EX-POST EVALUATION REPORT
OF
JAPANESE ODA LOAN PROJECTS 2009 (PERU)

JULY 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

GLOBAL GROUP 21 JAPAN, INC.

Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, third-party evaluations conducted by experts will be enhanced.

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2007. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

July 2010
Atsuro KURODA
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA.

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External Evaluator : Global Group 21 Japan, Inc.
Hajime Sonoda

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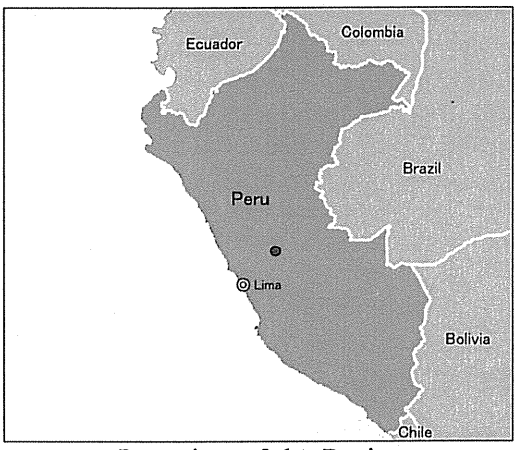
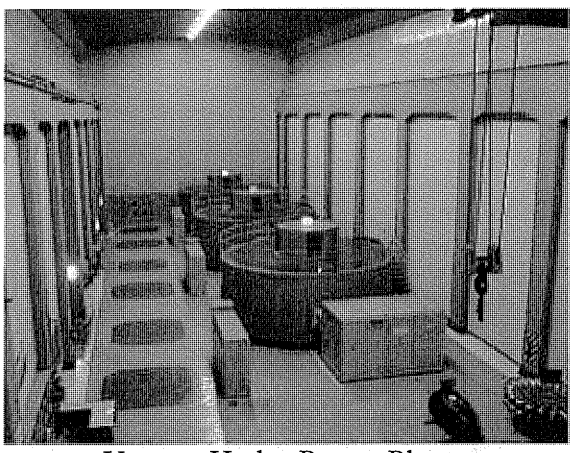


Location of the Project



Yuncan Hydro Power Plant
(Underground Powerhouse)

1.1 Background

Peru in the 1990's was leaving a period of economic confusion as the Fujimori Administration was implementing economic stabilisation policies along with structural adjustment policies. In 1993, the public investment programme was formulated, and the government was promoting prioritised public investment in the rehabilitation and development of socioeconomic infrastructure.

In the power sector in Peru, hydropower generation accounted for 56% of the installed capacity and 77% of the electric energy generated in 1995. Meanwhile, the electrification rate of 62% was still low and Peru's power consumption per capita of 689 kWh was half of the average for Latin America. Under these circumstances, the government designated the power sector as a priority sector for economic development and the Ministry of Energy and Mines (MEM) prepared a Referential Plan of Electricity up to 2005. This programme predicted that the power consumption would increase at an annual rate of 5.0 ~ 5.5% from 1995 to 2008. To meet such extra power demand, a plan for expansion of generation capacity was formulated and the subject project for the present evaluation was listed as one of 10 new hydro power plants to be constructed during the period from 2000 to 2008.

The early study for the Project began in the 1960's. After review of the feasibility study conducted from 1976 to 1978, the MEM conducted the detailed design in 1981 to 1982. Based on the above-mentioned plan, the Government of Peru made a formal request for a yen loan for the Project in 1995. This was followed by signing of the Loan Agreement in 1996 and the implementation of the Project from 1996 to 2005.

For reference, the Yaupi Power Plant (PAUCARTAMBO I) which has a generating capacity of 108 MW and which has been operating since 1956 is located some 10 km downstream of the project site.

1.2 Project Outline

To provide a timely response to the increasing power demand in Peru by means of constructing an underground hydro power plant with an installed generating capacity of 126 MW (42 MW x 3) with intake facilities, headrace tunnels and transmission lines at some 200 km northeast of Lima in the upstream of the existing power plant (PAUCARTAMBO I) along Paucartambo River in the Pasco Region, thereby assisting the development of production infrastructure in the region and contributing to the development and vitalisation of the local economy and local communities.

Approved Loan Amount / Disbursed Loan Amount	¥33,000 million / ¥30,669million
Exchange of Notes/ Loan Agreement	August 1996 / September 1996
Terms and Conditions	Interest Rate : 2.7% (Consulting service : 2.3%) Repayment Period (Grace Period) : 25 years (7 years) Procurement : General Untied
Borrower / Implementing Agency	Government of the Republic of Peru / EGECEN (since December 2009, ACTIVOSMINEROS) under the Ministry of Energy and Mines[1]
Final Disbursement	March 2008
Main Contractors (contract amount of ¥1 billion or more)	ALSTOM BRASIL LTDA.(Brazil) ・ ALSTOM POWER HYDRO(France)(JV), ALSTOM HOLDINGS(France) ・ Toshiba (Japan) ・ ALSTOM POWER HYDRAULIQUE SUCURSAL DEL PERU(France)(JV)、VA TECH HYDRO S.A.(Swiss)、Chizaki Industry(Japan) ・ COSAPI S.A.(Peru) ・ SKANSKA AB(Sweden)(JV)
Consultant (contract amount of ¥100 million or more)	J-POWER (EPDC) (Japan)
Feasibility Study (F/S)	Feasibility studies and detailed engineering studies were conducted by the Ministry of Energy and Mines during 1970 – 80s.

[1] The Project was originally supposed to be implemented by an implementing unit created in the Ministry of Energy and Mines, but in reality it was implemented by EGECEN which was assigned the implementation of the Project. All the facilities of the Project is owned by the State through EGECEN, which was created as a public company specialized in generation and sales of electric energy and merged with ACTIVOSMINEROS in December 2009. ACTIVOSMINEROS is a public company under FONAFE (*Fondo Nacional de Financimiento de la Actividad Empresaria del Estado*: National Fund for Financing of State Company Activity). It undertakes environmental conservation / rehabilitation projects at the state owned lands such as mines and currently supervises the usufruct contract of the Yuncan Hydro Power Plant.

2. Outline of the Evaluation Study

2.1 External Evaluator

Hajime Sonoda (Global Group 21 Japan)

2.2 Study Period

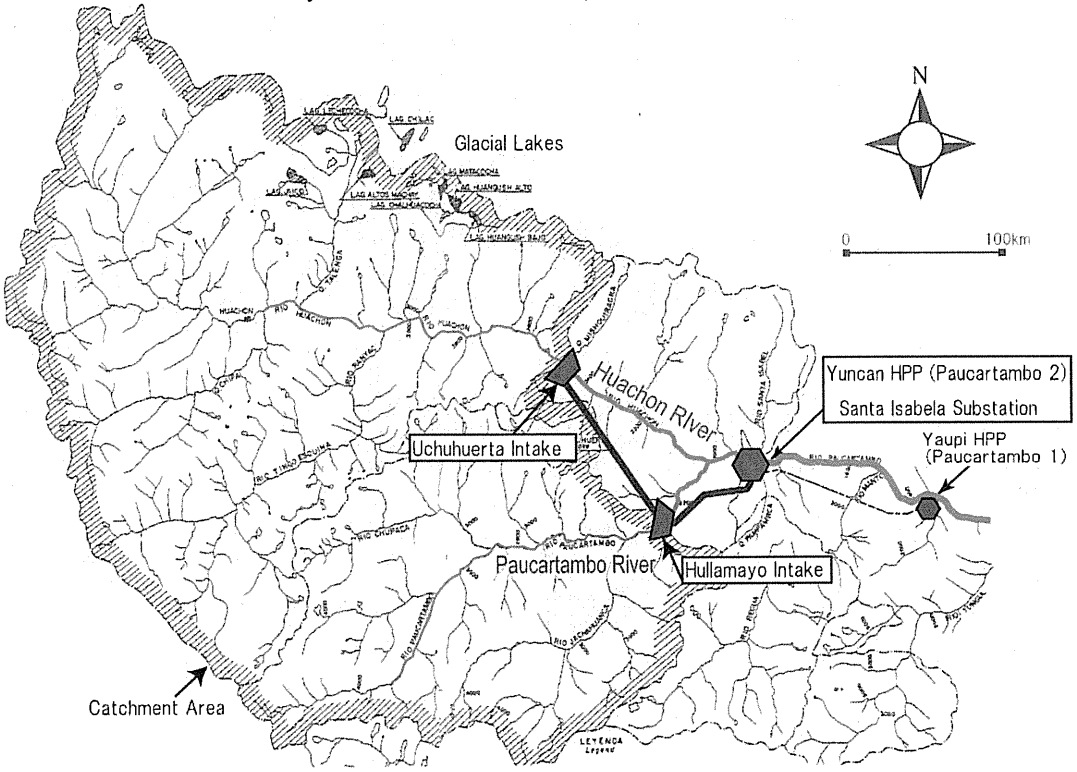
The ex-post evaluation study of the Project was conducted over the following period.

Study Period : September, 2009 to July, 2010
Field Survey : 14th November to 24th December, 2009
21st February to 16th March, 2010

2.3 Constraints to the Study

During the course of the Study, vital information was collected through a series of interviews with the project implementing body and other stakeholder organizations, gathering of relevant documents, visits to the project site (power plant) and nearby area, interviews and workshops targeting local residents and a household survey. In areas where strained relations existed between the power plant management and opposing local residents, only interviews involving a small number of residents were conducted and neither a workshop nor the household survey were conducted to avoid unnecessarily inciting local residents.

Layout of the Yuncan Hydro Power Plant



3. Evaluation Results (Rating: A)

3.1 Relevance (Rating: a)

3.1.1 Compatibility with Development Policies

As described in 1.1 - Background, the Project was included in the Referential Plan of Electricity based on the public investment policy of the Government of Peru and, as such, was highly compatible with the official development policy.

The primary objectives of the energy policies of the present government are (i) the rational utilisation of resources, (ii) reduction of external dependency, (iii) rationalization of energy prices that contribute to the strengthening of industrial competitiveness, and (iv) environmental conservation. As the power demand is expected to continually increase, the importance of the power sector in the overall economic development of Peru is expected to remain unchanged. However, there has been a shift in the priority of government investment since 1996 with policy emphasis on privatisation. To be more precise, the private sector has been increasing its investment in power generation, transmission and distribution (in urban areas) while government investment has been shifted its focus on rural electrification. The present government designates the promotion of rural electrification as a priority social policy, adopting a target of 90% electrification nationwide by 2011.

3.1.2 Compatibility with Development Needs

As described in 1.1 - Background, Peru's electrification rate and power consumption per capita in 1995 were low, making an increase of the power supply capacity an urgent task in the light of the anticipated continual increase of the power demand.

The current electrification rate and power consumption per capita in Peru are 80% (2007) and 1,010 kWh (2008) respectively. This level of power consumption per capita is still half of the Latin American average. There is much room for increase in terms of both the electrification rate and power consumption per capita, underlining the strong development needs in the power sector. The nationwide power demand in Peru increased at a high annual rate of 8.6% in the eight year period from 2000 to 2007 and the annual increase rate of 7.3% is expected to continue up to 2017. This situation of a continuous high power demand increase signifies a strong necessity for sustaining and the further development of the country's generating capacity.

3.1.3 Compatibility with Japan's ODA Policies

The old ODA Charter of Japan adopted in 1992 stipulated that Japan would provide assistance for the development of infrastructure which is an important precondition for socioeconomic development. Around that time, Japan actively provided assistance to Peru in recognition of the positive reform efforts of the then Fujimori Administration since 1990 to ensure sustainable economic development and to eliminate poverty. In line with the diverse development needs in Peru, Japan decided to provide loans every year, in principle, from FY 1996 onwards with the qualitative as well as quantitative

enhancement of cooperation in mind. In FY 1999, the development of economic infrastructure was identified as a priority field for Japan's ODA for Peru and active cooperation for the power sector, etc. was called for, partly to respond to the local needs. Accordingly, the Project was compatible with Japan's ODA policies at the time of its appraisal.

Based on the above, the Project was sufficiently compatible with the development policies and development needs in Peru and also with the ODA policies of Japan. As such, relevance of the Project is high.

3.2 Efficiency (Rating: b)

3.2.1 Outputs

According to the plan put forward at the time of appraisal, the Project would consist of the following three components.

① Power plant component: This would include (i) the construction of an underground powerhouse (126 MW) along Paucartambo River, (ii) the Huallamayo intake facility on Paucartambo River, (iii) the Uchuhuerta intake facility on Huachón River and (iv) tunnels and headrace tunnels to link these intake facilities to the underground powerhouse. Both intake facilities would be provided with a reservoir for daily control of intake volume.

② Power transmission component: Some 130 km long transmission lines would be constructed to link the Yuncan HPP to the adjacent Santa Isabel Substation as well as the Oroya Nueva Substation and Carhuamayo Substation.

③ Others: Harnessing of two glacial lakes upstream[2]. Procurement of maintenance equipment for waterways, discharge channels and roads would be procured. Consulting services for review of the detailed design and construction supervision.

The powerhouse component was completed almost as planned. The length of the tunnels and their construction method were modified through the process of reviewing the original detailed design, taking the actual geological and other conditions into consideration.

In the case of the transmission component, the introduction of expensive technologies of GIS (Gas Insulated Switchgear) to the Santa Isabel Substation was abandoned because government funding was restricted due to the fiscal difficulties experienced by the Government of Peru. Instead, conventional technologies were used. Furthermore, the construction of two new substations and part of one transmission line was removed from the scope of the Project and the work was conducted by a private transmission company (ISA PERU).

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[2] Harnessing of the glacier lakes was expected to have the effect of some 4% increase of the electricity generated by the Project.

The glacial lakes were owned by a state mining company (CENTROMIN) under FONAFE[3]. In the process of its division and privatisation, a different organization from the project implementing body was assigned to manage these lakes. Subsequently, the work to harnessing these lakes under the Project was cancelled[4].

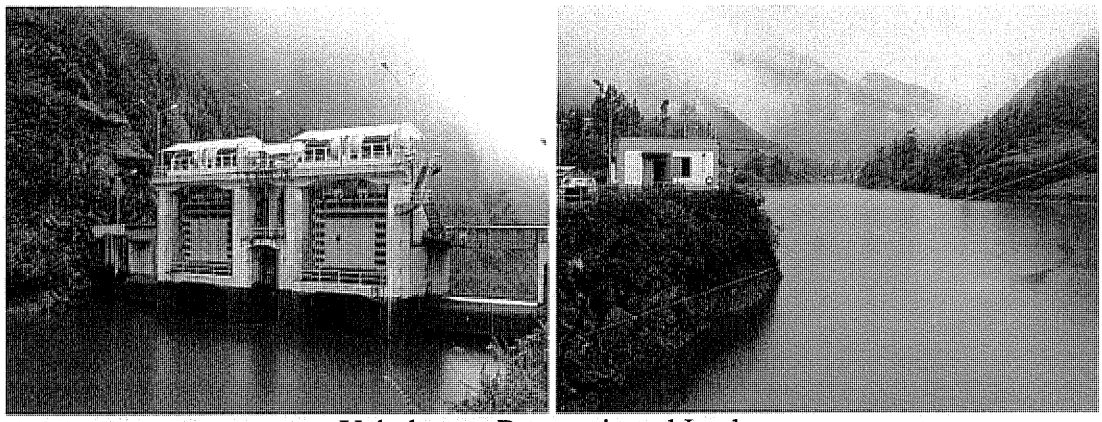
Meanwhile, the procurement of maintenance equipment became unnecessary as ENERUR, a private company awarded the usufruct of the Project through the process of privatization, was already in possession of the necessary equipment.

Table-1 Comparison of Planned and Actual Project Outputs

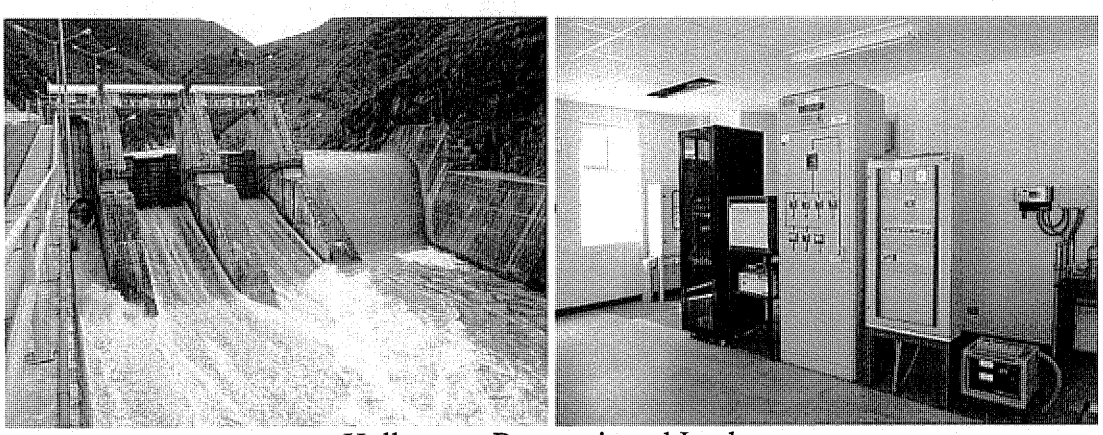
<Power Plant Component> ・ Uchuhuerta Intake Intake dam Intake (max 20m^3/sec.) Settling basin Tunnel No.1 (non pressure, 12.3km) Tunnel No.2 (pressure, 569.5m) ・ Huallamayo Intake Intake dam (hight 50m, capacity 1.8 million m^3) Intake (max. 30 m^3/sec.) Tunnel No.3 (pressure, 283.8m) Tunnel No. 4 (pressure, 7,036m) Surge tank Penstock line (784m) ・ Underground Powerhouse Tail Race Tunnel (976m) Outlets Turbine (43.3MW x 3 units) Generator (47MW x 3 units) Transformer (15.7MW x 10 units)	<Power Plant Component> ・ Uchuhuerta Intake : as planned Intake dam : As planned Intake (max 20m^3/sec.) : as planned Settling basin : as planned Tunnel No.1 (non pressure, 11.2km) : slightly shorter Tunnel No.2 (pressure, 1.6 km) : longer than planned ・ Huallamayo Intake : as planned Intake dam : (hight 60m, capacity 1.86million m^3) : Slightly smaller in capacity Intake (max. 30 m^3/sec.) : as planned Tunnel No.3 (pressure, 247.0m) : slightly shorter . Tunnel No. 4 (pressure, 7,010m) : slightly shorter Surge tank : as planned Penstock line (709m) : shorter ・ Underground Powerhouse Tail Race Tunnel (869m) : slightly shorter Outlets : as planned Turbine (44.5MW x 3 units) : slightly larger Generator (48.2MW x 3 units) : slightly larger Transformer (48.2MW x 3 units) : slightly smaller
<Power Transmission Component> ・ Transmission line (130km) ・ Substations Santa Isabel substation (construction) Oroya Nueva substation (expansion) Carhuamayo substation (expansion)	<Power Transmission Component> Part of the planned scope was excluded due to financial constraints and implemented by other funding. Transmission line was reduce to 50km; 80km was implemented by private sector. Santa Isabel substation (construction) : GIS→Conventional technology Oroya Nueva substation (expansion) : Out of scope (implemented by private sector) Carhuamayo substation (expansion) Out of scope (implemented by private sector)
<Others> ・ Harnessing of glacial lakes ; 2 lakes ・ Procurement of maintenance equipment for water canal, and access road ・ Consulting services	<Others> ・ Harnessing of glacial lakes : cancelled ・ Procurement of maintenance equipment for water canal, and access road : cancelled ・ Consulting services : as planned

[3] Refer the footnote 1.

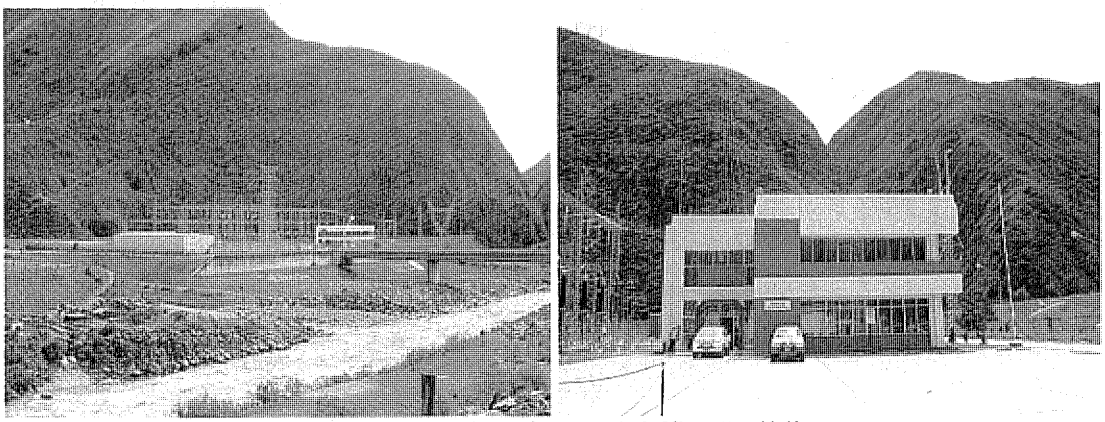
[4] The organization assigned to manage these glacial lakes was ELECTROANDES, a specialist company responsible for the operation and maintenance of power plants in the mine areas in Central Peru and sale of generated electricity.



Uchuhuerta Reservoir and Intake



Hullamayo Reservoir and Intake



Santa Isabel Substation and Office Building

3.2.2 Inputs

3.2.2.1 Project Period

The original plan was to implement the Project in 82 months from February, 1996 to November, 2002. In reality, the Project was implemented in 108 months from September, 1996 to August, 2005. The overall project period was 132% of the

originally planned period and completion was delayed by two years and two months compared to the original plan. The main reasons for this delay are explained below.

- The procedures by the Ministry of Economy and Finance and MEM to approve the transfer of the concession of implementation EGECEN and to transfer the necessary funds took a long time to complete, delaying the commencement of the preparatory work and civil engineering work by one and a half years and one year respectively.

- Difficulties of the tunnelling work caused by seepage and collapse delayed the completion of the work.

- The commencement of the civil engineering work was delayed due to insufficient funding for the domestic currency portion and the restriction on the use of external fund caused by the tight government finance from 2000 to 2003. Moreover, delayed payment led to the suspension of the work, considerably prolonging the overall work period[5]. The work was ultimately completed as funding for the domestic currency portion was secured through a usufruct contract with a private company regarding the operation of the facilities to be constructed under the Project[6].

- The work was temporarily suspended by the strike action of local residents demanding assistance for the development of local social infrastructure, as the short-term employment would end with the completion of the construction work[7].

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[5] As for the transmission line work, the original contractor could not fulfill the contract due to its financial problem etc., making it necessary to find a new contractor. As a result, completion of the work was delayed till February, 2006 after commissioning of the power plant. However, no practical problems were experienced as another transmission line was temporarily used until the completion of the new transmission line of ELECTRO ANDES.

[6] Because of funding difficulties faced by the Government of Peru, a possibility of discontinuation of the Project was examined in 2000. The Government of Peru made a proposal to continue the Project, as a part of privatization, by means of awarding an usufruct contract to a private company regarding the operation of the facilities to be constructed under the Project in return for the payment of an up-front fee by the said company. The materialisation of this proposal took several years because of (i) the incomplete state of the Project, (ii) the application of the social contribution system adopted by the Project being the first such application in Peru and (iii) initial opposition by local residents and local governments to privatisation. Finally, the usufruct contract for the operation of the project-related facilities was awarded to ENERSUR, a private power generating company with a power generating capacity of 1,030 MW in Peru (national share of 20%) in February, 2004. ENERSUR pays US$ 205 million to EGECEN over a period of 17 years as a fee for the usufruct for 30 years and has a legal authority to sell electricity generated by the power plant even though the ultimate ownership of the facilities remains with the State through EGECEN, now ACTIVOS MINEROS. Because of a number of risks, there was only one bidder. Although the bid amount of US$ 205 million is approximately half of the total investment amount, it exceeded the planned minimum price by the government. As the new power plant can expect to operate for at least 50 years with some additional investment, fund recovery operation can continue even after the contract period.

[7] In response to the strike, EGECEN constructed schools, health post and water supply facilities in areas around the new power plant.

3.2.2.2 Project Cost

The planned project cost at the time of appraisal was approximately ¥44.0 billion (Yen loan : ¥33.0 billion) and the actual cost ended up at approximately ¥42.8 billion (Yen loan : ¥30.7 billion) which was within the original budget. The cost of the civil work increased by 31% compared to the original plan due to the increased cost of the tunnelling work and the prolongment of the construction work period caused by temporary suspensions and delays. In contrast, the overall procurement cost of the electrical and mechanical equipment dropped by 40% compared to the original plan due to competition. The actual spending for the transmission lines and substations ended up at 49% of the original plan as some of these facilities were removed from the scope of the Project or their specifications were altered. In contrast, the cost of the consulting service increased due to the prolongment of the project period.

The efficiency of the Project is evaluated as medium (ranking: b) as the actual project period was much longer than originally planned period even though the project cost was within the original budget.

Table 2 Planned and Actual Project Cost

(Unit: ¥ million)

	Planned at the Time of Appraisal			Actual		
	Foreign Currency Portion	Local Currency Portion	Total	Foreign Currency Portion	Local Currency Portion	Total
Civil Works	3,871	11,090	14,961	0	19,530	19,530
Electrical & Mechanical Equipment	9,135	2,643	11,778	3,824	1,904	5,728
General Administration	0	565	565	0	3,098	3,098
Land Acquisition	0	785	785	0	135	135
Customs Duties and Taxes	0	6,646	6,646	0	8,909	8,909
Consulting Service	1,897	709	2,606	3,443	0	3,443
Physical Contingency	1,490	2,244	3,734	32	0	32
Interest During Construction	2,922	0	2,922	1,936	0	1,936
Total	19,315	24,682	43,997	9,234	33,577	42,811

Foreign Exchange Rates: (at the time of appraisal) US$ 1 = S/. 2.25 = ¥100.00
(at the time of evaluation) US$1 = S/. 2.85 = ¥116.46

3.3 Effectiveness (Rating: a)

3.3.1 Quantitative Effects

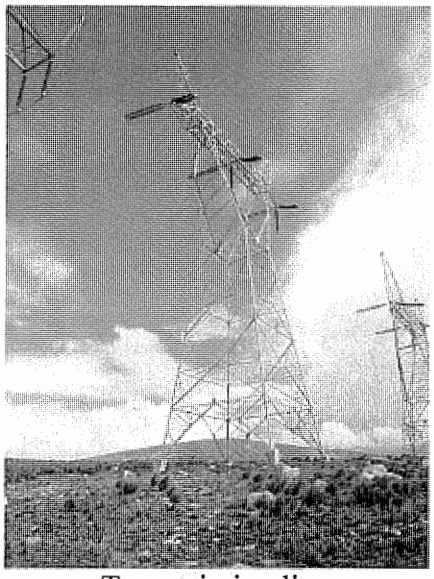
3.3.1.1 Operation and Effects Indicators

The Yuncan HPP regulates its level of electricity generation in accordance with commands given by the COES[8] based in Lima and supplies electricity to the trunk

[8] The COES (*Comité de Operación Económica del Sistema Eléctrico Interconectado Nacional*) is a private body which issues instructions on the amount of electric energy to be generated and other

transmission grid covering entire Peru (SEIN: accounting for 97% of the nationwide supply of electricity)[9].

The operation of the Yuncan HPP has been fairly smooth with few unplanned outages. The availability ratio from 2006 to 2009 (i.e. the ratio of hours when the plant in a state capable of generating electricity) was as high as 97.5%. The effective output based on the generating test in 2005 was 136.7 MW which exceeded the planned output. The maximum output recorded so far was 137.8 MW (2009).



Transmission line by the Project

The average annual electric energy generated by the Yuncan HPP in the period from 2006 to 2009 was 800.3 GWh which is equivalent to 88.0% of the originally planned figure at the time of appraisal (910.1 GWh) or 88.9% of the planned figure at the time of the detailed design (901.2 GWh). The main reason for failure to achieve the planned level of generation was the instruction by the COES to restrict the electric energy generated by the Yuncan HPP. This is because an increase of the generating capacity of a nearby thermal power plant due to rehabilitation created a situation where the critical transmission capacity limit was reached at parts of the existing transmission grid. This problem should be solved by the end of 2010 as an on-going project by a private company in coordination with the MEM will expand the capacity of the transmission line involved. The decline of the electric energy generated was partly caused by the suspended operation of one of the two intake facilities due to its occupation by local residents from November, 2008 to January, 2009[10]. The actual utilisation rate of the natural river runoff of some 50% is lower than the planned 70%[11].

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matters to the SEIN and connected power plants in order to achieve economical and stable power supply.

[9] The trunk transmission grid, i.e. National Electrical Interconnected Grid (SEIN: Systema Eléctrico Interconectado Nacional), covers 98% of the electricity market in Peru. It was born in 2001 through the connection of the central north transmission grid (market share: 80%) to the southern transmission grid (market share: 17%). At the time of appraisal, the Project was expected to supply electricity to the central north transmission grid.

[10] This incident is explained in detail in 3.4 - Impacts.

[11] The observation results for around the power plant indicate that the annual rainfall in 2006 through 2009 was within the normal range.

Table 3 Planned and Actual Figures for Indicators for Operation and Effects of the Yuncan Hydro Power Plant (Source : EGECEN)

	Target at Time of - Appraisal - Detailed Design	2005 (-23rd Aug.)	2006	2007	2008	2009
Availability Ratio	-	-	96.9%	98.6%	97.6%	96.7%
Maximum Output	126 MW 130.6 MW	132.3 MW	136.9 MW	136.6 MW	137.2 MW	137.8 MW
Electric Energy Generated	910.1 GWh 901.2 GWh	222.9 GWh	837.4 GWh	764.0 GWh	782.1 GWh	821.7 GWh

Source : EGECEN

3.3.1.2 Analysis Results of Internal Rate of Return

At the time of appraisal, the financial internal rate of return (FIRR) of the Project was calculated to be 9.1% but the assumptions and process of this calculation are unknown to the evaluator. For this ex-post evaluation, the FIRR of the Project was recalculated based on the following assumptions. The resulting FIRR was 9.3%. No comparison with the earlier calculation results, i.e. 9.1%, is made here because of the possibility of the use of different calculation methods.

Project life : 50 years
Benefits : Income from electricity sales; the electric energy generated in 2010 is based on the average figure from 2006 to 2009 and the figures for 2011 onwards will be those had been planned in advance; the electricity sales price is the average price from 2006 to 2009.
Costs : Power plant construction cost and cost for operation and maintenance

While the Economic Internal Rate of Return (EIRR) had not been calculated at the time of appraisal, EIRR of the Project was estimated as 18.4% considering as benefit the opportunity cost saved by the Project, which is the cost for construction and power generation by a thermal power plant of similar size completed in the same period.

3.3.1.3 Qualitative Effects

The electricity generated by the Yuncan HPP is primarily used to cater for the base load[12]. As the Yuncan HPP is located near the lead / zinc mines and the Lima Metropolitan Area, both of which are major power consumption areas, it can efficiently supply power with little transmission loss.

The water used for power generation by the Yuncan HPP is again used for power generation by the Yaupi HPP in the downstream along with water not used by the Yuncan HPP. Even though the Project has not directly contributed to an increase of the electric energy generated by the Yaupi HPP, the Yaupi HPP is now capable of quickly responding to power generation commands due to the fact that the river runoff in the downstream is controlled to a good extent by the Yuncan HPP.

[12] Demand for power fluctuates according to the time in a day and minimizes in early morning. Base load is the minimum demand for power that exists throughout a day.

Based on the above results, the effectiveness of the Project is evaluated as high as the anticipated effects have been mostly achieved as planned.

3.4 Impacts

3.4.1 Manifestation of Impacts

The Project was expected to contribute to steady power supply nationwide through its connection to the trunk transmission grid (SEIN) in Peru as well as to the vitalisation of the economy and regional development through the development of the country's production infrastructure.

Some US$ 2,900 million was invested for power generation in Peru from 1995 to 2008 and the generating capacity connected to SEIN increased by 1,962 MW. The Project, with an investment amount of US$ 380 million and a generating capacity of 137 MW, contributed to this increase. As of 2008, the hydro power plant constructed under the Project accounts for 2.3% of the total generating capacity connected to the SEIN and 2.6% of the total power supply to the grid. Changes of the power supply situation during the period concerned are shown in Table 4.

Table 4 Changes of the Power Supply Situation in Peru

	1995	2008
Total power supply to SEIN	12,426 GWh	30,830 GWh
Effective generating capacity connected to the SEIN	2,861 MW	5,371 MW
Surplus generating capacity connected to the SEIN	809 MW	1,172 MW
National household electrification rate	64.9%	79.5%
Power consumption per capita per year	584 kWh	1,010 kWh

Note: Increase in effective generating capacity during 1995 – 2008 includes the increase realized by the investment by those who are not form the private sector. The surplus generating capacity is the difference between the effective generating capacity and the maximum power demand.
Source: Evolución de Indicadores del Mercado Eléctirco 1995 - 2008 (Ministry of Energy and Mines)

Since 1995, the effective generating capacity connected to the SEIN has continually been above the maximum power demand, providing a sufficient surplus generating capacity. As such, no planned outages have taken place. According to the MEM and COES, stable power supply will continue for the foreseeable future if the power generating projects currently in progress and at the planning stage are implemented as scheduled. The COES has stated that the frequency and voltage profiles have been improved due to (i) the addition of new generating capacity, including that by the

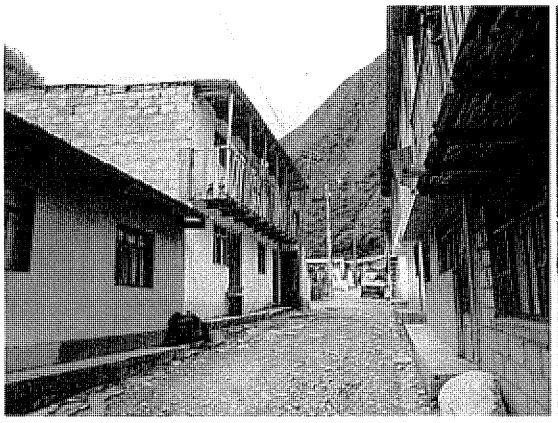
Project, (ii) rehabilitation of power plants of which the operation was frequently stopped because of deterioration and (iii) improvement of the transmission grid[13].

The growth of the Peruvian economy accelerated in the second half of the 2000's and the annual growth rate in 2008 was as high as 9.8%. According to a World Bank document[14], the investment environment in Peru is ranked 7th among 32 Central and South American countries. The main constraints for investors are the recruitment of workers and obtaining of construction permits/approvals. The power supply is good as the average number of outages per month is only 0.9 times which is one-third of the average number (2.68 times) in Latin America. This stable power supply situation in Peru is a contributory factor for economic growth through the promotion of investment. The Project is considered to have been contributing to this situation.

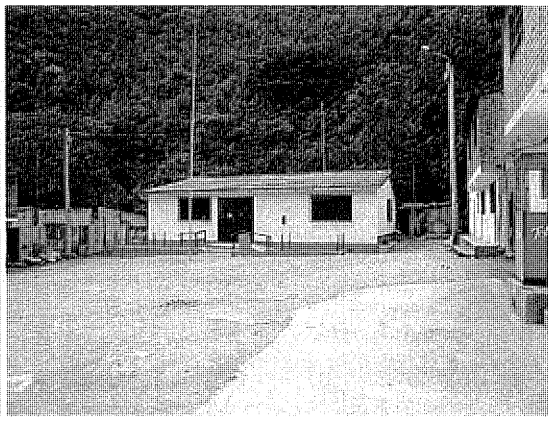
3.4.2 Other Positive and Negative Impacts

3.4.2.1 Relocation of and Compensation for Local Residents

The planned sites for the Santa Isabel Substation and reservoir under the Project, lands owned by EGECEN, were farmland with a number of private houses. The consent of some 70 households to evacuate their land and to relocate was obtained in January, 1996 prior to the commencement of the Project. At the substation site, 53 households were eligible for compensation and among which 25 households were relocated to a nearby settlement. At this settlement, the relocation of other 11 households was necessary as a result of land adjustment. The infrastructure at the settlement was improved with the construction of churches, a school, a health post and water supply and sewerage system. Vocational training was provided for 120 people. Work is currently in progress to grant land ownership to the relocated residents through the Municipality of Paucartambo.



Resettlement Site (Santa Anita)



Health Post Constructed at the Resettlement Site

[13] In the period from 1995 to 2008, some US$ 3,900 million was invested in improvement of the transmission and distribution grids, contributing to the reduction of the transmission and distribution loss (23.4% in 1995 to 10.1% in 2008) and improvement of the electrification rate and level of power consumption.

[14] Doing Business in Peru, 2010 (World Bank)

A questionnaire survey with relocated residents found that many of them were satisfied with the swift completion of the relocation procedure, granting of land ownership and infrastructure development at the new settlement but were not necessarily satisfied with the level of compensation and changes of the living environments[15].

3.4.2.2. Impacts on Socioeconomic Development in the Surrounding Area

A social survey conducted in the surrounding area of the power plant in Huachon District and Paucartambo District found that the following project-related activities produced favourable socioeconomic impacts[16].

School Constructed by the Project

- Short-term employment for the construction work (some 1,500 people) and long-term employment for operation of the power plant (some 70 people)
- Civilian use of the access road (some 30 km long) constructed for the Project and construction camps
- Rural electrification utilising the transmission line installed for the implementation of the Project
- Improvement of the social infrastructure conducted as part of the Project to support the local community (public hall, school, health post, water supply system and others)
- Improvement of the social infrastructure (public hall, health post, telecommunication system and others) conducted as a contribution by the power plant in the post-project period and an agricultural production support project[17]

[15] A questionnaire survey and group interviews were conducted with 25 households out of the 36 relocated households. As the site for the Santa Isabel Substation was originally owned by EGECEN, local residents inhabiting the site did not have land ownership. The level of compensation was calculated for each household based on the value of the house and the number of trees owned. Some of the relocated residents are not satisfied with the new living environment, that is a cluster of smaller lots and more crowded than before, without fruit trees and home gardens that they used to have.

[16] A questionnaire survey was conducted with 25 relocated households and 75 other households in the Huachon District and a workshop to which local residents were invited was held in six places. In the Paucartambo District where there was a strained relationship between some residents and ENERSUR only several local residents were interviewed individually to avoid any unnecessary provocation of these residents.

[17] There are two typical types of social contribution by the Project. One is based on the usufruct contract with ENERSUR and the other is independently made by ENERSUR. An example of the former was the establishment by law of a NPO called the Yuncan Social Fund Association in March, 2008 to follow the social contribution activities conducted by two successive trust funds in the period from 2004 to 2008 (total contribution equivalent to US$ 11.5 million). This NPO received the balance from the second trust fund of US$1.0 million and is due to receive US$ 10.8 million from ENERSUR by

At the settlement to which some residents were relocated and other nearby settlements, there has been a rush to rebuild houses using the compensation and income from project-related employment. As a result, the number of houses using durable building materials has increased, considerably changing the local landscape. Population inflow to these settlements after the commencement of the Project led to the opening of many shops and restaurants. After the completion of the Project, many shops closed down and the Project failed to produce a sustainable economic impact in this regard.

Both the water supply and sewerage service coverage and electrification rate in local settlements have much improved since the Project and the improvement of infrastructure by the Project has partly contributed to this. Some settlements now have a mobile telephone system under a social contribution project of ENERSUR.

The Project has proved to have benefited the local economy in which agriculture is the main player. Schools, health posts and public halls, all of which were constructed in connection with the Project, are also benefiting local communities. Moreover, the access road constructed for the Project that connects the two intakes has facilitated the development of farmland on the hillside and also made it easier to transport agricultural products. As a social contribution by the power plant, a large quantity of chemical fertiliser was distributed in 2008 and 2009, followed by the commencement of several projects to support agricultural production. However, no concrete results of such contribution to the agricultural sector have yet been observed.

3.4.2.3 Relationship Between the Yuncan Hydro Power Plant and Local Residents

Residents of the Paucartambo District who were dissatisfied with the slow progress of the social contribution projects of the power plant strongly demanded direct physical support (procurement and distribution of fertiliser) which was prohibited by law and violently occupied the intake facility of the power plant in August, 2009[18]. The government agreed to provide such support as an exceptional case to ensure continued power generating operation but in consequence ENERSUR suspended all other social

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2022 based on the usufruct contract. In addition to this contribution, ENERSUR has spent some US$ 4 million from 2005 to 2010 for its own social contribution projects.

[18] According to the findings of the survey conducted in the surrounding area of the power plant and the opinions of ENERSUR, EGECEN and MEM, the social contribution projects conducted in two districts using the second trust fund involved too many parties in the decision-making process. Moreover, these projects were required to follow a strict project supervision procedure similar to that applied to the execution of public investment projects. As a result, progress was very slow and many projects failed to produce sufficient results. Many others did not reach the implementation stage even though the preparatory study and planning stages were cleared. Such situation led to dissatisfaction and mistrust on the part of residents. In the Paucartambo District, one of the facilities was violently occupied in August, 2009 against the background of influence by a local politician and the nationwide social and political situation at the time. However, if genuine dialogue between ENERSUR and local residents is held in the months ahead, there is little possibility of a similar incident occurring. In the Huachon District, although a facility was peacefully occupied in October, 2008, a good relationship has been maintained in subsequent years, as local residents have given their consent to the contents of the social contribution activities proposed by ENERSUR.

contribution projects in the Paucartambo District thereafter. As of March, 2010, the strained relationship with local residents is still continuing.

Meanwhile, amidst the conflict with local residents, ENERSUR is maintaining its contact with representatives of residents and is examining a variety of social contribution activities, taking the demands of residents into consideration. ENERSUR plans to reopen full-scale dialogue with local residents regarding wide-ranging social contribution projects, including the introduction of a mobile telephone system and health post, the two projects for which the local demand is strong, and agricultural improvement. An activity starting in April, 2010 to promote school education will be used as an opportunity for this new initiative.

In contrast, more than 80% of the residents of the Huachon District where the relationship with the power plant is favourable have positively evaluated the construction of the power plant. Such positive evaluation is presumably the result of the improved infrastructure (construction of schools, health posts, water supply system and mobile telephone system), increased employment and commercial activities and assistance for agriculture with a number of social contribution projects under the Project.

3.4.2.4 Impacts on the Natural Environment around the Project Site

The environmental impact assessment conducted in 1982 confirmed that the Project would not affect the supply of clean water, living environment and local ecosystem and the Project was approved by the Department of the Environment. Subsequently in 1998, EGECEN conducted a supplementary study in line with the new environmental protection regulations, which concluded in favour of the approval of the Project. Based on the recommendations of the said study, EGECEN implemented environmental conservation measures during construction, and after the completion of the Project, ENERSUR is implementing an environmental monitoring program.

The environmental monitoring is conducted mainly on quantity and quality of river flow and the stability of the slopes at water reservoir and access roads. Though it had been pointed out that measures were needed to mitigate the collapses of slope due to soil erosion at a part of access road, as far as observed at the site inspection, their magnitudes are to be on the normally expected scale along the newly constructed access road and therefore judged not to be a serious problem. There is information that the trees along this access road were illegally cut at one time by unemployed local youths. Other than that no serious impacts on environment are reported.

The social survey conducted in the surrounding area of the power plant found that the majority of local residents believed that the types and quantities of the fish caught in the local river declined after the Project. As an environmental conservation measure, EGECEN twice released in total 105 thousands fish seedlings. However, this did not achieve sufficient results as local residents failed to abide by the official guidance on controlled fishing activities.

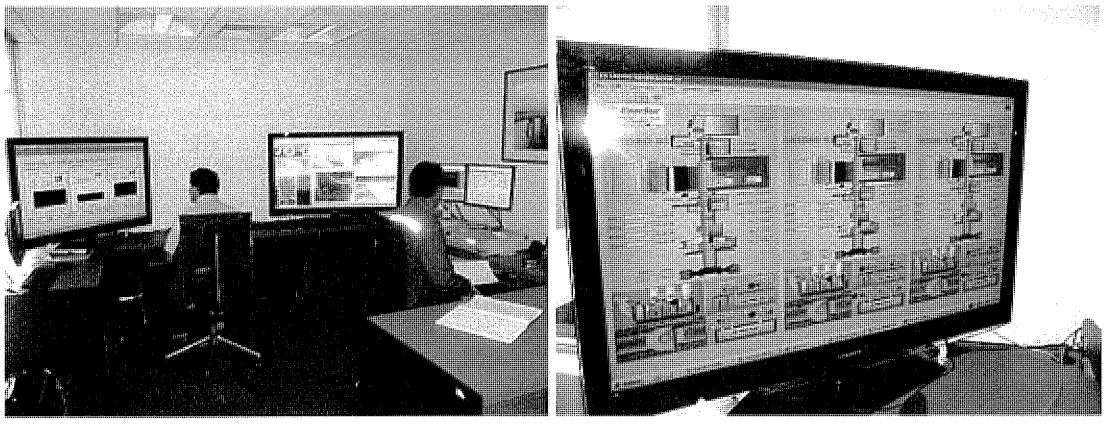
An estimate by ENERSUR suggests that hydro power generation on the scale of the Yuncan HPP can avoid the discharge of some 400,000 tons of CO_2 a year compared to thermal power generation.

3.5 Sustainability (Rating: a)

3.5.1 Institutional Aspect

ENERSUR has been awarded a usufruct contract to assume the entire operation of the power plant for a period of 30 years from September, 2005. ENERSUR operates the power plant from its control room in the capital of Lima in accordance with commands issued by the COES. Given the strained relationship with some local residents, the minimum number of maintenance staff is stationed at the power plant, while remote control from Lima has not encountered any problems. ENERSUR employs rural development experts (a sociologist and an agricultural expert) who plan and manage the social contribution activities in coordination with local residents and local administrations.

EGECEN owns the facilities constructed under the Project and supervises the operation of the power plant by ENERSUR in accordance with the terms of the usufruct contract. Apart from on-line monitoring of the state of operation, EGECEN receives regular reports from ENERSUR and also conducts annual technical audit using an external contractor. In December, 2009, EGECEN became part of ACTIVOSMINEROS but this merger has not caused any special problems as the responsibility for the operation of the power plant has been transferred to ENERSUR under the usufruct contract[19].



Control Room in Lima

At the time of the commissioning of the power plant, ENERSUR controlled the operation of the underground power house and two intake facilities from the office building on the premises of the Santa Isabel Substation. After the peaceful occupation of an intake facility by residents of the Huachon District in November, 2008, a stand-by control room was set up in Lima for remote control of the operation in preparation for

[19] Refer the footnote 1.

the occurrence of a similar incident. After the violent occupation of an intake facility by local residents of the Paucartambo District in August, 2009, ENERSUR immediately commenced remote controlled operation from Lima. At the same time, ENERSUR withdrew 17 employees, excluding four maintenance engineers, to Lima. The company plans to continue remote controlled operation even if the relationship with residents improves. However, the strength of the maintenance staff will be increased.

3.5.2 Technical Aspect

ENERSUR has implemented a series of measures to improve the efficiency of the operation and maintenance of the Yuncan HPP. These include, among others, (i) the introduction of a remote control system to operate the plant, (ii) the introduction of a remote video monitoring system to ensure safety and security at the Yuncan HPP and (iii) the introduction of software to assist the efficient planning of operation and maintenance. The technical audits conducted by EGECEN in 2006 through 2009 found that the availability ratio of the Yuncan HPP was high and that no serious problems existed with the operation and management. Given the contents of the various improvement measures and the high plant availability ratio, the technical standard of ENERSUR is judged to be sufficiently high.

Stock of Spare Parts at the Project Site

3.5.3 Financial Aspect

Under the usufruct contract for the Yuncan HPP, ENERSUR earns income from the sale of electricity generated. ENERSUR is responsible for the operation and maintenance of the Yuncan HPP and pays a total of US$ 205 million to EGECEN up to 2022 as the usufruct fee. ENERSUR is allowed to make its own investment to improve the facilities of the Yuncan HPP but the ownership of these additional facilities will be transferred to EGECEN (now ACTIVOS MINEROS) when the contract comes to an end.

Table 5 Profit from Operation of Yuncan HPP and Overall Operating Profit for ENERSUR (Unit : US$1,000)

	2007	2008	2009
Expenditure for usufruct fee	9,506	9,335	9,146
Operation and maintenance expenditure	926	1,531	1,108
Investment in improvement measures	697	733	349
Income from sale of electricity (Note)	26,555	54,631	25,173
Operational profit of Yuncan HPP	15,426	43,032	14,570
Overall operational profit of ENERSUR	107,893	159,326	NA

Note: The income from the sale of electricity is not directly linked to the electric energy generated as the market price of electricity fluctuates.
Sources: EGECEN and ENERSUR

As shown in Table 5, ENERSUR earns sufficient profit from the operation of the Yuncan HPP and no problems are anticipated for the company to secure a sufficient operation and maintenance budget. The overall operating profit of ENERSUR is sufficient, suggesting that there are no specific problems for the financial sustainability of the Yuncan HPP.

3.5.4 Current Status of Operation and Maintenance

Both the findings of the field survey and explanations given by ENERSUR indicate the good working order of all of the facilities of the Yuncan HPP. ENERSUR has introduced software designed to improve the efficiency of the operation and maintenance. Maintenance engineers in the field are conducting periodical inspection, preventive maintenance, repair and stocking as well as management of spare parts in accordance with the optimised maintenance programme.

Based on the above evaluation, the operation and maintenance of the Project presents no problems in terms of the institutional, technical and finance aspects. Accordingly, the sustainability of the positive effects produced by the Project is ranked high.

4. Conclusion, Recommendations and Lessons Learned

4.1 Conclusion

The Project was included in the power development programme for the power sector which is one of the priority sectors of the Government of Peru for the economic development of the country. Because of the continual increase of the power demand, there is still a strong need for a further increase of the generating capacity. As the Project was compatible with Japan's ODA policies, its relevance is high. The scale of the generating capacity of the constructed Yuncan HPP is as planned and the overall project cost was also almost as planned. However, the completion of the Project was delayed by two years and eight months due to the delayed commencement of the construction work caused by the stringent government finance and several suspensions of the work. Accordingly, the efficiency of the Project is judged to be medium. The high operating rate of the Yuncan HPP and achievement of 90% of the originally planned generation of electric energy indicate the high level of effectiveness of the Project. There is a room for further increased generation of electric energy by the Yuncan HPP if the bottleneck in the transmission grid is resolved. This problem has occurred because the rehabilitation of another power plant has increased an overall power supply capacity to the grid. The social contribution activities implemented in connection with the Project have produced positive impacts on the socioeconomic development of the area surrounding the Yuncan HPP. Strained relations with local residents have emerged in one area and ENERSUR is continually trying to resolve the situation through dialogue. The facilities constructed under the Project are in good working condition and ENERSUR which is contracted to operate these facilities under the usufruct contract is believed to possess an adequate operation and maintenance management system, technical expertise and financial strength. As such, the sustainability of the Project is judged to be high.

Based on the above evaluation results, the overall ex-post evaluation status of the Project is very high.

4.2 Recommendations

4.2.1 Recommendations for the Government of Peru and the Project Implementing Body

- To further increase the effectiveness of the Project, it is necessary for the MEM to complete the transmission line expansion project in the section between Nueva Carhuamayo and Paragsha II as planned and thereby remove the constraint to the power generation.

- To ensure the smooth operation of the Yuncan HPP in the years to come, ENERSUR should continue its present efforts to alleviate the strained relations with residents in the Paucartambo District.

4.2.2 Recommendations for the JICA

None

4.3 Lessons Learned

With a hydro power plant construction project which does not directly benefit the surrounding area, direct assistance for the socioeconomic development of such an area can contribute to the establishment of a relationship of trust between the project and the local residents. However, the inadequate management of such social assistance can inadvertently cause dissatisfaction on the part of local residents, risking the emergence of conflict between the project and local residents. Accordingly, when social contribution activities are to be introduced to ensure the smooth progress of a project which does not directly benefit the surrounding area, it is essential to set up a suitable management regime to promptly implement priority activities.

Comparison Between the Original Plan and Actual Results

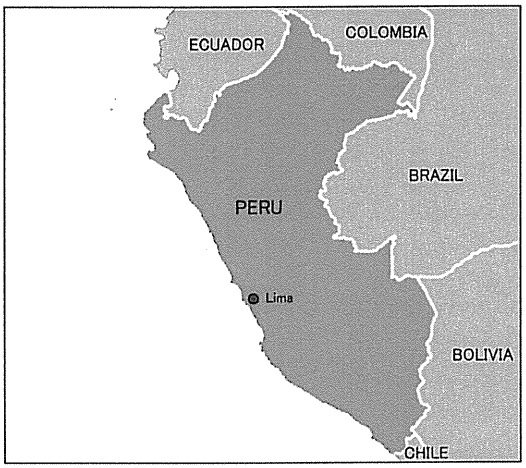
Item	Original	Actual
1. Outputs	<Power Plant Component> ・Uchuhuerta Intake Intake dam Intake (max 20m³/sec.) Settling basin Tunnel No.1 (non pressure, 12.3km) Tunnel No.2 (pressure, 569.5m) ・Huallamayo Intake Intake dam Intake (max. 30 m³/sec.) Tunnel No.3 (pressure, 283.8m) Tunnel No. 4 (pressure, 7,036m) Surge tank Penstock line (784m) ・Underground Powerhouse Tail Race Tunnel (976m) Outlets Turbine (43.3MW x 3 units) Generator (47MW x 3 units) Transformer (15.7MW x 10 units) <Power Transmission Component> ・Transmission line (130km) ・Substations Santa Isabel substation (construction) Oroya Nueva substation (expansion) Carhuamayo substation (expansion) <Others> ・Harnessing of glacial lakes ; 2 lakes ・Procurement of maintenance equipment for water canal, and access road ・Consulting services	<Power Plant Component> ・Uchuhuerta Intake : as planned Intake dam : As planned Intake (max 20m³/sec.) : as planned Settling basin : as planned Tunnel No.1 (non pressure, 11.2km) : slightly shorter Tunnel No.2 (pressure, 1.6 km) : longer than planned ・Huallamayo Intake : as planned Intake dam : slightly smaller in capacity Intake (max. 30 m³/sec.) : as planned Tunnel No.3 (pressure, 247.0m) : slightly shorter Tunnel No. 4 (pressure, 7,010m) : slightly shorter Surge tank : as planned Penstock line (709m) : shorter ・Underground Powerhouse Tail Race Tunnel (869m) : slightly shorter Outlets : as planned Turbine (44.5MW x 3 units) : slightly larger Generator (48.2MW x 3 units) : slightly larger Transformer (48.2MW x 3 units) : slightly smaller <Power Transmission Component> Part of the planned scope was excluded due to financial constraints and implemented by other funding. Transmission line was reduce to 50km; 80km was implemented by private sector. Santa Isabel substation (construction) : GIS→Conventional technology Oroya Nueva substation (expansion) : Out of scope (implemented by private sector) Carhuamayo substation (expansion) Out of scope (implemented by private sector). <Others> ・Harnessing of glacial lakes : cancelled ・Procurement of maintenance equipment for water canal, and access road : cancelled ・Consulting services : as planned
2. Project Period	February 1996 – November 2002 (80 months)	September 1996 – August 2008 (108 month)
3. Project Cost Foreign Currency Local Currency Total of which JICA Loan Exchange Rate	 ¥19,315 million ¥24,682 million (S/.555 million) ¥43,997 million ¥33,000 million US$1=S/.2.25=¥100 (September 1996)	 ¥9,234 million ¥33,577 million (S/.957 million) ¥42,811 million ¥30,669 million US$1=S/.2.85=¥116.5 (Weighted average during 1996 – 2005)

Republic of Peru

Southern Lima Metropolitan Sewerage Improvement Project

External Evaluator : Global Group 21 Japan, Inc.
Hajime Sonoda

1. Project Description



Project Location

San Bartolo Sewage Treatment Plant

1.1 Background

In the mid-1980's, sewage generated in the Lima Metropolitan Area was almost entirely discharged untreated to the sea. Some one-third of the total sewage went through the La Chira Outfall located in southern Lima and this untreated sewage was one cause of the serious pollution of coastal waters, including the declining water quality at nearby bathing beaches. Meanwhile, untreated sewage was used for irrigation at some suburban farmland in southern Lima and it was pointed out that such use of untreated sewage could be a health hazard for farmers as well as consumers of agricultural products. To rectify the situation, the Government of Peru recognised the importance of improving sewage treatment plants (STPs) in the Lima Metropolitan Area and called for an urgent action at a cabinet meeting[1].

A study conducted in 1985 with the assistance of the Inter-American Development Bank proposed a plan whereby the sewage discharged from the La Chira Outfall would be conveyed, instead of being discharged to the sea, to a suburban treatment plant and reused for the irrigation of 5,000 ha of San Bartolo Plain, a dry area in southern Lima.

[1] As stated in the reference materials at the time of project appraisal and the Final Report for "the Feasibility Study on the Improvement of Sewerage System in Southern Part of Lima (JICA, 1990)".

In 1988, the Government of Peru submitted an official request to the Government of Japan regarding an improvement of the sewerage system in southern Lima. In response, the JICA conducted the Feasibility Study on the Improvement of Sewerage System in Southern Part of Lima from 1988 to 1990. The sewerage improvement project proposed by this study would develop the sewage treatment capacity of 4.0 m^3/sec in two phases by the year 2000. The expected effects included the retrenchment of the prohibited bathing area by 3.0 km and the conversion of some 4,800 ha of land into green land or farmland through the use of the treated sewage.

In 1995, the Peru-Lima Waste Water Management and Coastal Pollution Control Project (of which the Spanish abbreviation is the PROMAR), a body established at the Peruvian President's Office, made a study of the "Project on Waste Water Management and Coastal Pollution Control" with the assistance of the World Bank[2]. It also prepared a proposal for the Southern Lima Metropolitan Sewerage Improvement Project (the Project) which corresponded to the phase 1 of the project proposed by the said feasibility study[3].

With such background, a request for a yen loan for the Project was made by the Government of Peru in 1995 to the Government of Japan. The Loan Agreement was signed in 1996 and the Project was implemented from 1996 through 2006.[4]

1.2 Project Outline

To alleviate the pollution of sea water and improve the quality of irrigation water from hitherto used untreated sewage in southern Lima by means of developing additional sewage treatment capacity of 3.25 m^3/sec through the construction of two new STPs, the expansion of one existing STP and the construction of new sewer lines, thereby contributing to an improvement of environmental hygiene in the area.

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[2] The study included the Project, the construction of two more treatment plants, and the extension of two deepwater outfall pipelines and anticipated investment by the World Bank and the OECF. However, investment by the World Bank did not materialise.

[3] Project proposal for "Improvement of Sewerage in the Southern Part of Lima": Immediate Action Plan (PROMAR, 1995)

[4] While the loan disbursement for the Project was completed in January, 2006, the San Bartolo STP, the last facility constructed under the Project, commenced operation in December, 2007. For analysis of the efficiency, the project period was considered to be up to the commencement of operation of the San Bartolo STP.

Approved Amount/ Disbursed Amount	¥12,660 million / ¥12,076 million
Exchange of Notes Date/ Loan Agreement Signing Date	August 1996 / September 1996
Terms and Conditions	Interest Rate : 2.5% (Consulting service : 2.1%) Repayment Period (Grace Period) : 25 years (7 years) Procurement : General Untied
Borrower / Executing Agency	Government of the Republic of Peru / Ministry of Presidency, later changed to Lima Water and Sewerage Service Company (SEDAPAL) / Ministry of Housing, Construction and Sanitation
Final Disbursement Date	January 2006
Main Contractor (Over 1 billion yen)	SADE(France) · COSAPI S.A.(Peru)(JV) / Companhia Brasileira de Projetos e Obras(Brazil) · Consorcio Odebrecht- CBPO(Peru)(JV) / Companhia Brasileira de Projetos e Obras(Brazil) · Construtora Norberto Odebrecht(Brazil)(JV) /Consorcio Odebrecht - CBPO(Peru)
Main Consultant (Over 100 million yen)	NJS
Feasibility Studies, etc.	The Feasibility Study on the Improvement of Sewerage System in Southern Part of Lima (1990, JICA), Project Proposal for "Improvement of the Sewerage in the Southern Part of Lima" Immediate Action Plan (Ministry of the Presidency, Republic of Peru, 1995)

2. Outline of the Evaluation Study

2.1 External Evaluator

Hajime Sonoda, Senior Consultant, Global Group 21 Japan, Inc.

2.2 Duration of Evaluation Study

The ex-post evaluation study of the Project was conducted over the following period.

Duration of the Study: September, 2008 to July, 2010

Duration of the Field Study: 14th November to 24th December, 2009

21st February to 16th March, 2010

2.3 Constraints during the Evaluation Study

Data and information was collected through a series of interviews with the project implementing body and other stakeholder organizations, the gathering of relevant documents, observation of the project-related facilities and the situation of the reuse of treated sewage, interviews and workshops with farmers using the treated sewage for irrigation and a questionnaire survey with swimmers at bathing beaches. No major constraints were encountered in the process of information gathering.

3. Results of the Evaluation (Overall Rating: C)

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plan of Peru

The Government of Peru already recognised in the mid-1980's that there was an urgent need to improve the sewage treatment facilities in the Lima Metropolitan Area. The current government has adopted the "Agua para Todos" (Water for Everyone) policy which aims at ensuring access to clean water by the entire population by the end of its term in 2011, identifying the water supply and sewerage sector as a priority sector for national development. The Project has been given the status of one of three mega projects forming the General Clean Water Plan (Plan General de Aguas Limpias) which is being implemented by the government in the Lima Metropolitan Area [5].

In view of such status, the Project designed to improve the sewerage system in the Lima Metropolitan Area is judged to be compatible with the development policies in Peru at the time of appraisal and also at the time of ex-post evaluation. However, it must be noted that no clear policy currently exists to promote the reuse of treated sewage for agricultural irrigation in southern Lima.

3.1.2 Relevance with Development Needs of Peru

At the time of appraisal, sewage generated in the Lima Metropolitan Area was almost entirely discharged untreated to the sea, making the introduction of sewage treatment facilities highly necessary. As of 2008 after the completion of the Project, the sewage treatment rate in the Lima Metropolitan Area is still as low as 14.6%, failing to arrest either the continual deterioration of environmental hygiene or contamination of the sea. Therefore, Lima Water Supply and Sewerage Service Company (SEDAPAL) had commenced the construction of the new Taboada STP (treatment capacity: 14 m^3/sec) in 2010 and also is planning the construction of a new STP near the La Chira Outfall. These moves illustrate the strong need for an increase of the sewage treatment capacity in the Lima Metropolitan Area.

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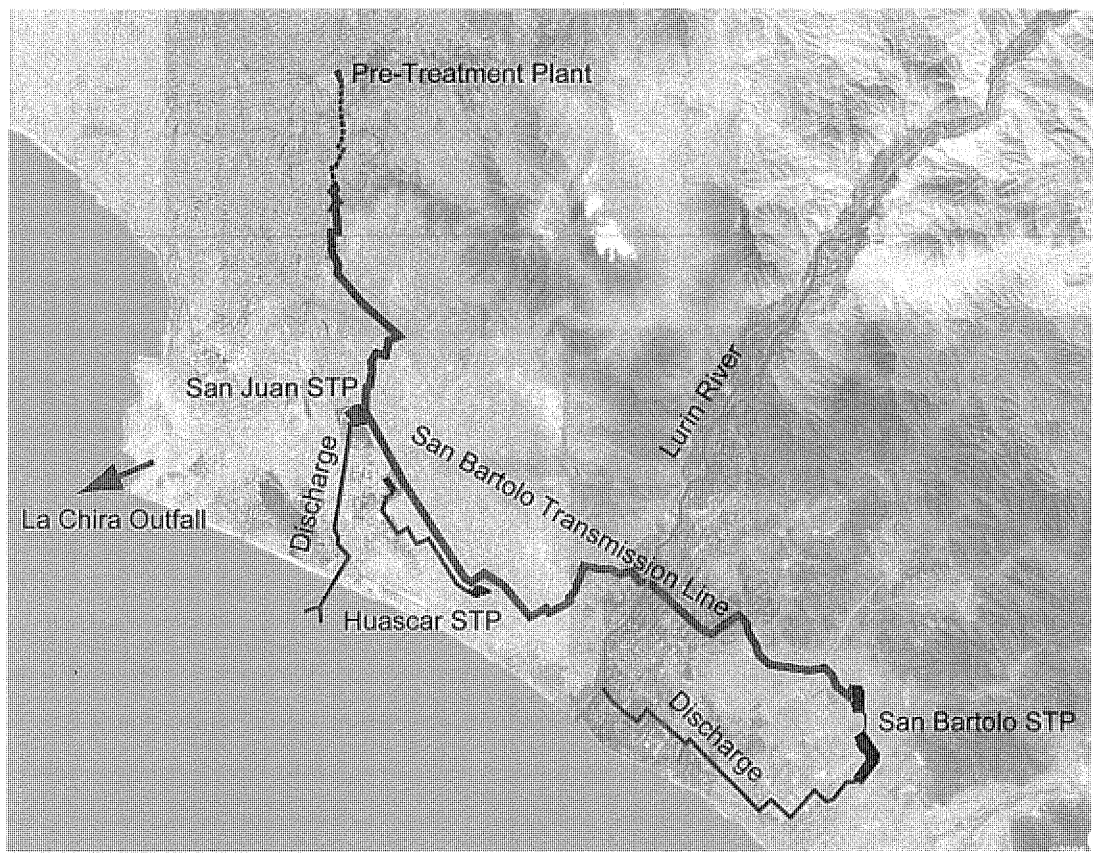
[5] This Plan stipulates investment of US$ 500 million with a view to improving the sewage treatment rate in the Lima Metropolitan Area to 100% by the end of 2011.



Layout of the Project

3.1.3 Relevance with Japan's ODA Policies

The old ODA Charter adopted in 1992 stipulated that Japan would provide assistance for the development of infrastructure, which is an important precondition for socioeconomic development. Around that time, Japan actively provided assistance to Peru in recognition of the positive reform efforts of the then Fujimori Administration to ensure sustainable economic development and alleviate poverty. In line with the diverse development needs in Peru, Japan decided to provide loans every year, in principle, from 1996 onwards with the qualitative as well as quantitative enhancement of cooperation in mind. In 1999, poverty alleviation and environmental conservation were identified as priority issues for Japan's ODA for Peru and active cooperation was called for to improve the country's water supply and sewerage services and to control water pollution. In these regards, the Project was compatible with Japan's ODA policies at the time of its appraisal.

Based on the above, this project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Efficiency (Rating: b)

3.2.1 Project Outputs

The plan at the time of appraisal consisted of the following two independent sewage treatment systems.

(i) Sewage from areas at an elevation of 130 m ~ 150 m within the Surco Drainage Area, which is discharged untreated through the La Chira Outfall, will be received by two intake points. The sewage will be then conveyed to the San Bartolo STP (treatment capacity: 2.2 m^3/sec) via two pre-treatment facilities to remove garbage and a 32 km transmission line[6]. The treated sewage will be discharged to Rio Lurin and also used for agriculture on the San Bartolo Plain and other areas. Part of the sewage running through the transmission line will be diverted and treated at the new Huascar STP (treatment capacity: 0.05 m^3/sec) that provides treated sewage for irrigation in the nearby area. All of these facilities will be newly constructed. Treatment will be made by the aerated lagoon method.

(ii) The treatment capacity of the existing San Juan STP will be increased from 0.25 m^3/sec to 1.0 m^3/sec. The aerated lagoon method will be introduced for more advanced treatment. The treated sewage will be used for irrigation in the nearby area.

After the signing of the Loan Agreement in September, 1996, the detailed design work was carried out until 1998. The finalised detailed design included such changes as; (i) extension of the discharge pipeline from the San Bartolo STP, (ii) addition of a stabilisation pond at the San Bartolo STP, and (iii) scale reduction of both the San Bartolo STP and San Juan STP in consideration of a likely increase of the project cost due to the weakening of the yen and also the anticipated financial stringency of the government due to damage caused by the El Niño phenomenon. Meanwhile, in consideration of the strong needs of reuse of treated sewage in the nearby area, the scale of the Huascar STP was expanded from the original plan at the time of appraisal. As a result of these changes, the sewage treatment capacity to be added by the Project was reduced to 2.67 m^3/sec or some 82% of the originally planned 3.25 m^3/sec at the time of appraisal.

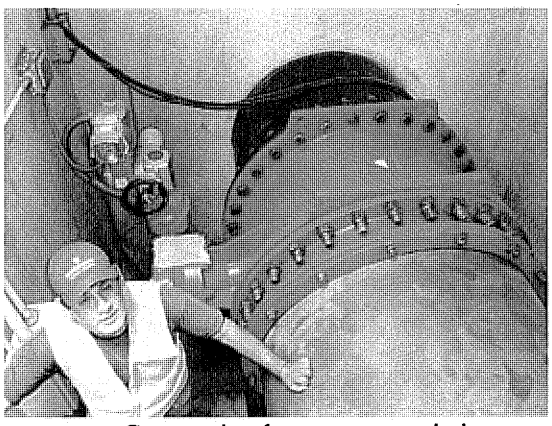
Moreover, the following changes were made after the commencement of the construction.

- The original plan intended two intake points from the existing sewer lines and the construction of a pre-treatment facility at each intake. However, it was found to be impossible to construct a pre-treatment facility at one of the planned two intake points due to strong opposition by nearby

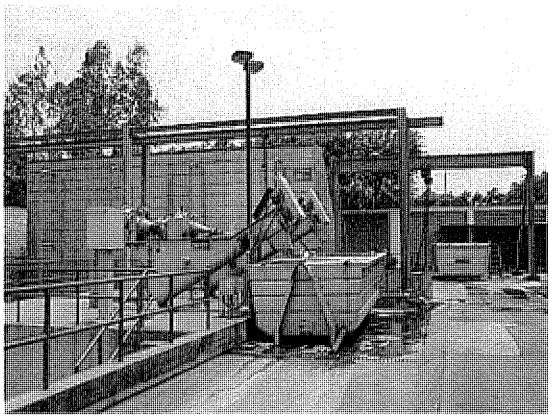
[6] The Project was based on an unprecedented concept in the world that the raw sewage would be transported for 35 km by a transmission line.

residents and the mayor of the district. Accordingly, one of the new connections with the existing sewer lines was abandoned[7].

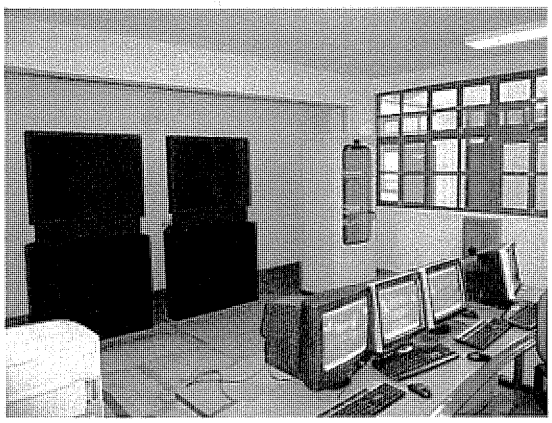
- During the detailed design process for the San Bartolo STP, the discharge pipeline of treated sewage to the sea was considered for a time. However, because of the opposition of coastal residents to this plan, the destination for the discharge pipeline was changed to Rio Lurin. The actual discharge point was then moved to downstream of the wells that supply water to local residents because of the opposition of residents living near the originally planned discharge point.
- Respecting the opinions of local resident, the discharge method for the treated sewage from the San Juan STP was changed from coastal discharge to deep-sea discharge.
- The original plan for the Huascar STP was to treat part of the sewage diverted from the main transmission line to the San Bartolo STP. However, because of a major delay of the commencement of operation of this transmission line and the San Bartolo STP, it was decided not to receive sewage from this sewer line. The Huascar STP was then remodelled to operate as an independent sewage treatment system receiving sewage from existing sewer lines in the nearby area.



Connection between an existing Sewer and the transmission line



Pre-Treatment Plant (Punto A)



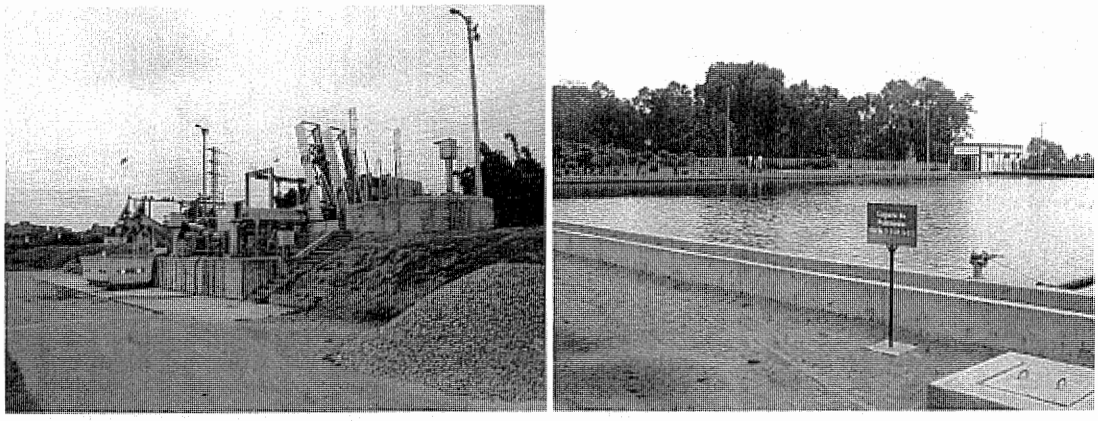
San Bartolo STP : Control Room(left), Discharge to Lurin River(right)

[7] The San Bartolo STP cannot receive more sewage due to an increase of the Biochemical Oxygen Demand (BOD) concentration of the sewage and no new connection with a sewer line is currently planned.

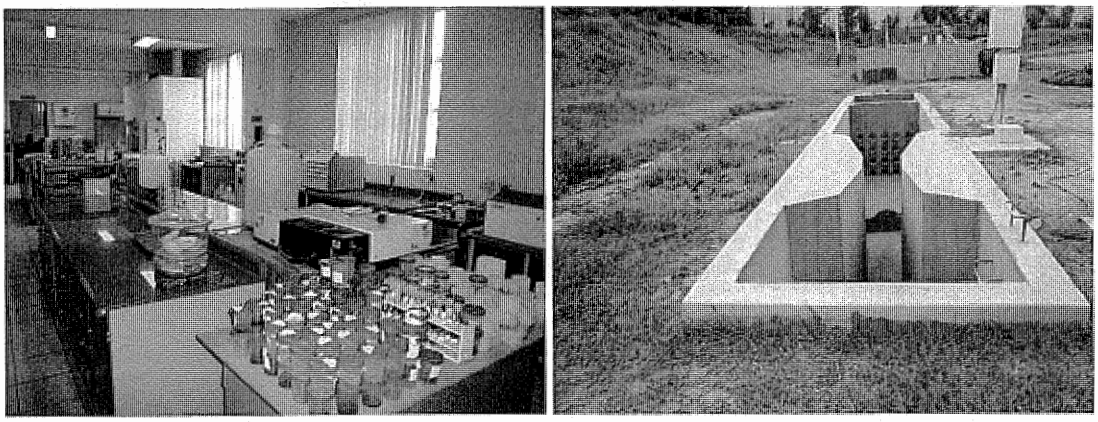
Table-1 Comparison of Planned and Actual Project Outputs

(a) Construction of Sewers (49.95km) San Bartolo Transmission Line : 31.55km Discharge Pipe for San Bartolo STP : 5.5km Discharge Pipe for San Juan STP : 5.4km Discharge Pipe for Huascar STP : 5.0km (b) Expansion of Sewerage Treatment Plants Expansion of San Juan STP : 0.25→1.0 m^3/sec. Collector for San Juan STP : 0.2km (c) Construction of Sewerage Treatment Plant Construction of San Bartolo STP : 2.20 m^3/sec. Construction of Huascar STP : 0.05 m^3/sec. (d) Consulting Services : Detailed Design, Construction Supervision	(a) Construction of Sewers (53.1km) San Bartolo Transmission Line : 32.5km Discharge Pipe for San Bartolo STP : 9.5km Discharge Pipe for San Juan STP : 5.6km Discharge Pipe for Huascar STP : 5.5km (b) Expansion of Sewerage Treatment Plants Expansion of San Juan STP : 0.25→0.8 m^3/sec. Collector for San Juan STP : 0.2km (c) Construction of Sewerage Treatment Plant Construction of San Bartolo STP : 1.7 m^3/sec. Construction of Huascar STP : 0.17 m^3/sec. (d) Consulting Services: (additional scope) supplemental EIA, manual and training for transmission line

Source : Material at the initial appraisal, SEDAPAL



San Juan STP : Pre-Treatment Plant (left), Stabilization Pond (right)



(Left) Laboratory at San Juan STP

(Right) Receptor from the Transmission Line (not in use due to change in plan)

3.2.2 Project Inputs

3.2.2.1 Project Period

The Project was originally planned to be implemented for 56 months from July, 1996 to February, 2001. In reality, it was implemented over a period of 136 months from September, 1996 to December, 2007. The length of the actual project period was 243% of the original plan. The San Bartolo STP, the last facility to be completed under the Project, commenced operation six years and 10 months behind the original schedule. Because of such delay, the time limit for loan disbursement was extended twice. Reasons for the delay will be explained as follows;

After the signing of the Loan Agreement, the project implementing agency was changed from the President's Office to the SEDAPAL as a result of the reorganization of government ministries and agencies. The impacts of this change of the project implementing body were small and the construction work commenced without any major delay. After the commencement of the work, however, the completion of the discharge pipeline from the San Bartolo STP was delayed by more than three years because of opposition by local residents. Moreover, the commencement of operation of the San Bartolo STP and the transmission line was delayed by further three years due to an accident during test operation.

The construction of the discharge pipeline from the San Bartolo STP to Rio Lurin was suspended in August, 2001 due to an opposition by local residents. Subsequent negotiations with local residents and head of the district experienced many difficulties and the work was finally completed in June; 2004. The opposition of local residents originated from their lack of a proper understanding of the project contents but the interference of a local politician made the issue political, delaying settlement of the issue[8]. The construction of the transmission line and San Bartolo STP was almost completed in February, 2002 and the test operation of these facilities could have commenced at that time. Because of the delay of the construction of the discharge pipeline, however, the said test had to wait until June, 2004 when the discharge pipeline was finally completed.

Moreover, the San Bartolo STP suffered from an incident in September, 2004 when part of the partial mixing aerated lagoons collapsed during the filling test. In this incident, part of the concrete plates laid at the bottom of the stabilisation pond collapsed as the soil below was eroded by water seeping through some of the joints. Several possible causes of the collapse were pointed out as listed bellow,

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[8] The opposition of local residents began when incorrect information was spread that the untreated sewage but not the treated one will be discharged. Although the SEDAPAL secured all of the necessary permits, etc. legally required for the construction of the discharge line, the opposing residents forcibly halted the work in 2001. The opposition of local residents subsequently became a political issue and the court ordered temporary suspension of the work on the grounds of resident protection.

but no conclusion has been reached as of March, 2010, as the SEDAPAL, the contractor and the consultant are in a dispute over where the responsibility lies and how the repair cost should be met.

- The filling test went ahead although the joint deteriorated during the period from completion of construction to the filling test[9].

- The geological survey prior to the commencement of the construction work failed to detect the localised presence of highly erosive soil.

- Fault in the design and/or execution of the joints.

In October, 2005, two incidents happened one after another during the test operation where the sewer exploded at the bottom part of the inverted siphon of the transmission line. According to the SEDAPAL, these incidents occurred as a result of the generation of a combustible as well as corrosive gas from the sludge accumulated inside the sewer. Even though oxygen was injected to prevent the generation of such gas, insufficiently dissolved oxygen was mixed with the combustible gas. This mixture was eventually ignited by sparks that occurred at the exhaust port. The insufficient performance of the oxygen dissolving device was pointed out as one cause of the explosion along with the generation of a large quantity of combustible gas due to the much accumulation of sludge, which was caused by a much lower sewage flow than the design flow.

The repair work necessitated by these incidents was completed in June, 2006. After the compilation of the manual and the implementation of training for the proper operation of the transmission line by the consultant, the San Bartolo STP and the transmission line finally commenced operation in December, 2007. Meanwhile, the San Juan STP commenced operation in 2002 almost as originally planned and the Huascar STP commenced operation in 2004 after remodelling as an independent system.

3.2.2.2 Project Cost

At the time of appraisal, the project cost was estimated to be approximately ¥16.9 billion. The finalised actual cost was approximately ¥15.0 billion (89% of the originally planned amount)[10]. The factors contributing to this lower spending were the reduction of the scale of the STPs, change of the project scope due to the omission of some pre-treatment facilities, and the reduction project cost owing to competition exceeding the currency exchange losses.

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[9] The original design of the joints assumed filling of the stabilisation pond immediately after the completion of the work but were left exposed to the sun for more than four years without any maintenance.

[10] The cost of the repair work following the collapse incident during the test operation was not included in the project cost as the incident occurred after the completion of the construction work. The cost is to be paid by the SEDAPAL (Ministry of Housing, Construction and Saniatation) using its own funds, the contractor and/or the consultant.

Table 2 Planned and Actual Project Costs

	Planned			Actual		
	Foreign Currency (¥ million)	Local Currency (US$ '000)	Total (¥ million)	Foreign Currency (¥ million)	Local Currency (US$ '000)	Total (¥ million)
Civil Engineering Work	6,660	43,154	11,061	7,161	4,248	11,408
Consulting Service	624	3,364	967	519	648	1,167
Price Escalation	430	4,712	911	-	-	-
Contingency	709	4,937	1,213	12	0	12
Land Acquisition	-	1,500	153	0	142	142
Taxes	-	25,243	2,575	0	2,302	2,302
Total	8,423	82,910	16,880	9,062	5,957	15,032

Source: Prepared by the evaluator using reference materials at the time of appraisal and data provided by the SEDAPAL.

Foreign Exchange Rates: (at the time of appraisal) US$ 1 = S/. 2.31 = ¥102.00
(at the time of evaluation) US$ 1 = S/. 3.28 = ¥112.4
(Weighted average for 1997 through 2005)

Based on the above figures, although the project period was significantly longer than planned, the project cost was lower than planned, therefore efficiency of the project is fair.

3.3 Effectiveness (Rating: b)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effects Indicators

At the time of appraisal, the Biochemical Oxygen Demand (BOD) concentration of the sewage flowing into each STP was assumed to be 250 mg/L. However, the actual level stands at 400 - 500 mg/L and exceeds the 600 mg/L level in some months. Such a high level is caused by (i) the decline of the water consumption per capita due to the installation of water meters etc. making the sewage denser, and (ii) the increase of industrial waste water with a high BOD concentration from stores, restaurants, factories and others[11].

[11] The amount of industrial waste water in the Lima Metropolitan Area has sharply increased in recent years because of rapid economic growth. But the regime to control the quality of industrial waste water is not functioning effectively. The industrial waste water standards are stipulated by the relevant laws enacted in 1960 and 2002. Under these laws, sewage connection can be terminated for unscrupulous violators. However, this provision has been practically unenforceable because of the unclear criteria for such termination, the insufficient capacity of the SEDAPAL to monitor the waste water quality, and the insufficient authority of SEDAPAL to implement the termination of connection. A new law is scheduled to take effect in November, 2011 to allow the imposition of a fine when the statutory standard is exceeded with certain indices. In preparation for this new legal set-up, the SEDAPAL is now planning to strengthen its capacity for water quality monitoring. The current reality is that it is still difficult to invoke such a strong measure as the forcible termination of sewage connection for waste water of which the BOD concentration exceeds, for example, 1,000mg/L.

Because the BOD concentration of incoming sewage far exceeds the planned level, each STP is trying to achieve a planned level of BOD concentration (30 mg/L) by means of reducing the amount of sewage inflow and thereby increasing the overall treatment efficiency (i.e. reduction rate of BOD concentration) [12]. The actual BOD concentration of treated sewage fluctuates depending on the original BOD concentration of the sewage inflow, water temperature and other conditions. The BOD removal rate has been relatively good achieving the original target level at the San Juan STP and the San Bartolo STP and the average annual BOD concentration of treated sewage at these STPs is around 40 mg/L in 2008. The nominal BOD removal rate and BOD concentration of treated sewage at the Huascar STP is relatively high as the higher ambient temperature at this STP stimulates the growth of green algae at the final treatment stage. The combined BOD removal rate in 2008 was 89.5% exceeding the target level of 88%.

Table 3 Operation and Effects Indicators at Each STP (Planned and Actual)

			San Juan STP	Huascar STP	San Bartolo STP	Total
BOD Concentration of Sewage Inflow	mg/L	Planned	250	250	250	-
		Actual (2008 Average)	458	483	395	-
BOD Concentration of Treated Sewage	mg/L	Planned	30	30	30	-
		Actual (2008 Average)	40	82	43	-
Sewage Treatment Capacity and Actual Treatment Volume	m^3/sec.	Planned	1.00	0.05	2.20	3.25
		Actual Treatment Capacity	0.80	0.17	1.70	2.67
		Actual Treatment Volume (2008)	0.43	0.07	0.73	1.23
BOD Removal Rate	%	Planned	88.0	88.0	88.0	88.0
		Actual (2008)	91.3	83.0	89.1	89.5
BOD Load Removed	g/sec.	Planned	220	11	484	715
		Actual (2008)	179	30	256	465

Source: Prepared by the evaluator using reference materials at the time of appraisal and data provided by the SEDAPAL.

Notes: BOD Removal Rate

= [(BOD concentration of sewage inflow) – (BOD concentration of treated sewage)] / (BOD concentration of sewage inflow)

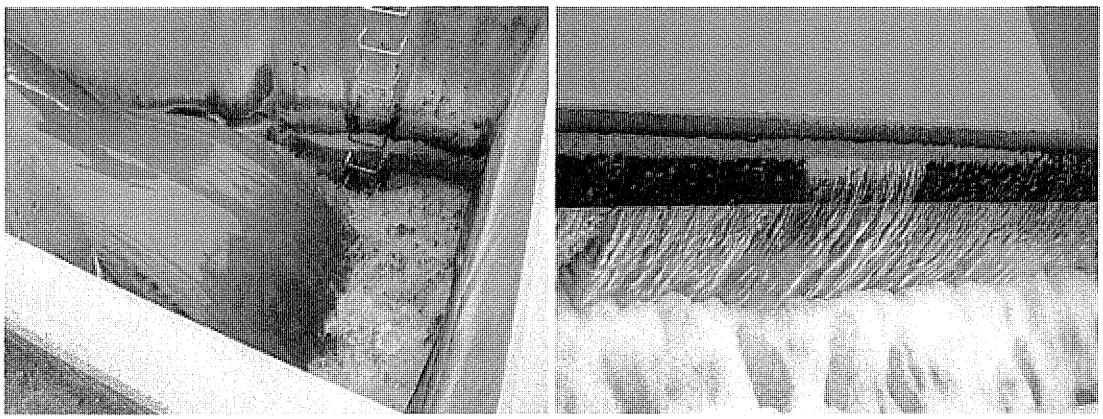
(Total BOD removal rate is a weighted average by volume treated of BOD removal rate at each STP)

BOD Load Removed

= [(BOD concentration of sewage inflow) – (BOD concentration of treated sewage)] x (Volume of sewage treated)

= (BOD concentration of sewage inflow) x (Volume of sewage treated) x (BOD removal rate)

[12] If a sewerage treatment plant receives more sewage inflow, treatment efficiency will be lowered and the BOD concentration of treated sewage will increase. It is not possible for SEDAPAL to receive more sewage, as it is obliged to make efforts for retaining the BOD concentration level close to the standard of 30mg/L.



San Bartolo STP : Sewage Inflow before treatment (left), Treated Sewage (right)

Although the combined sewage treatment capacity of these three STPs is 2.67 m^3/sec, the actual treatment volume is restricted to some 50% of the capacity at 1.23 m^3/sec (2008). This figure represents 38% of the planned sewage treatment volume at the time of appraisal. The estimated total amount of the removed BOD load is calculated as 465 g/sec (2008) based on (i) the difference between the BOD concentration of sewage inflow and treated sewage and (ii) the actual treatment volume at each STP. This figure represents 65% of the planned figure at the time of appraisal[13].

At the time of appraisal, the plan was to reduce the BOD load discharged to the sea via the La Chira Outfall by some 31% through the implementation of the Project. The actual reduction rate is inferred to be approximately 14%. Because of the higher BOD concentration of untreated sewage, the BOD load discharged from the La Chira Outfall almost doubled in five years from 2003 to 2008, recording 180% of the planned level at the time of appraisal.

3.3.1.2 Analysis Results of Internal Rate of Return

The internal rate of return of the Project was not calculated at the time of appraisal. Because of the difficulty of measuring the project benefits in monetary terms, no recalculation of the internal rate of return was conducted.

3.3.1.3 Qualitative Effects

No specific qualitative effects are observed.

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[13] Given one of the purpose of the Project is to alleviate ocean pollution by untreated sewage, the reduction of BOD load (i.e. amount of removed pollutants) is more suitable to judge the effectiveness of the Project than the actual sewage treatment volume. BOD load removed is a function of BOD removal rate, BOD concentration of sewage inflow and the volume of sewage treated. It was because the effect of lower treatment volume was greater than the effect of higher-than-planned BOD concentration of inflow that BOD load removed at San Juan and San Bartolo STP did not reach target level while BOD removal rate achieved the same,

Based on the above analysis, this project has somewhat achieved its objectives, therefore its effectiveness is fair.

3.4 Impacts

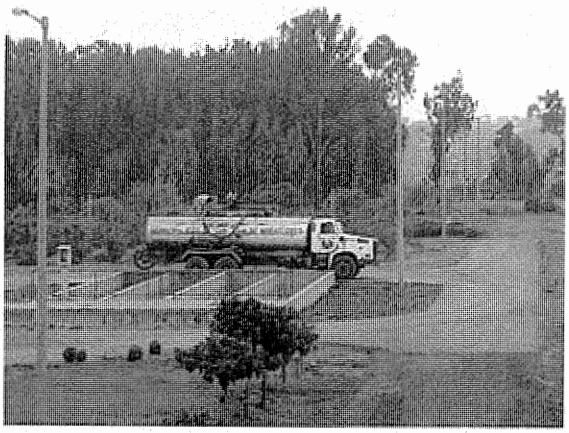
3.4.1 Intended Impacts

The anticipated impacts of the Project were (i) alleviation of ocean pollution, (ii) improvement of the quality of irrigation water for agriculture and greening of arid areas with the reuse of treated sewage and (iii) improvement of the environmental hygiene in southern Lima. The actual manifestation of these impacts is described next.

(1) Impact on Alleviation of Ocean Pollution

As shown in Table 4, according to the data of the Ministry of Public Health, the number of coli forms at swimming beaches at the south of the La Chira Outfall that are affected by the quality of discharged water from this outfall slightly reduced in the summer of 2008 (March), immediately after the commencement of operation of the San Bartolo STP. The level of the coli forms, however, returned to the pre-operation level in 2009. No significant positive impacts have been observed there, presumably because of the low treatment level (1.23 m^3/sec in 2008) compared to the overall discharge from the La Chira Outfall (4.69 m^3/sec in 2008).

Beach at Lima South (Agua Dulce)



Water Truck receiving Water at San Juan STP

Table 4 Change in Water Quality at the Beaches near La Chira Outfall

(1 - 4 weeks in March)

	March 2007				March 2008				March 2009			
Agua Dulce Norte	R	G	G	G	G	G	R	R	G	G	G	R
Agua Dulce Sur	G	G	G	G	R	R	R	R	G	G	G	G
Pescadores	B	G	R	R	B	G	B	B	G	R	R	R
Club Regatas 1	VG	VG	VG	VG	VG	VG	VG	VG	VG	VG	VG	B
Club Regatas 2	G	G	G	G	VG	VG	VG	VG	VG	VG	VG	VG
Club Regatas 3	VG	VG	VG	G	VG	VG	VG	VG	VG	R	R	R
La Caplina	R	R	G	R	R	R	B	B	B	B	B	R
La Herradura	B	B	B	B	B	R	R	R	G	B	B	R
La Chira Outfall												
Playa Villa	G	R	B	B	B	VG	B	B	B	B	B	B
La Encantada	R	B	B	B	B	R	B	B	B	B	B	B
Cocoteros	R	B	B	B	R	R	R	R	B	R	R	B
Country Club de Villa	R	B	B	B	R	R	R	B	B	B	B	B
Venecia	R	B	B	B	R	R	R	R	R	G	G	B

Source : Prepared by the evaluator based on data of the Ministry of Health

Notes : Number of coli forms VG (Very Good : less than 250MPN/100mL), G (Good : 250～500MPN/100mL)
R (Regular : 500～1000MPN/100mL), B (Bad : 1000～4000MPN/100mL)
MPN : Most Probable Number

The questionnaire survey conducted with swimmers at local beaches found that some 40% of the respondents acknowledged pollution of the seawater and sandy beach [14]. It must be pointed out that the primary culprit for pollution as identified by the respondents was rubbish discarded by swimmers and only 17% of the respondents cited untreated sewage as the main reason for pollution. The opinions expressed by the respondents suggested that the pollution of coastal water and beaches may have slightly improved compared to five years ago but no causal relationship with the Project was established.

(2) Impact on the Reuse of Treated Sewage

The treated sewage from the three STPs either newly constructed or expanded under the Project is reused for mainly agricultural irrigation, the greening of parks and streets and the greening of STP premises in the Villa el Salvador District and San Juan de Miraflores District at the north of Rio Lurin and the Lurin District at the south of Rio Lurin. As of March, 2010, approximately half of the treated sewage discharged by these three STPs is reused and it is inferred that some 500 - 600 ha of farmland are irrigated with the treated sewage. Prior to the reuse of the treated sewage, the SEDAPAL determines the amount for reuse and other relevant matters with individual users such as irrigation

[14] 40 swimmers at four beaches located to either the north or south of the La Chira Outfall were interviewed.

committees, district offices and other users. The facilities required to receive and convey the treated sewage are set up by individual users[15].

According to the interview results with the users[16], the treated sewage from each STP is used in the following manner.

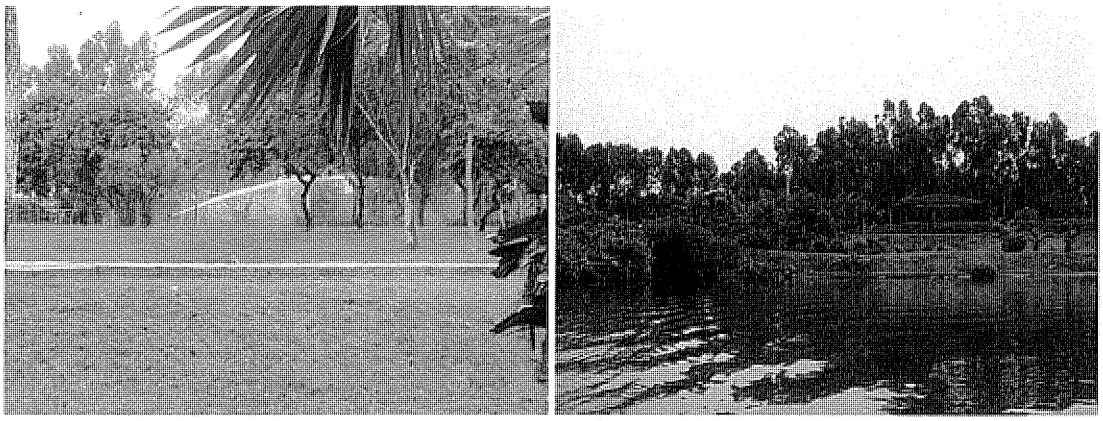
(i) San Juan STP: Of the treated sewage produced at a rate of some 0.4 m^3/sec, 0.2 - 0.3 m^3/sec is reused for the irrigation of nearby farmland and also for the greening of parks and streets. In the nearby area, raw sewage was formerly used for irrigation but, since 2001, 62 farming households of two irrigation committees commenced the use of treated sewage from the San Juan STP for the irrigation of their farmland. The quality of the treated sewage has improved due to the higher standard of sewage treatment since 2002 when this STP was expanded under the Project.

(ii) Huascar STP: The entire volume of treated sewage (0.07 m^3/sec) is reused for (i) the greening of an adjacent park and recharging of the pond in this park, (ii) a fish culture project operated by the Ministry of Housing, Construction and Sanitation and (iii) the greening of streets and other parks. Farming households near the Huascar STP formerly used raw sewage for irrigation but the opening of this new STP has enabled 36 farmers of one irrigation committee to use treated sewage. However, these farmers have again begun to use raw sewage as the construction of a pond in the park adjacent to the STP has resulted in an insufficient supply of treated sewage for irrigation.

Agricultural Irrigation using Treated Sewage from the San Bartolo STP :Existing agricultural land at Lurin District (left), Drop irrigation of fig at a new farmland (right)

[15] Under the present legal framework, no user charge can be imposed. In Peru, the Ministry of Environment, Ministry of Housing, Construction and Sanitation, Ministry of Health and Ministry of Agriculture are examining a desirable supervisory system and water quality standards regarding the reuse of treated sewage.

[16] A workshop with irrigation committees using the treated sewage was held seven times while six individual farmers were interviewed. Moreover, study visits were made to irrigated farmland and parks.



A district park using the treated sewage from the Huascar STP

(iii) San Bartolo STP: Of the treated sewage produced at a rate of some 0.7 m^3/sec, 0.2 - 0.3 m^3/sec is reused for agricultural irrigation and the greening of streets and parks. In the Lurin District, river water and groundwater were formerly used for irrigation but 68 farmers of three irrigation committees commenced the use of treated sewage for irrigation along with river water and groundwater at the end of 2008[17]. In addition, some 50 ha of orchards owned by an independent farmer in an area where irrigation water was unavailable before the Project has begun to practice drip irrigation using the treated sewage which undergoes a more advanced treatment process before use. The export of fruits produced in these orchards will begin in 2011 and the farmer plans to expand the irrigated area in the coming years. Several real estate companies also plan to use up to 0.35 m^3/sec of treated sewage for the greening of their development sites.

There has been a decrease of the farmland to the north of Rio Lurin where both the San Juan STP and Huascar STP are located due to a shortage of irrigation water and the pressure of urbanisation. At those farmlands using treated sewage from the San Juan STP, the quality of the irrigation water has improved. There are, however, still farmlands where raw sewage is used for irrigation.

In the south of Rio Lurin where the San Bartolo STP is located, both river water and groundwater have been used for irrigation since the 1970's. Local farmers using treated sewage consider the quality of the treated sewage is superior to that of river water which is contaminated by household waste, etc. In this area, the use of treated sewage appears to have slightly increased the area of cultivation as well as the overall production volume. The use of treated sewage has also reduced the production cost as a saving has been made on the cost of pumping up groundwater. The farmer who has started to cultivate fruits by means of drip irrigation using treated sewage from the San Bartolo STP believes that the high level of nutrients (nitrogen, etc.) in the treated sewage is effective for the positive growth of his fruit trees.

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[17] Because of the change of the discharge route due to the opposition of local residents, 30 farming households other than these 68 households were unable to use the reused treated sewage.

The use of either raw sewage or treated sewage for the cultivation of crops with short stalks is prohibited by the Ministry of Agriculture on the ground that the irrigation water is in contact with the edible part of such crops. At the farmlands using treated sewage from the old San Juan STP since some 10 years ago, production shifted to ornamental foliage plants, flowers and fruit trees around the time of the expansion of this STP under the Project. In comparison, a shift to new crops has not occurred in areas which began to use treated sewage from the San Bartolo STP since the end of 2008, leaving concern in regard to food hygiene. No concrete consultations or adjustments regarding the use of treated sewage for irrigation have been made between the SEDAPAL and the Ministry of Agriculture.

(3) Impact on Improvement of Environmental Hygiene in Southern Lima

In the Lima Metropolitan Area, the sewerage service coverage increased from 75% in 1995 to 90.4% in 2008. The Project did not have any components directly contributing to the increase of this coverage. However, it is fair to say that the Project indirectly contributed to the increase of the sewerage service coverage as the treatment of sewage produced by some 320,000 people and transported to the San Bartolo STP allowed the SEDAPAL to proceed with its work of extending the sewerage service without additional investment to sewage collectors linked to the La Chira Outfall.

3.4.2 Other Impacts

(1) Impacts on the Natural Environment

Using the consulting service under the Project, the SEDAPAL conducted a supplementary EIA in 2000 and confirmed that the treated sewage discharged to a river, etc. was not causing any serious problems.

At the San Bartolo STP, environmental monitoring of not only the quality of the treated sewage but also odour, vibration and noise is conducted. While the BOD concentration level sometimes exceeds the set standard of 30 mg/L for discharge from SPT, it is confirmed that the same of the water at Lurin river does not exceeds the standard for river water due to dilution. As for odour, vibration and noise no complaints have been made regarding the operation of this STP as no private homes are located in the vicinity. In the case of the other two STPs, only monitoring of the water quality is conducted. No special complaints have been made, presumably because of conscious efforts to alleviate any negative impacts on nearby private homes through the installation of a deodorisation unit and greening of the premises.

(2) Land Acquisition and Resettlement

No resettlement of residents was necessary under the Project. At the San Bartolo STP, the land expropriation procedure has not yet been completed and the SEDAPAL is currently engaged in this procedure.

3.5 Sustainability (Rating: b)

3.5.1 Structural Aspects of Operation and Maintenance

SEDAPAL has been undertaking a reform over a broad area[18]. While the sewerage section of the SEDAPAL is responsible for the operation and maintenance of the facilities newly constructed or expanded under the Project, some of the operation and maintenance work for the STPs and the transmission line is entrusted to private companies. While one full-time SEDAPAL engineer is stationed at the San Bartolo STP, most of the operation and maintenance work at this STP is entrusted to a private company. In fact, one private company is in charge of the operation and maintenance of three STPs and transmission line. The SEDAPAL evaluates the performance of the current contractor as "fair". There is another contract featuring the cleaning and greening of the three STP premises. In view of the above, it is judge that the organizational setup of SEDAPAL is well established and no problems are observed.

In order to swiftly achieve the improvement and effective operation of STPs in an appropriate manner, the SEDAPAL is now examining the possibility of entrusting the operation of 16 STPs, including those involved in the Project but excluding three STPs; La Chira STP, the STP currently being planned, etc., to a private company under a blanket contract and preparations are in progress to select a contractor some time in 2011[19].

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[18] The SEDAPAL has been conducting a series of reforms, including improvement of the human resource policies, introduction of an operation and financial management system, formulation of a short-term plan and long-term strategy and concession of some of the maintenance work and meter reading work. The SEDAPAL also has an annual management agreement with the Ministry of Housing, Construction and Sanitation with a view to achieving the agreed annual performance targets regarding quality, operation and finance.

[19] The terms of the contract under consideration will leave facility ownership to the SEDAPAL. The contractor will prepare a plan to utilise the treatment capacity of each STP to the full, making the necessary additional investment and operate the contracted facilities for 30 years. While this contractor will receive a fee corresponding to the amount of treated sewage from the SEDAPAL, it is liable to the payment of a penalty if the treatment standard (degree of water quality improvement after treatment) fails to meet the set criteria.

3.5.2 Technical Aspects of Operation and Maintenance

Although the SEDAPAL lacked experience of operating a large-scale STP before the Project, in view of the existence of a well-established training regime, acquisition of ISO certifications and history of awards received, it is inferred to have basic technical capacity to operate STPs[20].

The transmission line constructed under the Project extends for a total of 35 km. As they have several inverted siphon sections, they are rare facilities in the world. It must be said that the operation technique of these facilities has not yet been fully established even since the explosion incidents. According to the SEDAPAL, the technical manual on the operation of the San Bartolo transmission line which was provided by the consultant for the Project after the explosion incidents was insufficient as it lacks detailed technical information. The SEDAPAL is examining viable measures to reduce the risk of a similar incident. These measures include more advanced pre-treatment and a more effective method to inject oxygen to contain the generation of combustible gas. However, no definitive measures have so far been found, partly because of the difficulty of accurately assessing the degree of risk and possible causes based on amount of accumulated sludge and amount of gas generated.

3.5.3 Financial Aspects of Operation and Maintenance

Since 2004, the SEDAPAL has been steadily growing in terms of its sales and operating profit as a successful outcome of a higher water charge, reduction of non-revenue water and improved operational efficiency[21] Although the expenditure for facility maintenance and repair has also increased, it has been properly funded by the increased sales. It is, therefore, judged that the SEDAPAL should not encounter any serious problems regarding the financial sustainability of its operation.

The STPs constructed or expanded under the Project incur a large electricity bill as electricity is used for the aeration of sewage. The past expenditure for the operation and maintenance of the project-related facilities is shown in Table 6.

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[20] Almost all of the 2,200 employees of the SEDAPAL undergo some kind of training every year. The training hours per person are as many as 66 hours for administrative staff and 32 hours on average. It has also received a number of awards, including Peruvian Company of the Year 1999 and Best Water and Sewerage Management 1998.

[21] With the approval of the regulatory body (SUNASS), a system is in place to raise the water charge in accordance with SEDAPAL's water production cost and financial performance. SEDAPAL's operational efficiency as reflected in its working ratio (annual cost/annual turnover) shows a trend of annual improvement, and such indicators as the Current Ratio (current assets/current liabilities) and the Debt Ratio (liabilities/capital) are within an acceptable range.

Table 5 Financial Performance of the SEDAPAL

(Unit: S/. million)

	2004	2005	2006	2007	2008
Sales	624.0	660.8	748.1	827.4	959.1
Operating Profit	53.7	56.0	110.0	117.7	204.5
Net Profit	96.9	9.0	93.2	125.8	4.1
Maintenance/Repair Expenditure		52.6	54.0	66.5	82.0

Source: SEDAPAL

Table 6 Operation and Maintenance Expenditure for Project-Related Facilities (3 STPs and Transmission Line)(Unit: S/. '000)

	2001	2002	2003	2004	2005	2006	2007	2008
Operation	1,212	1,739	2,778	3,829	3,976	4,181	4,358	5,230
Maintenance	674	1,929	1,978	2,544	2,582	3,232	3,680	2,484

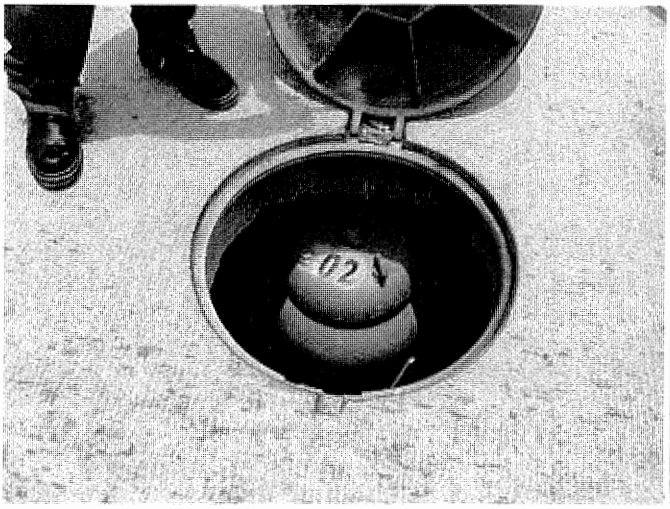
Source: SEDAPAL

3.5.4 Current Status of Operation and Maintenance

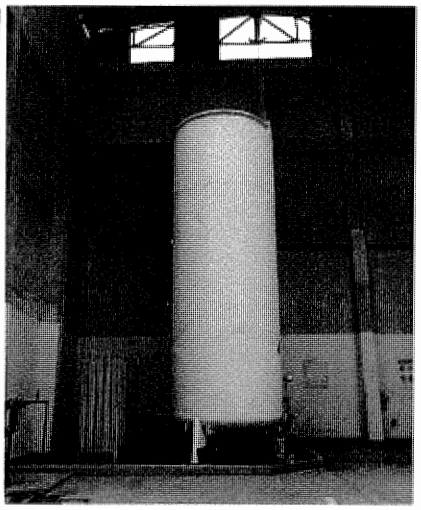
Because of the explosion incidents caused by gas generated from accumulated sludge in the transmission line, the contractor visually inspects nine sludge removal ports and gas exhaust ports on a daily basis to detect any signs of a problem. The current flow velocity of the sewage is far below the design rate due to the restriction on the receivable amount of raw sewage in view of the substantially higher BOD concentration level of the raw sewage than originally planned. This slow flow velocity creates an environment in which the sludge is liable to deposit itself. Moreover, the limited number of sludge removal ports means lengthy operation to remove the sludge accumulated at the bottom of the siphon. At some sections, it is impossible to remove the entire accumulated sludge. It is necessary to suspend the operation of the transmission line for approximately 10 days a year for sludge removal purposes.

At the San Bartolo STP, the SEDAPAL has set up observation wells (monitoring holes) to continually observe the seepage of sewage into the ground as this will eventually cause caving-in of the ground. In 2009, such seepage was detected at the same section where the collapse incident occurred in the past and the operation of this section was suspended. Even though no actual collapse occurred, as cracks were observed with some concrete panels, the SEDAPAL conducted a soil engineering study to examine how to improve the situation. Because of the fear of the recurrence of collapse, the SEDAPAL plans to continue the suspension of the operation of this section for the foreseeable future. This suspension has not significantly affected the overall sewage treatment volume of the San Bartolo STP. All other areas of the sewage treatment system centring on the San Bartolo STP have been

operating without any problems. In the case of the San Juan STP and Huascar STP, no special operational problems have been encountered so far.



Gas exhaust port at the transmission line



Oxygen tank for the transmission line

Based on the above evaluation, some problems have been observed in terms of technical aspects of the operation and maintenance; therefore sustainability of the project is fair.

4. Conclusion, Recommendations and Lessons Learned

4.1 Conclusion

At the time of its appraisal, the Project was considered to be urgent in the Lima Metropolitan Area where most sewage was discharged virtually untreated. Even today, there is a strong need to not only maintain but also reinforce the sewage treatment capacity in this area. As it also matched Japan's ODA policies, the relevance of the Project is high. While the overall project cost ended almost as planned, the commencement of operation at the San Bartolo STP was delayed by six years and 10 months from the originally planned date due to the delayed execution of the work caused by opposition by local residents and also due to a series of accidents during the test operation. Accordingly, the efficiency of the Project is rated as medium. Because of the much higher BOD concentration of the raw sewage than originally planned, the three project-related STPs have reduced the amount of raw sewage for treatment to less than half of the originally planned amount to maintain an acceptable quality level of the treated sewage. As the amount of BOD removed by the three STPs is 65% of the planned amount, the Project is found to have produced some positive effects and its effectiveness is judged to be medium. The amount of pollutants discharged to the sea from the La Chira Outfall (BOD load) is inferred to have decreased by 14% as a result of the Project but no clear

impacts on improving the water quality have been observed at nearby swimming beaches. Almost half of the treated sewage is now used, contributing to the promotion of irrigated farming and greening of the area. Some local farmlands are still marred by a problem from the viewpoint of food hygiene because of the use of raw sewage for irrigation. The SEDAPAL which assumes overall responsibility for operation and maintenance is believed to possess an appropriate operation and maintenance system, technical expertise and financial capability. The sustainability of the Project is judged to be medium because of the suspension of a part of the sections in the San Bartolo STP and absence of well-established operation and maintenance techniques for the transmission line. In conclusion, the Project is judged to be generally high.

4.2 Recommendations

4.2.1 Recommendations for the Government of Peru and Project Implementing Body

- It is necessary for the SEDAPAL to promptly conduct a technical review for the safe and efficient operation of the transmission line and San Bartolo STP with a view to further improving the existing facilities. While it is not a bad idea for the SEDAPAL to introduce the broad experience and technical expertise of the private sector through a contract with a private company, preparatory work for which is currently in progress, the SEDAPAL should also improve its facilities in stages, starting with the improvement of the pre-treatment facilities (introduction of finer screen mesh to remove more garbage from the raw sewage) and other types of work which can be quickly started.

- The SEDAPAL need to strengthen its capacity to monitor the quality industrial waste water to ensure the effectiveness of the regulatory regime for industrial waste water for which new standards have been introduced.

- To facilitate the safe and efficient reuse of treated sewage, the Government of Peru should promote consultations between stakeholders (Ministry of Housing, Construction and Sanitation, Ministry of Environment, Ministry of Agriculture and others) with a view to determining the responsibility of each ministry, management framework, standards for water quality and method of use (watering or irrigation method) by purpose of use of treated sewage and cost sharing system.

- The SEDAPAL and Ministry of Agriculture should cooperate and coordinate with each other to achieve the safe and efficient reuse of treated sewage, and should also discuss with irrigation committees in the Lurin District which use treated sewage from the San Bartolo STP on the supply and distribution of treated sewage, shift to the crops suitable for treated sewage.

4.2.2 Recommendations to the JICA : None

4.3 Lessons Learned

- For any STP project, it is imperative to eliminate any anxiety and/or misunderstandings on the part of residents who will be affected by the project so that any unnecessary delay of the project implementation can be prevented. For this reason, it is extremely important to conduct public relations and educational activities aimed at local residents by the time of commencing the construction work at the latest. These activities are designed to convey accurate information on the purposes, benefits and environmental impacts of the project to local residents. In the case of the project in question, the opposition of local residents to the Project originated from the fact that wrong information on the project was spread among the residents. Once the matter developed into a political issue, the completion of the San Bartolo STP was substantially delayed. In turn, this delay caused modification of the original plan for the Huascar STP. This delay may also have been a remote cause of the caving-in incident at the San Bartolo STP.

- For projection of the future sewage quality for the planning of a STP, it is important to increase accuracy by means of thoroughly examining the quality of the sewage by sources, an increase of the quantities of the pollutants as a result of economic growth, changes in amount of water consumption and other relevant matters. In the case of the Project, such projection was conducted while referring to the World Bank and Japanese standards for general sewage. However, this projection exercise did not examine the likely sewage discharge volume by different sources (such as ordinary households and industrial premises), possible changes of the quantities of the pollutants to be discharged as a result of economic growth and possibility of reducing the overall amount of sewage through water saving by end users. Consequently, the projected future sewage quality was widely off the mark, necessitating restriction of the inflow volume of raw sewage to approximately half of that originally planned. In turn, this has made the operation of the transmission line difficult.

- The Project was based on an unprecedented concept that the raw sewage would be transported for 35 km by a transmission line so that sewage produced in the city centre could be treated and reused for irrigation and greening of the San Bartolo Plain. Several new technologies of which the application had been rare throughout the world were employed, including oxygen injection to restrict the generation of combustible gas and sludge removal from long distance transmission line using inverted siphons. The overall plan for the Project was found to be quite vulnerable to unexpected situations, such as changes of the BOD concentration of the sewage and the delayed completion of some of the facilities. These experiences suggest the importance of formulating a project based on not only thorough technical analysis but also vital assumptions regarding the potential risks of changes of the demand, delayed work and others when the planned contents (technologies) of a project do not have many precedents.

Comparison Between the Original Plan and Actual Results

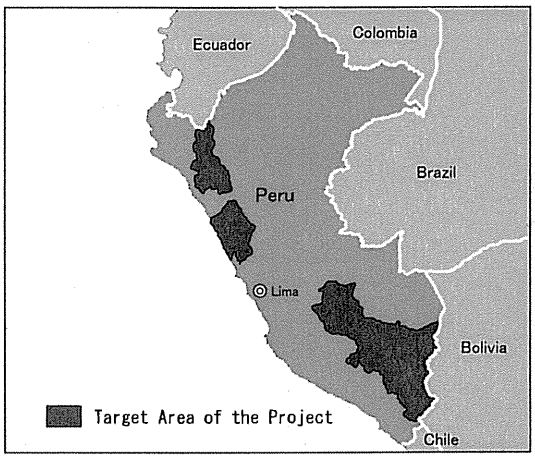
Item	Original	Actual
1. Outputs	(a) Construction of Sewers (49.95km) San Bartolo Transmission Line : 31.55km Discharge Pipe for San Bartolo STP : 5.5km Discharge Pipe for San Juan STP : 5.4km Discharge Pipe for Huascar STP : 5.0km (b) Expansion of Sewerage Treatment Plants Expansion of San Juan STP : 0.25→1.0 m^3/sec. Collector for San Juan STP : 0.2km (c) Construction of Sewerage Treatment Plant San Bartolo STP : 2.20 m^3/sec. Huascar STP : 0.05 m^3/sec. (d) Consulting Services : Detailed Design, Construction Supervision	(a) Construction of Sewers (53.1km) San Bartolo Transmission Line : 32.5km Discharge Pipe for San Bartolo STP : 9.5km Discharge Pipe for San Juan STP : 5.6km Discharge Pipe for Huascar STP : 5.5km (b) Expansion of Sewerage Treatment Plants Expansion of San Juan STP : 0.25→0.8 m^3/sec. Collector for San Juan STP : 0.2km (c) Construction of Sewerage Treatment Plant San Bartolo STP : 1.7 m^3/sec. Huascar STP : 0.17 m^3/sec. (d) Consulting Services: (additional scope) supplemental EIA, manual and training for transmission line
2. Project Period	July 1996 – February 2001 (56 months)	September 1996 – December 2007 (136 month)
3. Project Cost Foreign Currency Local Currency Total Japanese ODA Loan Portion Exchange Rate	 ¥8,423 million ¥8,457 million (S/.192 million) ¥16,880 million ¥12,660 million US$1=S/.2.31=¥102円 (September 1996)	 ¥9,062 million ¥5,957 million (S/.174 million) ¥15,032 million ¥12,076 million US$1=S/.3.28=¥112.4 (Weighted average during 1997 – 2005)

Republic of Peru

Social Sector Development Project in the Sierra Area II

External Evaluator : TREA Ltd.
Takeshi Yoshida

1. Project Description



Target Area (at appraisal)

New Class Room (Ancash)

1.1 Background

Peru is roughly divided into three areas: coastal (Costa), mountain (Sierra) and Amazon (Selva). Compared to the Costa area with many industrial clusters, including that in the capital of Lima, economic and industrial development in the Sierra and Amazon areas lags behind and a sizable population of both areas suffer from poverty. At its onset, the first Fujimori administration (1991 - 1995) faced a Peruvian economy suffering from huge external debt, fiscal deficit and high inflation. To restore the health of the national economy, the first Fujimori administration introduced a tight fiscal policy and market economy. At the same time, it established the National Compensation and Social Development Fund (FONCODES) in 1991 under the direct jurisdiction of President Alberto Fujimori to tackle the problem of poverty. The highest priority of the FONCODES was improvement of the socioeconomic infrastructure in poor areas for the purpose of poverty reduction. The FONCODES has since been actively engaged in the development or improvement of the socioeconomic infrastructure in response to requests by local communities.

During the second Fujimori administration period (1996 - 2000), poverty reduction remained an important issue on the policy agenda as some 4.5 million people, accounting for 20% of the total population of Peru at the time (1995), were classified as "extremely poor". In the Sierra area covering

some 30% of the national land, two-thirds of the households were classified as "poor", half of which were classified as "extremely poor" (1995). Four Regions, i.e. Cajamarca, Ancash, Cusco and Puno, in the Sierra area in particular were the poorest and the development of basic infrastructure was urgently required to improve the livelihood and production activities of the rural populace.

Against this background, the Government of Japan provided loans in response to a request by the Government of Peru for the "Social Sector Development Project in the Amazon Area" in 1997 and the "Social Sector Development Project in the Sierra Area" in 1999. These loans have now been followed by another loan for the "Social Sector Development Project in the Sierra Area II" which is the subject project of this evaluation.

1.2 Project Outline

To meet the basic human needs (BHNs) of local residents in four regions in the Sierra area, i.e. Cajamarca, Ancash, Cusco and Puno by implementing small-scale socioeconomic infrastructure sub-projects in a participatory manner, thereby contributing to improvement of the standard of living in the Sierra area.

Approved Amount/ Disbursed Amount	¥6,794 million / ¥6,758 million
Exchange of Notes Date/ Loan Agreement Signing Date	September 2000 / September 2000
Terms and Conditions	Interest Rate : 2.2% Repayment Period (Grace Period) : 25 years (7 years) Procurement : General Untied < Consulting Service> Interest Rate : 0.75% Repayment Period (Grace Period) : 40 years (10 years) Procurement : Bilateral Tied
Borrower / Executing Agency	Government of the Republic of Peru / FONCODES
Final Disbursement Date	July 2007
Main Contractor (Over 1 billion yen)	None
Main Consultant (Over 100 million yen)	None
Feasibility Studies, etc.	None
Related Projects	Social Sector Development Project in the Amazon Area (PE-P19) Social Sector Development Project in the Sierra Area (PE-P24)

2. Outline of the Evaluation Study

2.1 External Evaluator

Takeshi Yoshida, President, TREA Ltd.

2.2 Study Period

This ex-post evaluation of the Project was conducted over the following period.

Duration of the Study:	September, 2009- July, 2010
Duration of the Field Study:	17th November through 19th December, 2009
	3rd March through 17th March, 2010

2.3 Constraints during the Evaluation Study

Under the Project, while a total of 1,726 sub-projects were conducted in nine regions[1], the project implementing body did not gather data on the project effects (indicators for operation and effects). For this reason, a field investigation was conducted for 36 sub-projects of seven types in Ancash, Puno and Arequipa. Moreover, a beneficiary's survey consisting of workshops and questionnaire survey was conducted, featuring 14 sub-projects in Ancash and Puno. It was found to be necessary to carry out the analysis of the effectiveness, impacts and sustainability of the Project based on the limited information obtained by these surveys.

3. Results of the Evaluation (Overall Rating: A)

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plan of Peru

As part of its priority policy issue of poverty reduction, the second Fujimori administration (1996 - 2000) adopted the target of halving the number of the extremely poor by the year 2000. The FONCODES was identified as the leading organization to achieve this policy initiative.[2]

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[1] As described in 3.2.1 - Outputs, the scope of the Project was expanded to include five southern regions which were badly hit by an earthquake during the project implementation period in addition to the original four regions.

[2] The FONCODES (*Fondo Nacional de Compensación y Desarrollo Social*) was established in 1991 as an organization to specifically deal with the problem of poverty in rural areas where existing administrative organizations were found to be slow to introduce effective measures. Its activities are characterised by the reflection of local needs, swiftness of fund transfer and transparency of spending through the employment of

One of the targets adopted by the present Garcia administration[3] is reduction of the poverty ratio from 50% in 2005 to 30% in 2011 and the social programme for poverty reduction is in progress. This programme has positively appraised the performance of the FONCODES. The Garcia administration has enacted the Act for the Promotion of Exports from the Sierra (*Ley de Sierra Exportadora / Ley No.28890*) to encourage agriculture and the handicrafts industry in the Sierra area as part of its drive to eliminate poverty in rural villages in the Sierra. The objective of the Project conforms to these government policies.

3.1.2 Relevance with Development Needs of Peru

At the time of initial project appraisal, the development of basic infrastructure to meet BHNs was upheld as a first step towards achieving poverty reduction. Therefore, the Project to be implemented by the FONCODES was thought to be indispensable and urgent for the alleviation of poverty in Peru.

Peru's population statistics for 2007 showed that the water supply coverage and electrification rate in rural areas were still low at 22% and 30% respectively, illustrating the strong need for improvement of the basic infrastructure in rural areas. Meanwhile, a situation was observed that the income of the poor in rural areas was not rising in accordance with the progress of basic infrastructure development. In the face of this situation, the FONCODES introduced an experimental projects designed to directly support productive activities such as coffee, aquiculture, dairy farming, fruits, hand craft, etc. in rural areas (*Proyecto Productivo*). As the problem of poverty in the Sierra is still very serious, the development of the Sierra is a priority for the present administration. In 2007, the national poverty rate of 39% (extreme poverty rate: 14%) while the corresponding rate in the Sierra was as high as 60% (extreme poverty rate: 29%).

3.1.3 Relevance with Japan's ODA Policies

The old ODA Charter adopted in 1992 stipulated that Japan would provide assistance for the development of infrastructure. Japan has actively provided assistance for Peru in recognition of the positive reform efforts of the Fujimori administration since 1990 to ensure sustainable economic development and to eradicate poverty. In line with the diverse development needs in Peru, Japan decided to provide Yen loans every year, in principle, from FY 1996 onwards with the qualitative as well as quantitative enhancement of cooperation in mind. Japan's Country Assistance Program for Peru prepared in 2000 listed (i) poverty alleviation, (ii) social sector assistance, (iii) economic

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participatory approaches. The FONCODES was later in 2002 integrated to the Ministry of Women and Social Development (MIMDES) and was renamed as *Fondo Nacional de Cooperación para el Desarrollo Social* (National Fund for Social and Development) in 2005.

[3] Politicas Gubernamantales 2006 - 2011

infrastructure development and (iv) environmental conservation as the priority areas for assistance. The subject Project for the present evaluation was highly compatible with Japan's ODA policies as it met the first three priority areas listed above.

Based on the above, this project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Efficiency (Rating: b)

3.2.1 Project Outputs

The Project originally intended the implementation of 1,987 sub-projects in six sectors in four regions but ended with 1,726 sub-projects in nine sectors in nine regions (Table 2).

Table 2 Planned and Actual Outputs

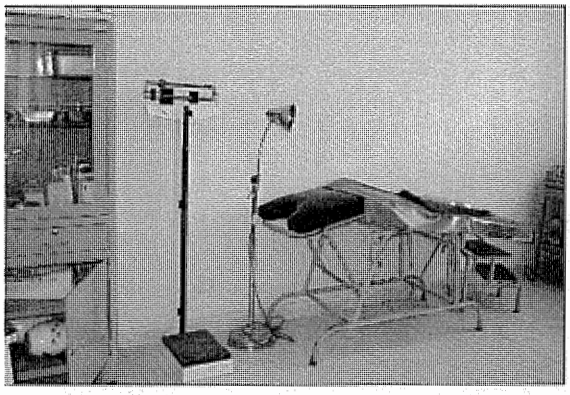
(Unit: sites)

Sub-Project	Planned	Actual
• Social Infrastructure		
- School Buildings (New or Rehabilitated)	470	532
- Health Post (New or Rehabilitated)	116	90
- Community Centre Building (New)	13	6
• Economic Infrastructure		
- Improvement of Irrigation Channels	387	193
- Improvement of Roads/Bridges	621	385
- Rural Electrification	440	226
• Sanitation Infrastructure (added in 2004)		
- Water Supply	0	199
- Latrines	0	94
- Sewerage Facilities	0	1
Total	2,047	1,726

Sources: Project documents at the time of appraisal and FONCODES (PCR)

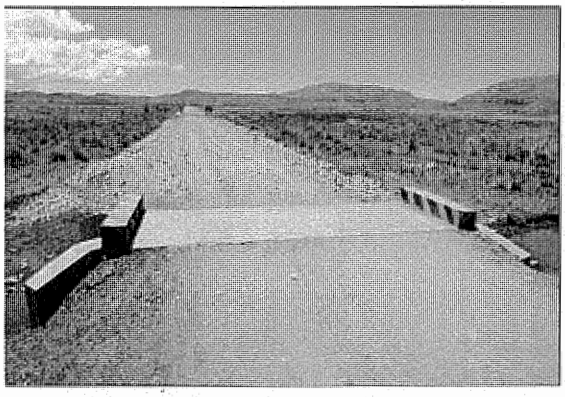
Originally, the target regions were Cajamarca, Ancash, Cusco and Puno. For the rehabilitation of areas devastated by an earthquake in June, 2001, five regions, i.e. Arequipa, Moquegua, Tacna, Ayacucho and Apurimac, were added to the geographical scope of the Project and 151 sub-projects were conducted in these regions. These sub-projects predominantly involved the rehabilitation of schools or health post buildings damaged by the earthquake. Several sub-projects featured the rehabilitation of irrigation channels. Local communities expressed their deep gratitude for the swift response by the FONCODES and the financial assistance of Japan in the immediate aftermath of the earthquake. This quick assistance under the Project to rehabilitate earthquake-hit facilities was a very positive move.

In September, 2004, the decision was made to implement sanitation-related sub-projects under the Project. This decision was taken to compensate for the cancellation of similar sub-projects under the "Social Sector Development Project in the Sierra Area" due to the reduction of the loan amount for the FONCODES.[4] Because of this, the number of sub-projects in other sectors was reduced. The level of satisfaction among the beneficiaries of the sanitation-related sub-projects was very high as described later, indicating the very strong needs for improved sanitation-related infrastructure. As such, the re-arrangement of the sub-projects is judged to have been appropriate.

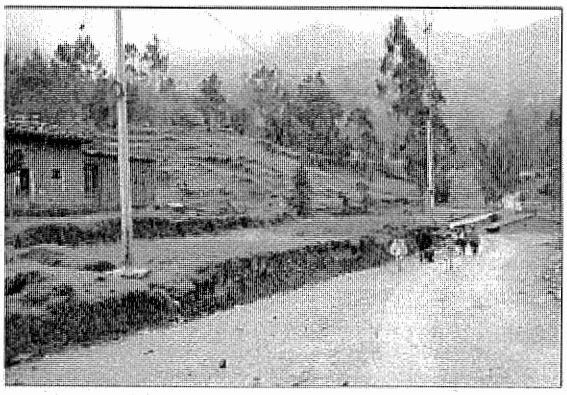


Health Post (Puno)

Irrigation Channel (Ancash)



Improvement of Road and Bridge (Puno)



Rural Electrification (Ancash)

A study on the impacts of social infrastructure improvement which was supposed to be conducted as part of the consulting service was cancelled because the planned study contents were believed to duplicate a theme-based evaluation study in FY 2005 on "Improvement of Living Conditions and Livelihood in Poor Areas". The findings on assistance for institutional strengthening for the benefitted

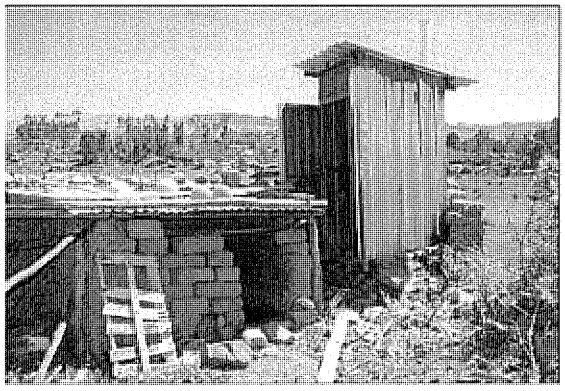
[4] Since the enforcement of the Fiscal Prudence Law in 2000, the Ministry of Economy and Finance (MEF) with the approval of the Congress set an upper limit for external borrowing. The Toledo administration introduced an austere fiscal policy to reduce government expenditure. As a result, the total disbursement for the Social Sector Development Project in the Sierra Area was limited to approximately 30% of the originally planned amount.

communities and FONCODES were positive, among others on the training on operation and maintenance of the completed infrastructures. However, these findings were not reflected by the sub-projects because of the timing of the study was near the end of many sub-projects and another reason would be that then there were discussions on the change of responsible ministries for FONCODES.

As for the post-project monitoring system designed during the project, no such system was established because of the budgetary shortage of the FONCODES.

As for the promotion of sub-project formulation, the participatory approach where local residents make proposals based on their own needs was continuously employed even after the progress of decentralisation with local government's initiative in project formulation.

Water Supply (Puno)



Latrines (Puno)

3.2.2 Project Inputs

3.2.2.1 Project Period

The Project was originally planned to continue for 61 months from September, 2000 (signing of the L/A) to September, 2005. In reality, it was implemented over a period of 83 months from September, 2000 (signing of the L/A) to July, 2007 (36% longer than the originally planned period). This necessitated one extension of the loan disbursement period. The main reason for the extended project period was insufficient counterpart funding by the government to cover the domestic portion due to the policy of the Peruvian government to reduce its external debt.[5]

3.2.2.2 Project Cost

The actual spending of ¥8,962 million was 99% of the originally planned project cost of ¥9,059 million. This almost exact level of spending as the planned level was the result of the reduction of the

[5] See Footnote 4.

sub-projects to contain the actual project cost within the planned project cost. The number of sub-projects implemented was 1,726, 84% of the planned number of 2,047 sub-projects, as a result of the reduction of the number of sub-projects to keep the final project cost within the planned project cost despite an increase of the unit cost of the construction work.

Although the project period was longer than planned, the project cost was lower than planned, therefore efficiency of the project is fair.

Table 3 Planned and Actual Project Cost (Unit: Million Yen)

Item	Plan			Actual		
	Yen Loan	Gov. of Peru	Total	Yen Loan*	Gov. of Peru	Total
Sub-Projects	6,703	1,691	8,394	6,696	1,674	8,370
Consulting Services	91	0	91	56	13	69
Administration	0	362	362	0	341	341
Promotion, Evaluation	0	212	212	0	182	182
Total	6,794	2,265	9,059	6,752	2,210	8,962
Item	Plan			Actual		
	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total
Sub-Projects	0	8,394	8,394	0	8,370	8,370
Consulting Services	91	0	91	56	13	69
Administration	0	362	362	0	341	341
Promotion, Evaluation	0	212	212	0	182	182
Total	91	8,968	9,059	56	8,906	8,962

Source: FONCODES, material at the time of initial appraisal

Exchange rates: US$1=S/. 3.291=¥118.45 (Weighted average during December 2001 – July2007)

*Transaction charge amount is not included.

3.3 Effectiveness (Rating: a)

According to data compiled by the FONCODES, a total of 1,634,000 people benefited from the 1,726 sub-projects which were implemented under the Project. The primary objective of the Project was expansion and qualitative improvement of basic infrastructural services through the development of such infrastructure by sub-projects. As mentioned earlier, the FONCODES did not gather data on the concrete effects of individual sub-projects. The present evaluator visited 29 sub-project sites in either the Ancash or Puno Regions and seven sub-projects in the Arequipa Region to establish a clear picture of the current conditions and situation of use of the facilities and the concrete effects of individual sub-projects. In addition, the evaluator conducted a series of interviews, workshops and questionnaire survey (with a total of 280 households) in connection with 14 sub-projects in either the Ancash or Puno Regions to establish the project effects through a comparison of the local situation before and after the implementation of the sub-projects. The opinions of beneficiaries of the Project were also studied.

Table 4 Effects of Sub-Projects Confirmed by the Field Survey

Sub-Project	Village	Number of Beneficiaries	Project Effects (Expansion and/or Qualitative Improvement of the Service)
School Building	Huata (Ancash)	202	The construction of four classrooms has eliminated the need for combined classes and the number of pupils per classroom came within the set size. Classes are now pleasantly held in a spacious, bright and quiet environment.
	Juncal (Puno)	240	The old classrooms were liable to collapse at any time. The construction of six classrooms has created a bright and well-ventilated pleasant environment with no worry about a leaking roof. Pupils now come from even neighbouring villages, increasing the overall number of pupils. The old classrooms are now used as a staffroom, storage room and other.
Health Post	Chucos (Ancash)	2,100	The environment for clinical examinations at the health post has been drastically improved with a new extension. The number of examination beds has increased along with a new waiting area. No leaking roofs mean the safe storage of medicines. The number of visitors a month has almost doubled with more women and children.
	Pinaya (Puno)	1,400	The extension to the health post has secured storage space for medical equipment and medicines without worrying about leaking roofs. Clinical examinations are now conducted in a warm and dry environment and in privacy. The old building is now used as accommodation for pregnant women from distant areas.
Improvement of Irrigation Channel	Santa Rosa (Ancash)	700	The change to a concrete channel has eliminated water leakage, increasing the usable water volume. Water now continually runs to the far end of the channel. The irrigated area has increased by some 30% while less labour is required for maintenance work.
	Miramar (Ancash)	300	The change to a concrete channel has eliminated water leakage and the water runs faster. The usable water volume has increased and less labour is required for maintenance work.
Improvement of Road/ Bridge	Compina (Ancash)	2,500	The absence of a bridge in the past made it impossible for the people of some villages to cross the river in the rainy season. In addition, people were sometimes swept away. The construction of a suspended footbridge has made it possible to safely cross the river all year round. The travelling time to the nearby town has been shortened.
	Huayrapata (Puno)	500	In the past, the use of a local road was difficult in the rainy season even on foot. The construction of an unpaved rural road and a small bridge has made it easy to travel to the town all year round, shortening both the travelling distance and travelling time. Travel by 4-wheel vehicle has also become possible.
Rural Electrification	Progreso (Ancash)	400	Some 80% of the households in this village have been electrified along with a school, health post and church. Many households now have electric lighting (75%) and radio (85%).
	Cantunani (Puno)	490	Most of the households in the village have been electrified and many of them now have lighting (84%) and radio (90%).
Water Supply	Calliri (Puno)	275	Groundwater was mainly used in the past. A river was the main water supply source in the dry season. The new facility constructed under the sub-project has enabled water use throughout the year although the water volume is insufficient in the dry season. Most households now use the common outdoor tap. The water quality has significantly improved.
Introduction of Latrines	Cayepampa (Ancash)	325	In the past, toilets were simply dug holes. Almost all of the households today have an access to sanitary toilet.
	Yapuscachi (Puno)	1,038	

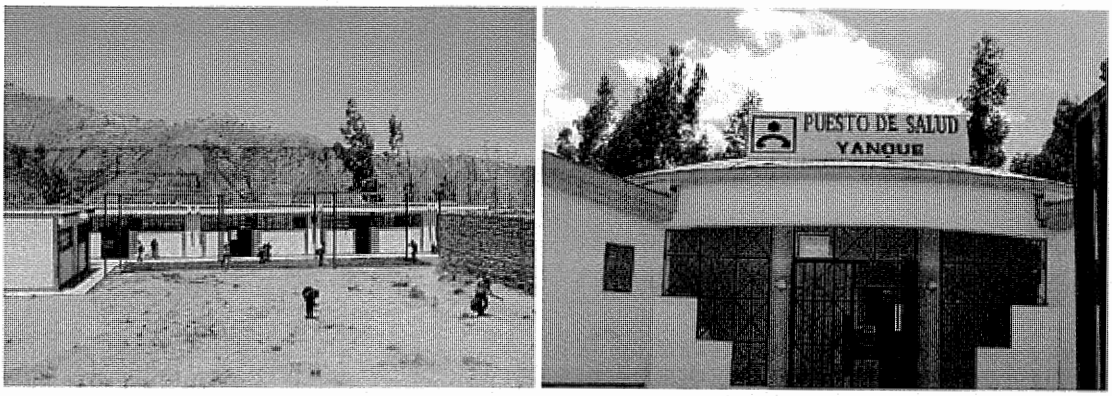
Source: Prepared by the evaluator based on the findings of the beneficiaries' survey.

At more than 90% of the 36 sub-project sites visited, the facilities constructed or rehabilitated under the Project were found to be actively used. At the 14 sub-project sites for which a more detailed analysis was conducted, the facilities were effectively used by the beneficiaries without exception as shown in Table 4. These findings clearly suggest that the Project had some positive effects regarding the expansion and qualitative improvement of the basic social, economic or sanitary infrastructure and/or services in the Sierra.

In the case of school and health post damaged by an earthquake in the Arequipa Region which are not listed in Table 4, following effects are confirmed based on the opinions obtained in the field.

At one primary school in Pampa Nueva, most of the concrete school buildings were not able to use after the earthquake. Then prefabricated school buildings were constructed but they did not provide good environment to study, for example roof were blown by window, dusts came in. At the primary school in Wambo, having classes were very difficult as there were not enough number of class rooms after the earthquake, as part of the school building constructed by adobe fell down and they needed to continue classes in the remaining part of the school building. The new class rooms are safe, well-lighted and students can comfortably concentrate on studying. In the primary school of Wanka, some beams fell down and part of the school building was not able to use after the school, forcing them to continue classes in inadequate conditions with limited space using the undestroyed part of the building. The villagers show gratitude to the new class rooms that are spacious, safe, well-lighted and students can comfortably concentrate on studying.

At the health post in Yanque, part of the building were not usable because of cracks on walls, and the services were given in the space remained after the earthquake. The new health post is spacious and sanitary, enabling an efficient provision of medical services. In Maka, the health post was destroyed and forced to close temporary after the earthquake. After the reconstruction, the villagers highly appreciate the new health post as physical environment for medical services were remarkably improved by having separate rooms for different functions.



(Left) Reconstructed primary school in Arequipa
(Right) Reconstructed health post in Arequipa

The level of satisfaction with each sub-project is very high as shown in Table 5 as the combined ratio of respondents who are either "very satisfied" or "satisfied" is as high as 77% - 99%. In contrast, the maximum ratio of those which are "not satisfied" of 6% is low. The types of sub-projects recording an especially high level of satisfaction are those in the category of sanitary infrastructure improvement. These include the installation of portable water facilities and the introduction of latrines. Such a high level of satisfaction justifies the expansion of the scope of the Project in the middle of the implementation period. In contrast, the level of satisfaction with improved transport infrastructure (roads and bridges) is relatively low, presumably because of the different degree of benefit for those owning a car or another means of transport and those who do not own a means of transport.

Table 5 Beneficiaries' Satisfaction to Sub-Projects

(%)

	Very Much Satisfied	Satisfied	Regular	Not Satisfied	No Answer	Total
School Building	22	62	6	6	4	100
Health Post	17	63	17	0	3	100
Irrigation	17	71	12	0	0	100
Road & Bridge	22	50	27	2	0	100
Rural Electrification	24	72	2	0	2	100
Water Supply	38	57	4	1	0	100
Latrines	31	68	2	0	0	100

Source: Prepared by the evaluator based on the findings of the beneficiaries' survey.

Based on the above, this project has largely achieved its objectives, therefore its effectiveness is high.

3.4 Impacts

3.4.1 Intended Impacts

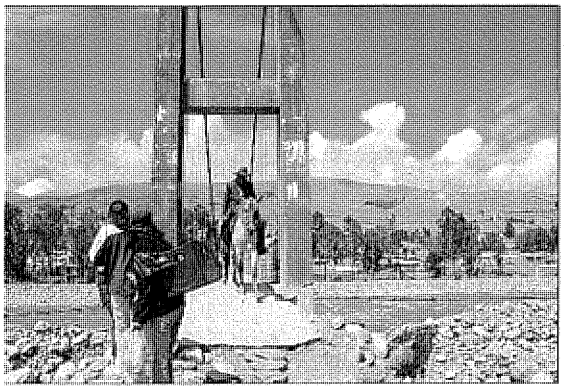
The anticipated effect of the Project was the fulfilment of the BHNs of the beneficiaries through the implementation of wide-ranging sub-projects, thereby contributing to improvement of the standard of living.

Table 6 summarises the impacts of the sub-projects based on the findings of the beneficiaries' survey (consisting of workshops and a questionnaire survey) featuring 14 sub-projects in the Ancash and Puno Regions. It is clear that certain impacts leading to improvement of the standard of living did manifest, reflecting the positive utilisation of each sub-project.

Table 6 Impacts of Sub-Projects (Typical Replies)

Sub-Project	Village	Impacts (Contribution to Improvement of the Standard of Living)
School Building	Huata (Ancash)	The improvement of the educational environment has enhanced the appetite of pupils for learning. Teaching has been modernised by the introduction of a computer room.
	Juncal (Puno)	The previously poor environment underlined by cracked walls and a leaking roof used to cause problems, including pupils catching colds. The number of pupils suffering from health problems has decreased since the construction of the new school building. More than 90% of the beneficiaries (parents) believe that the learning performance of their children has much improved due to the new classroom.
Health Post	Chucos (Ancash)	The medical service has greatly improved, especially for pregnant women, mothers and children. The most popular reasons for the positive assessment are (i) less frequency of falling ill (58%) and (ii) improved medical examination and diagnosis (22%).
	Pinaya (Puno)	The extended floor space of the health post has enabled the introduction of preventive medical care for mother and child health, etc. 40% of the respondents said that the medical service has generally improved but some expressed dissatisfaction with the lack of a full-time doctor.
Improvement of Irrigation Channel	Santa Rosa (Ancash)	The improved irrigation has improved the productivity. Together with an increase of the market demand, the improved irrigation has expanded the cultivation of cash crops. As a result, the household income has increased for some 70% of the beneficiaries.
	Miramar (Ancash)	The improved irrigation has increased the unit yield of crops. Some 40% of the beneficiaries now earn a better income. The transition to cash crops has been slow due to poor market access and the limited land availability.
Improvement of Road/Bridge	Compina (Ancash)	The new footbridge is used to go to the market to purchase miscellaneous goods and to sell agricultural products, school, health post and farmland. The volume of agricultural products brought to the market has increased. 90% of the respondents said that the new footbridge has improved the convenience of daily life. 25% said that the bridge has had an economic benefit in terms of better market access.
	Huayrapata (Puno)	The number of visits by villagers to the town has considerably increased. The new road and bridge have proved very convenient for the sale of products to the market and for the movement of livestock. Commercial activities using vehicles have become possible. 93% of the respondents said that the new road and bridge have improved the convenience of daily life. 27% said that they have had an economic benefit in terms of better market access.
Rural Electrification	Progreso (Ancash)	The supply of electricity has been found to be very useful for learning by children (41%) and entertainment (33%). 90% of the respondents said that the electricity supply has improved their daily lives. New commercial, sewing and flour milling businesses have been set up even though the number is small.
	Cantunani (Puno)	Children can now do their homework. Accidents involving fire due to the use of candles have been eliminated. Access to the latest news is now possible. Street lighting has reduced the number of crimes. While 97% of the respondents said that the electricity supply has improved their daily lives, hardly any new businesses using electricity as a key factor have been set up.
Water Supply	Cayepampa (Ancash)	75% of the respondents said that the heavy labour of fetching water has been reduced, allowing them to use their time more effectively. Half of the respondents said that the use of more water for hygiene purposes, including hand/face washing and house cleaning, has reduced the occurrence of infectious diseases. 95% said the tapped water supply has improved their daily lives.
	Calliri (Puno)	92% of the respondents are satisfied with the significant reduction of the labour of fetching water. The frequency of house cleaning, face washing, clothes washing and other tasks has slightly increased. The respondents generally feel that the frequency of digestive and skin disorders has fallen.
Latrines	Cayepampa (Ancash)	There are now cleaner toilets near homes. The contamination of farmland and water by human excreta has been reduced. 90% of the respondents said that toileting is no longer a problem (as a suitable place is provided) while 80% said that the introduction of latrines has improved their daily lives.
	Yapuscachi (Puno)	The clean toilets have reduced the bad odour. 35% of the respondents said that the use of the latrines has reduced the occurrence of diarrhoea. All of the respondents said that the introduction of latrines has improved their daily lives.

Source: Prepared by the evaluator based on the findings of the beneficiaries' survey.



Pedestrians Bridge (Ancash)

Small Business (Sewing) Started with Electrification (Ancash)

The agricultural income of the beneficiaries of the two irrigation sub-projects in Ancash has clearly increased since the Project, illustrating the fact that irrigation channel improvement contributes to improving the income of beneficiaries through diversification of crops etc., while there might be another influencing factors such as use of fertilizer.

Table 7 Increase in Agricultural Income by Irrigation Channel Improvement

(Unit : Nuevo Soles per family per year)

Village	Before the Project	After the Project
Santa Rosa	1,068 (2006)	2,237 (2009)
Miramar	307 (2004)	446 (2009)

Source: Prepared by the evaluator based on the findings of the beneficiaries' survey.

Apart from irrigation sub-projects, other sub-projects also contributed to improving the income of the beneficiaries. For example, the construction of a new footbridge over a river in Ancash has increased the shipment volume of local agricultural products to the market. In the field of rural electrification, there are examples of expanded business activities. One is a sewing business using electric sewing machines and another is increased timber production using electric sawmill machinery.

However, such examples of new or expanded business activities due to rural electrification are rare. The main impacts of electrification appear to be social impacts, including reading at night, access to information through radio and crime prevention through street lighting. As yet, there is no strong preparedness to set up a new business taking the opportunity of the development of infrastructure under the Project. For a further increase of the income of the beneficiaries, it is hoped that training will be provided to develop entrepreneurship among the rural populace and also to transfer the necessary know-how and skills.

3.4.2 Other Impacts

No negative impacts of the Project (sub-projects), such as environmental destruction and the forced resettlement of residents, were pointed out in the course of the beneficiaries' survey. Sub-projects are small and will not have significant impact to environment, and were approved based on the condition that there would be no negative impact to environment. Issues on land acquisition were basically solved by the beneficiaries themselves, as the Project took a participative approach.

The Project had a positive economic impact in that local residents were employed with a daily wage of S/.10 per person as non-skilled labour for the construction work.

3.5 Sustainability (Rating: a)

The FONCODES provided training for the beneficiaries on the maintenance of the new facilities. After the completion of a sub-project, the FONCODES handed over ownership of the sub-project to the body responsible for the operation and maintenance of the new facilities, be it the Ministry of Education, Ministry of Health or municipalities. While these bodies are primarily responsible for the operation and maintenance of the new facilities, the beneficiaries also conduct some of the maintenance work for sub-projects other than those involving health post or rural electrification. The field investigation and beneficiaries' survey found that the new facilities improved or constructed under the various sub-projects are being maintained fairly well except for some facilities in the water supply sector.

The organization, technical issues, finance and current maintenance situation are described next for each type of sub-project.

(1) School Buildings

Since the completion of the sub-projects, each new school building has been operated and maintained by the Ministry of Education via the Department of Education of the relevant regional government. However, simple maintenance work, including cleaning and repainting, is conducted by a parents' association and/or local residents. At each site, the FONCODES provided maintenance training for the benefit of a parents' association and/or local residents prior to the completion of the sub-project. In the case of school buildings reconstructed in the Arequipa Region in the aftermath of the earthquake, earthquake countermeasures, including the use of flexible joints for the walls, were employed.

Funding to cover the maintenance cost is allocated from the budget of the Ministry of Education. In FY 2009, the maintenance budget was directly allocated by the Ministry of Education to each school

and was used for the repainting of the buildings and other maintenance work. The field investigation conducted by the present evaluator did not find any specific problems relating to school building maintenance.

(2) Health Post

Since the completion of the sub-projects, each new health post has been operated and maintained by the Ministry of Health although cleaning and simple repairs are conducted by the benefiting local residents. As same as in the case of school buildings, earthquake countermeasures were employed for the health centre buildings newly constructed in Arequipa as part of the reconstruction efforts in the aftermath of the earthquake.

Funding to cover the maintenance cost is allocated from the budget of the Ministry of Health. In FY 2009, the maintenance budget was directly allocated by the Ministry of Health to each health post and was used for the repainting of the buildings and other maintenance work.

(3) Irrigation Channels

Since the completion of the sub-projects, the ownership of the improved irrigation channels has been transferred to the relevant municipality which is responsible for operation and maintenance. In general, the benefiting farmers have formed a farmers' association to take responsibility for the operation and maintenance of the irrigation channel.

Prior to the completion of the sub-projects, the FONCODES provided training for the benefiting farmers on the required maintenance work, including cleaning, oiling of the gates and simple repair of the channel.

Each farmer's association collects money from the beneficiaries to pay for the necessary maintenance work. Simple work, such as cleaning, is conducted by the beneficiaries. When the facility is damaged by a landslide or something else, the beneficiaries restore the channel themselves using materials and machinery provided by the district authority. The field investigation found that all of the irrigation channels improved under the Project was well maintained.

(4) Roads and Bridges

Since the completion of the sub-projects, the new or improved roads and/or bridges have been maintained by the relevant municipality. While the municipality provides the necessary materials and machinery, local residents who have undergone training by the FONCODES on appropriate use and simple repair methods prior to the completion of the sub-project provide labour for simple civil works.

Funding to cover the maintenance cost is allocated from the budget of the relevant municipality. Because of the limited budget of each municipality, the size of the budget allocation is not necessarily sufficient as it only covers the minimum cost of maintaining the road or bridge function.

(5) Rural Electrification

Since the completion of the sub-projects, each facility has been operated and maintained by the relevant local power distribution company. These companies have established service centres to ensure the proper operation and maintenance of the new power supply facilities in accordance with the standards stipulated by the Ministry of Energy and Mines.

Prior to the completion of the sub-projects, the FONCODES organized training sessions for the benefiting local residents on the proper use of electricity to prevent accidents. As far as the visited sites are concerned, no maintenance-related problems are found.

Each local power company receives the electricity charge from the users' association in each village based on the reading of a meter installed in each village. Initially each village had one collective meter and each household were paying same amount. But in the last two or three years, there has been a shift towards the installation of a meter at each household so that the electricity charge is collected from each household based on its actual electricity consumption. According to the findings of the beneficiaries' survey, the monthly average electricity charge per household in the Ancash Region is S/.9 and 26% of users pay S/.5 or less a month. In the Puno Region, the average is S/.4 and 93% of users pay S/.5 or less a month. The principal sources of income for payment of the electricity charge are agricultural products (58%) and commercial activities other than agriculture or stock raising (26%) in the Ancash Region and agricultural products (67%) and stock raising (17%) in the Puno Region. The electricity consumption figures reflect the poorer status of the Puno Region.

(6) Water Supply

Since the completion of the sub-projects, each municipality has been responsible for the operation and maintenance of the new facilities. In general, the benefiting local residents have formed a users' association to collect the water charge from each user to pay the cost of ordinary maintenance and to conduct simple repairs.

Prior to the completion of the sub-projects, the FONCODES organized training sessions for the benefiting local residents on such maintenance-related issues as cleaning of the intake facility and water tank, maintenance of the pipeline and injection of a disinfectant. The state of maintenance is generally good. There is one case among the sites visited of complaints regarding failure of the water

supply to reach the tap in the dry season because of the inadequate distribution. There is another case of insufficient protection of the tap in the cold season resulting in the freezing of and damage to the tap. At one water supply sub-project site, a users' association has not yet been formed. At the workshop held at this site, a staff member of the FONCODES urged representatives of the local community to form such an association.

According to the findings of the beneficiaries' survey, the monthly water charge per household varies from S/.1.5 to S/.5 at the sub-project sites in the Ancash Region and from S/.0.25 to S/.0.5 in the Puno Region. When repair is found to be necessary, the municipality provides the necessary funding from its reserve fund. According to the municipalities interviewed, water supply as an important service is said to be given priority for the funding of repairs, etc. by the reserve fund.

(7) Latrines

Since the completion of the sub-projects, the ownership of the newly constructed latrines has been transferred to the benefiting local residents for maintenance by individual users. Local residents jointly conduct the work to relocate the simple toilet enclosure to a new latrine site when the existing pit becomes full.

Prior to the completion of the sub-projects, the FONCODES organized training sessions for benefiting local residents on the hygiene maintenance of the latrines, including the occasional application of lime. The visited latrines were found to be generally clean and in good working order.

The maintenance cost is paid by local residents and is not a heavy burden for them.

In summary, the maintenance of the new facilities constructed under the Project poses no problems in terms of the system, technology or finance even though the actual maintenance system differs depending on the mode of participation of the management body and local residents in each sub-project. No major problems have been observed in the operation and maintenance system, therefore sustainability of the project is high.

4. Conclusion, Recommendations and Lessons Learned

4.1 Conclusion

A total of 1,726 sub-projects were implemented in nine regions under the Project for the purpose of improving the basic infrastructure to help poor farmers in the Sierra. The Project made a great contribution to improvement of the standard of living in the target area, thereby assisting the policy of

poverty reduction adopted by successive governments in Peru. While the finalised project cost was within the original planned cost, the actual implementation period was longer than planned, resulting in a project efficiency rating of medium. The findings of the beneficiaries survey conducted for the present evaluation exercise indicate that almost all of the facilities constructed/improved under the relevant sub-projects are effectively used with a high level of satisfaction among the intended beneficiaries. The sustainability of these facilities is rated high as they are adequately operated and maintained by mostly public bodies with the cooperation of local residents.

In light of the above, this project is evaluated to be highly satisfactory. .

4.2 Recommendations

4.2.1 Recommendations for the Project Implementing Body

It is believed that the need for the improvement of basic infrastructure will remain strong in both the Sierra and Selva of Peru in the years to come. It is, therefore, highly desirable for the FONCODES to continue its work to meet this need. It is also desirable for local residents to utilise the socioeconomic infrastructure improved by the FONCODES to increase their income to reduce poverty throughout Peru. For this purpose, technical assistance for the intended beneficiaries will be required. Examples of such assistance are farming guidance for farmers benefiting from an irrigation system and guidance on business start-up, technical issues and management for the beneficiaries of rural electrification for those who hope to start a new business venture using electricity. Capacity building and expansion of the jurisdiction of the FONCODES will also be required to realise such assistance.

4.2.2 Recommendations to the JICA

None

4.3 Lessons Learned

In the face of the damage caused by the earthquake which struck some parts of Peru in 2001 during the implementation period of the Project, the geographical scope of the Project was expanded to allow the reconstruction of school and health post buildings and other work. By fulfilling the BHNs of the disaster victims through such work, the Project achieved certain positive effects on the post-disaster rehabilitation. As seen in the Project, such prompt and flexible response of the project is desirable for other Japanese ODA as a change of the project scope at the time of an emergency can have highly positive impacts/effects which were not originally intended.

Like the other projects of FONCODES, formulation and implementation of the sub-projects under the Project were carried out in a participatory manner by an implementation core (*Nucleo Ejector*) organized by the villagers themselves. The implementation core has a high sense of ownership and financial transparency as it is entrusted with the payment of construction and other costs. However, the implementation core is a temporal institution that is dissolved after the completion of a sub-project. On the other hand, in line with the recent decentralization policy, budget for municipal government are increasing and their involvement to the project of FONCODES now encompasses selection and implementation of sub-projects. Therefore it is desirable that the municipalities would learn and inherit the experiences gained through the implementation core, and thereon build up a methodology for developing social, economic and sanitary infrastructures in poor area together with FONCODES.

Comparison Between the Original Plan and Actual Results

Item	Original	Actual
1. Outputs	(a) Sub-Projects Social Infrastructure School Building : 470 Health Post : 116 Public Hall : 13 Economic Infrastructure Irrigation channel : 387 Road and Bridge : 621 Rural Electrification : 440 Sanitation Infrastructure (not included) Total : 2,047 (b) Consulting Services (c) Promotion, Evaluation	(a) Sub-Projects Social Infrastructure School Building : 532 Health Post : 90 Public Hall : 6 Economic Infrastructure Irrigation channel : 193 Road and Bridge : 385 Rural Electrification : 226 Sanitation Infrastructure Water Supply : 199 Latrines : 94 Sewerage : 1 Total : 1,726 (b) Consulting Services 4 years delay in execution (c) Promotion, Evaluation 4 years delay in execution
2. Project Period	September 2000 – September 2005 (61 months)	September 2000 – July 2007 (83 month)
3. Project Cost Foreign Currency Local Currency Total Japanese ODA Loan Portion Exchange Rate	 ¥91 million ¥8,962 million ¥9,059 million ¥6,794 million US$1=S/.3.34=¥113.5 (October 1999)	 ¥56 million ¥8,906 million ¥8,962 million ¥6,758 million US$1=S/.3.291=¥118.45 (Weighted average during December 2001 – July 2007)