Paraguay

The Road Improvement (Rehabilitation and Maintenance) Project

Report date: March 2001
Field survey: August 2000

1. Project Profile and Japan's ODA Loan

Project Area Location Map

A Road Improved under the Project

1.1. Background

The transport sector in the Republic of Paraguay is largely dependent on road transport, and it is critical to the country's economic growth to improve and expand the road network. In the second half of the 1980s, however, only 10% of all roads were paved. The remainder were earth roads, which were closed when it rained, and even paved roads were heavily damaged. In addition, the machinery used for maintenance and repair had become extremely obsolete and needed replenishing. In order to upgrade the economic infrastructure by improving road transport functions, the government emphasized the improvement and repair of existing roads in its Five-Year National Transport Plan (1987-1991).

1.2. Objectives

The objective of the project was to repair the 19 heavily damaged sections (364 km in total) of the paved trunk roads (2,150 km) and raise the maintenance and repair levels for the transnational road network (paved roads: 2,150 km; gravel roads: 480 km; and earth roads: 12,300 km) by procuring maintenance and repair machines, thus contributing to the promotion of smooth transport and economic development in the country.

1.3. Project Scope

The ODA loan covered the following project items:

(1) Road repair (civil engineering work)

Pavement repairs (two repair methods based on the degree of damage: laying of an asphalt base layer and performing patch repairs - partial filling -) and the

widening of roads (repairs to hard shoulders to ensure safety and smooth traffic flow)

(2) Procurement of machinery for road maintenance and repair

Transport machinery and other types of machines, parts (equivalent to 20% of machinery), and three years' consumption of fuel

(3) Consulting services

Specialists (240 M/M), supervision of road repair work (management of soil quality and materials, general management of repair work, etc.), and technical advices in the effective use of procured machines, etc.

1.4. Borrower/Executing Agency

The government of the Republic of Paraguay/The Directorate General of Roads (DGV) of the Ministry of Public Works and Communications (MOPC)

1.5. Outline of Loan Agreement

Loan amount/Loan disbursed amount	¥9,696 million/¥9,696 million
Exchange of notes/Loan agreement	June 1989/July 1990
Terms and conditions Interest Rate Repayment period (grace period) Procurement	 2.9% p.a. 30 years (10 years), Partially untied
Final disbursement date	April 1998

2. Results and Evaluation

2.1. Relevance

The project aimed to repair trunk roads and raise the maintenance and repair levels for the national road network with the goal of improving road transport functions in line with the objectives of the 5-year National Transport Plan. The project has maintained its relevance to the present day.

2.2. Efficiency

The original schedule called for bidding to be held in July 1990. Prior to the bidding, however, it was discovered that there was partial overlap with a project planned by another aid organization, necessitating changes to the scope of the project. Adjustments and revisions of the plans in collaboration with the aid organization were time-consuming, and some contractors could not open letters of credit easily. For these reasons, bids were actually called for in February 1993, two years and seven months behind schedule. Consequently, the project was completed in May 1996, one year and eight months behind the initially scheduled completion date of September 1994.

2.3. Effectiveness

(2.3.1.) Quantitative Effects

Under the project, overlay pavement work and marking (road surfacing signs and the installation of road signs) was performed for 16 heavily damaged sections of paved national and trunk roads, which totaled 358 km in length. As a part of safety measures, parking areas (3.5 metres wide, 50 metres long each) were constructed along the rehabilitated sections on National Road No. 9 at intervals of 10 km to provide drivers with a place to rest or nap.

As shown in Table 1, the traffic volume and the growth rate of average annual traffic volume for National Roads No. 1, No. 2, No. 7 and No. 9 all continued to rise after the completion of the project. In particular, the growth rate of average traffic volume at Ybyraro on National Road No. 1 increased from the pre-project level of 3.2% (1993-1995) to the post-project 5.5% (1996-1999), that for San Lorenzo on National Road No. 2 from 3.0% to 9.6%, and that for Pastoreo on National Road No. 7 from 5.8% to 14.7%. This suggests that the project helped improve driving comfort and safety by implementing appropriate measures for the growing traffic volumes through the repair of key national and trunk roads. This also suggests that the project contributed not only to domestic transport but to international transport between the country and the neighbouring MERCOSUR states.

Although quantitative data on the reductions in travel times rendered by this repair work are not available, in light of past examples of road repairs, it is inferred that travel times have been considerably reduced.

Table 1 Average Traffic Volumes (Units/Day)

	National Road No. 1		National Road No. 2		National Road No. 7		National Road No. 9	
Year/city	Ybyraro	Villa Florida	San Lorenzo	Ypacaraí	Coronel Oviedo	Pastoreo	Remanso	Cerrito
1992	5,817	1,202	23,434	8,084	4,089	2,652	3,794	666
1993	5,942	1,355	24,472	9,428	3,943	2,791	4,161	799
1994	6,498	1,467	23,395	10,190	4,349	3,355	4,568	858
1995	6,385	1,660	25,529	11,808	4,999	3,094	5,069	971
1996	7,025	1,669	26,504	12,576	5,505	3,921	5,791	1,013
1997	7,377	1,678	29,857	12,633	6,001	4,224	6,017	1,154
1998	8,485	1,448	34,010	14,572	6,291	4,642	6,130	1,197
1999	7,819	1,949	36,775	15,296	6,502	No data	No data	1,268

Source: MOPC

(2.3.2.) Qualitative Effects

Indications are that the technical advices provided to DGV personnel substantially enhanced their road maintenance and repair skills. Under the programs, technical

trainings were provided on machine management, operation and maintenance, targeting greater work efficiency and reduced costs. A total of more than 600 engineers, operators, mechanics and other personnel took part in these programs. In addition, the main contractor, a Japanese construction company, effectuated the transfer of technologies related to the 26 Paraguayan construction companies from the private sector participated in construction work under the project.

2.4. Impact

(2.4.1.) Environmental Impact

It is assumed that the noise and powder/dust reductions generated by road maintenance and repair work have had a positive impact on the environment in the areas concerned. However, no accurate data have been obtained to date.

(2.4.2.) Impact on Society

The maintenance and repair of existing roads under the project facilitated smoother road and traffic conditions than prior to its implementation. The marking of roads and the installation of traffic signs also contributed to improving safety for road users (distributors, general drivers, etc.).

2.5. Sustainability

Operation and maintenance (O&M) work is generally performed by the DGV, the executing agency, with such work for certain road sections undertaken by private enterprises under the DGV's supervision. Qualitative and quantitative improvements have been made to maintenance work as exemplified by the fact that the frequency of such work has increased from once to twice a year and that the total length of roads for which such work is provided has increased from the pre-project 366 km to the post-completion 732 km. The central government allocates O&M budgets to the DGV, which amounted to US$522,300 in 2000.

Table 2 Maintenance Activities

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Frequency of consolidated maintenance activities	1	1	2	2	2	2	2	2	2	2
Consolidated length of roads maintained (km)	366	366	732	732	732	732	732	732	732	732
Maintenance costs (US$)	168,400	176,800	361,800	385,000	405,000	430,000	451,200	470,800	495,400	522,300

Source: MOPC

The total number of machines allocated to the nine districts of the national road network to maintain ordinary roads was 612 (25 bulldozers, 70 motor graders, 26

wheel loaders, 56 wheel tractors, 23 rollers, 25 scrapers, 10 hydraulic excavators, 107 dump trucks, etc.). Appropriate maintenance and repair work is performed as necessary using the repair machines allocated to each district. The maintenance of repair machines is also undertaken by the respective districts, while a system was established, and has remained in use, whereby the central organization effectuates repairs that cannot be handled in the regions.

Table 3 Number of Maintenance Machines Owned by Each District

	District 1	District 2	District 3	District 4	District 5	District 6	District 7	District 8	District 9	Total
Dump trucks	31	38	19	25	21	17	21	20	19	211
Trucks	6	6	2	3	5	4	4	4	4	38
Motor graders	20	29	14	14	11	15	16	14	2	135
Other trucks	16	19	12	13	20	11	10	12	9	122
Other tractors	12	9	6	8	6	6	8	7	19	81
Wheel loaders	11	9	6	8	5	4	7	6	3	59
Bulldozers	10	8	4	4	5	2	5	4	0	42
Scrapers	7	16	0	2	5	6	4	4	0	44
Total	113	134	63	77	78	65	75	71	56	732

Source: MOPC

The DGV employees 21 engineers, including those who received technical education and training under the project, 298 administrators, 187 repairmen, and 829 O&M officers, who perform their duties in their respective districts. Trained engineers are effectuating technology transfer within the DGV, and thus, skilled human resources are being secured on a continuous basis.

Table 4 Human Resources of the DGV

	District 1	District 2	District 3	District 4	District 5	District 6	District 7	District 8	Central	Total
Engineer	4	3	2	2	2	2	2	2	2	21
Clerical administrator	56	67	32	45	45	15	27	27	16	298
Repairman	35	41	21	23	23	9	21	18	8	187
Operation and maintenance officer	168	159	71	84	84	45	77	79	87	829
Total	263	270	126	154	154	71	127	126	113	1,335

Source: MOPC annual reports for 1993-1998

There is no particular problem with the technical aspects of the maintenance being provided by the executing agency. There are cases, however, in which it takes time to secure funds for procuring replacement parts and new equipment. Securing sufficient operation and maintenance budgets in a timely manner is an issue that will need to be addressed in the future.

Comparison of Original and Actual Results

Item	Plan	Results
1. Project scope		
Improvement of paved trunk roads	19 sections (total length: 364.4 km)	16 sections (total length: 358 km)
Procurement of machines for road maintenance and repair		
(a) Equipment	667 units (58 types)	612 units
Excavators and loaders	204 units (10 types)	
Pavement maintenance and repair machines	15 units (10 types)	
Compaction machines	37 units (8 types)	
Transporters	246 units (12 types)	
Workshop equipment	24 units (3 types)	
Other machines and instruments	141 units (15 types)	
(b) Spare parts	Equivalent to 20% of (a)	
(c) Fuels, oils and fats	3 years' worth	
Consulting services	240 M/M	240 M/M (Phase B)
2. Implementation schedule		
Road repair	February 1991 to October 1993 (2 years and 9 months)	July 1994 to May 1996 (1 year and 11 months)
Procurement of machines for road maintenance and repair	June 1990 to July 1991 (1 year and 2 months)	July 1993 to December 1996 (3 years and 6 months)
Consulting services		
Selection of consultants	July 1990 to December 1990	April 1992 to October 1992
Consulting services	January 1991 to December 1993	April 1993 to May 1996
Completion	September 1994	December 1996
3. Project cost		
Foreign currency	¥8,.489 million	¥8,489 million
Local currency	PYG5,227 million	¥1,207 million*
Total	¥9,696 million	¥9,696 million
ODA loan portion	¥9,696 million	¥9,696 million
Exchange rate	PYG1.00=¥0.23 (PYG: Paraguay Guaraní)	(*According to the executing agency)