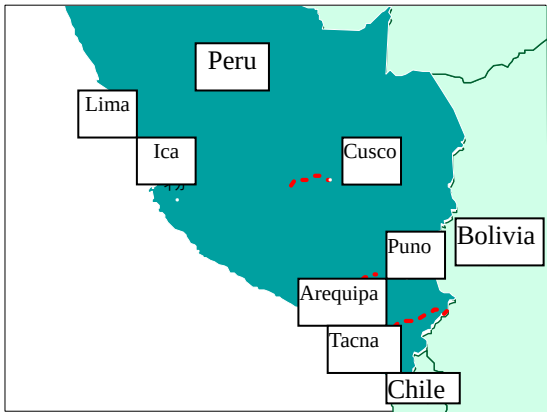
Peru

Rural Highway Rehabilitation and Improvement Project

External Evaluator: Takeshi Yoshida (Torea Co., Ltd.)

Field Survey: November-December 2005

1. Project Profile and Japan's ODA Loan



Map of project area

National Highway Improved by This Project

1.1 Background

Only 30% of Peru's 70,000km of total roads had been paved or had low-cost pavement surface, and the rest were unpaved tracks. The road network was deteriorating substantially due to problems such as lack of funds, operation and maintenance activities, and public disorder. Since its inauguration, the Fujimori administration placed emphasis on improving the transportation system and, in the first term (1990-1995), the administration carried out the rehabilitation of the Pan-American Highway along the Pacific coast with financing of Inter-American Development Bank (IDB)[1]. In the 2nd term (1996-2000), the 10-Year Program for the Rehabilitation of the Transport Network was established. In this plan, it was acknowledged that Southern Peru's arterial roads required repair works.

1.2 Objectives

By carrying out rehabilitation and construction of arterial roads (4 sections, total of 613km) in Peru's southern inland area, the project aimed to allow smoother transportation in the area, and thereby contribute to the revitalization of the regional economy and to the promotion of trade and commerce with coastal area and neighbouring country Bolivia.

[1]IDB loaned the Fujimori administration 210 million dollars in order to finance their first road project, Rehabilitation and Maintenance Roads Program

1.3 Borrower/Executing Agency

Republic of Peru/ PROVIAS NATIONAL-Ministry of Transport and Communication

1.4 Outline of Loan Agreement

Loan Amount Disbursed Amount	16,421 million yen 16,339 million yen
Exchange of Notes Loan Agreement	August 1996 September 1996
Terms and Conditions - Interest Rate - Repayment Period - Grace Period - Procurement	 2.7% p.a. (Project) 2.3% p.a.(Consulting Service) 25 years 7 years General Untied
Final Disbursement Date	January 2003
Main Contractors	CONSTRUTORA NORBERTO (Brazil)/BESALCO (Peru), SAGITARI (Peru) (JV)/BUFETE (Mexico), UPACA (Peru) (JV)/CONSTRUTORA QUEIROZ (Brazil)/COSAPI (Peru)
Consulting Services	BADALLSA (Peru)/HIDROSERV (Brazil), HOB (Peru) (JV)/HIDROI (Former Yugoslavia), OFICINA DE INGENIERI (Peru) (JV)/CPS (Peru), PCI (Japan) (JV)
Feasibility Study (F/S) etc.	(1) Ministry of Transportation, Communication, Housing and Construction, PERT Southern Basic Corridor: Nazca-Abancay-Cusco section restorative improvements F/S, 1996. (2) Ministry of Transportation, Communication, Housing and Construction, PERT, PCVS Yura-Patahuasi-Santa Lucia road feasibility and engineering survey[2], 1999 (3) Ministry of Transportation, Communication, Housing and Construction, PERT, PCVS Ilo-Desaguadero road feasibility and engineering survey[3], 1998

[2] As this section was mountainous and, therefore, required higher-level engineering works, additional engineering feasibility was studied.

[3] Same as above

2. Evaluation Result

2.1 Relevance

2.1.1 Relevance at the time of appraisal

Upon entering office, the Fujimori administration placed importance on maintenance, management, and rehabilitation of the road network. In the 2nd term, the administration established the 10-Year Program for the Rehabilitation of the Transport Network. One of the objectives of this plan was to carry out rehabilitation of roads connecting coastal and inland areas and inland North-South roads. This project was given high priority in the 10-Year Plan because it was designed to repair arterial roads in southern inland areas. Road sections nearby had been also developed.

2.1.2 Relevance at the time of evaluation

Under the Toledo administration (2000~), it is widely recognized that elimination of poverty required the growth of employment and, for that reason, promotion of investment and trade is necessary. The transportation infrastructure development is essential for promotion of investment and trade. PROVIAS NACIONAL, which conducts construction and operation and maintenance of national highways under the Ministry of Transport and Communication, also points out the importance of strengthening an axle for the integration of South America[4]in ”Organizational Strategy Plan 2005-2008.” From this point of view, the project still maintains relevance. In addition, the objective of this project copes with poverty reduction.

This project is expected to support the forming of the inter-ocean highway, the promotion of commerce with neighbouring countries, Brazil and Bolivia, and the allowing of the flow of goods between southern mountain areas and coastal regions. As such, this project remains a high priority.

2.2 Efficiency

2.2.1 Outputs

Table 1 shows the comparison between planned and actual output. The reason for changes is mainly due to fluctuations in the yen/dollar exchange rate. The changes of output include a reduction of the Cusco-Abancay section, a 73km subsection near Cusco funded by the Peruvian government, because of its urgency. In addition, it was decided

[4]The Initiative for Regional Infrastructure Integration in South America (IIRSA) is the plan to promote regional integration through strategically planned infrastructure development by South America’s 12 countries and three international organizations (IDB, CAF and FONPLATA); this was referred to in the New Japan-Latin America and Caribbean Partnership announced by Prime Minister Junichiro Koizumi in September 2004.

that the section between Juliaca and Desaguadero would not be funded by JBIC, though there was no change in the project scope. This section was to be carried out through a loan by the co-financing entity, Corporación Andina De Fomento (CAF). Initially, three subsections were scheduled between Desaguadero and Santa Rosa. Due to this change in the subsection near Cusco, however, one subsection was added as a substitute, making a total of 4 sections.

Table 1. Comparison of Outputs-Planned and Actual

Planned (at Appraisal)	Actual(at Ex-post Evaluation)
Improvement and paving of 2-lane unpaved tracks. (1) Cusco-Abancay 129km (2) Yura-Patahuasi 182.4km (3) Juliaca-Desaguadero 189.0km (4) Desaguadero-Santa Rosa 112.2km Total 612.6km	Changes to engineering sections and extensions are as follows: (1) Cusco-Abancay 49.9km (2) Yura-Patahuasi 179.4km (3) Juliaca-Desaguadero: To be improved (4) Desaguadero-Santa Rosa 162.2km Total 391.5km

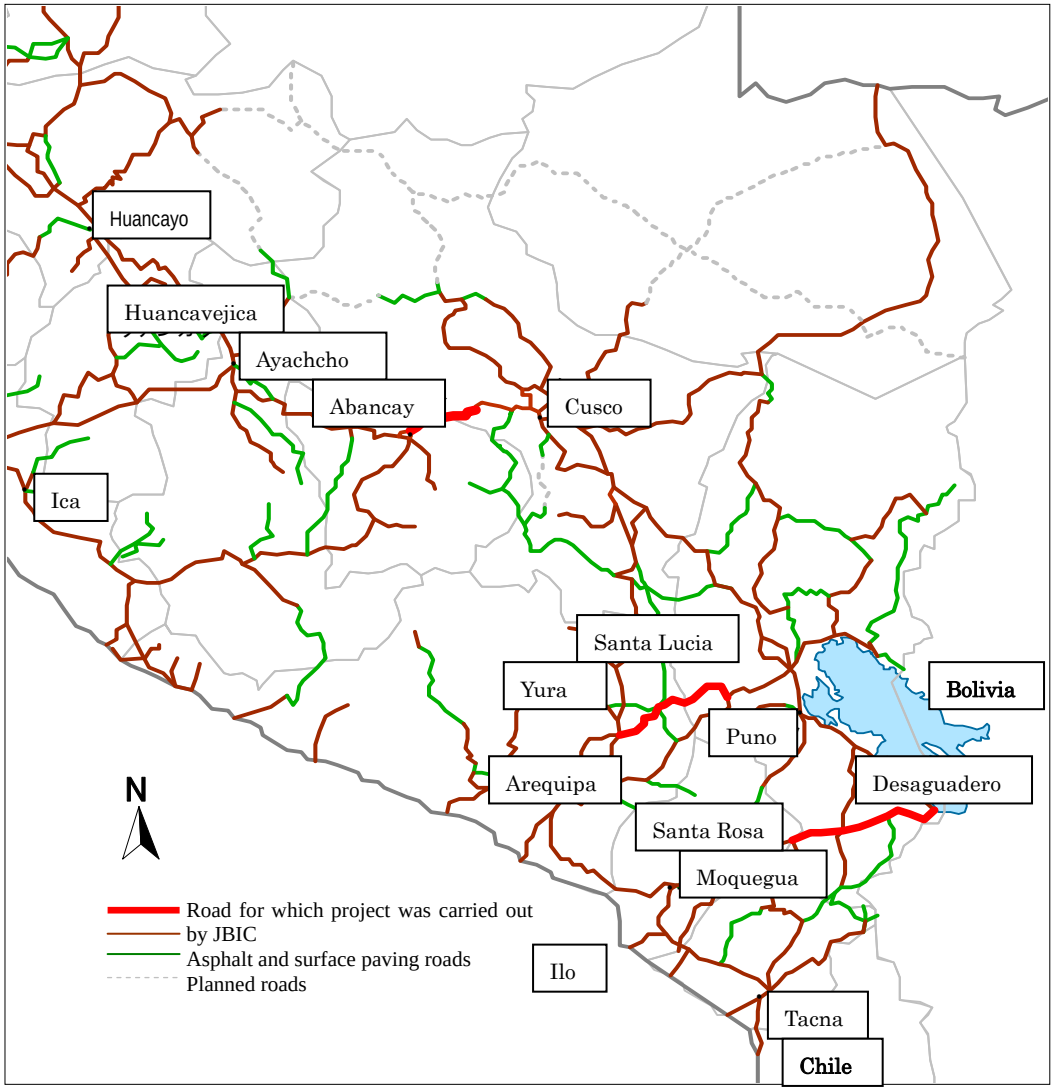
2.2.2 Project period

The project period was initially 2 years and 7 months, but in fact it prolonged to 6 years and 5 months were required. Consultant selection was scheduled to last 10 months but actually took 22 months, a 10-month delay. Also, contractor selection was scheduled to take 12 months but actually took 25 months, a 13-month delay. Construction period was scheduled to take 22 months but actually took 49 months, a 27 month delay. The reasons for these delays in the construction period included the consultant in charge of project management being unfamiliar with the procedures of JBIC loan operations and a change of one contractor.

2.2.3 Project cost

Project costs were initially estimated to be 21,895 million yen (102 yen/US$ at time of appraisal); however, the actual costs were 23,123 million yen (weighted average at the time of disbursement: 113.33 yen/US$), 5.6% over the initial plan. The main factor in running over-budget was the weakening of the yen to the US dollar. Secondary factors were changes in the design standards, which resulted in adding paving and drainage work between Yura and Patahuasi, and drainage work between Desaguadero and Santa Rosa which was not been considered in the initial phase.

Fig. 1 Location of road maintenance engineering sections



2.3 Effectiveness

2.3.1 Traffic volume

A comparison of the projections made at the planning stage for Annual Average Daily Traffic (AADT) in 2005 and actual AADT measured in December 2005 shows that in all sections actual traffic volume is higher than projected, and that there has been a substantial increase in the Cusco-Abancay section. We can conclude that this project has effectively accommodated with the increase traffic volume. With regard to the Cusco-Abancay section, which is a improved road of the existing route, the increase in traffic volume is unlikely to be diverted from the existing route. It is therefore surmised that the increase in traffic volume is due to newly induced traffic. According to transportation companies, the amount of sightseeing traffic has substantially increased

in line with a reduction in terrorism. On the Yura-Santa Lucia section, which is a newly constructed bypass route, traffic has diverted from a route used before the project. Additionally, it seems that an increase in the traffic for tourism activities has contributed to the increase in newly induced traffic. As the Desaguadero-Santa Rosa section is a route which is almost a newly constructed route, it can be concluded that the diverting traffic from the existing route has increased.

Table 2. Comparison of Planned and Actual Traffic Volume

	Daily traffic volume projected at time of appraisal		Actual		Plan/Actual
	1995 Actual (Vehicles)	Predication for 2005 (Vehicles)	December 2005 (Vehicles)	Comparison with previous year (%)	Percentage (%)
Cusco-Abancay	94	203	606	26.2	299
Yura-Santa Lucia	304	554	794	19.3	143
Desaguadero-Santa Rosa	84	223	424	79.5	190

Source: PROVIAS NATIONAL, except for the December 2005 actual figures, which are taken from ex-post evaluation survey data.

2.3.2 Traffic speed and reduced journey times

Looking at the traffic velocity and travel time for vehicles using these roads before and after the project, we can see that traffic velocity[5] has increased in all sections while travel time has decreased. The reduction in journey time is not large between Cusco and Abancay as this is a section where the existing road was improved. However, because the majority of the other two sections were newly constructed, reductions in travel time rates are substantial.

Table 3. Velocity and Travel Time (Passenger Vehicles)

Engineering section	Before Project (1999)		After Project (2003)		Increase/Reduction	
	Velocity (km/h)	Travel time (minutes)	Velocity (km/h)	Travel time (minutes)	Velocity (%)	Time (%)

[5] Actual measurements of average velocity by the implementing agency PROVIAS NATIONAL in the corresponding sections.

Cusco-Abancay	37.5	82	47.6	64	21.2	-22.0
Yura-Santa Lucia	33.0	89	70.0	42	52.9	-52.8
Desaguadero-Santa Rosa	29.0	374	56.0	173.8	53.6	-53.5

Source: PROVIAS NATIONAL

2.3.3 Economic Internal Rate of Return

Economic Internal Rate of Return (EIRR) can be seen in Table 4 (Costs: Project costs and operation and maintenance costs. Benefits: Vehicle Operating Cost Saving . Project Life: 20 years from completion).

Calculation assumptions are shown below:

(1) For traffic volume projections, actual traffic volume of different types of vehicles was used, assuming that the traffic volume will increase at 5% per year. The growth rate of traffic volume at the time of appraisal was also 5%.

(2) PROVIAS's traffic data for different types of vehicle were used to estimate the benefit of Vehicle Operating Costs (VOC). More specifically, the calculation was based on the difference in VOC between before and after pavement on a standard section from HDM-4.

(3) Time benefits were not considered.

(4) Construction costs were the actual costs.

(5) Maintenance and operating costs were 2% of construction costs per year.

(6) Costs and benefits were estimated for 20 years.

Table 4. Economic Internal Rate of Return (EIRR) by Engineering Section

Road Section	At the time of appraisal (%)	At the time of appraisal, recalculated (%)	At the time of ex-post evaluation (%)
Cusco-Abancay	43.5	10.4	11.6
Yura-Patahuasi	37.7	13.6	18.9
Desaguadero-Santa Rosa	17.4	-	9.2

Source: References for appraisal and data from the time of field appraisal

The EIRR in the appraisal documents is calculated by MTC by using the software HDM-3, which is developed by the World Bank. The EIRR are high, but since the details of the calculation procedure are not detailed enough, a comparable EIRR re-calculation could not be conducted. For the comparison of both EIRR at the appraisal

and that at the ex-post evaluation, the EIRR at the ex-post evaluation was calculated under the above assumptions while the EIRR at appraisal were estimated with the projections for traffic volume and project period at the appraisal. Since actual traffic volume in Cusco-Abancay and Yura-Santa Lucia sections surpassed the projection at the appraisal, the EIRR at the ex-post evaluation was more than the recalculated EIRR at the appraisal.

2.3.4 Improvement of traffic safety

A questionnaire survey[6] for the transportation companies, which are the direct beneficiaries, focused on improvement before and after of the project. According to bus operators, 73% of the respondents mentioned a reduction in travel time and 18% referred a reduction in travel cost. According to freight service operators, 44 % of the companies said there was increased safety and 33% said there was a reduction in travel time. From the survey result, it should be noted that the effects include not only the reductions in travel time and costs, but also the improvement of traffic safety.

Fig. 2 Interviews with Freight Operators

Fig. 3 Traffic Volume Survey

2.4 Impact

2.4.1 Economic revitalisation

Comparing before (1997) and after (2003, 2004) the project of the Gross Regional Domestic Product (GRDP) of the provinces where the project was implemented, we can see that, with the exception of Apurimac Province, economic growth in all provinces is above the national average. Given this result, in this project, the development of the arterial roads was presumably the underlying support for the development of the southern inland regions.

[6]No multiple answers allowed. Valid responses from 20 companies, (11 bus companies and 9 truck companies)

Table 5. Gross Regional Domestic Product (GRDP) in the Provinces Where the Project Was Implemented

Province	GRDP (Unit: Millions of Sol)			Average annual growth rate 1997-2004 (%)
	1997	2003	2004	
Apurimac	704	601	600	-2.3
Arequipa	8,698	9,946	10,966	3.4
Cusco	2,795	2,955	3,412	2.9
Puno	1,981	2,376	2,431	3.0
Sub-total	14,178	15,878	17,409	3.0
All Peru	117,214	132,119	138,474	2.4

Source: El Cuanto, Anuario Estadistico Peru en Numeros

Regarding relationship with neighbouring country Bolivia; the number of foreigners' entry from Bolivia to Peru there posted a substantial increase from 74,457 people before the project in 1997 to 138,096 people after the project in 2004. Moreover, the number of foreigners' entry in the border town Desaguadero increased from 13,450 in 1997 to 69,966 in 2004. Puno customs, which has jurisdiction over trade with Bolivia, has recently seen a rapid increase in customs collections, as shown in Table 6. This increase shows that the trading tie with Bolivia has also strengthened.

Table 6. Puno Province Customs Collection Revenue (Millions of US dollars)

Year	2001	2002	2003	2004
Puno customs collections revenue	7.8	8.9	11.6	21.1

Source: El Cuanto, Anuario Estadistico Peru en Numeros

Fig. 4 Border Town, Desaguadero

Fig. 5 Yura Tourism Resources (Hot-Spring Facilities)

2.4.2 Increase in income

A survey of beneficiaries (a household visit survey) living along the road sections was conducted and 135 households responded to the survey. Surveyors asked the beneficial households if they thought their monthly income had increased compared to before the project took place. The results can be summarized in Table 7. In general, those living in the areas along the Cusco-Abancay section and Yura-Santa Lucia section thought that the improvements in the road were related to increases in their incomes; however, those in the Desaguadero-Santa Rosa section felt that their incomes had not increased yet. Since traffic just passes through in Desaguadero-Santa Rosa section, the increase in traffic volume presumably has not stimulated the regional economy.

Table 7. Improvement of Income-Before and After of the Project

Engineering section	Yes (%)	A little (%)	No (%)
Cusco-Abancay	45	26	29
Yura-Santa Lucia	31	24	45
Desaguadero-Santa Rosa	18	22	60

Source: Beneficiary survey (135 households)

In order to evaluate the project with local residents, workshops were held in the settlements of three sections. A large number of residents gave the opinion that the road improvements had been beneficial for them. Some of the residents expressed supportive opinions for the promotion of tourism, citing that will lead to increases in income of the local residents.

Fig. 6 Workshop in Yura

Fig. 7 Workshop in Santa Rosa

2.4.3 Improvement of access

In the aforementioned beneficiary survey, residents were asked whether there were

any improvements compared to before the project took place regarding access to various public facilities. It seems that most residents recognize that their access to public facilities (city hall, hospitals and schools) has improved.

Table 8. Improvements to Market Access

Engineering section	Yes (%)	A little (%)	No (%)
Cusco-Abancay	78	22	0
Yura-Santa Lucia	73	24	2
Desaguadero-Santa Rosa	62	31	7

Source: Beneficiary survey (135 households)

Table 9. Improvements to Hospital Access

Engineering section	Yes (%)	A little (%)	No (%)
Cusco-Abancay	78	17	5
Yura-Santa Lucia	54	33	12
Desaguadero-Santa Rosa	62	23	14

Source: Beneficiary survey (135 households)

Table 10. Improvements to School Access

Engineering section	Yes (%)	A little (%)	No (%)
Cusco-Abancay	82	15	3
Yura-Santa Lucia	60	28	9
Desaguadero-Santa Rosa	62	35	12

Source: Beneficiary survey (135 households)

2.4.4 Environmental impact

During the aforementioned workshops, local residents gave the opinion that there had been negative impacts such as traffic noise, traffic accident, and decreases in natural wildlife. In the aforementioned questionnaire survey of 20 transportation companies, when asked about the number of traffic accidents compared to before the project took place, 15% of the respondents said the number of accident had increased a lot, 40% said the number had increased, 30% said the number had increased a little, and 15% said the number had not increased. In general, the respondents felt that traffic accidents are increasing.

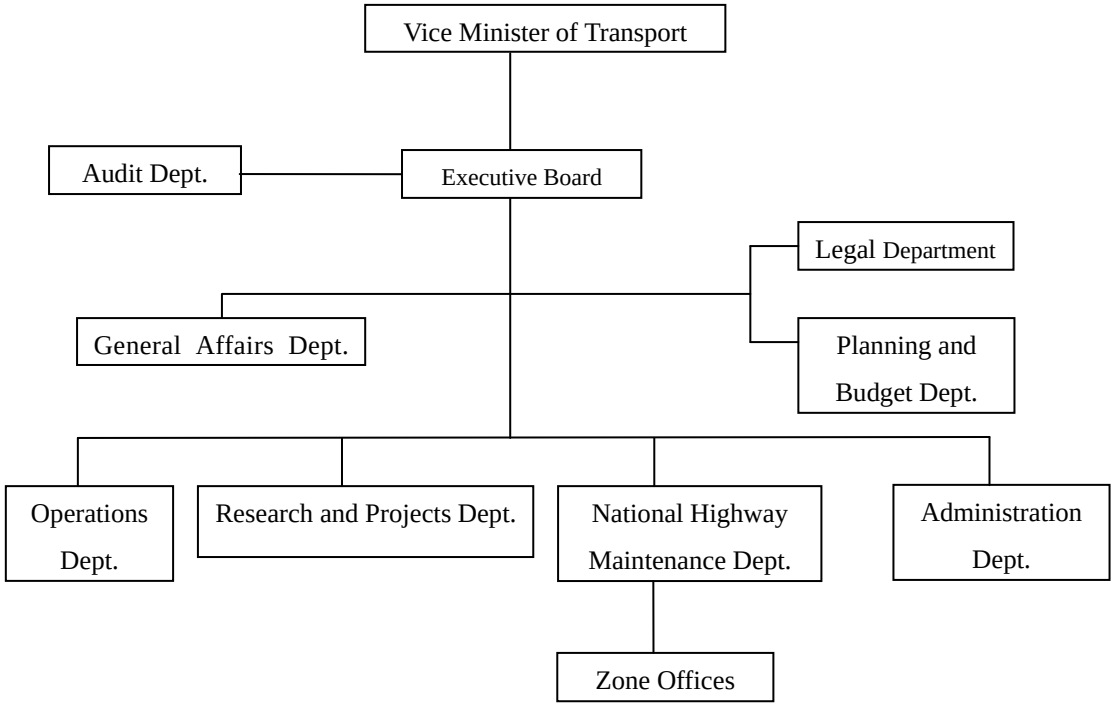
2.5 Sustainability

2.5.1 Technical capacity

PROVIAS NATIONAL assigned superintendent engineers at each section, and no serious problem were seen, with the technical or morale levels reaching the standard. For example, the Arequipa office, in charge of managing the Yura-San Lucia section, has a general manager (engineering work), one technical coordinator, four superintendent engineers, two assistant engineers and one mechanical operator on the engineering side, two administrative staff in the office and two drivers. There are also 25 people including tollbooth collectors, and 10 people for weight inspection stations. Maintenance is carried out according to the annual maintenance plan. As for engineering manuals, road maintenance standards are being prepared.

2.5.2 Structure

Fig. 8 Organizational Chart of PROVIAS NATIONAL



PROVIAS NATIONAL was established under the Ministry of Transport and Communication as a special unit in charge of highway construction and operation and maintenance, by integrating PERT[7] and SINMAC[8]. It is an organization under the jurisdiction of the Vice-Minister of Transport. Conducting construction and operation and maintenance under the same organization has benefits. Foe example, careful attention can be paid to the operation and maintenance phase in the designing and

[7] Proyecto Especial Rehabilitacion Infraestractura de Transportes (the Special Transportation Infrastructure Rehabilitation Project) was established in 1991 in order to implement road projects funded by foreign loans, but later was integrated into PROVIAS.
[8] Sistema Nacional de Mantenimiento de Carreteras (the National Road Preservation System) was established in 1993 to maintain and manage roads developed by PERT, but later was integrated into PROVIAS.

construction phases, and any problems arose for construction phase can easily be dealt with at the time of operation and maintenance.

2.5.3 Financial status

As PROVIAS NATIONAL is an organization under the Ministry of Transport and Communication, government funds are appropriated to PROVIAS NATIONAL, and therefore financial sustainability is presumably secured. For a routine maintenance budget of the national road network, 57 million sol has been allocated from PROVIAS NATIONAL's 2003 toll income of 165 million sol. For a routine maintenance budget of the national road network, 51 million sol has been allocated from the 2004 toll income of 194 million sol.

The required operation and maintenance budget is supplemented by the fee income and for the time being the project effectiveness is not undermined due to a lack of funds.

2.5.4 Operation and maintenance

PROVIAS NATIONAL evaluates the road surface conditions by classifying the IRI[9] into five levels. The Cusco-Abancay section is in level 2 (1.500001-2.500000) and although one part of the Yura-Patahuasi and Desaguadero-Ilo is in level 2, most of these sections are in the level, 1 (0.780000－1.500000), so it can be said that there are no problems with operation and maintenance. From a viewpoint of nurturing small local companies, the responsibility for daily inspections and maintenance has been contracted out to local small companies; side ditch cleaning and minor repairs of pavement are carried out well every day. At the same time, PROVIAS NATIONAL directly conducts maintenance works when dealing with peeling of slope face[10], overlays of pavement[11]. Here also, operation and maintenance is being carried out well and, with the exception of areas with bad geological conditions, appropriate responses are taken. Also, according to the Puno office of the executing agency, in a few subsections with overloaded traffic between Desaguadero and Ilo, appropriate measures are taken such as the early repair of pavement surface, and setting up of weight inspection

Fig. 9 Routine Maintenance Work

[9] International Roughness Index. An index showing the roughness of paved road surfaces.
[10] Artificial slop made by excavation of mountains and embankment
[11] resurfacing works by putting a new layer of asphalt on exciting pavement

stations.

3. Feedback

3.1 Lessons Learned

Appropriate attention is paid to the operation and maintenance of this project. Surface deterioration by overloaded traffic is being dealt with by early repair of pavement surface and setting up of weight inspection stations, and thus the executing agency are taking appropriate actions. For similar road projects, appropriate attention should be paid to operation and maintenance activities. The setting up of weight inspection stations upon the opening of new roads is desirable, especially on sections of roads where overloaded traffic is expected.

3.2 Recommendations

Recommendations for the executing agencies

The primary goal of development of wide-area transportation by improvement and construction of road has been achieved. From the view point of the revitalization of the regional economy, however, further development of the rural (feeder) road network in areas connecting to the arterial roads of this project, and development of “Michino eki” (road station) which can contribute to development of the surrounding areas are desirable. There are abundant tourism resources, for example, hot springs and scenic areas around Yura or ancient ruins and lakes along the Desaguadero-Ilo route. Also, with a view to assuring traffic safety of pedestrians, it is desirable that development of promenade be constructed in cities and towns where the roads pass through.

Comparison of Original and Actual Scope

	Plan	Actual
(1) Outputs Road maintenance		
(1) Cusco-Abancay	129km	49.9km
(2) Yura-Santa Lucia	182.4km	179.4km
(3) Juliaca-Desaguadero	189km	To be improved
(4) Desguadero-Santa Rosa	112.2km	162.2km
Total extension	612.6km	391.5km
(2) Project Period L/A signing	September 1996	September 1996
Consultant selection	April 1996-January 1997	July 1997-April 1999
Consultant services	February 1997-March 1999	September 1998-July 2002
Contractor selection	June 1996-May 1997	June 1997-June 1998
Construction	June 1997-March 1999	January 1999-January 2003
Project Period	31 months	77 months
(3) Project Cost		
ODA Loan Portion	16,421 million yen	16,339 million yen
Local currency	5,474 million yen	6,784 million yen
Total	21,895 million yen	23,123 million yen
	(Rate at time of appraisal: 102 yen/1 US$)	(Weighted average at the time of disbursement: 113.33 yen)