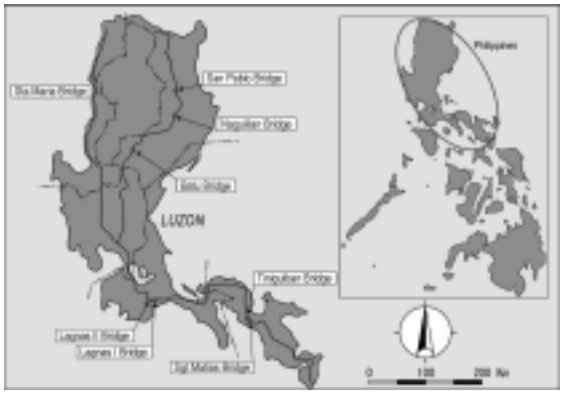
Philippines

Rehabilitation and Maintenance of Bridges Along Arterial Roads Project (Phase III)

Report Date ：October 2002

Field Survey ：June 2001

1. Project Profile and Japan's ODA Loan



Project Location Map

Naguilian Bridge

1.1 Background

The Pan-Philippine Highway and the Manila North Road have functioned as the principal north-south arteries for both economic and social activities. Most of the bridges on these highways, however, were constructed between 1946 and 1948. By the time of the launch of this project, most had been superannuated and damaged heavily as a result of repeated natural disasters over the years, and consequently posed serious problems to traffic safety and traffic efficiency. In order to recover the basic function of these main arteries, and to secure traffic safety and efficiency, the rehabilitation of these bridges was required urgently. The total number of bridges requiring rehabilitation or reconstruction, identified by a JICA study in 1989, was 742. Among them, 41 bridges were selected as a priority group at the feasibility study stage. Out of these, thirteen bridges were implemented under the preceding Phases I and II of this JBIC-financed project, and with local funds, repairs on five bridges were either carried out or discontinued midway. While the rehabilitation works on the remainder were required urgently, the final revision before the appraisal of Phase III replaced five bridges with two others of comparatively high priority, reducing the number of listed bridges for this project to 20.

1.2 Objectives

To avoid traffic interruption resulting from bridge collapse, to ensure smooth road traffic between the Metropolitan area and the North area, and to activate communication of the inhabitants and the transportation of goods between regions; and thereby to support the development of the regional economy through reconstructing/rehabilitating the main damaged bridges along the Pan-Philippine Highway and the Manila North Road. The project bridges were those not included in the preceding projects described above.

1.3 Project Scope

(1) Bridge Construction

At the time of appraisal, the project scope was the reconstruction /rehabilitation of the following bridges, which were selected from those not implemented in Phases I and II. First priority was to be placed on the nine bridges under Category A. If there was still unused commitment of the loan, additional bridges would be selected from Category B with the consent of JBIC.

Category A: 9 bridges (priority bridges) - Sta. Cruz I, -Sta. Maria, -Langlangka I, - Batu, - Talaba, - Binahaan, - Palsabangon, - Naguilian, - San Pablo

Category B: 11 bridges (options) - Sulipan, -San Gabriel, -Pahono, -Tiniguiban, -Sgt.Matias, - Guinobatan, - San Fernando, - Pamukid, -San Isidro, -Sook, - Kanapawan

(2) Consulting Services for topographic and geological surveys, traffic surveys, review of the detailed design, supervision of the construction work and the equipment procurement.

1.4 Borrower/Executing Agency

Republic of the Philippines / Department of Public Works and Highways (DPWH)

1.5 Outline of Loan Agreement

Loan Amount Loan Disbursed Amount	4,616 million yen 4,365 million yen
Exchange of Notes Loan Agreement	November 1994 December 1994
Terms and Conditions Interest Rate Repayment Period (Grace Period) Procurement	 3.0 % p.a. 30 years (10 years) General Untied
Final Disbursement Date	October 2001

2. Results and Evaluation

2.1 Relevance

The Pan-Philippine Highway, linking the four major islands of Luzon, Samar, Leyte and Mindanao, and the Manila North Road, linking Manila and Laoag, are primary arterial roads functioning as the backbone of the land transport system in the Philippines. Under the National Five Year Development Plan in effect at the time of project appraisal, the highest priority in infrastructure development was placed on the improvement of existing roads and on the enhancement of road maintenance. This road development policy remains valid even at present, since the improvement / rehabilitation of the existing infrastructure is emphasized in the current Medium Term Philippine Development Plan (1999-2004).

The project is still appropriate for sustainable growth of the regional industries and agricultural

activities, since the current national development plan points out that it is important to provide adequate infrastructure facilities so as to enable timely and effective delivery of support services, especially in relation to regional agro-industrial centers in order to develop the productivity and enhance the competitiveness in the agricultural sector and other industrial sectors.

Accordingly, the project objective is considered consistent with the national development policy, both at the time of the project appraisal and at present.

2.2 Efficiency

(2.2.1) Project Scope

The actual project scope was changed to a considerable extent at the project implementation stage, after a priority review of the above 20 bridges.

Out of the 20 bridges originally listed for Phase III of the project, seven were dropped, and two were added. It was found during the consultant's field inspection that San Gabriel Bridge had been rehabilitated by DPWH because the required cost was not so large and could be covered by the local financial budget. DPWH decided that the three bridges at Talaba, Binahaan and Palsabangon should be implemented in Phase I, taking into account their severe deterioration. The three bridges at Guinobatan, Pamukid and San Isidro were excluded from the project list after arrangements were made to repair them with local funding resources. The two bridges at Lagnas I and Lagnas II were added to the project list, after consultation with the JBIC, because Lagnas I had been washed away and Lagnas II had been damaged heavily by a typhoon in November 1995. Among the fifteen on the final list, priority was given to eight bridges as a result of technical and economic review by the consultant from viewpoints of urgency and budget availability. Those actually implemented are the following eight bridges:

- Lagnas I and Lagnas II (Package 1)
- Tiniguiban and Sgt. Matias (Package 2)
- Batu (Package 3)
- Naguilian and San Pablo (Package 4)
- Sta. Maria (Package 5)

As for the consulting services, various surveys and a review of the detailed design and construction supervision were implemented concerning the above eight bridges. According to DPWH, the experience of detail designing for Phase I and Phase II was helpful in this phase in terms of efficiency and accuracy.

(2.2.2) Implementation Schedule

The project was originally scheduled to be implemented during the period from May 1994 to December 2000. The actual project implementation was finalized in May 2000, six months ahead of schedule. The early completion was a factor of immense importance for supporting economic activities in the country, since some of the bridges had collapsed.

The result revealed efficiency of implementation, and met the ends of scope modification.

(2.2.3) Project Cost

The total project cost was originally estimated at 6,154 million yen, while the actual project cost was 5,351 million yen. It is, however, difficult to determine whether the result was a cost underrun, since the project scope was significantly changed from the original plan.

2.3 Effectiveness

(2.3.1) Traffic Restriction and Interruption

Among the eight bridges actually worked on, the central span of the Sta. Maria Bridge collapsed in 1997 on account of an over-loaded truck. This bridge was of the warren-truss type, the most typical kind in the Philippines about 40 to 50 years ago, when such heavy loads were not expected. It is particularly vulnerable to the repeated vibrations caused by heavy vehicles. After interrupting of traffic for about a week, a temporary wooden bridge with a weight limit of two tons was built at the site. A new bridge could save traveling time and costs for heavy vehicle traffic, which was forced to make a long detour in the interim.

In the case of Lagnas I, which had been washed away by a typhoon in 1995, a temporary bridge was being used for vehicular traffic. Heavy vehicle traffic had been restricted until the completion of the new bridge. There were traffic interruptions due to flooding in every rainy season, though there is no record of such interruptions, according to DPWH. For all bridges repaired during this project, the weight limit was lifted from 5 tons or less to 15 tons. Accordingly, this report concludes that the bridge reconstruction project has significantly contributed to the efficiency of the land transport system.

(2.3.2) Traffic Volume on the Project Bridges

The average traffic volume has increased steadily on all project bridges. Since all the eight bridges are either replacements or improvements of the old ones, and since traffic volume was growing even before project completion, it is impossible to know whether the increase was the result of the project alone. However, it can be said that, in light of the growing traffic volume, the bridges were in danger of collapsing. This would have resulted in traffic restrictions on heavier vehicles, if improvements had not been made as part of this project.

Table 2: Traffic Volume on Project Bridges

(Unit: number of vehicle/day)

Bridge Name	Completion Year	Year of Appraisal 1994	1996	1998	1999	2000
Sta. Maria	2000	4,275	4,745	5,210	5,486	5,870
Batu	1999	5,766	6,515	7,160	7,518	7,946
Naguilian	1999	4,469	4,719	5,167	5,400	5,751
San Pablo	1999	4,469	4,719	5,167	5,400	5,751
Tiniguiban	1998	4,670	5,184	5,696	5,981	6,340
Sgt.Matias	1998	4,670	5,184	5,696	5,981	6,340
Lagnas I	1997	n.a.	n.a.	n.a.	4,192	n.a.
Lagnas II	1997	n.a.	n.a.	n.a.	4,192	n.a.

Source: DPWH

(2.3.3) Travel Time

The travel time required in each of three road sections, which include the project bridges, is shown in Table 3. Travel times generally decreased 25-40 percent after the completion of the new bridges. This project, together with some other road rehabilitation projects in the same areas funded by ADB or Japan's ODA loans, may have contributed to some extent to the said reduction of travel time.

Table 3: Travel Time between Major Cities

Road Section	Length (km)	Travel Time before project	Travel Time after project	Bridges in the Road Section
San Fernando – Vigan	140	4.0 hrs	3.0 hrs	Sta. Maria
Santiago – Llagan – Solana	108	5.0 hrs	3.0 hrs	Naguilian, San Pablo
Naga City – Daet	77	3.0 hrs	2.0 hrs	Tiniguiban Sgt.Matias

Source: DPWH

(2.3.4) Internal Rate of Return (IRR)

The Economic Internal Rate of Return (EIRR) has been re-estimated using the actual project cost and actual traffic volume. All the other conditions for the estimation are assumed to be the same as for the original calculation at the time of the project appraisal. The EIRR figures re-estimated are generally higher than the original values calculated at the time of project appraisal.

The reason for the higher EIRR figures is that the actual traffic growth rates have been higher

than those expected at the time of appraisal. However, a lower EIRR was found for Sta. Maria Bridge. The project cost in this case rose because the original plan for rehabilitation was changed to re-construction.

Table 4: Economic Internal Rate of Return

Bridge Name	Internal Rate of Return (%)	
	Original	Actual
Batu Bridge	21.6	42.4
Naguilian Bridge	15.5	16.7
San Pablo Bridge	16.6	28.4
Sta. Maria Bridge	85.9	28.6

Note: Original indicates the value estimated at the time of project appraisal

2.4 Impact

(2.4.1) Socio-Economic Impact

Since most of the project bridges were completed during the years 1997 to 1999, it is difficult to assess the socio-economic impact from the statistical data. For instance, GRDP (regional GDP) growth in 1998 was below zero in most regions, reflecting the Asian Financial Crisis in 1997. In 1999, most of the provinces, including the regions in which the project bridges are located, had recovered from the economic recession. It is still too early to judge whether the growth of GRDP in the project region is significantly higher than in other regions.

Table 5: GRDP (million pesos: at constant 1985 prices)

Name of Region	Ilocos	Cagayan Valley	Southern Tagalog	Bicol	Philippines Total
Name of Bridges in the Region	Sta. Maria	Naguilian San Pablo Batu	Lagnas I Lagnas II	Tiniguiban Sgt. Matias	-
Year of Appraisal 1994	22,295	15,428	120,155	23,087	766,368
1995	24,225	16,142	125,248	23,517	802,224
1996	25,155	16,712	134,814	24,625	849,121
1997	26,776	18,450	140,913	26,041	893,151
1998	27,938	17,377	138,829	25,512	887,905
1999	28,639	21,377	142,075	25,811	917,382

Source: 2000 Philippine Statistical Yearbook

(2.4.2) Impacts on Natural Environment

No serious negative impact on the environment has been reported.

(2.4.3) Impacts on Social Environment and Resettlement

No resettlement issues nor other serious negative impact on residents have been reported.

(2.4.4) Technology Transfer

According to DPWH, there were various kinds of technology transfer from foreign consultant/contractors to the local firms and technicians throughout the design and implementation stage. For instance, in case of the Naguilian Bridge, about 30 engineers had on-the-job training at the project site. The railing method[1)], used instead of a crane, was adopted for the construction of the center span; cranes were not available at the site. For building the PC box girder, the balanced cantilever method[2)] was adopted, which was a new experience for the local engineers. Likewise, for the Lagnas II, treatment with gabion was found to be very effective for protecting the foundation of the piers, where scoring was a serious problem before the project. There were also many visitors from the engineering departments of colleges every year.

2.5 Sustainability

(2.5.1) Operation and Maintenance

a. Organization of O&M

The organization responsible for the maintenance of the project bridges is the Bureau of Maintenance (BOM) of DPWH. The actual maintenance work is undertaken by the 174 district offices scattered over the country under the supervision of BOM. There are normally about 30 workers, including 4 to 5 engineers, in each district. The engineers have sufficient knowledge and experience for the maintenance work, which consists of routine maintenance, periodic maintenance and special maintenance. Routine maintenance includes cleaning, painting and checking the drainage. Periodic maintenance work includes inspection (twice a year) and repair of damage to the superstructure and to the piers under the water, particularly damage caused by scoring during the rainy season. If repair work is required for a bridge, a private contractor is employed on a contract basis.

b. Current Maintenance Condition

On the site survey on two bridges, Batu Bridge and Naguilian Bridge, it was found that they were still new and there were no problems in the structure or the pavement. The connecting roads to the bridges were also found to be well maintained. There are notices of the vehicle weight limit of 15 tons posted at both ends of the bridges, as well as weight checking points. However, actual checking is carried out rarely; moreover, the weight instruments are not always accurate. A stricter checking system should be introduced for over-loaded vehicles.

[1)] For building the central part, rails are installed at first between the abutment and piers to convey the construction materials.

[2)] The PC girder is constructed by extending from the pier toward the both sides simultaneously in order to balance the dead load.

(2.5.2) Financial Status

The maintenance budget is allocated to each district office by DPWH based on the equivalent maintenance kilometer (EMK) and the basic cost of EMK. The EMK is calculated by using one of the following formulae.

a. EMK for roads

   EMK= Total Length (km) x Variable coefficient depending on the surface condition and traffic volume x Coefficient by road width

b. EMK for bridges

   EMK= Bridge Length (m) x Coefficient by type of bridge

Accordingly, the maintenance budget for the bridges is included in that for roads of the corresponding district office.

The basic cost of EMK is determined every year by BOM, taking into account the inflation of maintenance cost items. Each district office has to submit a maintenance plan to the BOM.

In contrast with the theoretically required O&M costs, the actual budget allocation does not reflect potential increase in the required costs over years.

The annual maintenance cost for Batu Bridge is shown in Table 6. It has remained at almost the same level since 1996 in terms of constant price. The maintenance cost for 2000 is not clear, but according to DPWH, it has dropped sharply, since the bridge is still new.

Table 6: Annual O & M Cost for Batu Bridge

(Unit: pesos)

Bridge Name	Cost	Year of Appraisal 1994	1995	1996	1997	1998	Year of Completion 1999
Batu	Current Price	270,144	300,160	482,764	510,862	568,600	568,000
	Const. Price (1994)	270,144	277,661	411,213	408,690	431,051	403,747
	Growth over previous yr.	1.00	1.03	1.48	0.99	1.05	0.94

Source: DPWH

Nationwide, total maintenance expenditures for roads and bridges are shown in Table 7.

Total national expenditures for the maintenance of roads and bridges have decreased in terms of constant prices, with a peak in 1995, in spite of the increasing trends for total road length and traffic volume. According to DPWH, sufficient funds have not been allocated for recent years, reflecting the economic recession after the Asian Financial Crisis.

Table 7: Total Maintenance Expenditure for Roads and Bridges in the Philippines

(Unit: million pesos)

Annual Maintenance Expenditure	Year					
	1993	1994	1995	1996	1997	1998
Current price	1,661	1,767	3,237	3,399	3,586	3,787
1993 Constant price	1,661	1,621	2,746	2,655	2,633	2,623
Growth over Previous yr.	-	0.98	1.69	0.97	0.99	0.99

Source: DPWH

All the bridges implemented under this project are still new, and therefore are not expected to require high costs for maintenance and repair for several years. However, costs are expected to increase year by year. The district office is responsible for bridge maintenance, but has a budget for routine work only. Recognizing this potential budget shortage, since last year the Government of the Philippines has earmarked the vehicle registration tax levied annually exclusively to fund road development and maintenance. While it expected that this decision will alleviate the financing difficulties for maintenance to a certain extent, the size of effect is unpredictable.

Comparison of Original and Actual Scope

Item	Plan	Actual
(1)Project Scope		
1) Reconstruction/Rehabilitation of the following bridges		
Category A: (first priority)		
- Sta. Cruz I	260.6 m	-
- Sta. Maria	298.2 m	320.00 m
- Langlangka I	17.4 m	-
- Batu	350 m	385.50 m
- Talaba	28.1 m	-
- Binahaan	52.5 m	-
- Palsabangon	61.2 m	-
- Naguilian	675 m	687.80 m
- San Pablo	290 m	272.90 m
Category B: (Second priority)[1)]		
- Sulipan	328.5	-
- San Gabriel	19.5 m	-
- Pahono	12 m	-
- Tiniguiban	19.9 m	23.40 m
- Sgt.Matias	15 m	16.40 m
- Guinobatan	55.6 m	-
- San Fernando	21.6 m	-
- Pamukid	22.6 m	-
- San Isidro	22.5 m	-
- Sook	33.3 m	-
- Kanapawan	45.6 m	-
Additional Bridges [2)]		
- Lagnas I	-	207 m
- Lagnas II	-	206 m
2) Consulting Services	Topographic/geological survey Traffic Survey Review of D/D Supervision of Construction	Topographic/geological survey Traffic Survey Review of D/D Supervision of Construction
(2) Implementation Schedule		
Selection of Consultant	May 1994 – May 1995	
Consultant Services for D/D	April 1995 – May 1996	June 1995 – December 1996
Civil Works	January 1997 - December 2000	October 1996- May 2000
(3) Project Cost		
Foreign currency	2,816 million yen	4,818 million yen
Local currency	3,338 million yen	533 million yen
Total	6,154 million yen	5,351 million yen
ODA Loan Portion	4,616 million yen	4,365 million yen
Exchange Rate	1 peso = 3.76 yen	1 peso = 3.48 yen

NOTE: [1)] Up to the loan availability, and with JBIC's consent, additional funding could be extended by JBIC to a group of bridge prioritized from among those in Category B.

[2)] The bridges were added at the time of project selection during the engineering study.

Independent Evaluator's Opinion on Rehabilitation and Maintenance of Bridges along Arterial Roads Project (Phase III)

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1. Relevance

The project remains highly relevant to the Philippine development policy. This was reflected in the Medium-Term Development Plan for 2001 to 2004 which placed high priority on the rehabilitation and/or improvement of arterial roads and bridges. In fact, for the planned period (2001 to 2004), more bridges are programmed for reconstruction, improvement and construction in different parts of the country.

Official Development Assistance still places high priority on rehabilitation and maintenance of roads and bridges. For the pedestrians and the motorists the need for the project remains high.

In general, the project objectives have been met and its relevance remains high in spite of the changes in its intended/original scope.

2. Impact

The project's impacts are its contribution to improvement in literacy, health and sanitation, access to employment opportunities and women empowerment.

Immediate impacts are reduction in travel time, increased traffic flow, increased in the frequency of trips, improved access to economic and social services, reduction in the cost of maintenance of vehicles. The project also contributed to institutional strengthening.

There were no reported negative impact of the project on the environment as well as resettlement problems.