

2.4.3 Other Impacts on the Environment

As anticipated at the time of appraisal, the installation of new water mains has led to less pumping of groundwater in some areas, resulting in the recovery of the groundwater level at some pumping wells (see 2.3.1-(2) Improvement of the Distribution Efficiency).

The rehabilitation of the sewerage system was expected to reduce the contamination of groundwater by sewage. Even though the groundwater at most of the pumping wells now meets the water quality standards, the existence of pumping wells where the groundwater fails to meet the water quality standard for nitrate nitrogen or nitrous nitrogen, suggests possible contamination of groundwater by sewage. As mentioned in 2.3.2 Sewerage, the sewerage treatment rate remains low at 14.6%, which is an issue to be tackled. Because of limited data, a comparison cannot be made between the level of contamination prior to and after the project.

The increased water consumption as a result of the Project has led to an increased discharge of sewage. It is inferred that the volume of sewage has increased by 1.4 m³/sec compared to the 1995 level. At the same time though, the increase of the sewage treatment capacity during the same period is larger, therefore the overall discharge volume of untreated sewage has been reduced. The construction of the new Daboada sewage treatment plant with a capacity of 14 m³/sec is due to commence in 2009. When this plant is completed, the sewage treatment ratio will improve to more than 80%, substantially reducing the negative effects to the environment.

2.5 Sustainability (Rating: a)

No major problem has been observed in the capacity of the executing agency nor its operation and maintenance system, therefore sustainability of the project is high.

(1) Institutional Aspects

At the time of appraisal, it was planned to transfer the operation department of SEDAPAL to a private company. However, this plan was cancelled by the new administration after 1995. Instead, SEDAPAL has been implementing a series of reforms, including improvement of the human resource policies⁷, 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. Furthermore, SEDAPAL 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.⁸ The positive effects of these efforts include the improved service mentioned earlier as well as improved labour productivity⁹ and an improved financial performance.

SEDAPAL assesses the performance level of its external contractors in the range of fair to excellent. From its experience over the years, it is judged that SEDAPAL is capable of selecting external contractors with adequate ability.

⁷ Simplification and levelling of the pyramidal organizational structure, introduction of the principle of competition to the salary system and strengthening of the training system for better quality of service and productivity.

⁸ The actual performance is evaluated every year and the bonuses for staff members partly reflect the evaluation results. In 2008, for example, most of the targets were achieved.

⁹ As a result of conscious efforts to suppress an increase of the staff compared to the increase of the number of customers (connections), the number of permanent employees per 1,000 connections decreased from 2.49 in 1994 to 1.77 in 2008.

Based on the above analysis, it is judged that SEDAPAL has a well-established organizational structure and sufficient capacity to sustain the effects of the project.

(2) Technical Aspects

SEDAPAL employs some 2,200 people, almost all of which undergo training every year. The average annual training hours per person are 32 hours or as many as 66 hours for those in managerial positions.

SEDAPAL acquired ISO-certified status regarding quality management and environmental management in 2002 and 2003 respectively. It has also received a number of awards, including Peruvian Company of the Year 1999 and Best Water and Sewerage Management 1998.

In view of the well-established training system, ISO-certified status, series of awards and good operation records, SEDAPAL is believed to have sufficient technical capacity.

(3) Financial Aspects

Since 2004, SEDAPAL has been able to steadily increase its annual turnover and operating profit based on the increase of the water charge, reduction of the unaccounted-for water supply and improvement of the operational efficiency. 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. Expenses for facility maintenance and repair have increased in line with the annual turnover, indicating adequate funding practices. Based on these analysis results, it is judged that there are no special problems regarding the financial sustainability of SEDAPAL.

Table 6 Financial Performance of SEDAPAL

(Unit: million sol)

	2004	2005	2006	2007	2008
Turnover	624.0	660.8	748.1	827.4	959.1
Operating Profit	53.7	56.0	110.0	177.7	204.5
Net Profit	96.9	9.0	93.2	125.8	4.1
Maintenance & Repair Expenses		52.6	54.0	66.5	82.0

Source : SEDAPAL

Table 7 Financial Performance Indicators for SEDAPAL

	2004	2005	2006	2007	2008
Working Ratio	62%	61%	55%	52%	44%
Current Ratio	64%	46%	91%	87%	98%
Debt Ratio	51%	50%	45%	46%	50%

Source : SEDAPAL

(4) Current Status of Operation and Maintenance

The head office of SEDAPAL is responsible for the operation and maintenance of the water mains and distribution pipes (up to the entry point of each section) while some repair work is entrusted to external contractors. Cleaning and repair of primary sewers is conducted by external contractors while the terminal distribution pipes and sewers are operated and maintained by the maintenance department of each of the seven service centers. Connection to new users and pipeline

maintenance and repair work are entrusted to external contractors. The control room at the head office remotely controls water production, transmission and distribution through the SCADA system. This system almost entirely covers the project area while in those areas which are not covered by the SCADA system, operators are deployed in each area to manually operate the pumps and valves.

The field survey findings and a report of SEDAPAL indicate that all of the new facilities constructed/installed under the Project, including those under the JICA loan portion, are working favourably and no major maintenance problems have been encountered.

3. Conclusion, Lessons Learned and Recommendations

3.1 Conclusion

Although the implementation of the Project was delayed by approximately two years, the Project has resulted in a substantial improvement of the water supply service in the Lima-Callao Metropolitan Area due to the reduction of leakage through the rehabilitation of the water supply network, suppression of water consumption through the installation of water meters, efficient use of water through sectorization and other measures. Meanwhile, the rehabilitation of the sewerage network is believed to have contributed to the improvement of environmental sanitation. In the emerging districts, expansion of the sewerage system has contributed to improving the living environment of the low income population. SEDAPAL has the capacity to operate and maintain the Project in an appropriate manner and financial sustainability is feasible with the setting of an adequate water charge.

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

3.2 Lessons Learned

When a more effective approach to maximize a project's effectiveness is found, it should be well examined and incorporated into the project design even after the commencement of the project.

In the Lima-Callao Water Supply and Sewerage Systems Development Project, rehabilitation of the water supply and sewerage systems was planned without sectorization, and the sectorization and SCADA system was implemented after project commencement. Despite the fact that the number of connections in the metropolitan area increasing by 50%, the average water supply hours increased to 21.5 hours a day and better satisfaction of water users was achieved even though the total length of the rehabilitated pipelines nor the reduced amount of leakage achieved the original targets, and the volume of water production did not increase (due to a delay in construction of water plants that was out of the Project's scope). These achievements can be attributed to the implementation of the approach that was introduced after the commencement of the Project, the sectorization and SCADA.

3.3 Recommendations

- Although the unaccounted-for water ratio of SEDAPAL has improved, it is still high at 37%. A further reduction of this rate is urgently required in view of the future increase of the water demand, scarcity of water sources of Lima-Callao Metropolitan Area, as well as further improvement of financial performance of SEDAPAL. While leakage was reduced in 12 districts under the Project, there are still areas with a high water leakage rate in the Lima-Callao Metropolitan Area. SEDAPAL's continuation of rehabilitation work similar to that employed under the Project, putting priority in those areas with a high water leakage rate, is essential.
- SEDAPAL should complete the planned construction work for the Taboada waste water treatment plant as soon as possible in order to reduce environmental pollution to the surrounding water system.

Comparison Between the Original Plan and Actual Results

Item	Original	Actual
1. Outputs	<p>< Rehabilitation of Water Supply System ></p> <ul style="list-style-type: none"> • JICA Loan Portion (7 Districts) <ul style="list-style-type: none"> - Rehabilitation of water distribution mains ... 392 km - Replacement of gate vales ... 652 - Installation of fire hydrants ... 791 - Replacement house connections ... 72,276 • World Bank Portion (5 Districts) <ul style="list-style-type: none"> - Rehabilitation of water transmission lines and reservoirs; procurement of maintenance equipment <p>< Rehabilitation of Sewerage System ></p> <ul style="list-style-type: none"> • JICA Loan Portion (7 Districts) <ul style="list-style-type: none"> - Replacement of concrete sewers ... 417 km - Replacement of house connections ... 83,291 - Replacement of manholes ... 8,331 • World Bank Portion (5 Districts) <ul style="list-style-type: none"> - Rehabilitation of primary sewers, secondary sewers and household service pipes; procurement of maintenance equipment <p>< Rehabilitation of Pumping Wells ></p> <ul style="list-style-type: none"> • World Bank ... 85 <p>< Installation of Water Meters ></p> <ul style="list-style-type: none"> • World Bank ... 406,000 <p>< Extension of Water Transmission Lines ></p> <ul style="list-style-type: none"> • JICA and World Bank ... 73 km <p>< System Expansion in Emerging Districts > World Bank</p> <ul style="list-style-type: none"> - Laying of new water transmission lines and water mains ... 89 km - Laying of new sewers ... 33 km - New connections ... 302,000 households <p>< Consulting Service (JICA; World Bank) ></p> <ul style="list-style-type: none"> - Detailed design; work supervision; management service; related surveys 	<p>< Rehabilitation of Water Supply System ></p> <ul style="list-style-type: none"> • JICA Loan Portion (7 Districts) <ul style="list-style-type: none"> - Rehabilitation of water distribution mains ... 270 km - Replacement of gate vales ... 814 - Installation of fire hydrants ... 791 - Replacement of house connections ... 12,974 • World Bank Portion (5 Districts) <ul style="list-style-type: none"> - Rehabilitation of water transmission lines and reservoirs; procurement of maintenance equipment <p>< Rehabilitation of Sewerage System ></p> <ul style="list-style-type: none"> • JICA Loan Portion (7 Districts) <ul style="list-style-type: none"> - Replacement of concrete sewers ... 165 km - Replacement of house connections ... 9,890 - Replacement of manholes ... 3,105 • World Bank Portion (5 Districts) <ul style="list-style-type: none"> - Rehabilitation of primary sewers, secondary sewers and household service pipes; procurement of maintenance equipment <p>< Rehabilitation of Pumping Wells ></p> <ul style="list-style-type: none"> • World Bank ... 89 <p>< Installation of Water Meters ></p> <ul style="list-style-type: none"> • World Bank ... 427,000 <p>< Extension of Water Transmission Lines ></p> <ul style="list-style-type: none"> • JICA and World Bank ... 61 km <p>< System Expansion in Emerging Districts > World Bank</p> <ul style="list-style-type: none"> - Laying of new water transmission lines and water mains ... 64 km - Laying of new sewers ... 37 km - New connections ... 200,000 households <p>< Consulting Service (JICA; World Bank) ></p> <ul style="list-style-type: none"> - Detailed design; work supervision; management service; related surveys
2. Project Period	February, 1995 to November, 2001 (82 months)	March, 1996 to September, 2004 (103 months)
3. Project Cost JICA loan Portion World Bank Portion Total of which JICA Loan Exchange Rate	<p>¥11,236 million ¥21,087 million ¥32,323 million ¥8,427 million US\$ 1 = ¥103 (as of 1994)</p>	<p>¥11,321 million ¥22,254 million ¥33,575 million ¥8,415 million US\$ 1 = ¥121 (Based on the actual exchange rate at the time of each payment)</p>

Peru

El Niño-Affected Highway Rehabilitation Project

External Evaluator: Takeshi Yoshida (TREA Ltd.)
Field Survey: June 2009

1. Project Profile and Japan's ODA Loan



Map of the Project Area



La Oroya-Huancayo Highway

1.1 Background

The El Niño phenomenon during the spring of 1997 to the summer of 1998 is said to have been one of the severest ever recorded, causing extensive damage to the coastal areas of Peru in particular due to the flooding of rivers and sediment discharge. The estimated total amount of damage caused by this phenomenon was approximately US\$ 1,005 million, severely impacting the economy of Peru where road transportation accounts for 88% of cargo transportation and 64% of passenger transportation. By sectors, infrastructure related to the transportation was the most damaged. In the road sub-sector, the amount of damage caused by washed out roads, broken bridges and landslides was provisionally estimated to be US\$ 299.6 million, accounting for some 30% of the total damage.

Under these circumstances, the Government of Peru declared the state of emergency in June, 1997 and formulated the El Niño Emergency Assistance Programme with US\$ 374 million, 40% of the total funding plan for the Programme, being allocated to the road sector. The El-Niño Affected Highway Rehabilitation Project, which included the rehabilitation and improvement of major trunk roads and was supported by the Japanese ODA loan was part of this Programme..

1.2 Objective

To normalise road transportation which was badly damaged by the El Niño Phenomenon by rehabilitating and improving major trunk roads, thereby contributing to smooth road transport in the future.

1.3 Borrower/Executing Agency

Borrower: Government of the Republic of Peru

Executing Agency: Ministry of Transport and Communication (MTC)

1.4 Outline of Loan Agreement

Approved Loan Amount/ Disbursed Loan Amount	¥15,833 million/¥15,639 million
Exchange of Notes/ Loan Agreement	April 1999
Terms and Conditions	Interest rate :2.2% Repayment Period (Grace Period) : 25 years (7 years) Procurement : General Untied (Consulting Service: 0.75%, 25 years (10 years), Bilateral Tied)
Final Disbursement	August 2006
Main Contractors (contract amount of 1 billion yen or more)	Consortio Rio Maranon (Peru); Consortio Jaen (Serbia); Consortio Iccgsa-Iesa (Peru); Sagitario S.A.; Construcoes e Comercio Camargo Correa S.A. (Brazil); Mendez Junior Group (Chile); Vegsa CG (Peru) (JV)
Consultants (contract amount of 100 million yen or more)	PCI (Japan); CESEL S.A. (Peru); Nippon Koei (Japan); OPMAC (Japan); Barriga Dall'orto S.A.; Ingenieros Consultores (Peru) (JV)
Feasibility Study (F/S)	None

2. Evaluation Results (Rating: B)

2.1 Relevance (Rating: a)

This project has been highly relevant with the country's national policies and development needs at the times of both appraisal and ex-post evaluation, therefore its relevance is high.

2.1.1 Relevance at Appraisal

Following the declaration of the state of emergency for El Niño in June 1997, the El Niño Emergency Assistance Programme was formulated by the Peruvian Government in November 1997. This Programme consisted of three stages: prevention stage, emergency stage, and reconstruction stage. The project for evaluation here formed part of the reconstruction stage, for which 40% of the entire Programme budget was allocated. It involved the rehabilitation and improvement of paved and unpaved roads which were selected based on their priority under the Programme and roughly estimated traffic volume of 400 vehicles/day.

2.1.2 Relevance at Ex-Post Evaluation

The Garcia Administration inaugurated in 2006 pledged and adopted the promotion of exports from the Sierra as one of its economic development policies. In its first year of office, the Garcia Administration enforced the Act on Promotion of Exports from the Sierra (Ley de Sierra Exportadora / Ley No.28890). This act aims at reducing poverty in the Sierra through the development of local industries, such as agriculture, manufacturing and hand crafts. The roads targeted by the Project form part of the trunk road network linking the Sierra and Amazon areas to large cities on the coast. As the improvement of such networks contributes to the industrial development and poverty reduction in inland areas, the Project is in conformity with the policy of the present administration.

The Ministry of Transport and Communication (hereinafter referred to as the "MTC"), which was the executing agency for the Project, points out the importance of road transport for logistics in Peru in its strategic plan (2007 - 2011) and considers the national road network to be the most important infrastructure. The roads rehabilitated and improved under the Project are part of the national road network of Peru and are an important means of achieving the above-mentioned economic development at the time of ex-post evaluation.

2.2 Efficiency (Rating: b)

Although the Project was implemented mostly as planned in terms of the project cost, the project period was much longer than planned; therefore, the efficiency of the Project is fair.

2.2.1 Outputs

The main components of this Project were the rehabilitation of paved roads and the improvement of unpaved roads. The planned and actual outputs are compared in Table 1.

The Project was implemented as a sector loan project. As such, the target sections for the loan were not finalised at the time of appraisal, and instead were left for subsequent decisions by the consultant after the completion of the detailed design, etc. Because of this, the actual sections are not exactly the same as the planned sections.

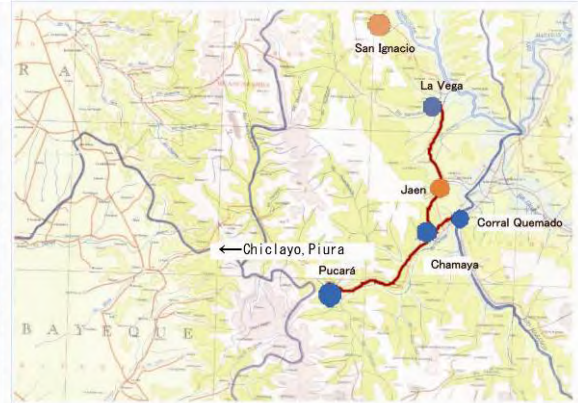
Table 1 Comparison of Planned Outputs at Appraisal and Actual Outputs

Planned	Actual
<ul style="list-style-type: none"> • Rehabilitation of Paved Roads Total Length of Damaged Roads: approx. 498 km - Heroes de la Brena 133.6 km - La Oroya-Huancayo 123.0 km - Cruces Olmos-Corral Quemado 193.1 km - Haura-Sayan 24.7 km - Lima-Canta 23.7 km • Improvement of Unpaved Roads Total Length of Damaged Roads: approx. 241 km - Chamaya-Jaen-San Ignacio 128.41 km - Sayan-Churin 57.0 km - Jauja-Tarma 56.0 km 	<ul style="list-style-type: none"> • Rehabilitation of Paved Roads Total Length of Damaged Roads: 309.02km - Heroes de la Brena 136.41 km - La Oroya-Huancayo 116.36 km - Cruces Olmos-Corral Quemado 56.25 km - Haura-Sayan* Cancelled - Lima-Canta Cancelled • Improvement of Unpaved Roads Total Length of Damaged Roads: 106.09 km - Chamaya-Jaen-San Ignacio 50.08 km - Sayan-Churin* Cancelled - Jauja-Tarma 56.01 km • Construction of Bridges - Stuart Bridge 83 m - Collana Bridge 150 m
<ul style="list-style-type: none"> • Engineering Consulting Service - Detailed Design - Work Supervision - Environmental Study 	<ul style="list-style-type: none"> • Engineering Consulting Service - Detailed Design As planned - Work Supervision As planned - Environmental Study As planned
<ul style="list-style-type: none"> • Management Consulting Service - Assistance for tender, coordination with various organizations involved, management of fund disbursement and other work 	<ul style="list-style-type: none"> • Management Consulting Service - Assistance for tender, coordination with various organizations involved, management of fund disbursement and other work As planned

* The rehabilitation and improvement of the Haura-Sayan, Lima-Canta and Sayan-Churin sections were removed from the scope of the Japanese ODA loan in August.



Target Roads in the Junin Region



Target Roads in the Cajamarca Region



Stuart Bridge (Junin)



Olmos-Corral Quemado Highway
(Cajamarca)

2.2.2 Project Period

The actual project period was 89 months from April 1999 to August 2006. As the planned project period at the time of appraisal was 33 months from April 1999 to December 2001, the actual period was equivalent to 270% of the planned period.

The primary cause of the extended project period was fiscal problems faced by the Government of Peru. Due to the introduction of restrictions on the size of the government expenditure as part of the government's obligation to reduce the fiscal deficit in line with its agreement with the International Monetary Fund (IMF) in 2003, the Government of Peru was unable to provide the domestic currency portion of the project budget. In addition, because of the preferential allocation of the government budget to other two preceding ODA loan projects in the road sector (Rural Roads Rehabilitation Projects I and II), the budgetary allocation for the Project was substantially cut. Thus, all sections could not commence at once, leading to inefficient implementation. Another factor was the reorganization of the MTC in 2002 and subsequent reshuffle of staff members, resulting in a lengthy clearance time for procedural matters by new staff who were unfamiliar with the necessary work.

Since the nature of the Project is a sector loan for rehabilitation and improvement of the damaged road network, there were modifications in the target road sections after detailed design. The unexpected period for the detailed studies and related processes also caused the extension of the project period.

2.2.3 Project Cost

The actual project cost of 21,241 million yen was mostly the same (100.61%) as the planned project cost of 21,111 million yen at the time of appraisal. The actual ODA loan amount was 98.8% of the originally planned amount.

2.3 Effectiveness (Rating: a)

This project has largely achieved its objectives; therefore its effectiveness is high..¹

2.3.1 Traffic Volume

The traffic volume data obtained at tollgates suggests that the traffic volume for all rehabilitated sections after the project was higher than that before the implementation of the project. Similarly, the annual traffic volume studied at the time of ex-post evaluation was higher than the pre-project annual traffic volume. The average daily traffic volumes at different tollgates and the annual traffic volume at the time of ex-post evaluation are shown in Table 2 and Table 3 respectively.

Table 2 Average Daily Traffic Volume at Tollgates (Unit: vehicles)

Before the Project (2001)		After the Project (2008)	
1) Junin Region		1) Junin Region	
Heroes de la Brena (Corcona)	3,419	Heroes de la Brena (Corcona)	4,409
La Oroya-Huancayo (Quiulla)	1,333	La Oroya-Huancayo (Quiulla)	1,868
2) Cajamarca Region		2) Cajamarca Region	
Olmos-Corral Quemado (Olmos)	477	Olmos-Corral Quemado (Olmos)	844

Source: MTC

¹ Because of the absence of quantitative targets on the effectiveness of the Project at the time of appraisal, it was not possible to quantitatively evaluate the precise effects of the Project were as planned. Moreover, traffic volume data and other data were not sufficiently available. Efforts were made to gather as much pre-project as well as post-project data as possible. Based on such data and the findings of the interview survey, an attempt to reasonably measure the effects of project execution was made.

Table 3 Annual Traffic Volume

(Unit: thousand vehicles)

Before the Project		After the Project (2009)*	
1) Junin Region		1) Junin Region	
La Oroya-Jauja (2002)	547	La Oroya-Jauja	640
Jauja-Huancayo (2002)	548	Jauja-Huancayo	1,605
Jauja-Tarma (2004)	149	Jauja-Tarma	584
2) Cajamarca Region		2) Cajamarca Region	
Olmos-Corral Quemado (2002)	301	Olmos-Corral Quemado	441
Chamaya-Jaen (2004)	405	Chamaya-Jaen	480
(MTC data)			

* The observed traffic volumes by the evaluator are converted to the annual traffic volume equivalent.

2.3.2 Shortening of Travel Time

As part of the traffic survey on each targeted road, interviews with drivers were conducted on the difference in travel time before and after the Project. The result of the survey showed obvious shortening of the same.

As part of the traffic survey, transport companies operating buses or trucks in the Junin Region and Cajamarca Region were interviewed. Table 4 shows the findings of these interviews.

Table 4 Difference in Travel Time Based on Interviews with Transport Companies

(Unit: hours)

	Junin Region (Between Huancayo and Lima)		
	Before the Project	After the Project	Shortened Time
Bus Operator	9.6	6.9	2.7
Road Haulier	9.3	8.8	0.5
	Cajamarca Region (Between Jaen and Chiclayo)		
	Before the Project	After the Project	Shortened Time
Bus Operator	11	5.8	5.7
Road Haulier	19	9.5	9.5

The results of the interviews with both bus operators and road hauliers confirm that the travelling time on the targeted roads of the Project has been shortened. The findings of the household survey and workshop suggest that the shortening of the travelling time was relatively modest in the Junin Region. While in the Cajamarca Region, the travel time between Jaen and Chiclayo by truck was reduced to half. (See 2.3.3 Impact)

2.3.2 Economic Internal Rate of Return (EIRR)

Table 5 shows the EIRR for each section at the time of appraisal and ex-post evaluation. A fair comparison between the two EIRR figures for each section is, however, difficult due to the fact that the basis for calculation at appraisal is unclear. At the time of ex-post evaluation,

reduction of the vehicle operating cost before and after the Project was considered to be a benefit for calculation of the EIRR² while the rehabilitation and maintenance expenditure constituted the cost.³ Both the benefit and cost were converted to economic prices for calculation of the EIRR.⁴ A project life of 20 years was assumed.

The calculated EIRR figures are generally high, indicating the sufficient economic return of the Project. The very high EIRR figures at the time of appraisal are assumed to be attributable to the inclusion of saved travel time and saved vehicle operation cost as benefits of the project.⁵

The EIRR for the Ricardo Palma-La Oroya section of the Heroes de la Brena Highway (Carretera Central) is high because of the high traffic volume. In contrast, the EIRR for the Jauja-Tarma section is low due to the low traffic volume while the construction cost was relatively high.

Table 5 Comparison of Economic Internal Rate of Return (EIRR)

At Appraisal		At Ex-Post Evaluation	
	EIRR(%)		EIRR(%)
Junin		Junin	
Ricardo Palma-Cocachacra	51.4	Ricardo Palma-Cocachacra	30.3
Cocachacra-Matucana	36.1	Cocachacra-Matucana	26.1
Matucana-San Mateo	37.8	Matucana-San Mateo	32.0
San Mateo-La Oroya	50.4	San Mateo-La Oroya	33.3
La Oroya- Pte. Matachico	36.2	La Oroya- Pte. Matachico	23.7
Pte. Matachico-Huancayo	37.1	Pte. Matachico-Huancayo	28.8
Huaura-Sayan	31.4	Huaura-Sayan	*
Lima-Canta	24.2	Lima-Canta	*
Cajamarca		Cajamarca	
Olmos-CoralQuemado	22.6	Olmos-CoralQuemado	15.9
Sayan-Picunche	26.6	Sayan-Picunche	*
Picunche-Churin	27.6	Picunche-Churin	*
Chamaya-km.50	33.0	Chamaya-km.50	20.7
Jauja-Tarma	47.9	Jauja-Tarma	9.8

* These sections were not calculated as they were not included in the scope of the Project.

2.3.3 Financial Internal Rate of Return (FIRR)

The average financial internal rate of return (FIRR) for all sections calculated at the time of appraisal was 12.4% for all sections. However, the basis for calculation is unknown. At the

² Based on the observed traffic volume, the traffic volume was forecast to grow at an annual rate of 5% through consultations with the MTC. As the observed traffic volume at Corretera Central was lower than the normal traffic volume, the average annual traffic volume at the tollgate was used.

³ MTC data was used for the vehicle operating cost by type of vehicle and by section while PROVIAS data was used for the construction and maintenance costs by section.

⁴ The conversion coefficient from financial prices to economic prices was that normally used by the MTC.

⁵ The reasons for the non-inclusion of travel time saving in the benefit in the EIRR calculation at the time of ex-post evaluation are that it is common not to include travel time saving in the benefit in the case of road construction projects in rural areas and that the benefit of travel time saving is not considered in the EIRR calculation method used by the MTC.

time of ex-post evaluation, the FIRR was not calculated as the MTC does not conduct financial analysis for road projects because the toll revenue does not cover the cost of the construction and maintenance.

2.4 Impacts

A household survey was conducted at towns situated along the target roads to measure the impacts of the Project. This survey actually took place in the towns of Mito, Tarma, Jauja and La Oroya Sinco in the Junin Region and the towns of Chamaya, Chiple and Jaen in the Cajamarca Region. 410 beneficiaries of 25 years old and older were interviewed on the issues explained next to establish the changes before and after the Project.

Many people responded that the accessibility to markets had improved as shown in Table 6. By region, the improved accessibility was more apparent in the Cajamarca Region.

Table 6 Improved Accessibility to Markets

(Unit: %)

Region	Much Improved	Improved	Slightly Improved	Not Improved
Junin	24	19	30	27
Cajamarca	34	38	24	4

Source: Household survey

Nearly half of the interviewees noted that the accessibility to the provincial centre had been much improved as shown in Table 7.

Table 7 Improved Accessibility to the Provincial centre

(Unit: %)

Region	Much Improved	Improved	Slightly Improved	Not Improved
Junin	43	17	21	20
Cajamarca	47	36	15	2

Source: Household survey

In both regions, the interviewees predominantly agreed that employment opportunities for women had increased as shown in Table 8.

Table 8 Increased Employment Opportunities for Women

(Unit: %)

Region	Much Improved	Improved	Slightly Improved	Not Improved
Junin	52	26	12	9
Cajamarca	42	32	21	5

Source: Household survey

The interviewees in the Cajamarca Region generally agreed that household income increased while those in the Junin Region did not necessarily agree as shown in Table 9.

Table 9 Increase of Income

(Unit: %)

Region	Much Increased	Increased	Slightly Increased	Not Increased
Junin	1	9	30	60
Cajamarca	2	20	51	26

Source: Household visit survey

The interviewees in the Junin Region had a negative opinion on the effect of the Project, namely road traffic safety as shown in Table 10. This is presumably because of the increased number of traffic accidents due to speeding.

Table 10 Improved Road Traffic Safety

(Unit: %)

Region	Much Improved	Improved	Slightly Improved	Not Improved
Junin	3	9	27	60
Cajamarca	26	31	22	21

Source: Household visit survey

As for environmental impact, EIA (Environmental Impact Analysis) was conducted and an environmental management plan was prepared as a part of the detailed survey for each section. In the EIA, environmental impacts related to soil excavation, soil deposit, slope and vegetation were analyzed. Environmental management plans included measures for environmental management, environmental monitoring, and environmental education program. These plans have been handed over to the operation and maintenance agency, PROVIAL NACIONAL.

As the Project is a rehabilitation of existing roads, no major socio-environmental impacts were expected. In fact, no adverse impact to environment was observed during the field inspection by the evaluator at the time of ex-post evaluation. In the workshops with local residents, their opinions on the Project's impact was mostly positive, while one negative opinion was an increase of traffic accidents and the necessity of countermeasures for it.



Workshop at Sicaya (Junin)



Workshop at Chamaya (Cajamarca)



Road Eroded by a River
(Olmos-Corral Quemado Highway)



Removal of Fallen Boulder
(Jauja-Tarma Highway)

2.5 Sustainability (Rating: b)

The maintenance system and technical capacity of the executing agency and maintenance agency are reasonable in general. However, some problems have been observed in terms of financing of maintenance cost and maintenance conditions; therefore sustainability of the project is fair.

2.5.1 Project Executing Agency

2.5.1.1 Institutional Aspects

The executing agency of this project was the Ministry of Transport and Communication (MTC)⁶ and the agency in charge of road maintenance work is PROVIAS NACIONAL⁷.

⁶ The MTC was established in 2002 after the reorganization of the Ministry of Transport, Communication and Housing Construction.

⁷ PROVIAS NACIONAL, which is situated directly below the Vice Minister of Transport, has two predecessors. One was the MTC's Special Programme for Rehabilitation of Transport Infrastructure (PERT) which was responsible for road projects with foreign loans and the other was the National Highway Maintenance System (SINMAC). Their integration created the PROVIAS NACIONAL to be responsible for the construction and maintenance of national roads.

While the MTC is responsible for general policies and planning regarding transport and communication, the PROVIAS NACIONAL is responsible for the construction and maintenance of national roads. PROVIAS NACIONAL has 18 zone offices which conduct maintenance, toll fare collection, weight checking and other work across Peru. At the time of ex-post evaluation, the PROVIAS NACIONAL has staff of 983 people.

The section between Olmos and Corral Quemado (Cajamarca Region) forms part of the 955 km long east-west corridor traversing northern Peru called the IIRSA⁸ Norte, and the toll fare collection and road maintenance work are conducted by a concession holder by the same name, IIRSA Norte. The revenue from the collection of the toll fares goes to the account of MTC and MTC pays some certain amount to IIRSA Norte for the work of toll collection. However this toll system does not give IIRSA Norte high incentive to prioritize toll collection as the toll revenue does not become their own. According to the authority of IIRSA Norte, the concession was awarded with an assumption that the roads would not require any major repair works. On the contrary, the actual situation is that civil engineering works are sometimes required to cope with landslides and scouring of the roadbed by adjacent rivers. Therefore the maintenance system of the section between Olmos – Coral Quemado has some weakness.

2.5.1.2 Technical Aspects

The PROVIAS NACIONAL entrusts the routine inspection and maintenance work of national roads to local small and medium enterprises while it directly conducts large-scale works to deal with collapsed slopes and such. Both PROVIAS NACIONAL and its maintenance contractors are judged to have reasonable technical capacity required for the expected maintenance work.

However, the staffing level of the zone offices of the PROVIAS NACIONAL is insufficient as each office has only one supervisor responsible for the national road network in the area of their jurisdiction. According to the zone offices, maintenance work requiring heavy machinery is conducted by PROVIAS NACIONAL but the number of such machinery possessed by the PROVIAS NACIONAL is insufficient, making speedy road repair work difficult in some cases.

2.5.1.3 Financial Aspects

The PROVIAS NACIONAL maintains national roads using the revenue from the toll fares. However, this revenue is insufficient to cover the actual expenditure. The total maintenance expenditure of the PROVIAS NACIONAL in 2008 was S/.290 million and the revenue from toll fares was S/.189 million (approximately US\$ 63 million). Although PROVIAS NACIONAL is legally an independent entity, its finance is greatly assisted by the MTC.

As mentioned earlier, for the section between Olmos and Corral Quemado, the IIRSA Norte collects the toll fares under the concession conditions with MTC. The toll revenue goes to MTC and apart from it MTC pays the cost of toll collection and the maintenance works. Here, the income is lower than the actual cost needed for maintenance. Given the fact that toll fares

⁸ The IIRSA stands for the South American Regional Infrastructure Integration Initiative which is planning to integrate such infrastructure as roads, railway and electricity supply in South America.

are not collected at some road sections due to road closure and such, the urgent establishment of a normal toll fare collection system is essential.

2.5.2 Current Status of Operation and Maintenance

Some parts of the target roads are prone to damage by frequent landslides and such due to the topography. Even though it is desirable that the route alignments are changed fundamentally, the achievement of such alterations are difficult from the technical as well as financial point of view. The alternative is the regular implementation of repair work. As the year in which the ex-post evaluation was conducted (2009) saw more rainfall than average, eroded road sections due to flooding and sections closed to traffic due to landslides and such were observed in the mountainous areas. While the response to damage of the maintenance agencies is swift and appropriate, the chronic necessity for rehabilitation work suggests that the road maintenance remains problematic at some of the targeted sections. In order to attain increased efficiency in road maintenance, PROVIAL NACIONAL is currently promoting an outsourcing of routine maintenance and emergency response for the paved road sections with more than 200km through 5-year concession agreements.

3. Conclusions, Lessons Learned and Recommendations

3.1 Conclusions

The Project aimed at the rehabilitation and improvement of trunk roads in Peru which were severely damaged by the El Niño phenomenon. The relevance of the Project is high from the viewpoint of the government policies and development needs in Peru. Regarding efficiency, although the outputs and project cost were almost as planned, the actual project period was much longer than the planned period. The generally high, positive effects of the Project are confirmed as the ex-post evaluation data suggests an increased traffic volume, saved travel time, high EIRR and favourable responses from the beneficiary survey. In terms of sustainability, while there are such chronic problems as landslides in mountainous areas, the organizational set-up and strength of the executing agency and road maintenance bodies are sufficient. Based on these evaluation results, the overall evaluation result of the Project is satisfactory.

3.2 Lessons Learned

One reason for the substantial prolongment of the project period was that the originally anticipated period was too short. For similar projects that require urgency such as the disaster rehabilitation projects, simplification or shortening of pre-construction surveys should be considered.

3.3 Recommendations

Roads in mountainous areas of Peru are inherently liable to temporary closure due to heavy rainfall, which may or may not be associated with El Niño as these areas are characterised by

steep topography and fragile geological conditions which are susceptible to landslides due to rain or erosion by flooding rivers. As the roads targeted in this Project were trunk roads, any rehabilitation work must aim at guaranteeing the safe and steady passage of vehicles. To achieve this, continuous improvement of disaster prone areas should be made as well as the establishment of a quick disaster response system.

It is hoped that the MTC will develop a database for project-related data and reference materials. This ex-post evaluation study found it difficult to obtain sufficient information/data because no reference materials produced at the time of appraisal were available. Establishment of a systematic database would contribute to effective and efficient operation and maintenance of MTC's road network under limited resources.

Comparison Between Original Plan and Actual Results

Item	Components	Original Plan	Actual Results
① Outputs	<ul style="list-style-type: none"> • Rehabilitation of Paved Roads 		
	Total Length of Damaged Roads	approx. 498km	309.02km
	- Heroes de la Brena	133.6 km	136.41 km
	- La Oroyoa-Huancayo	123.0 km	116.36 km
	- Cruces Olmos-Corral Quemado	193.1 km	56.25 km
	- Haura-Sayan	24.7 km	Cancelled
	- Lima-Canta	23.7 km	Cancelled
<ul style="list-style-type: none"> • Improvement of Unpaved Roads 			
Total Length of Damaged Roads	approx. 241 km	106.09 km	
- Chamaya-Jaen-San Ignacio	128.4 km	50.08 km	
- Sayan-Churin	57.0 km	Cancelled	
- Jauja-Tarma	56.0 km	56.01 km	
<ul style="list-style-type: none"> • Construction of Bridges 			
- Stuart Bridge	-	83 m	
- Collana Bridge	-	150 m	
<ul style="list-style-type: none"> • Engineering Consulting Service 			
- Detailed Design	Planned	As planned	
- Work Supervision	Planned	As planned	
- Environmental Study	Planned	As planned	
<ul style="list-style-type: none"> • Management Consulting Service 			
- Assistance for tender, coordination with various organizations involved, management of fund disbursement and other work	Planned	As planned	
② Period		April, 1999 (L/A) to December 2001 (33 months)	April, 1999 (L/A) to August 2006 (89months)
③ Project Cost	<ul style="list-style-type: none"> - Foreign Currency Portion - Domestic Currency Portion (Local Currency Equivalent) 	<ul style="list-style-type: none"> ¥5,703 million ¥15,408 million (S/.313.7 million) ¥21,111 million (¥15,833 million) US\$ 1 = ¥140 (June 1998) 	<ul style="list-style-type: none"> ¥7,267 million ¥13,974, million (S/.435.5 million) ¥21,241 million (¥15,639 million) US\$ 1 = ¥113 (Average between May 2005 ~ August 2006)