, and 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 Program Management Unit (PMU) for the program's execution and management. The PMU will hold a tendering procedure to select a

qualified firm for performing the consulting services, as Operating Consultant (OC). Such services will include preparation of individual *perfils*, social promotion in the pre-execution stage, as well as the preparation of the detailed design, construction supervision and soft component implementation management and operation support in the execution stage. The PMU will employ the Supervising Consultant from the private sector to evaluate the consultant's design for individual profiles and detailed design.

For Program's implementation, it is envisioned to apply the so called 'Design –Bidding– Build method which is widely applied by international donors for similar projects. In this method, the beneficiary or Executing Unit is responsible for the design works, including the soft-component, due to the characteristics of the Program.

Subsequently, the contractor (construction company associated with an NGO or a soft-component-specialized company) selected through a tendering process will execute the construction works based on the drawings and technical specifications issued by the PMU through the Operating Consultant, as well as the soft component implementation..

i) Individual *Perfils*, Detailed Design and Tendering

The Operating Consultant (CO) will carry out individual profiles, in accordance with SNIP 05A, detailed design (Proyect file) including investigation, preparation of detailed design drawings of water supply and sanitation system, cost estimates and pre-qualification and tendering procedure. At the same time, the OC should include the soft-component in the *perfils* and detail designs for the implementation of the capacity building in the areas of organization, administration, operation and maintenance of the sanitation services for the community organizations and district municipalities as well as hygiene education for the community.

The Supervising Consultant (from the private sector) is recommended to be employed for the evaluation of the consultant's Individual Profiles and Detailed Design of works and soft-component, produced by the OC.

ii) Implementation of construction works and soft-component

The Feasibility Study recommends International Competitive Bidding (ICB) for the tendering processes for the construction works. Although most of the works are composed of small-scale project with no-special techniques, sufficient capability for management of construction procedures in multiple localities shall be required.

During the implementation period, the consultant will carry out the supervision of construction works based on the donor's (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.

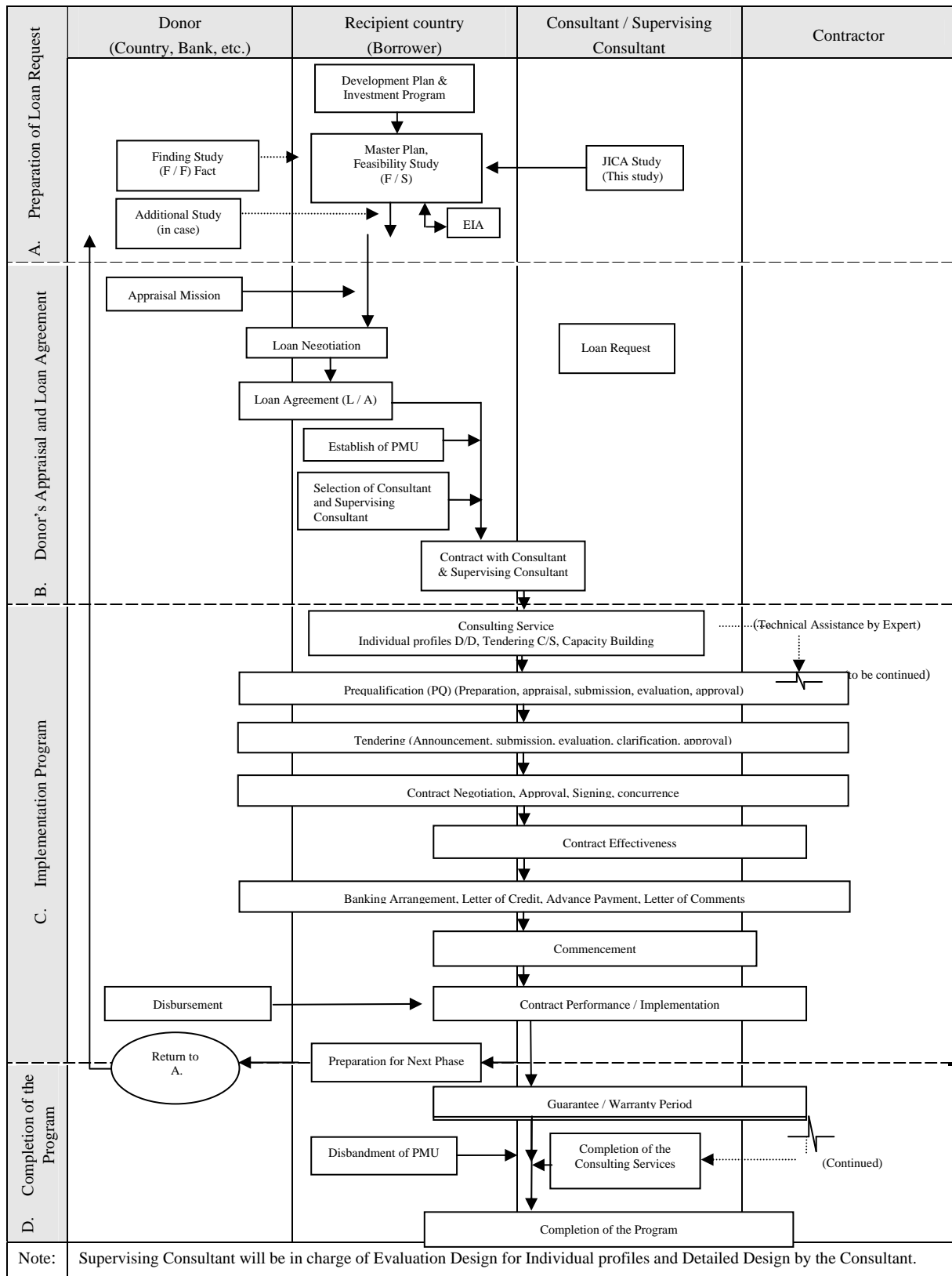
The capacity-building programs for the municipalities and community organization, as well as the hygiene education programs will also be implemented during this period, by the Contractor and supervised by the Operating Consultant.

(4) Completion of the Program

After completion of the implementation, a guarantee period (Defect Liability Period for design and hidden faults in the works) will start. Throughout the entire implementation period and the monitoring period, the capacity building, such as strengthening of district municipalities, social promotion of communities and training to the community organizations, will be provided by the Contractor and Supervised by the Operating Consultant for a sustainable management and a reliable water supply and sanitation system and services.



Figure N° 4.19.1-1 Sequence of the Loan Program



Source: JICA Study Team, (2009)

#### 4.19.2 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. At the same time, the Program involves various uncertainties which may affect the Program implementation in the course of the execution. Therefore, the Feasibility Study Report recommends the application of a phased-implementation plan where implementation will be realized step by step in phases, 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 Conglomerate 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 step-wise implementation shall be considered with the *Selva Baja* (Front Forest) as a priority; in order to allow 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 two (2) or three (3) administrative regions at most, not in all five (5) regions simultaneously, so that 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 of preceding projects in the selected localities should be reflected in the succeeding projects, as those with difficult access conditions, non-conventional solutions and/or challenging AOM for sustainability.

To work out the implementation of the Program, not only the strategy above but also the capability/availability of PMU, private firms of Operating Consultant, Supervising Consultants and Contractors should be taken into account.

And also, the following conditions were considered for the formulation of 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 in the dry season.
- 4) The soft-component should be implemented simultaneously in each locality

Having examined five (5) alternatives to be explained below, the Feasibility study recommends that the Program be implemented in three (3) phases, as shown in Table N° 4.19.2-1 (as long as the Program includes the 1,500 target localities).

(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 (5) 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 few similar projects have been implemented so far.

This Feasibility Study therefore strongly recommends that the first phase should be implemented as a status of the "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, the others; and to examine the applicability of technical options, social intervention methodology and its possible impacts; to review investment cost that has been proposed based on the Perfil Study in 50 sample localities and extrapolated to the 1,500 localities.

According to the distribution of localities by Conglomerate and administrative región of the Program, it is observed that 1,303 localities, which represent 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. Niveles de pobreza a nivel de distrito

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 districtis in the three (3) administrative regions are shown in Table. It can be noted that in the región of Amazonas tow (2) districts have been selected of a total of 48; in Loreto, five (5) districts have been selected of a total of 51; and in San Martin eight (8) districts have been selected of a total of 75.

From this information the localitites have been distributed by administrative and geographical regions (Conglomerates). 32 of which are located in the region of Amazonas, 52 are in Loreto and 46 in San Martin. Also, 92 localities are located in the Low Forest (Conglomerate C-1), 30 localitites in the High Forest (Conglomerate C-2) and 8 localities in

the Front Forest (Conglomerate C-2), as shown Table N° 4.19.2-2. The list of localities by administrative and geographic region is attached in Appendix 1.

In Conclusion, in the First Phase of execution (Pilot Program) 130 project will be implemented, of which 92 belong to the Conglomerate C-1 and 38 to the Conglomerate C-2.

**Table N° 4.19.2-1: Prioritized Districts for the First Phase of the Water and Sanitation Improvement Program for the Rural Amazon Area**

Region	District	Total Population 2007	% of Deficit for potable water	% of Deficit for sanitation	Total % of poverty incidence	% Average Rate <sup>2/</sup>
Amazonas	El Cenepa	1,618	99.81%	99.51%	84.3%	83.73%
	Rio Santiago	2,398	100.00%	99.79%	80.7%	80.53%
	Imaza	4,420	88.73%	96.74%	78.1%	67.04%
Loreto	Cahuapanas	1,141	99.7%	99.7%	93.7%	93.2%
	Balsapuerto	2,487	98.5%	98.8%	94.6%	92.1%
	Torres Causana	808	95.2%	95.4%	90.6%	82.3%
	Morona	1,100	99.0%	98.4%	84.2%	82.0%
	Andoas	1,514	98.3%	96.6%	83.9%	79.7%
	Yaquerana	427	100.0%	95.3%	78.5%	74.8%
	Lagunas	2,463	99.5%	92.6%	79.7%	73.4%
	Urarinas	2,194	99.5%	98.5%	74.6%	73.2%
	Jeberos	732	100.0%	99.2%	73.7%	73.1%
Pastaza	1,061	100.0%	95.1%	74.1%	70.5%	
San Martín	Barranquita	1,275	99.1%	94.4%	85.2%	79.7%
	Sauce	1,579	97.0%	91.1%	83.0%	73.3%
	Chazuta	1,751	93.3%	97.5%	77.5%	70.5%
	San Fernando	846	98.8%	94.6%	75.4%	70.5%
	Elias Soplin Vargas	1,950	98.8%	88.3%	74.5%	65.0%
	Shatoja	567	79.2%	98.1%	74.2%	57.6%
	Huallaga	651	100.0%	98.3%	57.9%	56.9%
	San Roque de Cumbaza	344	100.0%	95.6%	59.4%	56.8%
	Yorongos <sup>1/</sup>	770	80.5%	93.5%	71.0%	53.5%
	San Martín	1,932	80.7%	96.5%	68.6%	53.4%
	Alberto Leveau	207	100.0%	95.7%	55.7%	53.3%
	Buenos Aires	765	96.9%	95.7%	56.2%	52.1%
	Pinto Recodo	2,048	85.7%	94.4%	64.0%	51.8%
Alto Biavo	1,274	99.8%	99.1%	51.9%	51.3%	

1/ Not considered. It only has one locality

2/ The average of the deficit for the potable water and sanitation services and the total rate of poverty

Source: Prepared by the JICA Study Team (2010)- Base on the Results of the 2007 Census- INEI and Poverty Map - 2007 - INEI

**Table N° 4.19.2-2: Prioritized Localities for the First Phase of the Water and Sanitation Improvement Program for the Rural Amazon Area**

Region	Province	District <sup>1/</sup>	% Average Rate <sup>2/</sup>	Conglomerate C-1	Conglomerate C-2		Total
				Low Forest	High Forest	Front Forest	
Amazonas	Condorcanqui	Cenepa	83.7%	7	3	-	32
		Rio Santiago	80.5%	21	1	-	
Loreto	Maynas	Cahuapanas	93.2%	7	-	-	52
		Torres Causana	82.3%	9	-	-	
	Alto Amazonas	Balsapuerto	92.1%	19	1	-	
	Datem del Marañón	Morona	82.0%	5	-	-	
		Andoas	79.7%	10	-	-	
San Martin	Bellavista	Huallaga	56.9%	2	-	-	46
	El Dorado	San Martín	53.4%	-	-	6	
		Shatoja	57.6%	1	3	-	
	Lamas	Barranquita	79.7%	5	-	-	
	San Martin	Sauce	73.3%	-	5	-	
		Chazuta	70.5%	6	-	-	
	Rioja	Elfas Soplin Vargas	65.0%	-	3	2	
San Fernando		70.5%	-	5	-		
<b>Total</b>				<b>92</b>	<b>30</b>	<b>8</b>	<b>130</b>

1/ Total number of districts: 26 (3 in Amazonas, 10 in Loreto and 13 in San Martin)

2/ The average of the deficit for the potable water and sanitation services and the total rate of poverty

Source: JICA Study Team (2010)

### (3) Phased Implementation Plan of the Program

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) Assumption for the consideration of implementation schedule

Because the Program shall deal with 1,500 localities in an execution period of 10 years, larger-scale contractors, associated with NGO or soft-component-specialized companies, will have to be employed. These contractors shall be capable of managing a bulk of small-scale construction works in rural areas, including the implementation of the soft-component. It is assumed, as a tool for the estimation of the implementation period, that each contractor should handle 50 localities per contract and that each contract will be executed in the “Unit implementation period”; e.g. ‘basic implementation period’

The basic implementation period, starting from the preparation of the individual profiles with social preparation and ending at the completion of implementation, including the defect liability period and the monitoring and follow-up period for the soft-component, is estimated to be approximately 50 months (4.2 years), based on the estimated period of each step of implementation as shown in Table N° 4.19.2-3.

**Table N° 4.19.2-3: Basic Steps for Implementation**

	<b>Basic Implementation Step</b>	<b>Estimated Period</b>
i)	<u>Preparation of Individual Profiles, Social preparation</u> This shall be conducted with one sub-consultant as subletting works for 50 localities.	5 months
ii)	<u>Evaluation and Approval of Profiles above</u> This shall be conducted with the Supervising Consultant.	1-2 months
iii)	<u>Detailed Design (works and soft-component) including Preparation of Tender Documents</u> This shall be conducted with one sub-consultant as subletting works for approximately 50 localities.	5-6 months
iv)	<u>Evaluation and Approval of Detailed Design</u> This shall be conducted with the Supervising Consultant	2 months / tender
v)	<u>Procedure for PQ</u> This shall be conducted with the consultant for procedure of one PQ before tendering.	4 months / PQ
vi)	<u>Procedure for Tender and Negotiation</u> This shall be conducted with the consultant for one tendering.	4-5 months / tender
vii)	<u>Construction, Soft-component and Supervision</u> One contract shall include localities with closed locations.	12 months / contract
viii)	<u>Defect Liability Period, period of monitoring and follow-up of the soft-component.</u>	12 months / contract
	<u>Total</u>	(45-48) ~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, (2009)

The implementation period of a project for construction in one locality is estimated in three (3) months for a small size locality (less than 100 households); and in a maximum of five (5) 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 twelve (12) months.

(5) Five (5) Alternatives for Implementation Plan

The Feasibility Study considered five (5) alternative implementation plans for comparison.

i) Outline of the five (5) alternatives

Alternative-A consists of only one phase, while the other four (4) alternatives: Alternative-B to Alternative-E consists of several phases ranging from 2 phases to 7 phases.

The Alternative-A was examined to evaluate the implementation plan proposed in the previous *Perfil* Study for this Program. The other four (4) implementation alternative plans were formulated according to the strategy mentioned before in the item (1) where phased-implementation plan was recommended. The first phase of the four (4) phased-implementation plans was regarded as Pilot Program Phase as recommended in the strategy.

ii) Explanation of the Five (5) Alternatives

The explanation of each alternative for the Program is described as follows.

a) Alternative A

The Alternative-A consists of only one phase implementation and requires the shortest implementation period of 56 months (4.7 years) for all localities (1,500 localities).

The time schedule chart is as shown in the Figure 4.19.2-1 (1) Alternative-A. The requirements/conditions for this alternative are listed in the Table N° 4.19.2-4.

[Availability of Private Firms, and Progress]

To execute the Program with Alternative-A will need 30 sub-consulting firms for the elaborating 50 *Perfil* studies per each firm, and five (5) contractors for the construction in 300 localities per each contractor including the implementation of the soft-component in each locality and district municipality. It is apparent that procurement of 30 sub-consulting firms and five (5) contractor who should undertake the bulk work in rural area will not be realistic; and therefore the time schedule of this alternative is also too tight and unrealistic, considering various uncertainties expected in the Amazon Forest regions.

[Financial Aspect]

It should be also considered, for an instance, that 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 financial agency of the government if the progress of the Program should delay, after obtaining the fund of considerable amount for all the projects of the Program from a foreign ODA funding agency; as this has been experienced in another preceding program.

**Table N° 4.19.2-4: Requirements for Implementation Schedule – Alternative A**

<b>Subject</b>	<b>Requirement</b>
Number of Loan Agreement(L/A)	One
Structure of Consultant with Sub-consultant for Individual Profiles	Approximately thirty (30) sub-consultants under main consultant are required to complete the works within five (5) months. (50 Perfil per sub-consultants)
Structure of Consultant with Sub-consultant for Detailed Design and Preparation of Tender document	Approximately thirty (30) sub-consultants under main consultant are required to complete the works and soft-component within five (5) months.
Number of Contract (Lot) and Contractor	Maximum five (5) contracts (Lots) (300 projects per contractor)

Source: JICA Study Team (2010)

b) Alternative B

The Alternative-B will have the second shortest implementation period of 86 months (7.2 years) for all localities (1,500 localities). This is a division of the Alternative-A into two (2) phases to relax the demanding time-schedule-requirements of Alternative-A.

This alternative proposed the Pilot Program as the 1<sup>st</sup> phase for the purpose of confirming the working sequence of the program and for examining the practicability of the organizational structure of the various agencies such as PAPT, PMU and others. The first phase includes approximately 130 target localities, with purposes of evaluation and analysis.

The time schedule chart is shown in the Figure 4.19.2-1 (1) Alternative-B. The requirements/conditions for this alternative are listed in Table N° 4.19.2-5.

[Availability of Private Firms and Progress]

The pilot program included in the alternative will allow the Program to review its implementation plan of implementation at the first phase. However, execution of 130 projects in the first phase as the Pilot Program will leave 1,370 project in the succeeding 2<sup>nd</sup> Phase. The second phase therefore will need 28 sub-consulting firms for the elaboration of 50 Perfil studies by each firm, and five (5) contractors for construction works and the implementation of the soft-component in 274 localities per firm. The second phase of this alternative will be tight in schedule and will not allow the Program to review or modify the implementation plan during the course of the execution of 1,370 project in the second phase, though various uncertainties expected in the Amazon Forest regions.

[Financial Aspect]

And also, the issues on such a financial aspect as the Commitment Charge that is usually imposed by a ODA financing agency should be taken into account; if a considerable



amount of budget should be financed for the second phase, as may be the case of the Alternative-A.

**Table N° 4.19.2-5: Requirements for Implementation Schedule – Alternative B**

Subject	Requirement
Number of Loan Agreements (L/A)	One or two
Structure of Consultant with Sub-consultant for Individual Profiles	Approximately twenty five (28) sub-consultants under main consultant in 2nd phase are required to complete the works within five (5) months. If all target localities (1,500) are divided equally into two groups, one of 750 localities, and the Pilot Program of 750 localities; approximately fifteen (15) sub-consultants are required.
Structure of Consultant with Sub-consultant for Detailed Design and Preparation of Tender document	Approximately twenty-five (28) sub-consultants under the main consultant are required in the 2nd phase to complete the detail designs and the soft-component design works within five (5) months. If all target localities (1,500) are divided equally into two groups, one of 750 localities, and the Pilot Program of 750 localities; approximately fifteen (15) sub-consultants are required.
Number of Contracts (Lots) and Contractors	1st Phase (Pilot Program) : 3 contracts (Lots) for 130 localities 2nd Phase : five (5) contracts (Lots) for 1,370 localities (274 project per contractor); or 1 <sup>st</sup> Phase (Pilot Program) : 5 contracts (Lots) for 750 localities 2 <sup>nd</sup> Phase : five (5) contracts (Lots) for 750 localities

Source: JICA Study Team (2010)

c) Alternative C

The Alternative-C will have the third shortest implementation period of 106 months (8.9 years) for all localities (1,500 localities). This alternative consists of 2 phase as Alternative-B, but divides the 2<sup>nd</sup> phase of Alternative B into two (2) steps to relax the demanding time-schedule-requirements of Alternative-B. There will be two Loan Agreement, one for the Phase-1, and the other for the Phase-2. The Phase-1 of this alternative is as regarded as the Pilot Program, containing approximately 130 target localities as is a similar case of Alternative-B.

The time schedule chart is as shown in the Figure 4.19.2-1. The requirements/conditions for this alternative are listed in the Table N° 4.19.2-6.

[Availability of Private Firms, and Progress]

The pilot program included in the Alternative-C will allow the Program to review its plan of implementation as in the case of Alternative-B above. Also employing fourteen (15) sub-consultants, and undertaking 146 projects by one contractor are considered to be more realistic.

[Financial Aspect]

One Loan Agreement for the Phase-2 which consists of the two steps of implementation may be a considerable sum of financing. As may be the cases of the Alternative-A and Alternative-B, such financial issues as the “Commitment Charge” for an example shall be taken into account, in case the implementation progress of the Program should not as in scheduled.

**Table N° 4.19.2-6: Requirements for Implementation Schedule – Alternative C**

Subject	Requirement
Number of Loan Agreement (L/A)	Two
Structure of Consultant with Sub-consultant for Individual Profiles	Approximately fifteen (15) sub-consultants under the main consultant for each step in the 2nd phase are required to complete the works within five (5) months. If all target localities (1,500) are divided equally into three phases, each having 500 localities including the Pilot Program of 500 localities, approximately ten (10) sub-consultants are required.
Structure of Consultant with Sub-consultant for Detailed Design and Preparation of Tender document	Approximately fifteen (15) sub-consultants under the main consultant are required in the 2nd phase to complete the detail designs and the soft-component design works within five (5) months. If all target localities (1,500) are divided equally into three phases, each having 500 localities including the Pilot Program of 500 localities, approximately ten (10) sub-consultants are required.
Number of Contracts (Lots) and Contractors	1st Phase (Pilot Program) : 3 contracts (Lots) for 130 localities 2nd Phase : five (5) contracts (Lots) for 732, 638 localities on each step (146, 128 projects per contractor); or 1 <sup>st</sup> Phase (Pilot Program) : 5 contracts (Lots) for 500 localities 2 <sup>nd</sup> Phase: five (5) contracts (Lots) for 500 localities in each step.

Source: JICA Study Team (2010)

d) Alternative D

The Alternative-D will have the fourth shortest implementation period of 116 months (9.7 years) for all localities (1,500 localities). This Alternative-D consists of three (3) phases, for each phase the new loan agreement will have to be entered upon. The Pilot Program is included as the 1<sup>st</sup> phase.

The time schedule chart is as shown in the Figure N° 4.19.2-1 (2) Alternative-D. The requirements/conditions for this alternative are listed in the Table N° 4.19.2-7.

Organizational arrangement for implementation of this Alternative-D is as the same as of the Alternative-C. Only the difference is that the Alternative-D will have each Loan Agreement for three (3) implementation phases. This arrangement will reduce risks that may arise in the financial aspect due to delay of progress, such as the commitment charge as was explained for the other alternatives.

**Table N° 4.19.2-7 Requirements for Implementation Schedule – Alternative D**

Subject	Requirement
Number of Loan Agreement(L/A)	Three times
Structure of Consultant with Sub-consultant for Individual Profiles	Same as Alternative C
Structure of Consultant with Sub-consultant for Detailed Design and Preparation of Tender document	Same as Alternative C
Number of Contract (Lot) and Contractor	Same as Alternative C

Source: JICA Study Team (2010)

e) Alternative E

The Alternative-E will have the longest implementation period of 226 months (18.9 years) for all localities (1,500 localities). This is the division of the Alternative-A into seven (7) phases, to relax the demanding time-schedule-requirements. The Pilot Program is included as the 1<sup>st</sup> phase, containing approximately 100 target localities at least.

The time schedule chart is as shown in the Figure 4.19.2-1 (2) Alternative-E. The requirements/conditions for this alternative are listed in Table N° 4.19.2-8.

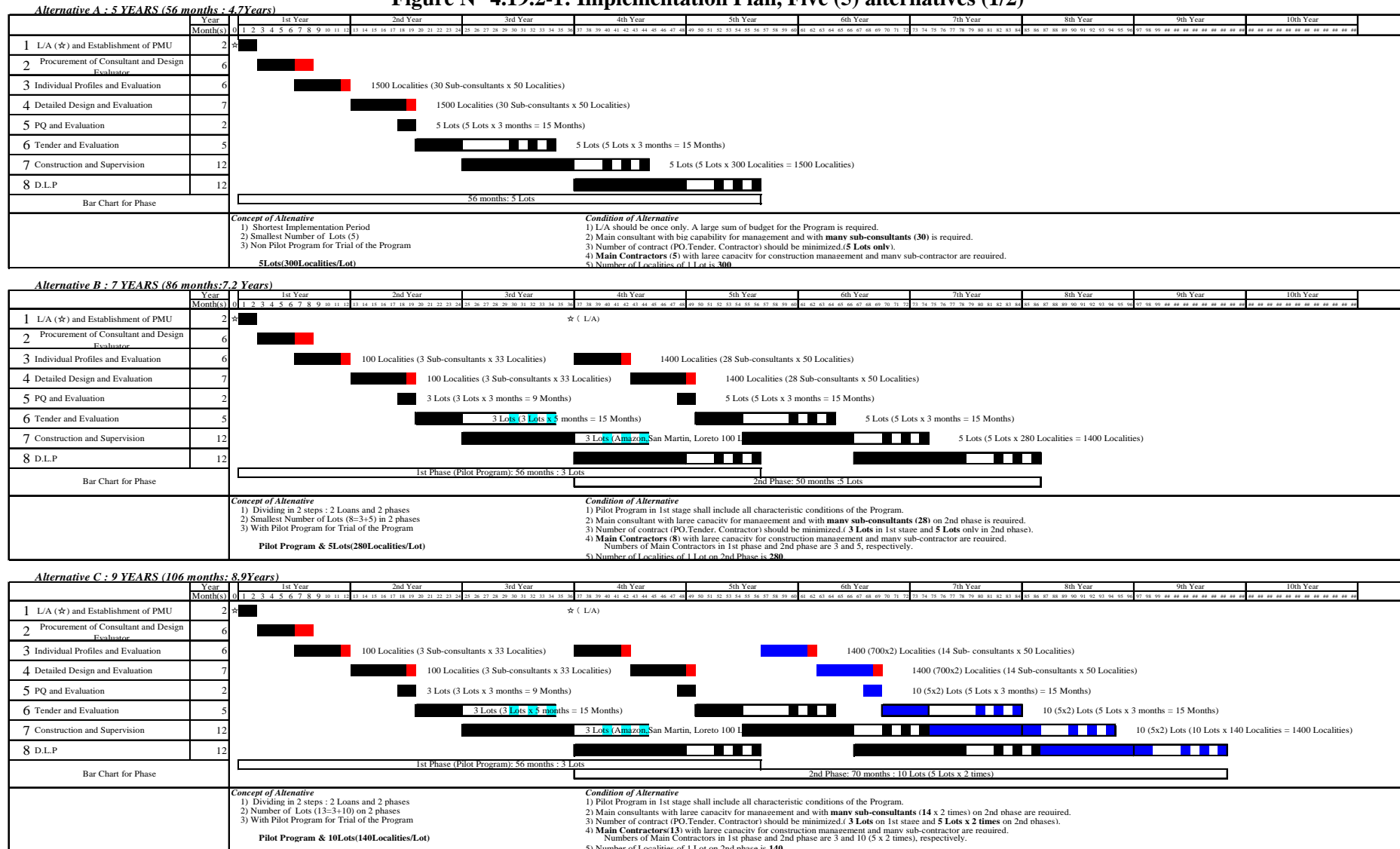
This alternative-E will be a more cautious alternative for step-wise implementation that consists of sub-divided seven (7) small scale sub-programs. Even though this alternative may considerably reduce risks arising due to uncertainties in terms of technical and/or financial aspects, loan agreements of seven (7) times for one Program might not be justifiable from a program feasibility point of view; and the project time period of 18.9 years may retard the realization of the effectiveness of the Program implementation.

**Table N° 4.19.2-8: Requirements for Implementation Schedule – Alternative E**

Subject	Requirement
Number of Loan Agreement (L/A)	Seven
Structure of Consultant with Sub-consultant for Individual Profiles	Approximately five (5) sub-consultants under the main consultant in the 2nd phase and onwards are required to complete the works within five (5) months.
Structure of Consultant with Sub-consultant for Detailed Design and Preparation of Tender document	Approximately five (5) sub-consultants under the main consultant are required in the 2 <sup>nd</sup> phase to complete the detail designs and soft-component designs within five (5) months.
Number of Contracts (Lots) and Contractors	1 <sup>st</sup> Phase (Pilot Program) : 3 contracts (Lots) for 100 localities 2nd Phase and onwards : five (5) contracts (Lots) for each phase (46 projects per contractor)

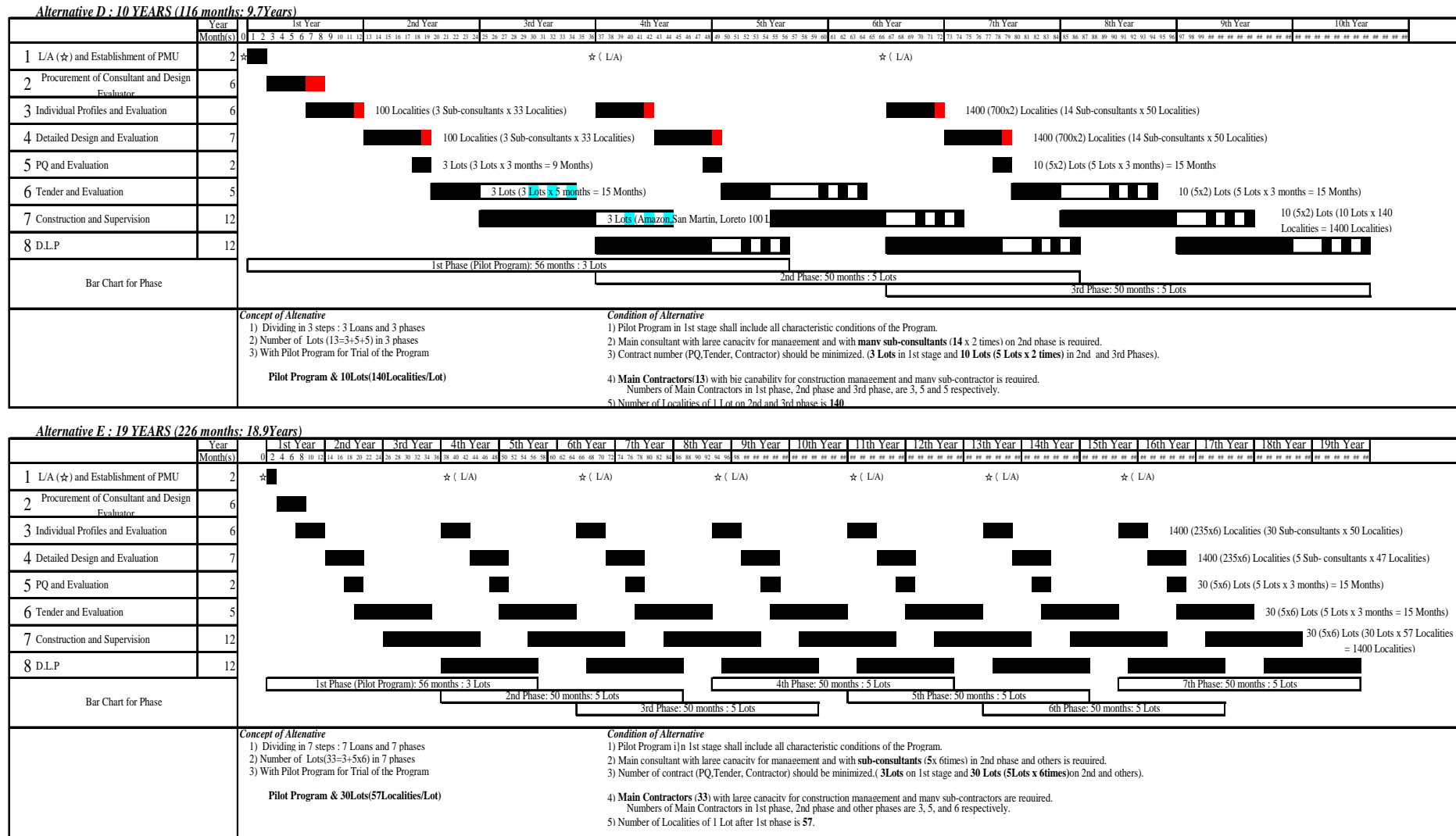
Source: JICA Study Team (2010)

Figure N° 4.19.2-1: Implementation Plan, Five (5) alternatives (1/2)



Source: JICA Study Team,2009

Figure N° 4.19.2-1: Implementation Plan, Five (5) alternatives (2/2)



Source: JICA Study Team,2009

(6) Selection of the Alternatives

A summary table for comparison is shown in the Table N° 4.19.2-9 below and the detailed comparison is as shown in the Table N° 4.19.2-10.

The Feasibility Study considers it reasonable and suitable that the Program shall be executed within ten (10) years, taking into account the viability/reliability of the conditions based on which the present Program has been formulated. On the basis of this consideration of the Program period and having examined the five (5) alternatives above, the Feasibility Study recommends that the Program shall be implemented in accordance with the implementation plan of the Alternative-D where the program shall be implemented in three (3) phases as shown in the Figure N° 4.19.2-2.

**Table N° 4.19.2-9: Summary of the Comparison of the Case Study of Implementation Plan**

Alternative	A		B		C		D		E	
Nos. of Phases	1 phase		2 phases		2 phases		3 phases		7 phases	
Nos. of L/A	once		twice		twice		3 times		7 times	
Nos. of Localities	Phase-1	1,500	Phase-1	130	Phase-1	130	Phase-1	130	Phase-1	100
	-	-	Phase-2	1,370	Phase-2, step-1	732	Phase-2	732	Phase-2	225
	-	-	-	-	Phase-2, step-2	638	Phase-3	638	Phase-3 to 7	235
Nos. of Contractor	Phase-1	5	Phase-1	3	Phase-1	3	Phase-1	3	Phase-1	3
	-	-	Phase-2	5	Phase-2, step-1	5	Phase-2	5	Phase-2	5
	-	-	-	-	Phase-2, step-2	5	Phase-3	5	Phase-3 to 7	5
Nos. of Localities per Contract	Phase-1	300	Phase-1	44	Phase-1	44	Phase-1	44	Phase-1	33
	-	-	Phase-2	274	Phase-2, step-1	146	Phase-2	146	Phase-2	45
	-	-	-	-	Phase-2, step-2	128	Phase-3	128	Phase-3 to 7	47
Nos. of Sub-consultant(*)	Phase-1	30	Phase-1	3	Phase-1	3	Phase-1	3	Phase-1	2
	-	-	Phase-2	28	Phase-2, step-1	15	Phase-2	15	Phase-2	5
	-	-	-	-	Phase-2, step-2	13	Phase-3	13	Phase-3 to 7	5
Program Period	4.7 years		7.2 years		8.9 years		9.7 years		18.9 years	
Recommendation	N/R		N/R		2nd Recommendable		1st Recommendable		N/R	
(*): One sub-consultant firm will undertake 50 Perfils. L/A: Loan Agreement; Nos.: Numbers; N/R: Not Recommendable										

**Table N° 4.19.2-10: Comparison of the Alternative for the Implementation Program**

Name of Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	5 Years	7 Years	9 Years	10 Years	19 Years
	5Lots(300Localities/Lot)	Pilot Program & 5Lots(max274Localities/Lot)	Pilot Program & 10Lots(max146Localities/Lot)	Pilot Program & 10Lots(max146Localities/Lot)	Pilot Program & 30Lots(57Localities/Lot)
<b>Main Concept of Alternative</b>	1) Shortest Implementation Period 2) Smallest Number of Lots (5) 3) Non Pilot Program for Trial of the Program	1) Dividing in 2 steps : 2 Loans and 2 phases 2) Smallest Number of Lots (8=3+5) in 2 phases 3) With Pilot Program for Trial of the Program	1) Dividing in 2 steps : 2 Loans and 2 phases 2) Number of Lots (13=3+10) on 2 phases 3) With Pilot Program for Trial of the Program	1) Dividing in 3 steps : 3 Loans and 3 phases 2) Number of Lots (13=3+5+5) in 3 phases 3) With Pilot Program for Trial of the Program	1) Dividing in 7 steps : 7 Loans and 7 phases 2) Number of Lots(33=3+5x6) in 7 phases 3) With Pilot Program for Trial of the Program
<b>General Condition of Alternative</b>	Common General Conditions of alternatives are as follows.	1) Capability of one subconsultant for Individual Profiles is 50 localities/time within 5 months. 2) Procedure of Evaluation and Approval for Individual Profile is conducted within 2 months for maximum 1,500 localities 3) Capability of one subconsultant for Detailed Design is 50 Localities/time within 6 months 4) Procedure of Evaluation and Approval for Detailed Design is conducted within 2 months for maximum 280 localities 5) Procedure of one Prequalification including Evaluation and Approval is 4 months 6) Procedure of Tender and Negotiation is conducted within 4 months for one lot. 7) Construction of one Lot (maximum 280 Localities) is conducted within 12 months 8) Defect Liability Period of one Lot (maximum 280 Localities) is 12 months			
<b>Particular Condition of Alternative</b>	1) Loan Agreement is once only. A large sum of capital budget is available. 2) 30 sub-consultants under a Main consultant are available for Individual profiles and detailed design 3) Number of Lots (PQ, Tender, Contractor) is 5 only. 4) 5 main contractors with large capacity for construction management and many sub-contractors are available. 5) 300 localities in 1 Lot are available.	1) Loan Agreement is twice. A large sum of capital budget is available in 2nd phase. 2) 28 sub-consultants under a Main consultant are available for Individual profiles and detailed design 3) Number of Lots (PQ, Tender, Contractor) is 8(3+5) only. 4) 8 main contractors with large capacity for construction management and many sub-contractors are available. 5) 130 localities in 1 Lot are available.	1) Loan Agreement is twice. A large sum of capital budget is available in 2nd phase. 2) 15 sub-consultants under a Main consultant are available for Individual profiles and detailed design 3) Number of Lots (PQ, Tender, Contractor) is 13(3+5x2) only. 4) 13 main contractors with large capacity for construction management and many sub-contractors are available. 5) 130 localities in 1 Lot are available.	1) Loan Agreement is three times. 2) 15 sub-consultants under a Main consultant are available for Individual profiles and detailed design 3) Number of Lots (PQ, Tender, Contractor) is 13(3+5+5) only. 4) 13 main contractors with large capacity for construction management and many sub-contractors are available. 5) 130 localities in 1 Lot are available.	1) Loan Agreement is seven times. 2) 5 sub-consultants under a Main consultant are available for Individual profiles and detailed design 3) Number of Lots (PQ, Tender, Contractor) is 33(3+5x6) only. 4) 33 main contractors with large capacity for construction management and many sub-contractors are available. 5) 57 localities in 1 Lot are available.

	6) Non Pilot Program includes all characteristics of the Program.	6) Pilot Program in 1st phase includes all characteristics of the Program.	6) Pilot Program in 1st phase includes all characteristics of the Program.	6) Pilot Program in 1st phase includes all characteristics of the Program.	6) Pilot Program in 1st phase includes all characteristics of the Program.
<b>Estimated Period</b>	56 months (4.7 years)	86 months (7.2 years)	106 months (8.9 years)	116 months (9.7 years)	226 months (18.9 years)

<b>Appraisal Comments of Alternatives</b>					
<b>Implementation Period</b>	Shortest period in all alternatives.	Shortest period with 2-phase program.	Second shortest period with 2-phase program.	Shortest period with 3 phases	Longest period in all alternatives.
<b>Reasonable Implementation Period shall be determined with consideration of capability of organization's structure.</b>					
<b>Number of Lots</b>	Smallest of number of Lots (PQ, Tender, Contractor)	Smallest of number of Lots (PQ, Tender, Contractor) in 2 phases	Second Smallest number of Lots (PQ, Tender, Contractor) in 2 phases	Smallest of number of Lots (PQ, Tender, Contractor) in 3 phases	Smallest of number of Lots (PQ, Tender, Contractor) with 7 phases
<b>Number of Lots shall be natural for reasonable workability. It should be as small as possible, if short implementation period is required.</b>					
<b>Finding of Main Consultant and Sub-consultants</b>	Difficult for main consultant to find/manage 30 capable 30 sub-consultants.	Difficult for main consultant to find/manage 28 capable sub-consultants in 2nd phase.	Difficult for main consultant to find/manage 15capable sub-consultants in 2nd phase.	Difficult for main consultant to find/manage 15 and 13 capable sub-consultants in 2nd and 3rd phases.	Easy for main consultant to find/manage 5 capable sub-consultants from 2nd phase to 7th phase.
<b>Employer will employ main constructor with large capacity for management, if short implementation period is required.</b>					
<b>Number of available Sub-consultants shall affect progress of the program ( Individual Profile and Detailed Design).</b>					
<b>Difficulty of Design Works</b>	Difficult for consultant to conduct 1,500 individual profiles and detailed designs.	Difficult for the consultant to conduct 1,370 individual profiles and detailed designs in 2nd phase.	Difficult for the consultant to conduct 1,370 individual profiles and detailed designs in 2nd phase.	Difficult for the consultant to conduct 1,370 individual profiles and detailed designs in 2nd and 3rd phases.	Easy for the consultant to conduct 1,400 (235x7)phases individual profiles and detailed designs from 2nd phase to 7th phase.
<b>Capability of Sub-consultants shall be confirmed in terms of reasonable workability.</b>					
<b>Finding of Main Contractor and Sub-contractors</b>	Difficult for main contractor to find/manage many sub-contractors.	Difficult for main contractor to find/manage many sub-contractors in 2nd phase.	Difficult for main contractor to find/manage many sub-contractors in 2nd phase.	Difficult for main contractor to find/manage many sub-contractors in 2nd and 3rd phases.	Difficult for main contractor to find/manage many sub-contractors from 2nd phase to 7th phase.
<b>Employer will employ main constructor with large capacity for management, if short implementation period is required.</b>					
<b>Number of available Sub-contractors shall affect progress of the program (Project).</b>					



<b>Difficulty of Construction Works</b>	Difficult for contractor to conduct 300 projects per one lot.	Difficult for contractor to conduct 274 projects per one lot in 2nd phase.	Difficult for contractor to conduct 146, 128 projects per one lot in 2nd phase.	Difficult for contractor to conduct 146, 128 projects per one lot in 2nd phase and 3rd phases.	Easy for contractor to conduct 57 projects per one lot by the contractor from 2nd phase to 7th.
	<b>Capability of Sub-consultants shall be confirmed in terms of reasonable workability.</b>				
<b>Pilot Program</b>	It is not considered/included to confirm possibility of the Program.	It is considered/included to confirm possibility of the Program.	It is considered/included to confirm possibility of the Program.	It is considered/included to confirm possibility of the Program.	It is considered/included to confirm possibility of the Program.
	<b>If the pilot program is considered/ included in the implementation plan of the program, the difficulties of the program, such as the capability of the organization's structure, given the sequence of the Program, shall be confirmed.</b>				
<p><b><u>Recommendation by the JICA Study Team</u></b></p> <p>The difficulty of this Program is not a sequence and/or technical issue of the construction works by the contractor. A difficult task involved in this Program is to strengthen the capability of organizations such as the executing agency (PAPT), PMU, the consultant with sub-consultants, the contractor with sub-contractors, district municipalities, and community organizations. A realistic implementation period should be determined with consideration for availability of the organization's structure.</p> <p>The reasonable alternative is suggested that Implementation Period shall be determined as <b><u>less than ten(10) years</u></b> with consideration of appraisal comments above. <b><u>Alternative D (or C) is recommended.</u></b></p>					



(7) 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) (ii) a distribution that includes each conglomerate (geographical region); (iii) one contract packaging for the construction/rehabilitation and implementation of the soft-component to include approximately 150 localities, (iv) one contract package to consist of localities in one administrative region; as follows;

- In the first phase as the Pilot Program, 130 localities were allocated as a reasonable scale for a pilot Program, based on the amount of investment; among those 92 localities are in Conglomerate C-1 and 38 localities are part of Conglomerate C-2. This allocation of localities is proportional, but slightly higher, to the the total localities of 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; the justification is described in item (2)
- In Amazonas San Martin, Ucayali and Loreto (four administrative regions), during the second phases for; 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 phase (two phases),
- Projects in San Martin and Loreto Region, in the three phases,
- Projects in Madre de Dios, in one phase of the third phase, and,
- Project in Ucayali, in one phase of the second phase

The selection of localities may vary according to the prioritization criteria.

The allocation of localities for each phase and for Contract packaging are shown in Table N° 4.19.2-11 and Table N° 4.19.2-12, respectively.

**Table N° 4.19.2-11 Proposed Allocation of Localities for Each Phase**

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

Source: JICA Study Team, (2009)

**Table N° 4.19.2-12: Proposed Contract Packaging**

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

Source: JICA Study Team, (2009)

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 2<sup>nd</sup> 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 1<sup>st</sup> phase. The loan for the 3<sup>rd</sup> 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 2<sup>nd</sup> phase.

On the other hand, the Operating Consultant shall design the capacity-building programs for the Management Unit of the District Municipality in administration, operation and maintenance (AOM), and the hygiene education program to be executed by the contractor during the implementation period. The follow-up activities for the soft-component will continue for twelve (12) months after takeover in an intermittent manner.

#### 4.19.3 Consulting Services – Operating Consultant

The Consulting Services that will be in charge of an Operating Consultant consist of two work groups (1) Engineering services for infrastructure and (2) Soft-component implementation as outlined below.

- Engineering services includes the elaboration of the pre-investment studies at the level of *Perfil*, the studies of the investment stage, which include (i) Detailed designs (ii), selection of contractors, and supervision of the construction works of water supply and sanitation systems/facilities, and elaboration of manual for social intervention,
- The Soft-component implementation includes field activities for social preparation, formation/re-activation of the Community Organizations, the design for the strengthening of the Management Unit of the district municipality and the community organization in charge of the administration, operation and maintenance of the sanitation services, as well as the design of the hygiene education program, including follow up during a year in the post investment stage.

The Operating Consultant will be contracted by the PAPT, which is the organization designated by MVCS as the Executing Unit of the Program and which will create a PMU within its organization to implement the Program. The OC will provide consulting services and will support the PMU in the implementation of the Program in the following aspects;

##### (1) Engineering Services

###### i) Pre-investment stage - Individual *Perfil* Studies

- Review of previous study 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* Study 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 Supervising Consultant 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 130 *Perfil Studies* in the first phase, 732 *Perfil Studies* in the second phase and also 638 *Perfil Studies* will have to be conducted in the third phase. The *perfiles* prepared as a part of the Feasibility Study will be reviewed.

The Feasibility Study recommends that the Operating Consultant sublets the *Perfil* studies to several sub-consultants. Each sub-consultant shall be in charge of approximately 50 *Perfil* studies. These sublet works shall be finished within a maximum period of six (6) months, including the evaluation by the Supervising Consultant and the approval and viability declaration of the project by the PMU-PAPT. It has been proposed that the Supervising Consultant shall evaluate the individual *perfiles* within one month.

ii) Investment Stage (1)- Detailed Design (Project Files) Services

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 detailed design works are to be conducted through sub-consultants.

- Review of previous studies and plans (Individual *Profile 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 Archeological 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.

- Cost estimation for the construction works and contract packaging.
- Coordination with PMU and 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).
- Strengthening of the PMU so they may conduct the processes of programming, follow up and monitoring of the above-mentioned activities.

iii) Investment Stage (2) – Selection of Contractors and Supervision of Construction

The Operating Consultant shall also be responsible for supporting the PAPT in the selection of contractors and for the supervision of the construction works 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 proceeding and evaluation
- Assistance to PMU-PAPT in the tender and evaluation processes
- Assistance to PMU-PAPT in contract negotiation and preparation of documents
- Assistance in contract negotiation and documentation
- Strengthening of the PMU so they may conduct the processes of programming, follow up and monitoring of the above-mentioned activities.

b) Supervision of Construction

- Supervision of construction works
- Technical and management support for the Project
- EIA monitoring,
- Strengthening of the PMU so they may conduct the processes of programming, follow up and monitoring of the above-mentioned activities.

(2) Social Intervention Services

The present Feasibility Study recommends that the social intervention shall be undertaken by the Operating Consultant, taking into consideration the proposed Integrated Approach to the improvement of the rural water supply and sanitation; where the approach shall integrate the construction of facilities/systems and the social intervention. The envisaged activities of the Operating Consultant for the social intervention will be as follows:

i) Pre-investment Stage - Perfil elaboration period

- Conducting of social preparation to motivate the benefited community
- Formation or re-activation of the Community Organizations,

- Facilitation for selection of facility type and service level, and
- Also facilitation for the decision of co-financing and the type of co-financing,
- It must 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.

ii) Investment or Execution Stage (1) -Detail Design period:

- Follow-up of locality's preparation for receiving intervention
- 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 (2) – Construction period

- 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.
- Supervision of the development of the Hygien Education Programa for the benefited population of each locality.
- Supervision of the implementation of the Capacity building Program for the district municipality in supporting the localities by monitoring them and giving them technical advice for the communal 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

#### 4.19.4 Design Evaluation – Supervising Consultant

The Supervising Consultant will be assigned under the PMU, which will be organized by the PAPT to support the PMU in the implementation of the Program, in the following aspects;



- (1) Individual Profiles Stage
  - Supervision and Evaluation of the Individual *Perfils* to be prepared by the Operating Consultant, including the soft component implementation for their approval by the PMU/PAPT and obtaining the viability of the projects.
- (2) Detailed Design Stage
  - Supervision and Evaluation of the detailed designs to be prepared by the Operating Consultant, as well as the design for the soft-component implementation described in item (2)

Currently, the Feasibility Study proposes the procurement of the Supervising Consultant by the PMU/PAPT, since the Program will be implemented in an “outsourcing mode” as in many other projects, where the supervision by a second consultant is required to evaluate the perfils and detail designs.

#### 4.19.5 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, who will associate with NGOs or specialized companies to implement the soft-component.

It is considered that the maximum 150 projects (localities) shall be included in one contract package; 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, the PMU, SC, and consultant groups and contractors associated with an NGO, and (4) the fact that the construction costs, including the soft-component, of rural water supply and sanitation facilities may be less two thousand USD per project or per locality.

As a result, the present Feasibility Study proposes the total of thirteen (13) contract packages, consisting of tow (2) in the 1<sup>st</sup> phase, five (5) in the 2<sup>nd</sup> phase and five (5) on 3<sup>rd</sup> phase.

##### (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) Labour 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 labour.

## 4.20 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 works for water supply and sanitation services in the 1,500 localities of the Program, as well as for soft-component implementation activities and consultant services for the development of pre-investment studies, technical files, or detailed designs, soft-component files, advice for the tendering and supervision of works and supervision of the soft-component and capacity-building activities, including capacity-building for the PMU of the PAPT foreseen in Components 1, 2 and 3 in the Program costs.

### (1) 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. In addition to the general conditions for the eligibility, costs for the Supervising Consultants may be included in the non-eligible part of the JICA financing; whereas the costs for Operating Consultant will be included in eligible part, and 100 % of the costs may be the subject of the financing.

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

### (2) 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 is in accordance with the execution capacity of the PMU-PAPT of 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 so is agreed with the JICA total funding for all phases of the Program.

In that sense, the Peruvian parties also informed that the PG requested JICA an financial assistance of 48.9 million USD for the first phase of the Program . The balance of resources would be covered by national counterpart funds, which consist of the budgets of the statements of MVCS, district municipalities' funds and the supply of community unskilled labor in monetary terms for the implementation of water and sanitation facilities. The analysis of financing by the municipalities is specified in the section 4.17.1 of the present Feasibility Study.

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%.

### (3) 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 N° 4.20-1, N° 4.20-2, and N° 4.20-3, with a summary in Table N° 4.20-4.

**Table N° 4.20-1: Financing Outline for the Water Supply and Sanitation Program for Rural Amazon Area – First Phase (2010-2013)**  
(thousands of dollars)

Item	Description	Total Program Cost	1st Phase									
			Total Cost	(%)	Financing				National Contribution			
					JICA	(%)	PG	(%)	MVCS	(%)	Municipality/ Community	(%)
<b>1)</b>	<b>Component 1- Conglomerate C-1</b>	<b>272,245</b>	<b>28,449</b>	<b>19%</b>	<b>21,052</b>	<b>74%</b>	<b>7,397</b>	<b>26%</b>	<b>6,657</b>	<b>90%</b>	<b>740</b>	<b>10%</b>
1.1	Water Infrastructure	105,594	10,794	19%	5,937	55%	4,857	45%	4,372	90%	486	10%
1.2	Sanitation Infrastructure	53,091	5,427	19%	2,985	55%	2,442	45%	2,198	90%	244	10%
1.3	Soft-Component (implementation stage)	27,453	2,867	19%	2,867	100%	0	0%	0			
1.4	Perfiles (Water and Sanitation)	17,643	1,856	19%	1,856	100%	0	0%	0			
1.5	Detailed Designs of works and Soft-component (Water and Sanitation)	28,448	2,865	18%	2,865	100%	0	0%	0			
1.6	Advising and Supervising works and Soft-component (Water and Sanitation)	33,554	3,432	21%	3,432	100%	0	0%	0			
1.7	Supervision of Perfiles(Water and Sanitation)	2,385	506	22%	506	100%	0	0%	0			
1.8	Supervision of Designs (Water and Sanitation) and Soft-component file	4,077	701	18%	701	100%	0	0%	0			
<b>2)</b>	<b>Component 2- Conglomerate C-2</b>	<b>133,668</b>	<b>8,642</b>	<b>10%</b>	<b>6,481</b>	<b>75%</b>	<b>2,160</b>	<b>25%</b>	<b>1,944</b>	<b>90%</b>	<b>216</b>	<b>10%</b>
2.1	Water Infrastructure	50,675	3,209	10%	1,765	55%	1,444	45%	1,300	90%	144	10%
2.2	Sanitation Infrastructure	23,540	1,491	10%	820	55%	671	45%	604	90%	67	10%
2.3	Soft-component Intervention (implementation stage)	19,141	1,229	9%	1,229	100%	0	0%	0			
2.4	Perfiles (Water and Sanitation)	8,286	538	9%	538	100%	0	0%	0			
2.5	Detailed Designs of works and Soft-component (Water and Sanitation)	13,375	830	9%	830	100%	0	0%	0			
2.6	Advising and Supervising works and Soft-component (Water and Sanitation)	15,769	994	11%	994	100%	0	0%	0			
2.7	Supervision of Perfiles(Water and Sanitation)	1,052	147	12%	147	100%	0	0%	0			
2.8	Supervision of Designs (Water and Sanitation) and Soft-component file	1,831	203	9%	203	100%	0	0%	0			
<b>3)</b>	<b>Component 3</b>	<b>20,296</b>	<b>1,855</b>	<b>16%</b>	<b>278</b>	<b>15%</b>	<b>1,576</b>	<b>85%</b>	<b>1,545</b>	<b>98%</b>	<b>32</b>	<b>2%</b>
3.1	Program Administration 1/	20,296	1,855	16%	278	15%	1,576	85%	1,545	98%	32	2%
<b>4)</b>	<b>VAT (19%)</b>	<b>80,980</b>	<b>7,400</b>	<b>16%</b>	<b>0</b>	<b>0%</b>	<b>7,400</b>	<b>100%</b>	<b>7,400</b>	<b>100%</b>	<b>0</b>	<b>0%</b>
<b>Grand Total</b>		<b>507,189</b>	<b>46,344</b>	<b>16%</b>	<b>27,807</b>	<b>60%</b>	<b>18,538</b>	<b>40%</b>	<b>17,611</b>	<b>95%</b>	<b>927</b>	<b>5%</b>

1/ Includes Strengthening of PMU-PAPT; Source: JICA Study Team (2010)

It is noted that for the first phase of Program's execution, the JICA loan amounts to USD 27.9 million, representing 60% of the total Program cost. The balance would be 95% covered by the investments budget statement of the MVCS for the period 2010-2013, and 5% covered by the following means: (i) valuation of community's unskilled man labor that is equivalent to 10% of the direct cost of works of the water connections and sinks, as well as the installation of latrines, whose total amounts to USD 0.662 million (S/. 2.86 million); and (ii) taking charge of the district municipalities' budgets by means of personnel participating in Program administration and cash contributions that amount to USD 311 thousand.

**Table N° 4.20-2: 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	(%)	JICA	(%)	Municipality /Community	(%)
<b>1)</b>	<b>Component 1- Conglomerate C-1</b>	<b>272,245</b>	<b>118,301</b>	<b>19%</b>	<b>87,543</b>	<b>74%</b>	<b>30,758</b>	<b>26%</b>	<b>27,683</b>	<b>90%</b>	<b>3,076</b>	<b>10%</b>
1.1	Water Infrastructure	105,594	45,758	19%	25,167	55%	20,591	45%	18,532	90%	2,059	10%
1.2	Sanitation Infrastructure	53,091	23,006	19%	12,653	55%	10,353	45%	9,317	90%	1,035	10%
1.3	Soft-Component (implementation stage)	27,453	11,878	19%	11,878	100%	0	0%	0			
1.4	Perfiles (Water and Sanitation)	17,643	7,801	19%	7,801	100%	0	0%	0			
1.5	Detailed Designs of works and Soft-component (Water and Sanitation)	28,448	12,599	18%	12,599	100%	0	0%	0			
1.6	Advising and Supervising works and Soft-component (Water and Sanitation)	33,554	14,850	21%	14,850	100%	0	0%	0			
1.7	Supervision of Perfiles(Water and Sanitation)	2,385	862	22%	862	100%	0	0%	0			
1.8	Supervision of Designs (Water and Sanitation) and Soft-component file	4,077	1,549	18%	1,549	100%	0	0%	0			
<b>2)</b>	<b>Component 2- Conglomerate C-2</b>	<b>133,668</b>	<b>76,313</b>	<b>10%</b>	<b>57,235</b>	<b>75%</b>	<b>19,078</b>	<b>25%</b>	<b>17,170</b>	<b>90%</b>	<b>1,908</b>	<b>10%</b>
2.1	Water Infrastructure	50,675	28,885	10%	15,887	55%	12,998	45%	11,698	90%	1,300	10%
2.2	Sanitation Infrastructure	23,540	13,418	10%	7,380	55%	6,038	45%	5,434	90%	604	10%
2.3	Soft-component Intervention (implementation stage)	19,141	10,842	9%	10,842	100%	0	0%	0			
2.4	Perfiles (Water and Sanitation)	8,286	4,799	9%	4,799	100%	0	0%	0			
2.5	Detailed Designs of works and Soft-component (Water and Sanitation)	13,375	7,751	9%	7,751	100%	0	0%	0			
2.6	Advising and Supervising works and Soft-component (Water and Sanitation)	15,769	9,135	11%	9,135	100%	0	0%	0			
2.7	Supervision of Perfiles(Water and Sanitation)	1,052	530	12%	530	100%	0	0%	0			
2.8	Supervision of Designs (Water and Sanitation) and Soft-component file	1,831	953	9%	953	100%	0	0%	0			
<b>3)</b>	<b>Component 3</b>	<b>20,296</b>	<b>9,731</b>	<b>16%</b>	<b>1,460</b>	<b>15%</b>	<b>8,271</b>	<b>85%</b>	<b>8,106</b>	<b>98%</b>	<b>165</b>	<b>2%</b>
3.1	Program Administration 1/	20,296	9,731	16%	1,460	15%	8,271	85%	8,106	98%	165	2%
<b>4)</b>	<b>VAT (19%)</b>	<b>80,980</b>	<b>38,826</b>	<b>16%</b>	<b>0</b>	<b>0%</b>	<b>38,826</b>	<b>100%</b>	<b>38,826</b>	<b>100%</b>	<b>0</b>	<b>0%</b>
<b>Grand Total</b>		<b>507,189</b>	<b>243,170</b>	<b>16%</b>	<b>145,902</b>	<b>60%</b>	<b>97,268</b>	<b>40%</b>	<b>92,405</b>	<b>95%</b>	<b>4,863</b>	<b>5%</b>

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 N° 4.20-2 and N° 4.20-3.

**Table N° 4.20-3: 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	(%)	Municipality /Community	(%)
<b>1)</b>	<b>Component 1- Conglomerate C-1</b>	<b>272,245</b>	<b>125,495</b>	<b>19%</b>	<b>92,866</b>	<b>74%</b>	<b>32,629</b>	<b>26%</b>	<b>29,366</b>	<b>90%</b>	<b>3,263</b>	<b>10%</b>
1.1	Water Infrastructure	105,594	49,043	19%	26,973	55%	22,069	45%	19,862	90%	2,207	10%
1.2	Sanitation Infrastructure	53,091	24,658	19%	13,562	55%	11,096	45%	9,986	90%	1,110	10%
1.3	Soft-Component (implementation stage)	27,453	12,708	19%	12,708	100%	0	0%	0			
1.4	Perfiles (Water and Sanitation)	17,643	7,986	19%	7,986	100%	0	0%	0			
1.5	Detailed Designs of works and Soft-component (Water and Sanitation)	28,448	12,985	18%	12,985	100%	0	0%	0			
1.6	Advising and Supervising works and Soft-component (Water and Sanitation)	33,554	15,272	21%	15,272	100%	0	0%	0			
1.7	Supervision of Perfiles(Water and Sanitation)	2,385	1,017	22%	1,017	100%	0	0%	0			
1.8	Supervision of Designs (Water and Sanitation) and Soft-component file	4,077	1,827	18%	1,827	100%	0	0%	0			
<b>2)</b>	<b>Component 2- Conglomerate C-2</b>	<b>133,668</b>	<b>48,714</b>	<b>10%</b>	<b>36,535</b>	<b>75%</b>	<b>12,178</b>	<b>25%</b>	<b>10,961</b>	<b>90%</b>	<b>1,218</b>	<b>10%</b>
2.1	Water Infrastructure	50,675	18,581	10%	10,220	55%	8,361	45%	7,525	90%	836	10%
2.2	Sanitation Infrastructure	23,540	8,631	10%	4,747	55%	3,884	45%	3,496	90%	388	10%
2.3	Soft-component Intervention (implementation stage)	19,141	7,070	9%	7,070	100%	0	0%	0			
2.4	Perfiles (Water and Sanitation)	8,286	2,949	9%	2,949	100%	0	0%	0			
2.5	Detailed Designs of works and Soft-component (Water and Sanitation)	13,375	4,794	9%	4,794	100%	0	0%	0			
2.6	Advising and Supervising works and Soft-component (Water and Sanitation)	15,769	5,639	11%	5,639	100%	0	0%	0			
2.7	Supervision of Perfiles(Water and Sanitation)	1,052	375	12%	375	100%	0	0%	0			
2.8	Supervision of Designs (Water and Sanitation) and Soft-component file	1,831	675	9%	675	100%	0	0%	0			
<b>3)</b>	<b>Component 3</b>	<b>20,296</b>	<b>8,710</b>	<b>16%</b>	<b>1,307</b>	<b>15%</b>	<b>7,404</b>	<b>85%</b>	<b>7,256</b>	<b>98%</b>	<b>148</b>	<b>2%</b>
3.1	Program Administration 1/	20,296	8,710	16%	1,307	15%	7,404	85%	7,256	98%	148	2%
<b>4)</b>	<b>VAT (19%)</b>	<b>80,980</b>	<b>34,755</b>	<b>16%</b>	<b>0</b>	<b>0%</b>	<b>34,755</b>	<b>100%</b>	<b>34,755</b>	<b>100%</b>	<b>0</b>	<b>0%</b>
<b>Grand Total</b>		<b>507,189</b>	<b>217,674</b>	<b>16%</b>	<b>130,605</b>	<b>60%</b>	<b>87,070</b>	<b>40%</b>	<b>82,716</b>	<b>95%</b>	<b>4,353</b>	<b>5%</b>

Source: JICA Study Team (2010)

Table N° 4.20-4 presents the financing outline for the three (3) phases of the Program's execution. The financing of the involved parties will be as follows:

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

**Table N° 4.20-4: 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	Phases (1+2+3)									
			Total	(%)	Financing				National Contribution			
					JICA	(%)	PG	(%)	MVCS	(%)	Municipality /Community	(%)
<b>1)</b>	<b>Component 1- Conglomerate C-1</b>	<b>272,245</b>	<b>272,245</b>	<b>100%</b>	<b>201,461</b>	<b>74%</b>	<b>70,784</b>	<b>26%</b>	<b>63,705</b>	<b>90%</b>	<b>7,078</b>	<b>10%</b>
1.1	Water Infrastructure	105,594	105,594	100%	58,077	55%	47,517	45%	42,766	90%	4,752	10%
1.2	Sanitation Infrastructure	53,091	53,091	100%	29,200	55%	23,891	45%	21,502	90%	2,389	10%
1.3	Soft-Component (implementation stage)	27,453	27,453	100%	27,453	100%	0	0%				
1.4	Perfiles (Water and Sanitation)	17,643	17,643	100%	17,643	100%	0	0%				
1.5	Detailed Designs of works and Soft-component (Water and Sanitation)	28,448	28,448	100%	28,448	100%	0	0%				
1.6	Advising and Supervising works and Soft-component (Water and Sanitation)	33,554	33,554	100%	33,554	100%	0	0%				
1.7	Supervision of Perfiles(Water and Sanitation)	2,385	2,385	100%	2,385	100%	0	0%				
1.8	Supervision of Designs (Water and Sanitation) and Soft-component file	4,077	4,077	100%	4,077	100%	0	0%				
<b>2)</b>	<b>Component 2- Conglomerate C-2</b>	<b>133,668</b>	<b>133,668</b>	<b>100%</b>	<b>100,251</b>	<b>75%</b>	<b>33,417</b>	<b>25%</b>	<b>30,075</b>	<b>90%</b>	<b>3,342</b>	<b>10%</b>
2.1	Water Infrastructure	50,675	50,675	100%	27,871	55%	22,804	45%	20,524	90%	2,280	10%
2.2	Sanitation Infrastructure	23,540	23,540	100%	12,947	55%	10,593	45%	9,534	90%	1,059	10%
2.3	Soft-component Intervention (implementation stage)	19,141	19,141	100%	19,141	100%	0	0%				
2.4	Perfiles (Water and Sanitation)	8,286	8,286	100%	8,286	100%	0	0%				
2.5	Detailed Designs of works and Soft-component (Water and Sanitation)	13,375	13,375	100%	13,375	100%	0	0%				
2.6	Advising and Supervising works and Soft-component (Water and Sanitation)	15,769	15,769	100%	15,769	100%	0	0%				
2.7	Supervision of Perfiles(Water and Sanitation)	1,052	1,052	100%	1,052	100%	0	0%				
2.8	Supervision of Designs (Water and Sanitation) and Soft-component file	1,831	1,831	100%	1,831	100%	0	0%				
<b>3)</b>	<b>Component 3</b>	<b>20,296</b>	<b>20,296</b>	<b>100%</b>	<b>1,421</b>	<b>7%</b>	<b>18,875</b>	<b>93%</b>	<b>18,497</b>	<b>98%</b>	<b>377</b>	<b>2%</b>
3.1	Program Administration 1/	20,296	20,296	100%	1,421	7%	18,875	93%	18,497	98%	377	2%
<b>4)</b>	<b>VAT (19%)</b>	<b>242,939</b>	<b>242,939</b>	<b>100%</b>	<b>0</b>	<b>0%</b>	<b>242,939</b>	<b>100%</b>	<b>242,939</b>	<b>100%</b>	<b>0</b>	<b>0%</b>
<b>Grand Total</b>		<b>1,521,566</b>	<b>1,521,566</b>	<b>100%</b>	<b>912,940</b>	<b>60%</b>	<b>608,627</b>	<b>40%</b>	<b>578,195</b>	<b>95%</b>	<b>30,431</b>	<b>5%</b>

1/ Includes Strengthening of PMU-PAPT  
Source: JICA Study Team (2010)

## 4.21 Logical Framework

Logic Framework Matrix for Water and Sanitation Program for the Rural Amazon – Components 1 and 2

OBJECTIVES	AIMS	INDICATORS	VERIFICATION MEANS	ASSUMPTIONS
<p><b>AIM:</b> To contribute with the improvement of health and life quality of the rural population.</p>				
<b>COMPONENTS 1 &amp; 2</b>				
<p><b>PURPOSE:</b> 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.</p>	<ul style="list-style-type: none"> <li>◆ A 50% reduction in the incidence of intestinal infectious diseases (ADD's) in children of the rural area under 5 years of age, from the current 23.4% to 11.7% in the year 2020.</li> </ul>	<ul style="list-style-type: none"> <li>◆ Intestinal infectious diseases incidence rate mainly in the children population under 5 years of age.</li> </ul>	<ul style="list-style-type: none"> <li>◆ Results reports of the base line.</li> <li>◆ Results reports of the Program's impact evaluation.</li> <li>◆ Annual reports of the Ministry of Health centers.</li> </ul>	<ul style="list-style-type: none"> <li>◆ Compromises fulfillment by the main actors: the Municipality and the population.</li> </ul>
<p><b>RESULTS:</b></p> <p>1. Rural population within the area of intervention, with access to sustainable water and sanitation services in suitable conditions: quality, quantity and continuity.</p>	<ul style="list-style-type: none"> <li>◆ To increase in 85% the coverage of the water supply services for human consumption, in the intervened localities by 2020.</li> <li>◆ 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: <ul style="list-style-type: none"> <li>-1st implementation phase: 130 localities with WSS services by 2013.</li> <li>-2nd implementation phase: 732 localities with WSS services by 2017</li> <li>-3rd implementation phase: 638 localities with WSS services by 2020.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>◆ % of coverage of water service for human consumption within the intervention area.</li> <li>◆ N° of localities with continuous water service for human consumption no less than 12 hours</li> <li>◆ N° of systems that applied disinfection to the water supply service for human consumption.</li> </ul>	<ul style="list-style-type: none"> <li>◆ Final Report of the Works Liquidation.</li> <li>◆ Results report of the Ex Post evaluation.</li> <li>◆ Reports of the Ministry of Health Water Quality Surveillance Program</li> </ul>	<ul style="list-style-type: none"> <li>◆ Population's active participation in the project's implementation.</li> <li>◆ Administrative and financing processes.</li> </ul>
<p>2. The population in the intervention area, with access to a system of excreta disposal in suitable conditions.</p>	<ul style="list-style-type: none"> <li>◆ To increase by 80% the sanitation coverage (latrines) in the intervened localities by 2020.</li> <li>◆ 70% of families of the total of the localities have suitable practices of sanitary excreta disposal, by 2020</li> </ul>	<ul style="list-style-type: none"> <li>◆ % of sanitation coverage (latrines) in the intervened localities</li> <li>◆ % of families that properly use the latrines</li> </ul>	<ul style="list-style-type: none"> <li>◆ Final Report of the Liquidation of the Works</li> <li>◆ Results report of the Ex Post Evaluation.</li> <li>◆ Results reports of the Program's Impact Evaluation</li> </ul>	<ul style="list-style-type: none"> <li>◆ Population's participation in the Project's implementation.</li> </ul>

OBJECTIVES	AIMS	INDICATORS	VERIFICATION MEANS	ASSUMPTIONS
<p>3. Improve the hygiene habits of the population in the rural localities with intervention</p>	<ul style="list-style-type: none"> <li>◆ By 2020, 100% of families have knowledge of the critical times for hand washing:               <ul style="list-style-type: none"> <li>▪ Before eating</li> <li>▪ After going to the bathroom</li> <li>▪ After changing diapers or cleaning the baby's feces</li> <li>▪ Before feeding the baby</li> <li>▪ Before cooking</li> </ul> </li> <li>◆ By 2020, 50% of families practice proper hand washing:               <ul style="list-style-type: none"> <li>▪ With water</li> <li>▪ With soap or ashes</li> </ul> </li> <li>◆ By 2020, 70% of families properly use and maintain their latrines:               <ul style="list-style-type: none"> <li>▪ Without fecal remains</li> <li>▪ Without urinary remains</li> <li>▪ Without foul odors</li> <li>▪ Without waste or remains of the material used to wipe themselves</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>◆ % of families that have knowledge of the five critical times for hand washing</li>   <li>◆ % of families that wash their hands correctly</li>   <li>◆ % of families that adequately maintain their latrines</li> </ul>	<ul style="list-style-type: none"> <li>◆ Follow-up reports for the soft-component</li> <li>◆ Results of ex post evaluation</li> <li>◆ Report of Impact Evaluation Results</li> </ul>	<ul style="list-style-type: none"> <li>◆ Families recognize and understand the need to modify their behavior patterns with relation to health and hygiene</li> <li>◆ Use of suitable capacity building and communication strategies to achieve the behavior improvement.</li> <li>◆ Participation of qualified trainers.</li> </ul>
<p>4. The community organizations (JASS) in the intervention area have the abilities of administrating, operating and maintaining (AOM) the water and sanitation services.</p>	<ul style="list-style-type: none"> <li>◆ 100% of the Community Organizations that have AOM knowledge for the water services.</li> <li>◆ No less than 10 people of each intervened locality are trained in AOM of the water services.</li> <li>◆ 80% of the families of each locality pay their fees for the water service.</li> </ul>	<ul style="list-style-type: none"> <li>◆ N° of Community Organizations that perform adequate AOM for water services</li> <li>◆ N° of people trained in water services AOM at each intervened locality</li> <li>◆ N° of the families of each locality that pay their fees for the water service on time</li> </ul>	<ul style="list-style-type: none"> <li>◆ Final Report of the Community Organization capacity building.</li> <li>◆ Results report of the Ex Post evaluation</li> <li>◆ Reports of the supervision to the Community Organization, carried out by the Municipality's water services responsible.</li> <li>◆ Results reports of the Program's impact Evaluation</li> </ul>	<ul style="list-style-type: none"> <li>◆ Population's commitment to assume the services management responsibility.</li> <li>◆ Fulfillment of the Municipality's Commitment</li> <li>◆ Participation of the JASSs members and the population in the capacity building workshops.</li> </ul>

<p>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.</p>	<ul style="list-style-type: none"> <li>◆ 90% of the municipalities successfully carry out their functions of supervision and technical assistance to the community organizations</li> <li>◆ 100% of the commercial information is adequately registered and current (N° of Community Organizations, N° of users of WSS services, hours of water service, N° of supervision visits made, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>◆ N° of Community Organizations registered with the Municipality</li> <li>◆ % of WSS service coverage at the district level in the scope of intervention</li> <li>◆ N° of hours of water service</li> <li>◆ N° of supervisión visits made</li> <li>◆ % progress in Financial Plan</li> <li>◆ % progress in actions of technical assistance</li> </ul>	<ul style="list-style-type: none"> <li>◆ Supervision reports to the community organizations, from those responsible for the water services in each municipality</li> <li>◆ The Municipal plan incorporates water and sanitation activities</li> <li>◆ N° of Community Organizations with a registry of supervision visits and/or technical assistance to the municipality</li> <li>◆ Results of the ex-post evaluation</li> </ul>	<ul style="list-style-type: none"> <li>◆ Fulfillment of the municipalities' commitments with respect to their participation in the implementation of WSS services</li> </ul>
<p>ACTIVITIES:</p> <p>I. Development of <i>Perfiles</i> and detailed design files</p> <ol style="list-style-type: none"> <li>1. Development of pre-investment studies</li> <li>2. Development of detailed designs</li> </ol> <p>II. Evaluation of <i>Perfiles</i> and detailed design files</p> <ol style="list-style-type: none"> <li>1. Evaluation of pre-investment studies</li> <li>2. Evaluation of detailed designs</li> </ol>	<p>I. Pre-investment studies (<i>Perfiles</i>) and detailed designs for US \$80.6 million</p> <ul style="list-style-type: none"> <li>◆ 1,500 perfiles formed for US \$30.8 million</li> <li>◆ 1,500 detailed designs developed for US \$49.8million</li> </ul> <p>II. Evaluation and approval of pre-investment studies and detailed designs for US \$11.1 million</p> <ul style="list-style-type: none"> <li>◆ 1,500 perfiles declared viable</li> <li>◆ 1,500 detailed designs approved by Ministerial Decision</li> </ul>	<ul style="list-style-type: none"> <li>◆ N° of studies at the perfil level of the WSS projects in the Program</li> <li>◆ N° of detailed designs for the WSS projects in the Program</li> <li>◆ N° of perfiles declared viable</li> <li>◆ N° of detailed designs approved with Ministerial Decision</li> </ul>	<ul style="list-style-type: none"> <li>◆ Reports from the PMU, the PAPT, and the OC on the development of the <i>Perfiles</i></li> <li>◆ Reports from the PMU, the PAPT, and the OC on the development of detailed designs</li> <li>◆ Registry of <i>Perfiles</i> declared viable in the MEF Project Bank</li> <li>◆ Registry of Ministerial Decision approval of the detailed designs</li> </ul>	<ul style="list-style-type: none"> <li>◆ Sectoral, Regional, and Local Policy for WSS intervention in rural Amazon areas</li> <li>◆ Opportune fulfillment of established co-financing obligations by communities and municipalities</li> </ul>

<p>III. Water storage and sanitation, Conglomerates 1 and 2</p> <ol style="list-style-type: none"> <li>1. Rehabilitation, improvement, and expansion of existing water systems</li> <li>2. Construction of new water systems</li> <li>3. Installation of household latrines</li> </ol> <p>IV. Soft-component implementation</p> <ol style="list-style-type: none"> <li>1. Development of capacity-building and hygiene education Program</li> <li>2. Development of AOM capacity-building for water services for the Community Organizations</li> <li>3. Development of capacity-building Program for municipalities to provide support and basic technical assistance to the Community Organizations in localities with intervention</li> </ol> <p>V. Consulting for Tendering Process, supervision of the works and Soft Component</p>	<p>III. WSS infrastructure for US \$277.2 million</p> <ul style="list-style-type: none"> <li>◆ N° of water supply systems rehabilitated and-or improved in the year 2020</li> <li>◆ N° of new water systems in the year 2020</li> <li>◆ N° of families with latrines installed</li> </ul> <p>IV. Soft-component implementation for US \$55.4 million</p> <ul style="list-style-type: none"> <li>◆ 1,500 Community Organizations with AOM capacities for water services</li> <li>◆ 15,000 people with AOM capacities for water and sanitation services</li> <li>◆ 400 district municipality employees with capacities to provide support and basic technical assistance to the Community Organizations</li> </ul> <p>V. Consulting for Tendering Process, supervision of the works and Soft Component for USD 58.7 million</p>	<ul style="list-style-type: none"> <li>◆ N° of operative water storage systems rehabilitated, improved, or expanded</li> <li>◆ N° of new operative water systems</li> <li>◆ N° of latrines constructed and operative</li> <li>◆ N° of families with knowledge of hygiene education and practices of cleaning and hygiene</li> <li>◆ N° of people with knowledge of AOM of water services</li> <li>◆ N° of employees with knowledge to carry out their functions of supervision, financing, and technical support for the Community Organizations</li> <li>◆ Item III and IV</li> </ul>	<ul style="list-style-type: none"> <li>◆ Final liquidation report of works of rehabilitation, improvement, and/or expansion of water systems</li> <li>◆ Final liquidation report of new water works</li> <li>◆ Final liquidation report of sanitation works</li> <li>◆ Final report of capacity-building in hygiene education</li> <li>◆ Final report of capacity-building in AOM in the Community Organizations</li> <li>◆ Final report of capacity-building and strengthening of the municipalities</li> <li>◆ Ex post evaluation of Program Evaluation of Program Impact</li> </ul>	<ul style="list-style-type: none"> <li>◆ Fulfillment of agreement to assume responsibility for supervising and watching over water services</li> <li>◆ Participation by the population in the capacity-building workshops for hygiene education</li> <li>◆ Participation by members of the Community Organizations and the population in the capacity-building workshops</li> <li>◆ Fulfillment of commitments to assume responsibility for supervising and watching over the water services</li> </ul>
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### Logical Framework Matrix – Component 3

OBJECTIVES	AIMS	INDICATORS	VERIFICATION MEANS	ASSUMPTIONS
<p>I. Administration and Program Management</p> <p>1. Executing Unit of Program implemented</p> <p>2. Contracting of OC, SC, and Executing Contractors for implementation in Conglomerates 1 and 2</p> <p>3. Development of Annual Operative Plan for the Management of annual budgets for the functioning of the Program</p> <p>4. Follow-up and evaluation of Program implementation</p>	<ul style="list-style-type: none"> <li>◆ Program PMU is functioning as of 2011-2020 for USD 24.2 million</li> <li>◆ Operating Consultants contracted</li> <li>◆ Supervising Consultants contracted</li> <li>◆ Executing Contractors contracted by year</li> <li>◆ Annual Operative Plan for Program approved</li> <li>◆ 06 reports of follow-up and evaluation of the Program per year</li> <li>◆ 130 works concluded and operative in the year 2013</li> <li>◆ 732 works concluded and operative in the year 2015</li> <li>◆ 638 works concluded and operative in the year 2020</li> </ul>	<ul style="list-style-type: none"> <li>◆ N° of OC Contracts</li> <li>◆ N° of SC Contracts per year</li> <li>◆ N° of contracts with Executing Contractors per year</li> <li>◆ N° of follow-up and evaluation reports per year</li> <li>◆ N° of works concluded and operative by the year 2013</li> <li>◆ N° of works concluded and operative by the year 2015</li> <li>◆ N° of works concluded and operative by the year 2020</li> </ul>	<ul style="list-style-type: none"> <li>◆ Resolution of the Creation of Program's PMU</li> <li>◆ Contracts or assignments of PAPT of the Program's PMU specialists</li> <li>◆ Contracts signed by OC's</li> <li>◆ Contracts signed by SC's</li> <li>◆ Contracts signed by the Contractors of Works</li> <li>◆ Reports from the PMU for follow-up and evaluation of the Program</li> <li>◆ Resolutions for Liquidation of Works by the year 2013</li> <li>◆ Resolutions for Liquidation of Works by the year 2015</li> <li>◆ Resolutions for Liquidation of Works by the year 2020</li> </ul>	<ul style="list-style-type: none"> <li>◆ Commitments from the sector institutions to participate according to the sectorial guidelines</li> <li>◆ Sectorial and Regional Policy for the intervention in WSS in the rural Amazon area</li> </ul>

#### 4.22 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, obtaining the indicator for the Program with the average of the five (5) that correspond to the project.

The adjusted average of the department 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 N° 4.22-1 shows the values obtained according to the criteria described for the previous parameters. Nevertheless, upon implementation of the Program, each locality should include its own values, and impact will be measured as a function of their variation upon execution of the project.

**Table N° 4.22-1: Baseline for the Evaluation of Impact**

Concept	Indicators		
	Conglomerate C-1	Conglomerate C-2	Program
<b>Main indicators</b>			
% 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%
<b>Local capacities /Interviews to Sanitation Services</b>			
<b>Administrative Boards</b>			
% 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%
<b>Water and sanitation service/Home interviews</b>			
% 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%
<b>Hygiene practices in the population/home interviews</b>			
% of latrines that do not have an bad odors	69.0%	31.8%	44.5%
% of clean latrines	0.0%	0.0%	0%
<b>Handling of the water in the home(home interviews)</b>			
% 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

#### 4.23 Conclusions and Recommendations

- 1) The target area of the Water and Sanitation Program 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 1: Towns located in the region of low jungle, (902 locations)
  - Conglomerate 2: Towns located in the high jungle and in the Ceja de Selva (598 locations)
- 3) The Water Supply and Sanitation Program in Rural Amazon Area will have three (3) components:
  - Component 1: Conglomerate (C-1)
  - Component 2: Conglomerate (C-2)
  - Component 3: Management and Consulting Services
- 4) The total Program cost for the three (3) components amounts to S/. 1,521.6 million Nuevos Soles (USD 507.2 million). Its execution is scheduled in three phases, each one with an execution time of four (4) years, during the period 2010 -2020. Costs are: S/. 139.1million (USD 46.3 million) for the first phase, S / 729.5 million (USD 243.2 million) for the second phase and S / 653.1 million (USD 217.7 million) for the third phase.
- 5) The Study Team concludes that Conglomerate 1 (C-1) and 2 (C-2) are viable from the technical economically and environmental standpoints.
- 6) For the sanitation Project, values of cutoff lines have been established to social prices that result reasonable according to the proposed technical options.
- 7) From the results of the economic assessment of the water supply projects for Conglomerates 1 and 2 (C-1 and C-2), economic evaluation of the Program was conducted, and an NPV of S/ 86.5 million and a IRR of 16.4% were obtained. From such information, the Study Team concluded that the Program is viable from the technical and economic point of view.
- 8) The costs analysis of AOM for projects in the sample localities indicated that the estimated fee Program for AOM is within the payment capacity of families, in relation to family income. The facilities will be selected, through approaches based on demand induced and on active community participation. This is an aspect that will ensure in the medium and long term sustainability of water services.
- 9) The implementation Program projects will be carried out through Demand-driven Approach, which should be emphasized and generated by the Executive Unit, following two (2) basic policies: the comprehensive intervention policy and the policy of co-financing, through non-monetary contributions, the provision of the community's unskilled labor for installation of connections and washing water and sanitary latrines.

The program will set equal importance to both the implementation of infrastructure projects (design and construction of facilities), and the implementation of activities for strengthening and / or capacity building for the organization, planning, promotion, development and management of sanitation and health education in each of the localities and municipalities, contributing the knowledge of the program's benefits and generating demand for the services.

- 10) The organization raised a proposal for implementing the Program, which is headed by the Program Management Unit in Rural Amazon Area (PMU) of the PAPT. The PMU will be subject to strengthening by qualified personnel, as part of the activities of Component 3 of the Program. It also will receive technical assistance from the Operating Consultant in the tendering of works projects.
- 11) It was proposed that the Program should be executed in three (3) phases, during a period of ten (10) years (2010 to 2020). The first phase should be implemented as a Pilot Program Implementation, with the aim of achieving the applicability of the proposed program and the improvement needed for the success of the following phases. In the first phase, 130 water and sanitation projects should be implemented (92 in Conglomerate C-1 localities 38 in Conglomerate C-2 localities); in the second phase, 732 projects (390 localities in Conglomerate C-1 and 342 in Conglomerate C-2); in the third phase, 638 projects (420 localities in Conglomerate C-1 and 218 in Conglomerate C-2).
- 12) To finance the Program it is planned to use resources from Financial Cooperation from the Japanese Government through JICA that could be coordinated by the Peruvian Government (PG). In this sense, a financing outline for the phased implementation of the Program has been proposed. For the first phase the financing is foreseen in such way that 60% represent resources from JICA and a 40%, national contribution funds (95% by the MVCS and 5% co-financing by municipalities and communities). JICA's contributions would be maintained, taking into consideration the limit of 85% designated for projects in Peru. For the three phases of the Program financing outline is as follows: 59.6% by JICA; 38.3% by the MVCS; 1.5% by communities; and 0.6% by district municipalities.
- 13) The Study Team recommends to declare the viability of the Water and Sanitation Program for the Rural Amazon Area, with its two Conglomerates, provided that the present Feasibility Study has shown that components of the Program or Conglomerates (Conglomerate C-1 and Conglomerate C-2) and the Program as a whole has shown to be profitable and socially sustainable; and projects that comprise it are consistent with the policy guidelines of the sanitation sector.