Bolivia

Patacamaya-Tambo Quemado Road Improvement Project

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Field Survey: April 2006

1. Project Profile and Japan's ODA Loan

Map of project area

Photo 1: Upgraded road after the project

1.1 Background

As a landlocked country, Bolivia depends heavily on ports in neighboring countries as vital links in its trade routes for importing and exporting goods. Among these ports, Bolivia's dependence on the Port of Arica located on the Pacific coast in Chile is particularly high. However, infrastructure improvement of the road to Chile's border was lagging, resulting in difficult travel conditions during the rainy season. With the objective of ensuring a stable trade route to the Pacific coast for Bolivia and revitalizing the country's economic and social activities, a request for ODA loan assistance was made to the Japanese government for this project.

1.2 Objective

The objective of this project was to secure a trade route for imports and exports in Bolivia, which is a landlocked country, by upgrading the country's road to the Port of Arica in Chile, thereby revitalizing economic and social activity in that country.

1.3 Borrower/Executing Agency

National Road Service of Bolivia (SNC)

1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	3.955 billion yen 3.81304 billion yen
Exchange of Notes Loan Agreement	October 19, 1992 October 21, 1992
Terms and Conditions - Interest Rate - Repayment Period (Grace Period) - Procurement	 3.0% p.a. 30 years 10 years LDC untied
Final Disbursement	February 19, 2001
Main Contractors	Construcoes E Comerc (Brazil) Alfa (Bolivia), Apolo (Bolivia), etc.
Consulting Services	Hidroservice (Brazil)–Connal (Bolivia) Joint Corporate Body
Feasibility Studies (F/S) etc.	F/S: SNC 1975 F/S Review: SNC 1989
Cooperative Financing	Parallel cooperative financing with the Inter-American Development Bank (IDB) on the segment of the road where the IDB sector connects with the project sector IDB joint financing contribution: US$50.9 million.

2. Evaluation Result

2.1 Relevance

2.1.1 Relevance at the time of appraisal

Under the policy of economic revitalization of the administration in power[1] at the time of the appraisal, improvement of the economic and social infrastructure was cited as a priority policy goal[2], and the promotion of exports was specified as one of the basic strategies for achieving this goal[3]. Furthermore, the Transport Sector Master Plan, which is the basic policy document of the transport sector, also stated among its goals: (1) reduction of vehicle transport costs, (2) promotion of exports, and (3) the improvement of road infrastructure. In addition, among the main overland roads connecting to the Pacific coast in landlocked Bolivia, the shortest route[4] to Chile's Port of Arica is Route 4 to Tambo Quemado at the border. The ratio of Bolivia's exports

[1] Paz Zomora Administration (1989-1993)
[2] According to the 1990 Supreme Decree No. 22407 promoting the integration of economic stability and economic growth, employment, social development, and the modernization of the nation.
[3] Report at the time of the appraisal, September 1992.
[4] There are three major routes to the Pacific coast: the railway to Antofagasta in Chile (1,161km from the capital La Paz), a road (698km, also from La Paz) and a railway (793km) to Matarani in Peru, and a road (490km, also from La Paz) and a railway (441km, also from La Paz) to the port of Arica in Chile.

transported[5] on this road is extremely high at 35% (1990), making the level of importance of this road high. Therefore, as a project in line with Bolivia's high-level policies at that time and the country's economic needs, the project's relevance was high.

2.1.2 Relevance at the time of evaluation

At the time of the appraisal[6], the administration in power had not yet completed either the document for the Basic Plan for National Development or the basic policy document of the transport sector. However, a look at the current situation of transport on the road to Tambo Quemado shows that it carried the largest amount of freight and had the highest rate of growth in freight transport of any road in Bolivia in 2004[7] for all major transport modes. Furthermore, the volume of exports transported via this route is high, so the importance of the road at present remains extremely high. On the other hand, the ratio[8] of paved trunk roads in Bolivia in 2005 remained low at 35.6% (4,018km of its 14,052km roads). Therefore, it can be assumed that trunk road infrastructure will continue to maintain a position of high priority as an important issue in national development and sector policies[9]. Furthermore, Route 4 as a whole, which includes this sector, is considered important as one of South America's east-west corridors from Brazil to Chile, and its priority as the shortest route connecting to the Port of Arica remains unchanged. In addition, in accordance with the Initiative for Regional Infrastructure Integration in South America (IIRSA[10]) proposed by the presidents of 12 countries in South America in 2000, this road sector is expected to play a role in promoting trade in regional economic development across a wide area as part of IIRSA's Bioceanic Central Hub. Therefore, the role expected of this route can be said to have increased in importance and the importance of the project, which aimed at improvement of one of the nation's trade routes, can also be said to have increased in importance at present.

[5] Excluding exports by pipeline
[6] Evo Morales administration, inaugurated in January 2006
[7] Road, railway, aviation, ship transport, and transport by domestic animals; pipelines (mainly for transporting crude oil and natural gas) recorded the largest transportation value in 2004.
[8] The annual average growth rate of road hard-surfacing from 1990 to 2005 was 0.18% (about 145km). The land area of Bolivia is about three times that of Japan and stretches from the Andes plateau area over 5,000m above sea level to the headwaters of the Amazon River about 300 meters above sea level. Because of its rugged terrain, the construction of roads and their operation and maintenance are extremely costly. This aspect coupled with a chronic shortage of funds has been one of the impediments standing in the way of road infrastructure development in Bolivia.
[9] Political chaos continues in Bolivia with three changes of presidents in two years and three months since the resignation of President Sanchez Losada in October 2003 to January 2006. It was in this environment that the current Morales administration came into being. The "Government Program 2006-2010" mentioned above is expected to be completed by July 2006. Following on from this, the formulation of the Traffic Sector Master Plan is also anticipated.
[10] An abbreviation of La Iniciativa para la Integración de la Infraestructura Regional Suramericana. http://www.iirsa.org/acercade.asp?CodIdioma=ESP

Table 2. Value of Bolivia's Exports by Transport Route

(Unit: US$1,000)

From	Connecting to	2000	2001	2002	2003	2004
Tambo Quemado	Port of Arica, Chile	312,910	271,686	285,773	320,884	457,778
Piciga	Port of Arica, Chile	712	831	1,768	2,584	1,928
Desaquadero	Peru (domestic)	56,841	109,224	117,629	157,282	193,257
Other		42,894	45,601	31,986	50,500	92,023
Total Nationally		413,357	427,342	437,156	531,250	744,986

Source: Compiled from annual statistics released by the National Institute of Statistics of Bolivia (INE)

2.2 Efficiency

2.2.1 Output

The project was jointly funded by JBIC and the IDB and the portion of the total road length of 188.1km to be covered by the JBIC ODA loan was a section 56.3km in length. Major changes between the original plan and actual performance of the project are shown in Table 3. Due to the request of the executing agency,

(1) The procurement of spare parts was transferred in part to the upgrade of the main road and (2) disaster recovery and disaster prevention construction were added; however, the road upgrade, which was the main project, was executed according to the plan details.

Table 3. Output

	Original Plan (Time of Appraisal)	Actual Performance (Ex-Post Evaluation)
(1) Upgrade of the Road Body	1) Extension JBIC loan sector: 56.3km; Sector jointly funded by IDB (Inter-American Development Bank): 136.4km (including 131.8km for the main route and 4.6km for the access roads) Total: 192.7 km	As planned
	2) Width Main route: Lane width: 3.5m x 2 lanes + road shoulders 1m x 2 = 9.0m Bridge section: Lane width: 3.5m x 2 +	(Partial modification) Main route: Lane width: 3.5m x 2 lanes + road shoulders 2m x 2 = 9.0m Bridge section Lane width: 3.0m x 2 + road shoulders 0.65m x 2 = 7.3m

	road shoulders 0.65m x 2 = 8.3m	
	3) Design Speed 100km/h	As planned
	4) Paving Structure Main road: Surface thickness: 2cm (2 layers), upper roadbed layer 20cm, lower roadbed layer 15cm	Main road: Surface thickness: 2cm (modified to 3 layers), upper roadbed layer 20cm (as planned), lower roadbed layer 15cm (as planned)
	5) Shelters	(Additional) Established at 2.5km intervals (4m width x 50m length)
	6) Other Construction	(Additional) 1) Restoration and disaster prevention construction in areas that sustained damage or deterioration (landslides and road shoulder damage) due to heavy rains during abnormal weather conditions 2) Reinforcement of pavement damaged by excessive loads.
(2) Bridge Construction	Construction of concrete bridges in 2 places: One 120m bridge over the Queto River One 210m bridge over the Desaquadero River Effective width of 8.3m for both bridges	Construction of concrete bridges in 2 places: One 90m bridge (amended) over the Queto River, and one 210m bridge (as planned) over the Desaquadero River, with an effective width of 7.3m (amended)for both bridges
(3) Operation and Maintenance Machinery and Materials, Spare Parts, etc.	Procurement of spare parts for equipment used for road maintenance and management such as bulldozers	Due to regional decentralization, Bolivia's road works organization (SNC) ceased to require special operation and maintenance equipment. Therefore, as a result of an application by the executing agency, arrangements were reorganized in March 2006 as follows[11]: 1) Procurement of spare parts and operation and maintenance vehicles: 42% of the initial amount 2) Transfer to additional construction works in (1)-6: 58% of this

Source: Project Completion Report, SNC 2006

2.2.2 Project period

The initial plant for the road works to upgrade the main body of the road and bridges,

[11] Application lodged by the executing organization, March 2, 2000

which was the main component covered by the JBIC ODA loan, was for it to be completed in July 1996 after a period of 16 months. However, due to the reasons stated below, all outputs were not completed until February 2001 after a further period of approximately 56 months (project period performance of 101 months).

Main factors in the extension of the project period

1) Delay in the selection of a road construction company and delay in starting construction (an approximate 16-month delay in the completion date)
2) Delay in procurement procedures for spare parts (an approximate 25-month delay in the completion date)
3) Extension of the construction period due to additional construction work (an approximate 28-month delay in the completion date)
4) Road blockade from September to October 2000 due to a general strike (an approximate three-month delay in the completion date)

The main reasons for the above factors (1) through (3) were as follows:

1) Delay in SNC's procurement procedures
2) A decline in the SNC's project execution capability accompanying regional decentralization
3) Heavy rain disasters occurring from the end of 1996 to the beginning of 1997

2.2.3 Project cost

The total cost of the project in yen terms decreased by 3.5%. This was largely due to a strengthening of the yen[12]. As a result, it became possible to undertake measures for a number of additional project costs[13] to enhance the sustainability of the project. Disaster restoration construction following the upgrades resulted in an increased domestic currency burden of about US$2.71 million (equivalent to 54% of the domestic currency projection at the time of the planning of the project).

[12] The yen/dollar exchange rate at the time of the appraisal was 135 yen/US$1. In contrast, the rate from 1993 to 1994 when the main road construction, which was the main portion of the loan, was executed was ¥111.80 /US$1 to ¥99.76 /US$, equivalent to a 20 to 35% increase in value of ODA loan.
[13] "Other" construction in (1)-6)of Table 3

Table 4. Project Costs

	Original Plan	Actual	Actual Performance/ Plan Ratio
ODA Loan Portion	3,955 million yen US$29.296 million 1US$ =135.00 yen[14]	3,813 million yen US$35.096 million 1US$ =108.65 yen[15]	3.5% under the original plan
Portion Financed by IDB	US$50.9 million	US$50.900million	As planned
Local Currency (Government of Bolivia) Portion	US$5.0 million	US$6.485million	29.7% over the original plan
Total Cost of the Project	US$90.9 million	US$92.48 million	1.7% over the original plan

Source: Materials at the time of appraisal (1990), JBIC Project Completion Report, SNC 2006, IDB Project Completion Report, SNC 2002

2.3 Effectiveness

(1) Ensuring stable passage on Route 4 from Patamacaya to Tambo Quemado

1) Reduction in annual number of days when transit is impossible

Because road surface conditions of the targeted road segment deteriorate during the rainy season each year, passage on the road was not possible intermittently for approximately 180 days of the year. However, following completion of the road, all impediments to passage on the road due to poor weather were resolved and stable passage throughout the year became possible. In January 1997, flooding of the road and erosion damage of the road shoulders occurred as a result of heavy rain but the situation did not reach a stage where the road became wholly impassable, and no closure of the road due to natural disasters has occurred to date. Therefore, it can be said that the planned value was achieved.

Table 5. No. of Days a Year Road Surface Conditions Make Transit Impossible

Year	1991 (Prior to Completion)	Planned Value	1998 (Performance 2 Years after Completion)	2001 (Performance 5 Years after Completion)
No. of Days Transit is Impossible	Approximately 180 days a year	0 (Stable transit ensured throughout the year)	0 (See left)	0 (See left)

Source: Appraisal materials (1990), results of interviews at the SNC La Paz regional

[14] Exchange rate at the time of the appraisal

[15] Exchange rate divided by the actual loan amount (yen) as a dollar indication of the actual yen loan according to the Project Completion Report (compiled by SNC in 2006)
3,813.043 million yen/US$35.0955 million=108.65 yen/US$1

office

2) Improvement in the ease of road travel

This route had in the past been an unpaved dirt and gravel road (one sector) that went through wilderness. As a result, ease of travel was poor due to the presents of ruts and holes in the road. This compromised the load safety of trucks and the safety and comfort of the passengers in buses and passenger vehicles[16]. The road was fully paved as a result of the project, thereby resolving previous obstructions standing in the way of safety and comfort of travel on the road.

Photo 3. Previous Road (Samaja environs)

Photo 4. New Upgraded Road (Tambo Quemado environs)

3) Reduction in travel time

Travel time required for each type of vehicle for the entire 188.1km sector in periods when travel on the road was possible was reduced by between 2 hours 10 minutes and 3 hours 52 minutes[17]. Large trucks in particular had required about seven hours or more[18] to travel the length of the road prior to completion of the project but after completion were able to travel the distance in just under four hours. Therefore, the project value was achieved.

[16] In interviews with freight truck drivers from Chile at Tambo Quemado Customs, drivers indicated the reason for using this route was the higher degree of safety for loads in comparison with Route 12 from the port of Iquique to Oruro in Chile.

[17] Based on the IDB Ex-Post Assessment Report and actual measurements by SNC, traffic volume forecasts were made and calculations using the HDM3 software program were undertaken. HDM3 is a computer software program developed at the initiative of the World Bank for estimating investment plans for road construction as well as road maintenance and management in developing countries. (http://hdm4.piarc.org/html/info/abouthdm-e.htm)

[18] According to the SNC La Paz office, which has jurisdiction over this area, it sometimes took up to 12 hours for some trucks to complete the journey depending on the conditions of the road surface.

Table 6. Travel Time for Each Sector

(Unit: hours/entire sector length)

Type of Vehicle	Prior to Completion (hrs/227.0km entire length)	After Completion (hrs/188.1km entire length)	Reduction in Travel Time Following Completion (hours)
Compact Cars	4.09	1.99	2.10
Buses	5.55	2.67	2.88
Large Trucks	7.29	3.77	3.52

Source: Calculations based on IDB Ex-Post Evaluation Report (2002)

4) Savings in travel costs

Table 7. Reductions in Travel Costs by Main Vehicle Types(US$/Vehicles)

Sector		Sector 1: Patacamaya- Rio Desaquadero	Sector 2: Rio Desaquadero-Osani	Sector 3: Osani-Tambo Quemado
Distance		56.3km	62.4km	69.7km
Cost Reduction	Compact Cars	7.32	13.73	13.25
	Buses	13.51	17.47	19.53
	Trucks	21.96	31.82	33.48

Source: IDB Ex-Post Evaluation Report (2002)

Travel costs for each sector are estimated to have been reduced about US$9.82 million/year two years after completion and US$10.75 million five years after completion.

Table 8. Annual Cost Reductions in Travel

(Calculations based on per 188.1km for all sectors)

Year	1998 (2 Years after Completion)	2001 (5 Years after Completion)
Cost Reduction (US$1,000/year)	9,817	10,750
Source: Calculations based on IDB Ex-post Evaluation Report 2002		

5) Increase in traffic volume

Execution of the project made it possible to ensure stable, efficient passage on the road throughout the year. As a result, the volume of traffic utilizing the road increased. In the two years following completion of the 188.1km Patacamaya-Quemado sector,

traffic volume increased 221-499%, and in the five years following completion is expected to increase 246-553%. This is equivalent to 133-270% of the projection value for each year estimated at the time of the appraisal in 1990 and significantly exceeds the planned value. Therefore, it can be inferred that the effects of the project are being adequately demonstrated.

Table 9. Changes in Average Daily Traffic Volume over 9 Years

(Unit: vehicles per day)

Sector *	1990 Performance prior to completion	1998 Performance 2 years after completion (Projection at the time of appraisa1)	2001 Performance 5 years after completion (Projection at the time of appraisal)	Prior to completion/ after completion (%)		Prior to completion/after completion (%)	
				2 years after completion	5 years after completion	2 years after completion	5 years after completion
Sector 1	175	386 (284)	430 (323)	221%	246%	136%	133%
Sector 2	77	384 (212)	426 (241)	499%	553%	181%	177%
Sector 3	77	381 (141)	422 (160)	495%	548%	270%	264%

Source: Compiled from data from IDB Ex-Post Evaluation Report (2002)

* See Table 7 for names of sectors.

(2) Economic Internal Rate of Return（EIRR）

Table 10. EIRR: Comparison of the Plan at the Time of the Appraisal and Performance

	Plan (at the time of the Appraisal)	Actual (at the time of the Ex-post Evaluation)
EIRR	9.3%	9.5%
Sector	Entire 188.1km of the IDB/JBIC jointly financed sector	
Benefits	Time-saving and travel cost benefits	
Costs	Project costs, maintenance and management costs	
Project Life	30 years	

Using the updated figures at the time of the ex-post evaluation, detailed calculations were done using the HDM-3 program[19]. The EIRR was 9.5%, 102% of the achievement rate compared with the calculated value of 9.3% at the time of the evaluation.

[19] The “Highway Design and Maintenance Standards Model” is a computer software program developed at the initiative of the World Bank for preliminary calculations of investment plans for building roads and estimating road operation and maintenance costs in developing countries.
http: // www. worldbank. org / transport / roads / rd_tools / hdm3. htm

Therefore it can be said that the target economic effects were achieved. Because the actual calculation sheet at the time of the appraisal was not available, an exact comparison was not possible. However, in spite of traffic volume projections significantly exceeding the planned value the EIRR values were similar. Therefore, it may be inferred that this was due to more detailed[20] calculations of the car sector undertaken during the ex-post evaluation and benefit calculations as well as an effective increase in the dollar-denominated project costs due to a stronger yen.

2.4 Impact

2.5

(1) Increase in import/export volume

1) Increase in export/import value at Tambo Quemado Customs

Table 11. Transition in Export Value at the Tambo Quemado Customs Site

(Unit: US$1,000)

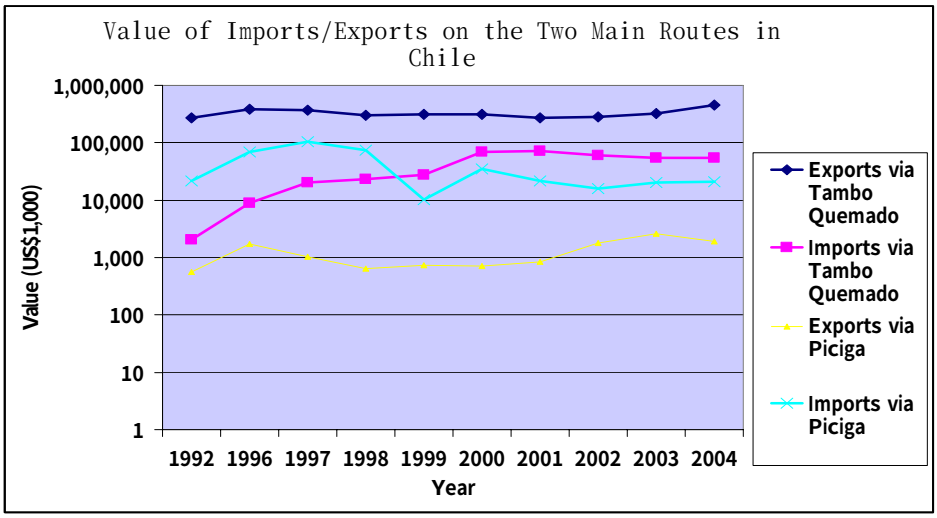
Year	Value		Compared with 1992	
	Exports	Imports	Exports	Imports
1992 (prior to execution of the project)	273,073	2,072	100%	100%
1998(2 years after execution of the project)	305,798	23,020	112%	1,111%
2004 Average (for the entire period following execution of the project)	328,791	47,398	120%	2,288%

Source: Bolivia National Institute of Statistics

The volume of traffic increased and the volume of import/export freight passing through Tambo Quemado Customs at the Chilean border increased due to the execution of the project. As a result, the value of exports in the second year after completion (1998) of the road upgrades increased 112% in comparison with 1992, and the average annual value of exports from the year following completion to 2004 rose 120%. During the same period, the value of imports soared dramatically by 1,111% and 2,288% respectively.

2) Increase in value of imports/exports transported via Chile

[20] At the time of the appraisal, there were three types of vehicles: (1) passenger vehicles, (2) buses, and (3) trucks. At the time of the ex-post assessment , there were seven types of vehicles: (1) passenger vehicles, (2) pick-up trucks, (3) buses, (4) small trucks, (5) mid-size trucks, (6) large trucks, and (7) refrigerated trucks.



The project is having an impact on the growth in trade volume transported via Chile's major trading ports. Total export value via the Tambo Quemado-Port of Arica route, which is the main route to Chile's ports on the Pacific Coast (Route 4), and the unpaved road Piciga-Port Iquique route (Route 12) two years following completion of the road upgrade (1998) increased 112% compared to exports in 1992. Furthermore, the average annual export value from the year following the upgrade until 2004 increased 121%. The value of imports also increased greatly during the same periods by 408% and 361% respectively. In comparison with the value of imports transported via Piciga, which suddenly fell dramatically, import value transported via Tambo Quemado continues to increase. Therefore, it can be assumed that vehicles which previously traveled via Route 12 shifted to using this road following execution of the project[21] and that the overall volume of imports also increased.

[21] In interviews with a number of freight truck drivers from the Port of Iquique at Tambo Quemado Customs, the drivers indicated that after the completion of the road upgrade in 1996, they switched from using the unsurfaced Route 12 to this route which is entirely hard surfaced.

Table 12. Transition in the Value of Imports and Exports at the Two Major Customs Sites Bound for Chile (Unit: US$1,000)

Customs (Route)		1992 Prior to Project Execution	1998 2 Years After Project Execution		1997-2004Annual Average Average After Project Execution	
		Total	Total	Comparison with 1992 (%)	Total	Comparison with 1992 (%)
Tambo Quemado (Route 4)	Exports	273,073	305,798	112%	328,791	120%
	Imports	2,072	23,020	1,111%	47,398	2,288%
Piciga (Route 12)	Exports	552	643	116%	1,281	232%
	Imports	21,585	73,557	341%	37,977	176%
Total for both Routes	Exports	273,625	306,441	112%	330,072	121%
	Imports	23,657	96,577	408%	85,375	361%

Source: Bolivia National Institute of Statistics

Photo 5. Trucks Entering Bolivia from Chile (Tambo Quemado Customs)

(2) Contribution to the economic development of Bolivia

1) Increase in the value of Bolivia's major export products

Bolivia's main exports in order of value are (1) oil and natural gas, (2) processed foods (table meat, vegetables, fruits, soy beans and oils and fats), and (3) non-ferrous metal ores (tin, lead, zinc, and antimony, etc.). Following the execution of the project, the total combined export value of items (ii) and (iii) exported via the upgraded road[22] increased 160% and for (ii) alone, export value increased 258%. The export value of these is included in the freight exported via this route, so it can be said that the project is contributing to boosting Bolivian exports by facilitating the transport of the country's major products.

[22] The total annual value of Bolivia's exports in 2004 was US$2.254 million. Of this, US$847,000 (about 38%) was derived from hydrocarbon products (petroleum and natural gas raw materials) which were exported to neighboring countries via pipelines. Of the remaining 62%, the export value of products transported via Tambo Quemado was US$458,000 dollars, equivalent to about 20% of the country's total export value.

Table 13. Export Value of Bolivia's Main Products

(Unit: US$1,000)

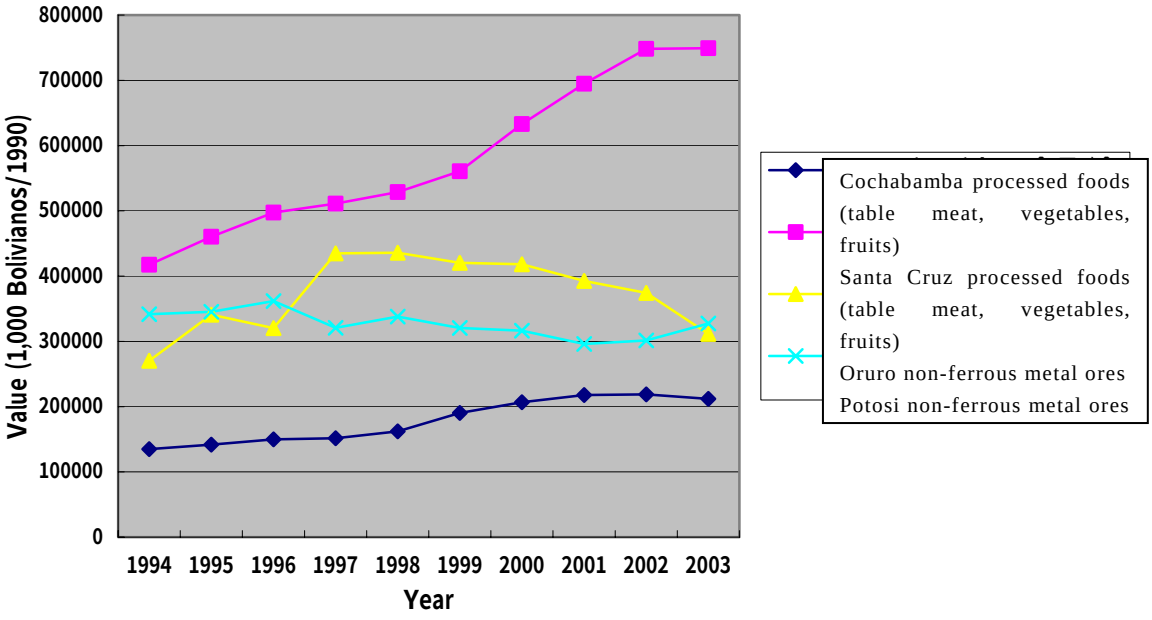
Export Items	Rank in Order of Export Items (2004)	Main Producing Departments	1994-1996 (Average Prior to Execution of the Project)	1997-2004 Annual Average (Average After Execution of the Project)	
			Value	Value	Before/ After Project
Processed Foods (table meat, vegetables, fruits)	2nd	Santa Cruz Cochabamba	117,752	303,883	258%
Non-ferrous metal ores	3rd	Oruro Potosi	218,522	234,346	107%
Total			336,274	538,229	160%

Source: Compiled from annual statistics by the Bolivia National Institute of Statistics

2) Increase in GDP of export products by region

The major producing region of Bolivia's main export products are Santa Cruz and Cochabamba for processed foods and Oruro and Potosi for non-ferrous metal ores. The GDP for each of these items by region is increasing. The overall growth in processed foods in Santa Cruz in particular is conspicuous and year-on-year growth for non-ferrous ores in 1997 following the completion of the project for the department of Oruro was about 36%. Therefore, the project can be said to be contributing to the GDP growth of these sectors in Bolivia.

Fig. 3. Major Export Products by Department GDP
Source: Compiled from Annual Statistics, Bolivia National Institute of Statistics



(3) Contribution to economic development of areas along the highway

1) Growth in the transport industry

A comparison of the GDP of the transport sector in Oruro department before and after execution of the project shows an increase of 165% following execution of the project. Annual GDP growth also rose dramatically from an annual average of 4.3% to 11.8%. The main transport industries are bus and truck transport and it can be inferred that the increase in traffic volume as a result of the project is contributing to an increase in the sector's GDP.

Fig. 4. Trends in GDP in the Transport Sector of Oruro Department

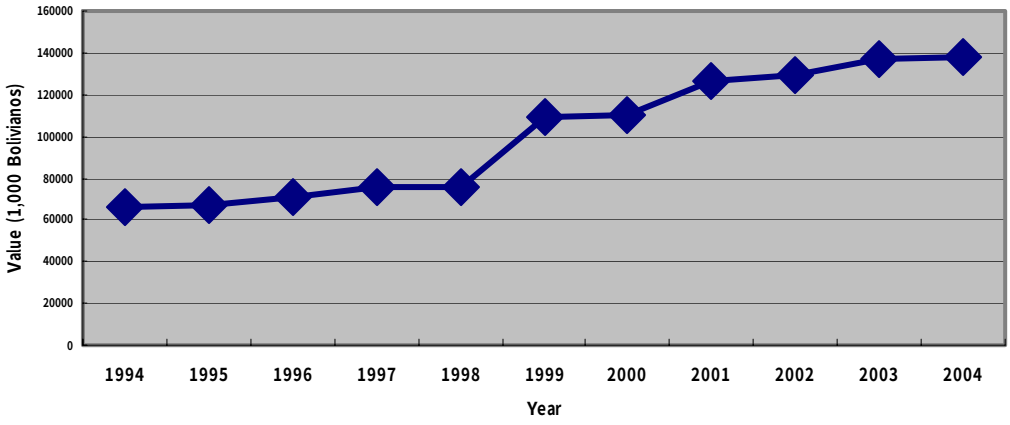


Table 14. GDP Trends in Oruro's Transport Sector

Unit: 1,000 Bolivianos

	1995-1996 (Average Prior to Execution of the Project)		1997-2003 Annual Average (Average After Execution of the Project)		
	Value	Rate of Growth	Value	Before/After Project	Rate of Growth
Oruro	68,122	4.3%	112,716	165%	11.8%
Bolivia Overall	1,588,974	6.1%	1,895,890	119%	2.7%

Source: Compiled from annual statistics by the Bolivia National Institute of Statistics

In a separate survey of five bus companies[23] in the department of La Paz, subjects responded that both local bus routes and international bus routes bound for Chile using the route which was upgraded during the project had increased dramatically in terms of

[23] The local bus companies are: Sindicato Mixto de transporte Aroma, Patavcamaya (Company A) and Sindicato de Transportes Sajama, Patacamaya (Company B). The international bus companies are: Trans Nuevo Continente, La Paz (Company C), Trans Salvador, La Paz (Company D), and Trans Internacional Litoral La Paz (Company E).

the number of routes and the number of trips. The five companies responded that both their sales and earnings had increased following completion of the project. Furthermore, there were seven companies (five of these Bolivian) with regular bus routes linking the ports of Arica and Iquique in Chile with the Bolivian capital La Paz and six of these (four of these Bolivian) had commenced transport operations in 1998 following the road upgrade executed by the project. Therefore, it can be said that the project is contributing to the growth of regional passenger transport services.

Table 15. No. of Bus Routes Utilizing the Project Sector and No. of Trips

Outline of Transport Operators				Prior to Execution of the Project (1996)		After Execution of the Project	
Vehicle Type	Company	Company Location	Main Destinations	No. of Travel Routes	Average No. of Trips Per Week	No. of Travel Routes	Average No. of Trips Per Week
Domestic Omnibus Microbuses	Company A	Patacamaya (La Paz)	Tambo Quemado, Sajama, Curahuara, Cosapa, Lagunas	0	0	Unscheduled	17
Regular Route Buses	Company B			7	8	7	84
International Regular Route Buses	Company C	La Paz City	Arica (Chile)	1	Arica-La Paz 2	2	Arica-La Paz 5 Arica-Iquique 5
	Company D			0	0	2	Arica-La Paz 7 Arica-Iquique 7
	Company E		Iquique, Chile	0	0	2	Arica-La Paz 5 Arica-Iquique 5

Source: Ex-post Evaluation Survey, April 2006

Photo 6
Short-distance Regular Route Bus (Patacamaya)

Photo 7
Omnibus Microbus

Photo 8
International Regular Route Bus Bound for Arica, Chile

2) Increase in investment

In areas along the road in the regions of Oruro, investment projects promoting industrial development and improvement in communications infrastructure described in the table below have either been executed or are in the planning stages. All of the projects were planned on the premise that completion of the project would result in improving import/export access.

Table 16. Oruro Investment Projects Planned as a Result of the Road Improvement Project

Project Description	Main Organizer	Desired Results	Project Status
Oruro city industrial complex development plan	Oruro Chamber of Commerce, Oruro city, Oruro Department	Expansion of distribution and production of imported vehicles and industrial products for export	Completion of a detailed plan in 2005
Construction of a network of industrial complexes	Oruro Department	Confirmation of potential development of industrial complex	Preliminary survey in 2005
Production sector network survey	Chamber of Commerce	Cross-sectional industrial development	Preliminary survey underway from 2005 to 2007
Residential development targeted for small and medium-sized enterprises within the industrial complex and the market	Association of small and medium-sized enterprises	Promotion of products for export by small and medium-sized enterprises	Residential construction works undertaken at a total project cost of US$11.78 million
Expansion of telephone line network in Oruro city and other urban areas	Oruro Telephone Company	Expansion of telephone line network in the area along Route 1 between Patacamaya and Oruro	Construction undertaken at a total project cost of US$2.47 million
New development of three mines within the department: Coichaca, Poopo, and Japo	Various mining companies	Revitalization of mining sector within the department	Commencement of development in succession 2004-2005

Source: Department for Planning and Coordination of Oruro Prefecture (April 2006)

Furthermore, in interviews with 135 residents living in a wide area along the road, 75 respondents, equal to 57% of respondents, said that they felt there had been an increase in land transaction prices since the execution of the project.

3) Establishment of special bonded areas

In 2005, a dedicated bonded warehouse (corporate enterprise)[24] for cars and car parts was established in Patacamaya in the department of La Paz, the starting point of the project. This is a venture launched in anticipation of an increase in secondhand car imports mainly from Japan via the upgraded route.

Photo 9. Automobile Bond Depository Established at Patacamaya, the Project Starting

[24] Zona Franca Comercial e Industrial Zofrapat S.A. (Zofrapat Commerce and Industry Bonded Area Company)

Point

(4) Impact on development policies of areas along the road

In Oruro's Social and Economic Development Plan 2004-2007 (PDDES[25]), which is the department's basic development plan, the following policy goals were adopted taking into consideration the effects of improved access to Chile as a result of the project[26]:

(1) To promote the social and economic development of the department by functioning as a hub[27] for the east-west corridor connecting the coasts of the Pacific and Atlantic Oceans

(2) To establish a tourism infrastructure and develop the tourism industry to introduce the cultural heritage in the department

(5) Improvement in benefits of residents living along the road

In a supplementary interview of residents along the route, the impact in areas described in 1) through 4) below was confirmed[28]. While the main focus of this project was to secure a national-level trade route, by doing so, it can be said that the project also brought about an improvement in benefits for the residents along the route.

[25] http://www.preforuro.gov.bo/pdds/pdfs/capitulo_06.pdf

[26] The relationship with the project was confirmed in a meeting with the governor of the department of Oruro (Mr. Alberto Luis Aguilar) at the time of the appraisal on 14 April 2006.

[27] The SNC at the moment is moving ahead with the hard surfacing of Route 12 which links Oruro city to the Port of Iquique, Chile via Piciga, with loans from the Italian government and CAF (Andean Development Corporation). Oruro hopes to become the hub on the project route (Route 4), Route 12, the two routes on the Chilean side, as well as routes from the major cities in Bolivia and from the Atlantic.

[28] The area along the road of the project is in the Andes plateau area of Altiplano. The combined population of this area is about 10,333 and is concentrated in three communities: Patacamaya, the starting point of the route with a population of 8,414; Curahuara de Carangas, which is about 100km from Patacamaya with a population of 1,314; and Tambo Quemado, which is on the Chilean border with a population of 305. The rest of the population consists of scattered households which earn their living by raising livestock and growing crops such as potatoes, etc. The population of the department of Oruro, which includes the area along the route, is 390,000 and the population of the department of La Paz is 2.350 million, with a combined total of 2.74 million. This is about 200 times more than the population of the immediate roadside areas along this route. Therefore, it is difficult to grasp the socioeconomic impact on the area along the route at the department level.

Table 17. Summary of Target Samples of Interviews with Residents

Local population target		25,622
No. of Samples	Commercial Areas	4141 residents/ 3 areas
	Urban Areas	54 residents/ 9 areas
	Farming Villages	40 residents/ 23 villages
	Total	135
	Men/Women	65/70 .
Age Range		18-78 years

Source: Social Survey during Ex-Post Evaluation Survey (April 2006)

1) Expansion of public transport

Ninety-three percent of all respondents stated that public transport in the region had improved as a result of the project. Details of this improvement are shown in Table 18. These findings are also supported by the increase in the number of bus routes and the increase in the number of trips via the project route as mentioned earlier.

Table 18. Increase in Public Transport as Perceived by Residents

Details of Increases in Services	Ratio of Respondents (%)
Increase in No. of Omnibus Microbuses	54%
Increase in the No. of Regularly Scheduled Buses	33%
Increase in the No. of Omnibus Station Wagons	86%
Increase in No. of Omnibus Trucks	51%
Commencement of New Transport Services (Taxis, Omnibus Bikes)	37%

Source: Social Survey during Ex-Post Evaluation Survey (April 2006)

2) Increase in mobility opportunities

Forty-nine percent of all respondents (more than 60% of them women) indicated that they used the road at least once a week, and 68% (more than 50% women) responded that mobility on the road was at a level where it adequately met their needs and that mobility opportunities had increased subsequent to the execution of the project[29]. In terms of the main mode of transport, as shown in Table 18, 94% of the people indicated that they used public transport[30] service while the remaining 6% indicated that they use private transport methods[31]. As a result, it can be assumed that due to the reduction in transport costs resulting from execution of the project, public transport services increased as well as mobility opportunities of residents living in areas along the road.

3) Increase in mobility scope

Ninety percent of the respondents indicated that their use of the road and the range of their movement on the road had increased after execution of the project. In terms of purposes for using the road, a total of 75% of respondents indicated that they were involved in sales of agricultural products (mainly llama and beef table meat, etc.[32]), sales of other goods (mainly the sale of food and drinks along the road[33] and buying and selling at markets), and public transport services as indicated in Table 18[34]. A further 13% indicated that they used the road to commute to work[35], 3% indicated they used it for other economic activities[36], 8% indicated that they used the road for leisure purposes[37], and 1% for commuting to school. Excluding those using the road for leisure and commuting to school, 91% of the respondents indicated that they use the road for some form of economic activities. Therefore, it is evident that, a reduction in transport

[29] Thirty-six percent of the respondents indicated that there was a significant increase in mobility opportunities while the remaining 32% indicated that transportation opportunities had increased to the level to sufficiently meet their needs. Responses from interviews with local residents also indicated that the time required to travel had been longer due to the poor road surface prior to the implementation of the project and, as shown in Table 15, the frequency of travel before the project was at least half of the current level due to the lower operating frequency of public transportation, and the vehicle traffic becoming extremely difficult during the rainy season.

[30] Omnibus (collective) and wagon cars 75 %, regular, scheduled buses 7%, trucks 4%, taxis and motor bikes 8%

[31] Bicycles 4% and private cars 2%

[32] Lamas are mainly fattened in the highlands about 100km from the starting point of the project road at Patacamaya, heading towards Tambo Quemado at about 4,000m above sea level or higher. Grazing areas spread over a very wide area extending tens of kilometers from the road area to hinterland. The number of head owned ranges from a few to hundreds. The main shipping locations for lamas are the markets in Curahuara de Carangas and Patacamaya on the project road sector. The animals are shipped live in omnibus trucks or cars belonging to middlemen. Cattle are also fattened on the Patacamaya side. The scale of operations for cattle is small, ranging from one to several head.

[33] Near the Tambo Quemado custom office and the vicinity of bus stops in the roadside communities, there are many outdoor stalls selling soft drinks, beans and sweets run by residents living along the road. An increase in the number of these stalls was reported as a result of the increase in traffic due to the project.

[34] The public transport service companies indicated in Table 18 are mainly located in Patacamaya. There are also a small number of private operators in Curahuara de Carangas. The numbers of local residents involved in transport are reported to be increasing.

[35] Those who go to La Paz to make payments or give or receive credit (2%), management of real estate (1%).

[36] People commute to companies, shops and private stalls in Patacamaya mainly from Cañaviri, which is 15km away, and the vicinity of Calteca, which is 30 km away, mainly by using omnibus-type microbuses or station wagons, scheduled bus services, etc.

[37] Those who go to towns to shops and restaurants, etc. in La Paz, Oruro and Patacamaya.

costs and an increase in public transport services following execution of the project resulted in expanding the reach of economic activities including the business and work activities of residents along the road.

4) Increase in household income

Seventy-four percent of all respondents indicated that the project was directly related to an increase in their household income while 18% said that it had an indirect effect on increasing their household income. Furthermore, 61% of all respondents indicated that their cash income had increased following the execution of the project. As reasons for this, 43% of the respondents (60% of them women) indicated that there was an increase in commodity sales prices, 23% (70% of them women) indicated that they had commenced new commercial activities, and 12% (80% of them men) indicated that they had gained new employment activities. In view of the responses described in 1) through 4), it can be assumed that the reduction in travel costs and an increase in public transport services achieved through the execution of the project resulted in: increasing the mobility opportunities for residents living along the road, expanding the range of their economic activities as well as revitalizing economic activity, enabling agricultural products to be sold under advantageous conditions, and increasing business and work opportunities. Therefore it can be inferred that these factors led to an increase in household income. Furthermore, it can be assumed that the increase in opportunities in commercial activities and trading at markets along the road has also resulted in providing new cash income opportunities for women.

5) Improvement in the living environment

Ninety-three percent of all respondents indicated that there had been an improvement in their living environment in some way following the execution of the project, and 94% said that access to public services had improved. In terms of specific areas, 85% indicated that there had been an improvement in access to health and medical services[38], 73% an improvement in access to markets and shopping, 26% improved access to schools[39], and 29% improved access to Catholic churches. Therefore, the project's contribution to improvement in these areas of the living environment of residents along

[38] There has been improvement not only in access to transportation to visit hospitals, emergency transport to hospitals in Patacamaya, and access to healthcare posts in Curahuara de Carangas, but it has also become easier for midwives to make house visits. In Oruro department, which includes areas along the road of the project, 47% of births are home deliveries assisted by visiting midwives. (Annual Report 2004, National Statistics Bureau)

[39] The education system in Bolivia is: eight years' compulsory education for elementary education from age six; four years for secondary education; and three to five years for university. In areas along the road of the project, middle schools are located in Patacamaya and Curahuara de Carangas. This indicates that commuting to these schools has become easier. Universities are located in the department seats of government such as Oruro and La Paz, and students who go on to tertiary education board in lodgings.

the road is recognized.

6) Negative impacts

Thirty-six percent of respondents indicated that the upgrade of the route had caused some damage to the living environment. In specific terms, 61% of respondents indicated air pollution resulting from exhaust gas emissions from cars, 39% from vibrations caused by automobiles, and miscellaneous reasons included deaths of animals and people[40] due to traffic accidents as well as littering. However, apart from the area in the vicinity of the intersection with Route 1 at the beginning of the route in Patacamaya, the road does not pass through any villages or urban areas and the volume of traffic is low at around 430 vehicles a day[41] (2004 estimated value a rate of one vehicle about every three minutes on average); therefore, it can be inferred that many of the responses regarding environmental damage due to noise and air pollution were based largely on impressions. On the other hand, there is a considerable proportion of large trucks with full loads on the road, and vibrations felt by respondents in city areas may have been reflected in the responses.

(6) Impact on the environment

Cooperative financing funds from IDB were used for environmental impact assessments for the entire route including the sector financed by the JBIC ODA loan. To keep the impact on the environment to a minimum, the measures described below were taken. The area's cultural and natural assets have subsequently have become protected in a more sustainable and planned manner and are being utilized in the ongoing development of the region's tourism industry.

1) Impact on the pre-Inca ruins in the environs of the Rio Desaquadero River

Scattered along a section of the road funded by the IDB are ancestral tombs which were built in the pre-Inca period and these are protected under the management of Bolivia's National Institute of Archeology (INAR). Under the guidance of INAR, the contours of the road were redrawn to circumvent these ancient graves. Parties involved in the construction operations were prohibited from causing any damage to these sites and initial plans to use a certain digging site for extracting soil were canceled due to concern over the possible impact on the area. As a result, a separate site nine kilometers

[40] There were no reliable statistics on traffic accidents and it is uncertain whether the number of accidents on the upgraded sector increased or decreased.

[41] This was not a project in response to general traffic demands; rather it was aimed at securing import/export routes by upgrading road infrastructure and by promoting economic and social revitalization. The allowable traffic volume. The declared traffic volume sufficiently meets the initial plan value (337 vehicles/day by the estimated value 2002).

away was chosen as the site for extracting soil. A protective net to prevent degradation of the ruins was placed over the Chulpa and an information board explaining to visitors the historical background of the ruins was erected to gain the cooperation of the public in preserving this tourism asset.

2) Preservation of church and buildings in Curahuara

From the perspective of cultural heritage preservation and promotion of long-term tourism along the road, restoration construction and the construction of barriers to prevent trespassing were undertaken to protect Catholic churches, which were historical buildings, in three places[42] along the route. In the town of Curahuara, the church became a tourist asset and a tour guide service by the people of the village as well as the collection of admission fees was initiated[43].

Photo 10.
Road construction circumventing historical ruins

Photo 11.
Catholic church where preservation construction was undertaken (Samaja)

3) Impact on old-growth forest in Sajama National Park

Extending along the northern area of the sector of the road funded by the IDB is Sajama National Park (established in 1939; total area:10,223ha), which is the habitat of indigenous plants and animals particular to the Andes Plateau. Although the national park area is not included within the impact area 5km from both sides of the center line of the road as established in Bolivia's environmental legislation, to avoid exerting any impact on the environment, the following measures were taken with respect to construction of the road:

- Modification of road contours to avoid impact on old-growth forests, natural springs, and wetlands
- Installation of cross culverts under the road and modification of road contours in accordance with hydraulic surveys to avoid changing drainage basins existing prior to execution of the project
- Prohibition of the cutting down and use of specified types of plants by the

[42] Abbreviations for Curahuara de Carangas, Tomarapi, Samaja
[43] Confirmed in the April 2006 Ex-Post Evaluation Field Survey

construction company and parties involved in the construction

- Prohibition of the hunting of protected wildlife for commercial purposes
- Conducting of familiarization activities for residents in the surrounding areas to promote the preservation of old-growth forests
- Establishment of shelter areas for the protection of wildlife such as llamas, vicunas, and other camel species, steps to prevent trespassing, and installation of warning signs on roads
- Employment of forest rangers

4) Acquisition of land and relocation of residents

Acquisition of land was not a problem and did not result in the relocation of residents. The project involved the re-establishment of the shape of the road by modifying the contours of the road rather than the paving of an existing road. Therefore it was possible to design the route without the need for the relocation of residents.

2.6 Sustainability

2.5.1 Sustainability of the project through the executing agency

2.5.1.1 Technical capacity

Since Bolivia underwent regional decentralization in 1996, road operation and maintenance works previously administered by the SNC are now commissioned externally to the private sector. Therefore, the practical work of planning, designing, construction and construction management is undertaken on a contract basis by consultants or construction agents through competitive tendering while the SNC undertakes the overseeing of the projects. At present there are no significant outstanding issues from a technical perspective. The SNC gives serious consideration to strengthening technical expertise in contract work management and is currently undertaking a number of projects to enhance technical expertise as part of its system reform strategies in accordance with the Economic Revitalization Law No. 2064 (2000). It is currently receiving assistance from JICA[44] in a program aimed at strengthening its contract work management technology[45]. This program is set to run from 2005 to 2007. In addition, it is also receiving assistance in obtaining ISO9000 and ISO14000 certification by 2006 through joint financing by the World Bank and various European donors[46].

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[44] Japan International Cooperation Agency, a government agency which chiefly undertakes technical cooperation within ODA

[45] JICA Bolivia Road Disaster Prevention Plan Study

[46] Plan to implement a quality control system through ISO 9001/2000 program by the World Bank (IDA), Holland (NEDA), Denmark (DANIDA), Sweden (SIDA), Germany, (Kfw) through loans and untied cooperative financing (IDA-3245-BO, NEDA-TF023309, DANIDA-TF23393, SIDA-TF023885, Kfw- DGFE/RFA/001/2000）

2.5.1.2 Structure

(1) Overall organization of the SNC

Table 18. Transition in SNC Staff	
Fiscal Year	No. of Staff
1990	3,997
2002	301
2003	301
2004	286
2005	286
2006	286

Source: Executing Agency (April 2006)

In addition to a general secretariat, the SNC has an internal auditing office and a quality management unit governed by a president. As service divisions, it has a general management bureau with a number of divisions under it: (1) construction division, (2) road maintenance division, (3) planning, technology and development division, (4) social and environmental division, (5) financial control division, (6) legal division, and (7) 10 national regional offices. With the transfer of the construction division to the road authorities (SEPCAM) of Bolivia's departments and the outsourcing of work accompanying regional centralization, the number of SNC employees decreased dramatically from 1996 onwards. At present, however, a staff of a certain scale is being maintained in line with the government's structural reform system strategies mentioned earlier. In addition to promoting a system for ensuring stable employment for employees, the government is also making efforts to improve the sustainability of the organization.

(2) Operation and maintenance structure

The operation and maintenance of the national roads are administered by the Road Maintenance Division (consisting of 18 officers, 12 of whom are university-graduate technicians) and the management of individual commissioned projects are managed by the jurisdictional regional offices. Apart from a limited area of operations[47], the SNC's employees, equipment, and facilities of the maintenance and management divisions of the 10 national offices were transferred to SEPCAM in the country's nine departments and are utilized for maintenance and management of department roads. Therefore, the spare parts provided through the project are presently in the process of being transferred to the respective SEPCAMs of the departments in line with procedures under administrative legislation [48].

[47] The material test laboratory and spare parts storage warehouse in La Paz city, a part of the buildings of the national maintenance and administrative bases for the management of contractors and four-wheel drive vehicles for contract management and disaster patrols. The spare parts and vehicles provided by the project are included in part of these SNC assets which have not yet been transferred. Of these spare parts, a basic policy of transfer has been decided for those in the warehouse. However, legal procedures such as financial appraisal have been slightly delayed, and they are still being kept in the SNC warehouse.

[48] All of the maintenance vehicles and repair plants were transferred to the SEPCAM of each prefecture by 2005. Spare parts are stored in the SMC warehouse in the El Alto repair plant. Less than 10% of the total has been transferred to SEPCAM in El Alto and Tarija. Due to delay in transfer procedures, the remainder are still maintained by the SNC.

Photo 12.
Maintenance & management equipment transferred to SEPCAM

Photo 13.
Parts in storage at the La Paz Warehouse

Photo 14.
La Paz Regional SNC Office

(3) Operation and maintenance structure of the project sector

Under the jurisdiction of the SNC La Paz regional office, there are currently 11 staff members (four of whom are university-graduate engineers) and this number of staff has for the most part been maintained since the establishment of organizational reforms in 2000. At present operation and maintenance works carried out by private sector contractors are supervised by this number of staff, and there have been no major problems in executing the work[49]. The equipment maintained by their office is one station wagon and one pickup truck. The nine operation and maintenance bases under its jurisdiction have not been transferred but are being maintained as bases for contractors.

(4) Operation and maintenance methods

Operation and maintenance works are currently undertaken systematically under a scheme where they are organized into six categories of operation and maintenance works which are outsourced[50]. In addition, to maintain the surface of roads the Bolivian government has put in place measures to prevent excessive loads. These regulations also apply to the project sector of the road and are currently being enforced[51].

2.5.1.3 Financial status

(1) SNC Operation and Maintenance finances

[49] According to the La Paz regional office manager

[50](1)regular maintenance and management, (2)periodic operation and maintenance, (3) repair works, (4) emergency works, (5) disaster prevention works, (6) general operation and maintenance

[51] A law to regulate traffic weights went into force in December 1999. Traffic weight measuring equipment (scales) was installed at Tambo Quemado Customs on the border with Chile in 2000 using a portion of the IDB loan for this project Overloading is now regulated at this checkpoint along with immigration control.

Table 20. Breakdown of the SNC Executive Budget
(Unit:US$1,000)

Year	2000	2001	2002	2003	2004
Personnel Expenses	1,599	2,194	3,100	3,936	4,448
Other Fixed Expenses	18,460	31,702	21,302	28,386	27,183
Public Works Investment Projects					
Road Construction	72,934	81,128	93,011	113,643	151,153
Surveys	1,387	466	1,394	510	1,318
Maintenance & Management (%)	48,932 (34%)	26,678 (19%)	10,654 (8%)	21,643 (13%)	34,802 (16%)
Disaster Recovery	-	-	9,827	666	905
Total	143,312	142,167	139,288	168,784	219,809

Source: SNC

Focusing on the operation and maintenance of national roads, the Bolivian government has established the National Roads Maintenance Budget (CNCV) as a special budgetary framework. About 20% of the CNCV's income is derived from the Hydrocarbon Tax Surcharge (IAHD) and 80% from road tolls[52]. In this way, Bolivia has established relatively sound source of funds which for the past five years has been providing on average about 18% of the SNC's total budget.

(2) Operation and maintenance costs of the project sector

Table 21. Operation and Maintenance Costs of the Route
Unit: US$

Fiscal Year	1999	2000	2001	2002	2003	2004
Maintenance & Management Costs	438,461	203,917	128,657	103,345	95,280	122,033
Per km	2,330	1,084	690	549	506	649

Source: SNC

[52] Seventy percent of road tolls collected is allocated to the CNCV and the remaining 30% to operation and maintenance expenses of SEPCAM in the respective departments.

The 2006 fiscal budget for the La Paz regional office was approximately US$4.099 million and has been effectively maintained at the same level with annual increments of 4.5% allocated for inflation for the past three years. The SNC's overall maintenance and management costs are US$500-$1500/km/yr and this amount includes costs for regular maintenance and management works undertaken on each section in three-year cycles. Results for the period from 1999 to 2004 on this route were US$506-2330/km/yr[53] annually and sufficient funds were secured within the SNC. Every year maintenance and management works have been undertaken regularly by dividing the road into three sectors, and at present the road is being well maintained.

2.5.2 Operation and maintenance

In the ex-post field survey on this occasion, we traveled over the entire 192.7km[54] of the project sector of the road by car and inspected areas where supplementary road works had been carried out. Although indentations in the surface of the road believed to be caused by excessive loads were visible in a few places, the road was on the whole well maintained. Restoration and improvement works such as widening the cross-section of drainage facilities, etc. had been undertaken in places damaged in the heavy rainfall disaster at the beginning of 1997. Since then the road has not sustained serious damage due to heavy rains.

Table 22. Main Maintenance and Repair Works Undertaken Following Completion of the Project

Site (Distance from Tambo Quemado)	Problem	Work Undertaken
16.125km	Damage to bridge railing on the Samaja River	Replaced railing
75.263km～75.293km	Improvement of sand washout of cross culverts under the road	(1) Widened the cross culverts, (2) modified their position (3) and fitted sand washout receptacles
76.190km	Same as above	Same as above
132.075km	Damage to bridge abutment and bank protection of the Rio Desaquadera River Bridge	Reconstruction of bridge abutment and improvement of bank protection
131.910km	Damage to bridge railing (54m)on the Rio Desaquadera	Replaced railing
100km～139km	Ruts and depressions in road surface due to vehicle overloads	Pavement overlay and filling of ruts
83.900km～138.208km	Sinking of roadbed in places	Replaced roadbed areas

[53] Large scale repair and improvement works (particularly construction of cross culverts under the road) were undertaken to repair damage caused by heavy rains from 1999 to 2000. In addition to the ODA loan by JBIC, SNC's own funds were also used to fund these works. The increase in operation and maintenance expenses shown in Table 21 during this two-year period was due to these works.
[54] The main road is 188.1km, the access road is 4.6km.

Source Report by the executing agency (2005)

Photo 15.
Cross Culverts Under the Road after Drainage Improvement Works

Photo16.
Rio Desaquadero: Bridge at the Mouth of the River

3. Feedback

3.1 Lessons Learned

For this project, the purpose of the route as an export route was clearly established from the preparation stage and the project objective was set accordingly. After verifying the project's relevance beforehand on the basis of data such as traffic volume and import/export value, the project was then carried out. These factors resulted in highly efficient planning and the realization o of favorable project results.

3.2 Recommendations

Spare parts for operation and maintenance equipment purchased during the project are expected to be transferred to the road authorities of the respective departments. However, the transfer has been somewhat delayed due to confusion accompanying regional decentralization. In the near future, the SNC should promptly undertake the transfer of the spare parts to the road authorities of the respective departments accordingly. It is desirable for the relevant parties on the Japan side to monitor the situation of the transfer in collaboration with the Ministry of Foreign Affairs and JICA, which have been providing related assistance in the area of roads.

Comparison of Original and Actual Scope

Item	JBIC ODA Loan		IDB（Inter-American Development Bank）Jointly Financed Portion	
	Original Plan (At the time of the JBIC Appraisal)	Actual (At the time of the Ex-post Evaluation)	Plan	Actual
(1) Output 1) Road Improvement	Extension: 56.3km Effective road width: 3.5m x 2 Road shoulder width: 1.0m x 2	Extension: as planned Effective road width: as planned Road shoulder width: 2.0 x 2m	Extension: 136.4km (main road: 131.8km, access road: 4.6km) Effective road width: 3.5m x 2 Road shoulder width: 1.0m x 2	Extension: as planned Effective road width: as planned Road shoulder width: 2.0 x 2m
	Bridges: No. of locations: 2 Total extension: 300m Effective road width: 6.5m	Bridges: No. of locations: as planned Total extension: 270m Effective road width: as planned	Bridges: No. of locations: 5 Total extension: 420m Effective road width: 6.5m	Bridges: No. of locations: as planned
2) Installation of Operation and Maintenance Facilities and Equipment	Provision of spare parts for maintenance administration (engines, filters, fuel pumps, batteries, blades, bolts, tires)	Redistributed to the following maintenance administration related items 1. Provision of spare parts (42 % of the initial amount) 2. Restoration work of the damaged section damaged by storm 3. Reinforcement work of the road surface damaged by excess loading (1 and 2 combined 58%)	Maintenance camp: refurbishment in 52 locations	Changed to purchasing cement for the maintenance works
3) Consulting service	None	None	Execution management,	As planned

			open tender subsidiary, environmental program, procurement service	
(2) Period 1) Selection of construction companies	October 1992-March 1993 (5 months)	October 1992-January, 1994 (16 months)	July 1991-April 1992 (10 months)	January 1992-March 1993 (15 months)
2) Construction work -Road improvement	July, 1993-February, 1995 (21 months)	January, 1994-July 1996 (31 months)	June 1992-September, 1994 (28 months)	February 1993-July 1996 (42 months)
-Additional work[55]	—	June 1999-February 2001 (21 months)	—	—
-Construction administration	—	—	June 1993-March 1995 (34 months)	January 1993-September 1996 (44 months)
-Implementation of environmental administration program	—	—	November 1991-November 1995 (49 months)	First phase: December 1991-June 1992 (6 months) Second phase: June 1993-December, 1996 (42 months)
3) Establishment of maintenance administration facilities and equipments				
・ Procurement of spare parts	July 1993-March 1994 (9 months)	March 1996-August 1998 (31 months)	—	—
・ Establishment of	—	—	July 1993-June 1994	None

[55] (1) restoration and disaster prevention works for the affected and damaged sections (landslides and damage to road shoulders) due to heavy rains in abnormal weather. (2) reinforcement works to pavement damaged by overloads (See 2.2 Efficiency in this report.)

maintenance administration bases			(12 months)	
(3) Project Cost[56] Foreign currency	Plan 10,827 million yen （US$80.196） ODA Loan Portion: 3,955 million yen		Actual 9,343 million yen (US$85.996) Yen Loan Portion: 3,813 million yen	
Local currency	675 million yen (US$5.0 million)		705 million yen (US$6.485 million)	
Total	12.272 billion yen[57] (US$90.9 million)		10.048 billion yen[58] (US$92.48 million)	
Exchange rate	135.00 yen[59]		108.65 yen[60]	

[56] According to the project completion report (compiled by the SNC in 2006)
[57] This is the value of the total amount of the planned project cost shown in dollars (US$9.09 million) in the project completion report (compiled by the SNC in 2006) after conversion based on the exchange rate at the time of inspection: 135 yen/US$1.
[58] This is the value of the actual total project cost shown in dollars (US$9.248 million) in the project completion report (compiled by the SNC in 2006) after conversion based on the exchange rate at the time of completion: 108.65 yen/US$1.
[59] The value in the report at the time of assessment in September, 1992.
[60] The exchange rate of the actual loan amount (yen) in the project completion report divided by the disbursed ODA loan shown in dollars (3,813.043 million yen / US$35.09552 million = ¥108.65 /1 US$.