PCR:LAO 18112

ASIAN DEVELOPMENT BANK

PROJECT COMPLETION REPORT

OF THE

THIRD ROAD IMPROVEMENT PROJECT

(Loan No. 866-LAO[SF])

IN

LAO PEOPLE'S DEMOCRATIC REPUBLIC

February 1995

CURRENCY EQUIVALENTS

Currency Unit - Kip (KN)

At Project Completion
(31 October 1994)

KN 1.00	=	$0.0014
$1.00	=	KN 720

At Appraisal
(31 October 1987)

KN 1.00	=	$0.0105
$1.00	=	KN 95.00

ABBREVIATIONS

ADT	-	Average Daily Traffic
BME	-	Benefit Monitoring and Evaluation
DBST	-	Double Bituminous Surface Treatment
MCTPC	-	Ministry of Communication, Transport, Post and Construction
mvpd	-	Motor Vehicles per Day
PCR	-	Project Completion Report
PMU	-	Project Management Unit
PSC	-	Prestressed Concrete Beam
RBCE	-	Road and Bridge Construction Enterprise
SBST	-	Single Bituminous Surface Treatment
UNDP	-	United Nations Development Programme
UNV	-	United Nations Volunteer
VOC	-	Vehicle Operating Costs

NOTES

(i) The fiscal year (FY) of the Government ends on 30 September.
(ii) In this Report, "$" refers to US dollars.

PCR: LAO 304

PROJECT COMPLETION REPORT

OF THE

THIRD ROAD IMPROVEMENT PROJECT
(Loan No. 866-LAO[SF])

IN

LAO PEOPLE'S DEMOCRATIC REPUBLIC

February 1995

Note: **This report was prepared by a Bank Mission comprising Preben Nielsen (Senior Project Economist/Mission Leader) and Teresa H. Mella (Senior Loan Clerk/Project Administration). The Mission collected information for the Project Completion Report (PCR) in the Lao PDR from 15-21 August 1994.**

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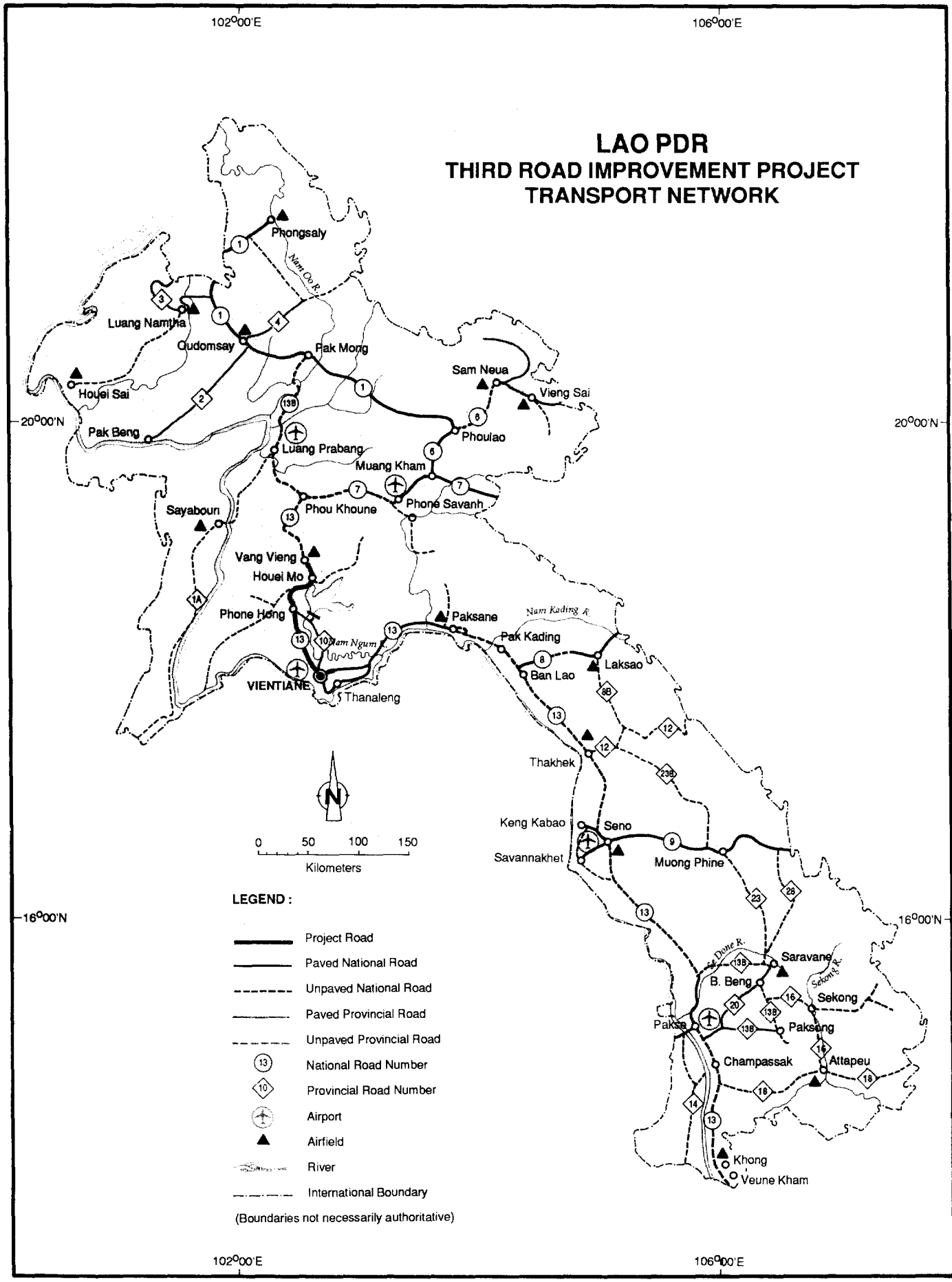
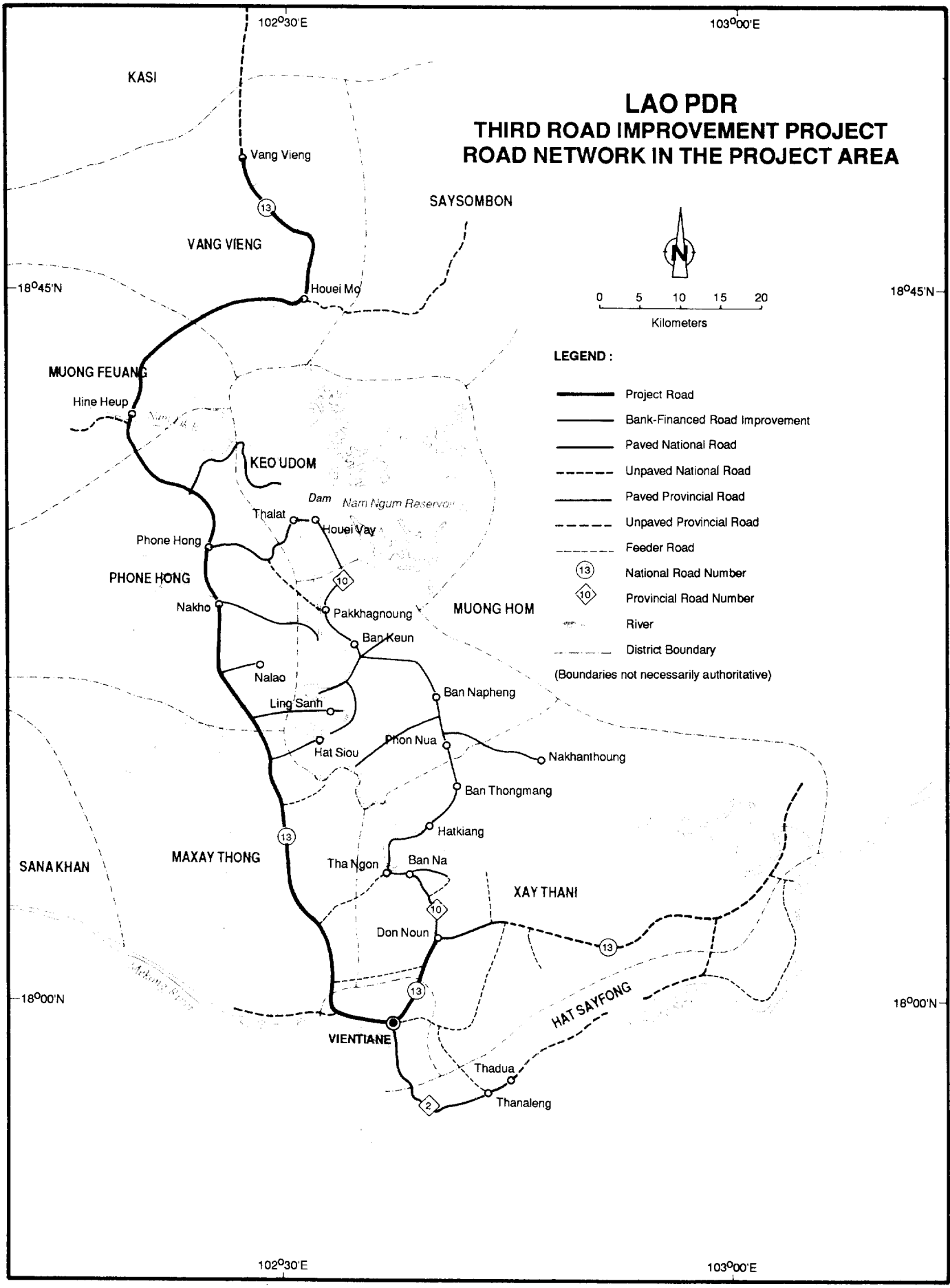
Map 1


LAO PDR
THIRD ROAD IMPROVEMENT PROJECT
TRANSPORT NETWORK
102°00'E
106°00'E
20°00'N
16°00'N
Phongsaly
Nam Ou R.
Luang Namtha
Oudomsay
Pak Mong
Houei Sai
Pak Beng
Sam Neua
Vieng Sai
Phoulao
Luang Prabang
Muang Kham
Phone Savanh
Phou Khoune
Sayabouri
Vang Vieng
Houei Mo
Phone Hong
Nam Ngum
VIENTIANE
Thanaleng
Paksane
Nam Kading R.
Pak Kading
Ban Lao
Laksao
Thakhek
Keng Kabao
Seno
Savannakhet
Muong Phine
Dong R.
Saravane
B. Beng
Sekong R.
Sekong
Paksa
Paksong
Champassak
Attapeu
Khong
Veune Kham
0 50 100 150
Kilometers
LEGEND :
Project Road
Paved National Road
Unpaved National Road
Paved Provincial Road
Unpaved Provincial Road
National Road Number
Provincial Road Number
Airport
Airfield
River
International Boundary
(Boundaries not necessarily authoritative)

Map 2


LAO PDR
THIRD ROAD IMPROVEMENT PROJECT
ROAD NETWORK IN THE PROJECT AREA
102°30'E
103°00'E
18°45'N
18°00'N
KASI
Vang Vieng
SAYSOMBON
VANG VIENG
Houei Mo
MUONG FEUANG
Hine Heup
KEO UDOM
Dam
Nam Ngum Reservoir
Thalat
Houei Vay
Phone Hong
PHONE HONG
Nakho
Pakkhagnoung
MUONG HOM
Ban Keun
Nalao
Ling Sanh
Ban Napheng
Hat Siou
Phon Nua
Nakhanthoung
Ban Thongmang
Hatkiang
SANA KHAN
MAXAY THONG
Tha Ngon
Ban Na
XAY THANI
Don Noun
HAT SAYFONG
VIENTIANE
Thadua
Thanaleng
0 5 10 15 20
Kilometers
LEGEND :
Project Road
Bank-Financed Road Improvement
Paved National Road
Unpaved National Road
Paved Provincial Road
Unpaved Provincial Road
Feeder Road
National Road Number
Provincial Road Number
River
District Boundary
(Boundaries not necessarily authoritative)

BASIC DATA

A. Loan Identification

1.	Country	:	LAO PDR
2.	Loan Number	:	866-LAO(SF)
3.	Loan Title	:	Third Road Improvement Project
4.	Borrower	:	Lao People's Democratic Republic
5.	Executing Agency	:	Ministry of Communication, Transport, Post & Construction
6.	Amount of Loan	:	SDR14,752,000 equivalent to $19,000,000 at appraisal[1]

B. Loan Data

1.	Appraisal		
	- Date Started	:	23 August 1987
	- Date Completed	:	31 August 1987
2.	Loan Negotiations		
	- Date Started	:	21 October 1987
	- Date Completed	:	23 October 1987
3.	Date of Board Approval	:	24 November 1987
4.	Date of Loan Agreement	:	27 November 1987
5.	Date of Loan Effectiveness		
	- Loan Agreement	:	February 1988
	- Actual	:	25 March 1988
	- Number of Extensions	:	one
6.	Loan Closing Date		
	- Loan Agreement	:	30 June 1993
	- Actual	:	30 June 1994
	- Number of Extensions	:	one
7.	Terms of Loan		
	- Service charge	:	1 per cent
	- Maturity	:	40 years
	- Grace Period	:	10 years

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[1] Equivalent to $19.814 million at the time of the PCR.

8. Disbursement

a) Dates

Initial	Final	Time Interval
22 Nov 1988	12 Oct 1994	6 years
Effectivity	**Original Closing**	**Time Interval**
25 Mar 1988	30 June 1994	6 years & 3 months

b) Amount ($ million)

Item/Component	Category	Original Allocation	Last Revised Allocation	Net Amount Disbursed	Undis-bursed Balance
Equipment - Improv.	01A	4.516	4.979	6.179	-1.201
Equipment - Maint.	01B	3.496	3.519	3.212	0.306
Materials - Improv.	02A	7.039	7.096	7.071	0.025
Materials - Maint.	02B	1.042	1.037	1.152	-0.115
Local Exp. - Improv.	03A	2.089	1.614	1.621	-0.007
Local Exp. - Surveys	03B	0.155	0.155	0.149	0.007
Service Charge	04	0.424	0.430	0.430	0
Unallocated	05	0.910	0.982	-	0.984
Total		19.671[1]	19.814[2]	19.814	0

C. Project Data

	Appraisal Estimate ($ million)	Actual ($ million)
1. Project Cost		
(a) Foreign Exchange Cost (FX)	18.00	19.61
(b) Local Cost (LC)	5.75	5.64
Total	23.75	25.25

[1] At the time of loan approval.

[2] No amount was cancelled.

		Appraisal Estimate ($ million)	Actual ($ million)
2.	Financing Plan		
(a)	Bank	19.00	19.81
(b)	Borrower	3.62	3.77
(c)	Other External (UNDP)	1.13	1.67
	Total	23.75	25.25

3. Cost Breakdown by Project Component

		Appraisal Estimate ($ million)			Actual ($ million)		
		FX	LC	Total	FX	LC	Total
(a)	Civil Works	7.88	4.70	12.58	8.22	4.49	12.71
(b)	Equipment	7.20	0.38	7.58	9.39	1.05	10.44
(c)	Consulting Services	1.00	0.10	1.10	1.57	0.10	1.67
(d)	Contingencies	1.52	0.57	2.09	-	-	-
(e)	Service Charge	0.40	-	0.40	0.43	-	0.43
	Total	18.00	5.75	23.75	19.61	5.64	25.25

4.	Project Schedule	Appraisal Estimate	Actual
A.	Road Improvement		
(a)	Date of Consultant's Contract	March 1988	March 1988
(b)	Completion of Detailed Engineering	October 1988	December 1988
(c)	Equipment and Supplies		
	- Date of First Procurement	July 1988	July 1988
	- Date of Last Procurement		July 1992
(d)	Civil Works Contract		
	- Commencement	October 1988	February 1989
	- Completion	July 1992	September 1994
B.	Road Maintenance		
(a)	Date of Consultant's Contract	January 1989	25 May 1989
(b)	Completion of Programming	July 1989	1 October 1989
(c)	Equipment and Supplies		
	- Date of First Procurement	July 1988	7 August 1989
	- Date of Last Procurement	December 1991	9 January 1992
(d)	Civil Works Contract		
	- Commencement	January 1989	15 October 1989
	- Completion	December 1991	31 December 1992

D. Data on Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-days	Specialization of Members
Fact-Finding	12-29 June 1987	3	54	a, b, e
Appraisal	23-31 Aug 1987	3	27	b, c, d
Country Consultation	1-5 Dec 1987	2	10	c
Special Loan Adm	19-26 May 1988	2	16	a, e
Review 1	17-22 Feb 1989	1	6	a
Review 2	21 Jun-7 Jul 1989	1	17	a
Disbursement	17-22 Nov 1989	2	10	f, g
Review 3	8-18 Jan 1990	1	11	a
Review 4	17-27 May 1990	1	11	a
Review 5	15-28 Aug 1990	1	14	a
Review 6	19 Apr-1 May 1991	1	13	a
Review 7	2-11 Apr 1992	2	10	a, b
Review 8	6-14 Jul 1993	1	9	b
Review 9 and PCR	15-21 Aug 1994	1	7	b, g

a/ Project Engineer; b/ Project Economist; c/ Programs Officer
d/ Counsel; e/ Staff Consultant; f/ Control Officer; g/ Technical Assistant

I. PROJECT DESCRIPTION

Objectives, Rationale and Scope

1. The main objectives of the Project were to: (i) reduce the transport costs and facilitate the efficient movement of goods and passengers in the Project influence area; (ii) support rural development by enhancing the mobility of rural communities; (iii) strengthen domestic capabilities for designing, constructing and maintaining the country's road network; and (iv) support the Government's road maintenance program.

2. The Project was formulated to assist the Government in its efforts to gradually rehabilitate and improve the infrastructure in the transport sector, and to support the development objectives of the Second Five-Year Development Plan (1986-1990). It was also aimed at institutional strengthening by providing on-the-job training for Lao staff by consultants in detailed engineering, construction management, and programming.

3. The Project was designed to provide the people residing in the influence area of the Project with improved access to the urban market and social infrastructure facilities in the city of Vientiane and an all-weather connection to all the northern provinces, which have a combined population of 2.0 million.

4. The scope of the Project as envisaged at appraisal [see Maps 1 and 2 at pages (i) and (ii)] comprised the following components:

(i) Rehabilitation of 71 kilometers (km) of national road No. 13 (NR13) from Km 6 to Km 12 northeast of Vientiane and from Vientiane (Km 5) to Phone Hong (Km 70) from a deteriorated 6-7 meters (m) wide bituminous surface to a 7 m wide carriageway with double bituminous surface treatment (DBST) and a 1.5 m wide compacted gravel shoulder on each side; through villages the shoulder width was designed for 2.5 m. The improvements envisaged also included replacement of all the deteriorated Bailey steel truss bridges with two-lane (9 m wide) concrete bridges (reinforced concrete deck girder type) to accommodate the forecast traffic and loads.

(ii) Upgrading of 91 km of NR13 from Phone Hong to Vang Vieng from a badly deteriorated 4-6 m wide gravel surface to a 6 m wide carriageway with DBST and a 1.5 m wide compacted gravel shoulder on each side. The other improvements for roadworks were identical to item (i). In addition, all the existing Bailey steel truss bridges were to be replaced with new Bailey bridges and the abutments and piers strengthened.

(iii) Provision of additional road construction equipment and spare parts (see Appendix 1) and workshop equipment and tools (see Appendix 2); the Government agreed to utilize all the road construction and workshop equipment and tools procured under the Bank-financed Loan No. 643-LAO (SF): Vientiane Plain Road Improvement Project,[1] (see Appendixes 3 and 4), for the Project.

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[1] Approved for $8.0 million in October 1983.

(iv) Establishment of a base field workshop, 4 km north of Phone Hong along NR13, in Vientiane Province to service and repair the road construction equipment fleet for the Project.

(v) Provision of consulting services for detailed engineering and construction management for a total of 60 person-months financed by the United Nations Development Programme (UNDP), covering assistance to the Executing Agency in detailed engineering and construction management, as well as the participation of one United Nations Volunteer (UNV) for two years to assist the consultants in equipment maintenance.

5. An advisory technical assistance (TA)[1] was processed in conjunction with the Project for a total of 18 months covering the services of an international expert experienced in road maintenance operations to advise, with assistance from two UNVs for two years each, the provincial services of Champassak, Saravane, and Vientiane, and Vientiane Municipality in road maintenance operations and programming and to provide on-the-job training to Lao staff involved in road maintenance.

II. EVALUATION OF IMPLEMENTATION

A. Project Components

6. The Project components were implemented generally as envisaged at appraisal. However, based on a comparative price analysis carried out in early 1990, it was decided to replace all 37 temporary Bailey bridges, except the Nam Lik structure, which was replaced with new Bailey bridge panels, with five box culverts and 32 permanent two-lane prestressed concrete girder type bridges (7 m and 6 m between curbs, between Vientiane and Phone Hong and between Phone Hong and Vang Vieng, respectively, in accordance with expected traffic volumes). This change in scope proved feasible with a higher local currency component, and the Lao engineers, technicians and contractors gained, for the first time, experience in the construction and launching of prestressed concrete structures.

7. During implementation, several changes in the construction methods and design standards were agreed upon and carried out. Because of new traffic projections near Vientiane, revised carriageway widths were approved: (i) for NR13 to the south from Km 6 to Km 12 and NR13 to the north from Km 5 to Km 11, the pavement width would be 12 m with DBST and one m shoulder on either side with single bituminous surface treatment (SBST); (ii) for NR13 to the north from Km 11 to Km 90, the pavement width would be 7 m with DBST and 2 m shoulders on either side with SBST; and (iii) for NR13 to the north from Km 90 to Km 158, the pavement width would be 7 m with DBST and one m shoulders on either side with SBST.

8. Regarding the base course materials, laboratory testing showed that the lime modification of the lateritic soils in the Project area resulted in a base course material that met or exceeded the specification. Consequently, the materials for base course were based on mixtures of river sand/gravel, laterite, and 1 per cent lime.

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[1] TA No. 923-LAO: Road Maintenance Training Project, for $225,000, approved in November 1987

9. A detailed analysis of the estimated bridge costs in the design stage showed that all bridges, apart from the one at Nam Lik, could cost-effectively be constructed by prestressed concrete beams (PSC), two lanes wide, instead of one-lane Bailey steel truss bridges, and within the existing financing plan. This proposal was approved in 1990 and bridges between Vientiane and Phone Hong were made 7 m wide and those between Phone Hong and Vang Vieng, 6 m wide. The Nam Lik structure was replaced by a new Bailey panel type bridge because the 20 m high masonry piers could not carry a concrete deck girder structure. To implement this change in scope, UNDP provided an additional $400,000 for the consultant's services. This funding proved adequate for the initial plant set up in Vientiane and construction, and further funding was provided by the Bank under TA No. 1495-LAO[1] to continue the training and technical assistance services.

10. The plant and equipment identified at appraisal for transfer from the First Road Project and the additional items to be procured under the Project were largely sufficient for the requirements with only minor variations. The original lists and the details of the variations are shown in Appendixes 1 and 2.

B. Implementation Arrangements

11. The implementation arrangements for the Project generally followed those envisaged at appraisal. The Ministry of Communication, Transport, Post and Construction (MCTPC) was the Executing Agency for the Project and was responsible for the overall implementation. The Project Management Unit (PMU) established within MCTPC and its incumbent Project Manager under Loan No. 643-LAO continued operations under the Project. The Project Manager under the overall guidance of the Vice Minister for Communications was responsible for the day-to-day implementation of the Project with the assistance of the PMU staff and consultants. The Construction Unit established under Loan No. 643-LAO (SF) continued to carry out civil works construction through force account under the Project using staff of the Road and Bridge Construction Enterprise (RBCE) No. 10. Engineering and construction management assistance was provided by the consultant, while equipment was transferred from the Bank-financed First Road Project; supplementary equipment was procured under the loan.

12. It was apparent early in the construction period that the required rate of progress to meet the schedule could not be achieved by the resources of RBCE No. 10 alone. Consequently, various smaller sections of the work were undertaken by other state-owned RBCE's as subcontractors under force account procedures. While the Rural Road Construction Enterprise completed earthworks, drainage, and subbase for 15 km at the northern end of the Project, Vientiane Municipality Road Construction Enterprise completed earthworks, drainage, subbase, base course, and DBST from Km 5 to Km 26 at the southern end of the Project, near Vientiane. Compagnie De La Construction Vois Des Communications undertook PSC bridge construction activities in the field for approximately 50 per cent of the bridge program. The precast yard at Km 5 completed all the precast work for the entire bridge program by March 1993.

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[1] Prestressed Concrete Bridge Training Project, for $570,000, approved in March 1991.

C. Project Costs and Financing Plan

1. Project Costs

13. The total cost of the Project at appraisal was estimated to be $23.75 million equivalent, with a foreign exchange component of $18.00 million (76 per cent of the total Project cost) and a local currency cost component of $5.75 million equivalent (24 per cent). The final cost of the Project as calculated by the PCR Mission in consultation with MCTPC officials and the consultant was $25.25 million equivalent, with a foreign exchange cost of $19.61 million (78 per cent of the final cost) and a local currency cost of $5.64 million equivalent (22 per cent). A summary of the costs and financing plans of the Project at appraisal and at actual completion is shown in Table 1.

Table 1: Summary of Project Costs and Financing Plans ($ million)

		Appraisal Estimate			Actual		
	Project Component	FX	LC	Total	FX	LC	Total
(a)	Civil Works	7.88	4.70	12.58	8.22	4.49	12.71
(b)	Equipment	7.20	0.38	7.58	9.39	1.05	10.44
(c)	Consulting Services	1.00	0.10	1.10	1.57	0.10	1.67
(d)	Contingencies	1.52	0.57	2.09	--	--	--
(e)	Service Charge	0.40	--	0.40	0.43	--	0.43
	Total	18.00	5.75	23.75	19.61	5.64	25.25
Financed by:							
Bank[a]		17.00	2.00	19.00	18.04	1.77	19.81
UNDP		1.00	--	1.00	1.57	--	1.57
Government		--	3.75	3.75	--	3.87	3.87
	Total	18.00	5.75	23.75	19.61	5.64	25.25

a The loan of SDR 14.752 million was equivalent to $19.0 million at appraisal and to $19.814 million at full completion in October 1994.

14. The overall actual cost of the Project was $25.25 million, which represented a 6 per cent increase over the appraisal estimate of $23.75 million. The minor cost overrun was met by UNDP and the result of favorable SDR/$ exchange rates over the procurement period. The entire loan amount was utilized as shown in Appendix 5, which also provides annual information about the loan amount by category, disbursements, and the Government's contribution.

2. Financing Plan

15. The appraisal and actual financing plans are shown in Table 1. The Bank's actual financing increased by $800,000 to $19.81 million in foreign exchange, but the loan amount in SDRs was constant. UNDP increased its funding by $570,000, mainly to introduce the technology of prestressed cement concrete for the Project bridges in the Lao PDR,[1] and to extend the consulting services. The Government's actual contribution

[1] This undertaking was co-financed with the Bank under TA No. 1495-LAO.

increased slightly from $3.75 million to $3.87 million equivalent. The actual Bank financing was 78 per cent compared with 80 per cent as estimated at appraisal.

D. Project Schedule

16. A chronology of the main events during implementation of the Project is shown in Appendix 6, and the estimated (at appraisal) and actual implementation schedules are in Appendix 7.

17. The implementation schedule prepared at appraisal for the road construction component envisaged that the detailed engineering phase would be completed from October 1987 to October 1988, and civil works would be carried out from June 1988 to June 1992. The actual starting and completion dates were slightly delayed because of late signing of the UNDP Project Document, which affected commencement of detailed engineering. The consultants for the design phase were on site between June 1988 and December 1988, and those for construction management from November 1988 to August 1993[1], when the Project was substantially completed.[2] The civil works start was delayed because of the extension of the Bank-financed First Road Project, which was not completed until January 1989. Therefore, the Project did not commence until February 1989 because the transfer of equipment was delayed.

18. After the change in the bridge construction method, this activity was set up as a separate component of the Project and the input of the consultant began in April 1990. The setting up of the precast yard took considerably more time than anticipated and the first concrete beams were not produced until December 1990.

19. Construction of the workshop at Nam Chim began in January 1989, in line with the schedule caused by the delay related to the extension of the earlier road project. Work ceased in March 1989 because of the lack of cement and steel reinforcement bars and did not begin again until August 1989. The workshop was eventually completed by the end of December 1989. Delivery of the pipe making plant was considerably delayed by the supplier and it was only received in July 1989. The plant did not begin full production until August 1990, considerably delaying the installation of cross drainage, and forcing pavement work to proceed in advance. The retroactive installation of pipe culverts, which was not fully completed until January 1994, resulted in a less than optimum smoothness of the road surface. The work on embankment formation began in February 1989, in the area immediately north of Phone Hong, and was completed by the end of September 1991. This was well within the scheduled completion date of June 1992. Following this process, the construction of subbase began in April 1989, also in the area immediately north of Phone Hong, and was completed by the end of January 1992. This was well within the scheduled completion date of June 1992.

20. The base course construction began in June 1989 on the south section of NR13 by RBCE - Vientiane Municipality, and in October 1989 on the section immediately

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[1] After August 1993 and until full completion in October 1994, the same consultant, then working under Loan No. 1009-LAO(SF): Fourth Road Improvement Project, for $39.0 million, approved in December 1989, also supervised the Third Road Improvement Project.

[2] The one year delay in civil works completion was mainly a carry over from the engineering phase and because of the change in the bridge construction technology.

north of Phone Hong by RBCE No. 10. This work was completed in November 1993, well after the scheduled completion date of June 1992. The problems that contributed to the late completion included: (i) late installation and start of production of pipe culverts from the pipe making plant; (ii) lack of prompt supply of cement, steel reinforcement bars and equipment spare parts resulting in inordinate delays to plant operations; (iii) delays of up to six months in payments to labor; and (iv) operational problems within the RBCEs', which reduced production, particularly at the crushing plant and the workshop.

21. The first sealing works with DBST began in June 1989 on the south section of NR13 by RBCE - Vientiane Municipality, and in December 1989 immediately north of Phone Hong by RBCE No. 10. At the end of December 1993, all work on the first seal coating had been completed and the second seal works were scheduled to be completed by the end of May 1994. The delay in this schedule was due to the completion of base course work as detailed above.

22. The preliminary preparations for the installation of the bridge beam moulds and concrete mixing plant at the precast yard in Vientiane were begun and the laboratory equipment installed in May 1990, coinciding with the arrival of the precast expert. Because of local funding difficulties, the yard was not fully established until November 1990, when the supplier commissioned the concrete batch plant. Production of bridge beams was delayed further by lack of cement supplies, mainly because of an export embargo placed on this material by the Government of Thailand. The first beams were poured late in December 1990, and production continued with cement imported from the People's Republic of China in January 1991. Despite some delays caused by cement supply difficulties, the entire precast production was completed by the end of March 1993. Under the revised program, the bridgeworks had been scheduled to be completed in June 1993, to coincide with the first extension of the loan from June 1992 to June 1993. This part of the bridge program was therefore on time.

23. In October 1990, RBCE No. 10 began field work on bridge erection. The work took considerably longer than anticipated, even allowing for the learning curve and necessary training. By July 1991, only one bridge had been completed and RBCE No. 10 was advised to form three construction crews to accelerate the bridge program, but it was not accelerated. In May 1992, MCTPC mobilized RBCE - Compagnie De La Construction Des Vois Des Communications in an attempt to increase the rate of construction. With the arrival on site of this new group, construction increased markedly so that by December 1993 the program was 78 per cent complete. Substantially full completion was reached by July 1994; about one year behind the scheduled completion in June 1993.

24. The details regarding the technical assistance for maintenance training of the provincial services of MCTPC in Saravane, Champassak, and Vientiane, and in Vientiane Municipality, are contained in the Final Report, Road Maintenance Component, Third Road Improvement Project, TA No. 923-Lao: Road Maintenance Training Project. This report was prepared and distributed in March 1991. Through the services of a Bank-financed advisor for 22 months and two UNVs, each for two years, the maintenance component started in May 1989 and was completed under the Project in December 1992, which was one year later than anticipated at appraisal. This delay was caused by a prolonged bidding process by MCTPC for Bank-financed equipment. The maintenance component begun under the

Project continues under the Fifth Road Improvement Project.[1]

E. Engagement of Consultants and Procurement of Civil Works and Goods

1. Consulting Services

25. Following the signing of the UNDP Project Document in April 1988, an Australian firm was recruited by the Bank, in accordance with the Bank's *Guidelines on the Use of Consultants,* to provide consulting services for detailed engineering; procurement of equipment, plant, spare parts, materials, and other requirements; and construction management. The consultants worked under PMU established by MCTPC exclusively for the administration of the Project. The consultant's contract originally provided for 60 person-months, which during the contract period was extended to 102 person-months mainly because of the change in the bridge construction technology and the extension of services caused by time overruns in the schedule for civil works.

2. Civil Works

26. Civil works were carried out departmentally under MCTPC through the force account method by RBCE No. 10 and its subcontractors with a local workforce of 300-700 personnel depending upon the season of the year. RBCE No. 10 had earlier successfully completed the Bank-financed First Road Project under Loan No. 643-LAO; at that time RBCE No. 10 was under the Vientiane provincial authority. In the beginning RBCE No. 10 was a small inexperienced enterprise, which through extensive on-the-job training by the same Australian consultant as for the Third Road Improvement Project gained valuable experience, which enabled it to produce high quality works in an efficient manner.

3. Goods

27. MCTPC transferred all construction equipment, spare parts, and tools procured under Loan No. 643-LAO for use on the Project in accordance with the Loan Agreement. MCTPC also, through its Bid Committee, procured the additional construction and maintenance equipment and all fuel supplies, spare parts, and materials for the Project. The procurement of equipment, which began in July 1988, was grouped into 16 contract packages, three of which followed international competitive bidding (ICB) procedures, ten used the international shopping (IS) method, and the rest used direct purchase (DP) procedures. The bid response was satisfactory for all the packages with from 3 to 12 technical responsive bids per package. It appeared that the more homogeneous the package in terms of equipment with almost similar functions, such as for earthmoving or compaction or hauling, the better the response. Most of the fuel products and materials were purchased through IS procedures. The time elapsed for the main supply groups between bid closing date and delivery of the items to site was about 12 months, on average, as estimated at appraisal.

28. Spare parts procurement accounted for about 30 per cent of the total value of goods procured and continued throughout the course of the Project. Many of these contracts were small (less than $10,000) and were let for the replacement of parts consumed on a routine basis. These were normally procured by the DP procedure. For

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[1] Loan No. 1108-LAO (SF), for $34.0 million, approved in October 1991.

larger orders, where it was possible to package a large group of spares, procurement was made by the IS procedure. The tedious procedures for approval of procurement of spare parts by the Bid Committee of MCTPC and by the Ministry of Finance contributed substantially to the implementation delays. During the latter part of the Project the imprest account established under the loan became operational and facilitated the procurement process.

F. Performance of Consultants, Contractors and Suppliers

1. Consultants

29. The performance of the consultants was satisfactory. As a result of their earlier involvement in the First Road Project, they were familiar with all aspects of the Project. The designs of the Project road sections and the PSC bridges were generally done well and the preparation of prequalification and bid documents was thorough, well prepared, and on schedule. The consultant's site supervisory staff consisted of a full-time resident construction management expert with short-term assistance from construction and equipment specialists. They showed resourcefulness and ingenuity in keeping construction activities going despite the shortages of construction materials, fuel, oil, and lubricants, and the breakdown of key units of equipment caused by the delays in the procurement of spare parts. The mechanical team[1] was particularly successful in maintaining most of the construction equipment fleet with a minimum of down time and in the forward planning of spare parts requirements. The consultants and the PMU team of 24 full-time technical and support staff worked together efficiently and harmoniously and successfully achieved the objectives of the Project, in terms of both the quality of the works constructed and the experience and expertise transferred. As a result of the training programs organized by the consultant's specialists in the various construction and workshop activities and also of the improved supervision and quality control procedures established early in the construction phase of the Project, the standard of workmanship achieved on the Project was high and continued improving. The consultant was successful in introducing a new bridge construction method and thereby increased the technical knowledge of the Lao engineers and the local content of construction. The final DBST paved surface was homogeneous and durable, and the riding surface was satisfactory.

30. The relatively limited number of person-months allocated for the consultant's staff did not, in the view of the PCR Mission, result in less than fully adequate site management because they closely monitored the key activities and administration of the Project and trained a team of capable Lao engineers, technicians, operators and mechanics. Throughout the Project, they assisted PMU in preparing monthly progress reports and prepared the final completion report.

2. Contractors

31. The force account staff of RBCE No. 10 performed satisfactory and completed the civil works with minimum delays. However, the team of RBCE - Vientiane Municipality (a Government-owned subcontractor) did not perform as well and remedial works were requested by a mission from the Bank in August 1993; these works were only completed in October 1994.

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[1] Assisted by a chief mechanic seconded to the Project team under the UN Volunteer scheme.

3. Suppliers

32. The performance of suppliers and manufacturers was satisfactory. Deliveries were generally made according to the contract schedules, although difficulties were experienced in forwarding some of the shipments to Thanaleng port on the Mekong River near Vientiane. The equipment, as supplied, conformed to the specifications and performed satisfactorily.

G. Conditions and Covenants

33. The Government took reasonable fast action in meeting the condition for loan effectiveness[1] and on 25 March 1988 the loan was declared effective, which was within four months of the signing of the Loan Agreement.[2] A detailed review of the Government's compliance with the loan covenants is provided in Appendix 8. No covenant was modified, suspended, or waived during implementation. The Borrower and MCTPC have complied with all covenants that had become due by the time the Project was completed. On 25 May 1993, the construction and maintenance equipment, which was leased from MCTPC, was transferred, with the Bank's consent, to the RBCEs in connection with their privatization prior to qualifying for work on the Sixth Road Improvement Project.[3]

H. Disbursements

34. The actual disbursements are shown in Basic Data Sheet (iv) and in Appendix 5. Because of the delays experienced in the procurement of construction and workshop equipment, major disbursements scheduled for the last quarter of 1988 were delayed by about three months in 1989. This, however, did not cause any delay in commencement of the civil works because construction proceeded with equipment procured under Loan No. 643-LAO. The final disbursements, scheduled for the second quarter of 1993 were actually made in the third quarter of 1994 following the revision of the loan closing date from 30 June 1993 to 30 June 1994.

35. The Bank closely monitored the status of disbursements throughout the Project and attempted to expedite problems by inviting Lao officials to the Bank's regular procurement seminars in Manila and by sending a Disbursement Mission to the Lao PDR in November 1989.

I. Environmental Impact

36. The Project has not generated any adverse environmental effects. The road generally followed the existing alignment. The only land acquired was, therefore, to realign some sharp curves and for the workshop. Farming communities were not adversely affected and no households were relocated. The provision of a bituminous seal has eliminated dust problems for village communities. So far, there has been no indication that the number and severity of traffic accidents have increased after completion of the road improvements. In summary, the Project has already improved the quality of life of the population within its area of influence.

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1. The arrangements required by the Government to obtain the UNDP grant for consulting services.
2. This Agreement was signed only three days after the Board's approval of the loan.
3. Loan No. 1234-LAO(SF), for $26.0 million, approved in June 1993.

J. Initial Operations and Project Benefits

1. Traffic and Traffic Growth

37. Traffic has increased considerably over the construction period of the Project and is expected to increase at an even greater rate as the links between Vang Vieng, Luang Prabang, and Pak Mong are progressively completed. A comparison between traffic volumes before the Project implementation began, and following substantial physical completion in April 1993 is in Appendix 9. A detailed comparison of vehicle type and daily variation is not relevant as the night traffic in the earlier survey was not classified because of security problems. Generally, it appears that traffic volumes on the southern section of NR13 have more than doubled, volumes on the northern section of NR13 between Vientiane and Phone Hong have almost doubled, while the volumes between Phone Hong and Vang Vieng have almost quadrupled.[1]

38. The annual traffic growth rates (appraisal estimates) of 3.4 to 5.0 per cent for passenger vehicles and 5.0 to 7.7 per cent for trucks were substantially exceeded during the period from 1987 to 1993 (see Appendix 9). The reasons for this higher growth are particularly related to (i) a considerable improvement in the economic conditions (see Appendix 10) around Vientiane brought about by the Government's reform program; and (ii) generated traffic. The latter component is estimated to account for about 50 per cent of normal passenger traffic between Vientiane and Phone Hong and for about 90 per cent of normal passenger traffic north of Phone Hong. The resulting elasticity (percentage generated passenger traffic of normal passenger traffic over percentage transport cost decrease) was calculated at -1.5 for the entire road sections covered by the Project. Further details on the traffic surveys are given in Appendix 11.

39. The pattern of truck growth rates did not follow that of passenger vehicles. The observed negative or nil growth on the road sections near Vientiane can be explained by the higher proportion of large trucks in 1993 compared with the more mixed traffic flow in 1987. Actual truck traffic growth north of Phone Hong is three times the expected volume because of the higher than expected economic development; no figures are available on the increased volume of production induced by the road improvements.

2. Project Maintenance

40. At appraisal, road maintenance in the Lao PDR was rudimentary and mostly focussed on emergency operations to keep the main roads open to traffic. Since then, the maintenance sector under MCTPC has undergone substantial changes, so that it now is able to maintain the trunk roads in a reasonable condition. On 31 December 1994, the maintenance of the road sections, which were improved under the Project, was handed over to the Maintenance Division's Northern Region within MCTPC. Funds for maintenance of national and provincial roads are provided by the Government through MCTPC, and actual maintenance is normally done by provincial road maintenance units under the supervision of MCTPC. The Government has acknowledged that regular maintenance operations are necessary if its investment in the road network is to produce the benefits envisaged. As an indication of this policy, the Government increased the budget for maintenance of important

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[1] The report "Traffic Counts on Third Road Improvement Project", April 1993, and an Addendum to that report dated July 1993 are stored in the Project file.

national and provincial roads from $1.9 million in 1988 to $4.5 million in 1994, an annual increase of about 12 per cent in real terms. This resulted in an average allocation of $1,000 equivalent per km in 1994 for both periodic and routine maintenance of these important national and provincial roads.[1] This is considered adequate, taking into account the road and traffic conditions in the country and the availability of local construction materials and labor at relatively low costs. During 1991-1994, the expenditures by MCTPC for maintenance of these roads have decreased because of the large ongoing road construction program, for which the contractors carry out maintenance of the sections they are responsible for during the construction period.

41. Over the past few years, the Government has initiated action to enhance the level of maintenance in terms of organizational changes (establishment of a maintenance division within MCTPC with 30 engineering staff and maintenance controllers for all provinces), budgetary support, and manpower development; this strategy is assisted by external agencies, particularly the Bank, through TA and loans. However, there is still scope for improvement, particularly in the organization of routine maintenance and in the quality and extent of maintenance, which are constrained by the limited availability of equipment and manpower. It is expected that Bank assistance for periodic road maintenance in selected areas and training of staff under ongoing TAs, as well as assistance currently being provided for the road subsector by other major aid organizations, notably the Swedish International Development Authority, the World Bank, the Nordic Development Fund and UNDP, will substantially improve maintenance. In 1994, the Government established three regions, comprising groups of provinces, directly under MCTPC for maintenance of national and provincial roads. This action will improve the efficiency and utilization of equipment and manpower.

3. Project Benefits

42. The actual traffic volumes observed in 1993 were considerably higher than the traffic forecast at appraisal, while the traffic composition was not significantly different, except for trucks. The increased volumes reflect an unexpectedly high initial demand generated by substantially improved road sections, but future traffic growth is expected to be in line with the estimates prepared at appraisal. The Project is thus considered to have realized its principal objective of facilitating more efficient road transportation. In addition, the Project generated about 10,000 person-months of employment for both skilled and unskilled Laotian labor.

43. The direct beneficiaries of reduced vehicle operating costs resulting from improvement of the road sections are vehicle operators. It has been verified by the PCR Mission through available data on passenger fares and truck rates, that about one half of the initial savings in vehicle operating costs have been passed on to the road users. Aside from quantifiable savings, indirect benefits have been observed to have occurred to the population in the influence area of the Project. Part of the estimated generated traffic is due to higher agricultural production of food grains and cash crops and higher prices of these products obtained by the farmers. The sawmills along the northern road sections of NR13 have been restored and timber is brought to Vientiane at substantially reduced transport costs. Prior to commencement of civil works, most of the villages remained isolated during

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[1] In India, Pakistan, and the Philippines the equivalent amounts for road maintenance are less, while in Thailand, the figure is higher but for a much higher quality of road surface.

the wet season, but as a result of the road improvements, Vientiane Municipality now operates a bus service using the road. Post-construction responses from interviews with residents in the influence area of the Project indicated easier access to health centers, primary and secondary educational facilities, and community stores. Bicycle access to primary schools has now been extended to about 10 km, allowing a larger percentage of school age children to attend school. New schools are also being constructed in the villages. Further, investment in new housing and stores, and renovation of existing ones can be observed along the road that can be attributed to the road improvements' stimulating effect on income generation. Prior to the construction phase, migration of population from the influence area was observed, but this movement has now turned into immigration with an annual population growth rate exceeding 3.0 per cent. Basic information in 1993 on the main activities, in the form of a moving survey, along the Project road is shown in Appendix 10. The post-construction traffic surveys and the economic survey are considered to fulfill the Government's obligation to conduct benefit monitoring and evaluation.

44. A number of institutional benefits associated with the Project have also been realized. These are associated with (i) the strengthening of the capability of RBCEs and MCTPC to plan, construct, and maintain road networks, and (ii) the introduction of improved techniques and work methods associated with road and bridge construction and equipment maintenance, which will support future road investment and maintenance programs. During the busiest phases of construction activity, the RBCEs employed up to 700 personnel.

45. The Project was reevaluated using the actual construction cost as a basis to calculate economic costs and adopting largely the same methodology for economic evaluation as applied at appraisal. As envisaged at appraisal, the main benefits of the Project accrue from savings in vehicle operating costs and reductions in maintenance costs. The economic internal rate of return (EIRR) for the Project road improvements has been recalculated in 1993 prices to be 24.7 per cent compared with the 22.3 per cent estimated at appraisal. This result is considered satisfactory. A summary of the economic evaluation methodology and the reevaluated EIRRs by section are given in Appendix 11.

46. No significant risks are envisaged throughout the economic life of the Project because the traffic is considered likely to grow at an annual rate of at least 5 per cent and a regular road maintenance program has been formulated and is being implemented with assistance from the Bank. However, the number and severity of road traffic accidents need to be constantly recorded, and remedial measures should be taken in case of increased figures at specific locations.

K. Performance of Borrower and Executing Agency

47. The arrangement in which MCTPC carried out the functions of the Executing Agency proved beneficial for the Project. The construction unit (RBCE No. 10) proved capable of constructing the civil works in a satisfactory manner. The PMU within MCTPC also proved generally efficient in executing its tasks, and kept the Bank informed about the progress of the Project through monthly reports and telexes.

48. For force account construction works, as implemented under the Project, the procurement of materials, equipment, and particularly spare parts constitutes one of the major administrative activities. Because the execution of each contract had to comply with both the Government's and the Bank's procedures, procurement often proved a time

consuming exercise. After the bids or quotations had been evaluated and the contract award had been recommended and approved, there was often a long interval between the actual signing of the contract or the issuance of a purchase order, and the request to the Bank for a commitment letter. However, it must be recognized that MCTPC was only directly involved in procurement matters up to the preparation of the request, while in accordance with Laotian procedures various other offices, particularly the Ministry of Finance, were responsible for the subsequent actions.

L. Performance of the Bank

49. The Project was closely monitored by the Bank. During implementation a number of Review Missions visited Vientiane and the PCR Mission made a final review in August 1994. Close monitoring by the Bank was invaluable in expediting implementation, particularly the decision by the Bank to provide funding under TA No. 1495-LAO, which enabled the training process, initiated under the Project, to continue in concert with the prestressed concrete bridge construction program. The terms of reference for the consultant were adequate, although there remained throughout the Project certain misconceptions by others, including MCTPC, regarding the consultant's role in providing technical assistance and training. In the future, the terms of reference should be as clear as possible about the consultant's role; in this case there was a clear expectation by the Executing Agency that the consultant was also the project manager, engineer, and contract supervisor. Clearly, if this is to be the case then full time inputs from a substantially increased consultant team would have been required. In all instances where the Executing Agency or consultant sought assistance or guidance from the Bank during implementation, such support was readily forthcoming.

III. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

50. The Project successfully contributed to the improvement of the Lao PDR's infrastructure by upgrading road transport in the Vientiane-Vang Vieng corridor and by improving the maintenance organization and quality in four provinces. The Project was completed within the budget. The quantifiable benefits in terms of vehicle operating and road maintenance cost savings were greater than expected, principally because (i) the traffic levels upon completion of the Project were higher than envisaged at appraisal, and (ii) the bridges were constructed as two-lane PSC instead of one-lane steel trusses as envisaged at appraisal. Therefore, the EIRR for the entire Project of 24.7 per cent upon completion of the Project is comparable with the forecast at appraisal of 22.3 per cent. Similarly, the reestimated rates of return by road section and for the road maintenance component remained higher than those estimated at appraisal.

51. Overall, implementation of the Project required about four and a half years, a year and three months longer than envisaged at appraisal because of implementation delays and a change in the bridge construction technology. At appraisal it was estimated that the preconstruction activities such as selection of consultants, detailed engineering, and procurement of equipment would be completed within 12 months of loan approval (i.e. by late 1988) and that a 45-month implementation period for civil works would be required (i.e.

until the middle of 1992). However, the recruitment of the consultant was delayed by three months because the UNDP Project Document was signed later than envisaged. The civil works construction began in February 1989, over five months behind schedule, using the equipment available to RBCE No. 10, while it waited for the delivery of the supplementary equipment that would be procured under the loan. Construction activities were also delayed because of the late delivery of plant; sporadic shortages of fuel, cement, and spare parts; and the change in bridge construction techniques.

52. Despite these minor delays, the Project was implemented successfully. The objectives of the Project were substantially achieved with the construction of high-quality road sections and bridges, the transfer of construction management expertise, and the training of personnel of RBCE No. 10, MCTPC, and the maintenance units in four provinces.

B. Recommendations

1. Project Related

53. It is recommended that the monitoring of the performance of the road sections, which were improved under the Project, by MCTPC be continued on an annual basis, considering the higher than expected traffic loading.

54. Although the Borrower has complied with all of its obligations so far for the maintenance of the road sections, MCTPC generally has had insufficient funds for maintenance of the national highway system. It is important that the newly constructed Project facilities be allocated resources sufficient to maintain a satisfactory level of service.

2. General

55. The major impediments to the Project consisted of the delays experienced in the procurement of spare parts. The PCR Mission's opinion is that for work implemented by force account, an imprest account for the Executing Agency is necessary throughout the construction period so that urgently needed spare parts and materials may be procured without delay.

56. The Government's procurement system entailed a lengthy process involving many steps and review of technical matters by nontechnical personnel in MCTPC and the Ministry of Finance. The streamlining of the Government's internal review and approval procedures will, therefore, greatly benefit future projects in the Lao PDR.

57. It is also the PCR Mission's view that force account works may no longer be possible in the Lao PDR, taking into account the fast development of the market economy and the related competition for skilled labor. During the last and prolonged phase of the implementation period, the lack of skilled labor became more of a problem when many staff resigned because of low pay by the Government. The privatization of the major road construction units in the country is therefore seen as the only option available; this is included in the covenants under Loan No. 1234-LAO. The Bank is also assisting in the training of engineers and technicians at the Road Training Center of the School of

Communication and Transport within MCTPC[1] and on job sites of the RBCEs.

58. The prestressed cement concrete technique for bridge construction, as introduced in the country for the Project, will be useful for future construction works in various parts of the country and MCTPC should encourage the construction plant to seek new domestic markets for this high-quality product.

59. In connection with the proposed transfer from force account works to local competitive bidding for civil works among prequalified private contractors, it would be useful to prepare general contract documents for bidding in the context of local conditions.

[1] TA No. 2248-LAO: Upgrading of the School of Communication and Transport Project, for $300,000, approved in December 1994.

APPENDIXES

LIST OF ADDITIONAL WORKSHOP EQUIPMENT AND TOOLS
Procured under Loan No. 866-LAO(SF)

Group	Description	No. Required	No. Purchased	
1.	Tracked tractor,160 kW	2	2	
	Motorgrader,95 kW	2	6	a/
	Wheeled loader, 107 kW	2	6	b/
	Excavator with rockbreaking attachment,78 kW	1	1	
2.	All terrain crane, 15-16 mt	1	1	
3.	Vibratory self propelled roller, 8-10 mt	3	3	
	Roller, multitire, 8-12 mt	1	1	
	Roller, pedestrian, 0.6 mt	2	2	
	Plate compactor rammer, 65 kg	2	10	c/
4.	Dump truck, 8 mt	6	18	d/
	Watertanker truck, 8,000 lit	3	5	e/
	Lubrication truck, 8 mt	1	1	
	Flattop truck, 8 mt	2	2	
	Fueltanker truck, 8,000 lit	1	1	
	Flattop truck with crane, 8 mt	1	4	f/
	Bitumen distributor truck, 6,000 lit	1	1	
	Prime mover & lowloader trailer, 35 mt	1	1	
5.	Air compressor, 22.5 cu m/min	1	1	
	Air compressor, 7.5 cu m/min	2	5	g/
	Jack hammer plus accessories, 25 kg	4	4	h/
	Jack pick plus accessories, 22 kg	1	1	
	Pneumatic concrete vibrator & asscessories	2	2	
	Concrete mixer & skip, 500 lit	2	2	
6.	Crushing & screening plant, 60 mt/hr	1	1	
7.	Generating set, 350 kVA	1	1	
	Generating set diesel, 5 kVA	1	1	
	Generating set diesel, 3 kVA	4	4	
8.	Pneumatic pile driver, 2,800 kg including pile support system	1	1	
9.	Bitumen heating, decanting and storage unit, 6,000 lit	2	2	

(Reference in text: page 1, para. 4; page 3, para. 10)

Group	Description	No. Required	No. Purchased
	Road broom, towed	1	1
	Chip spreader, mechanical	2	1
10.	Water pump,diesel,trailer mounted, 75 mm	2	2
	Water pump,electrical,submersible, 75 mm	2	2
11.	Motorcycle, step thru, 70 cc	2	2
	Motorcycle, 100 cc	2	10 i/
12.	Steel bar bending machine, 35 mm	1	1
	Steel bar cutting machine, 35 mm	1	1
	Steel bar cutter, hand operated, 19 mm	3	
13.	Twin cab pickup, 4x4, diesel powered	5	8 j/
14.	Transformer, 22 kV, 380-220 v, 200 kVA with transmission and electrical reticulation material	1 set	1 set
15.	Engine & pump, 180 kW, for gravel barge	1 set	
16.	Concrete pipe making plant complete with moulds	1	1
	Farm tractor, 50 kW	1	5 k/
	Miscellaneous survey equipment:		
	Theodolite	2	2
	Level	2	2
	Staff	6	6
	Soil testing equipment	1 set	1 set

NOTES:

a/ 4 units to maintenance component.
b/ 4 units to maintenance component.
c/ 8 units to maintenance component.
d/ 12 units to maintenance component.
e/ 2 units to maintenance component.
f/ 3 units to maintenance component.
g/ 3 units to maintenance component.
h/ Rotary rock drills.
i/ 8 units to maintenance component.
j/ 3 units to maintenance component.
k/ 4 units to maintenance component.

Appendix 2

LIST OF ADDITIONAL WORKSHOP EQUIPMENT AND TOOLS
Procured under Loan No. 866-LAO(SF)

Item	Description	No. Required	No. Purchased
1.	High pressure washing unit diesel powered	1	1
2.	Pressure water supply system	1	1
3.	Welder, diesel powered, 300A and trailer mounted plus accessories	1	1
4.	Radio equipment		3 sets
5.	Office stationery		
6.	Perimeter fencing		
7.	Security lighting		
8.	Stores shelving		
9.	Cardex system	5	5
10.	Prefabricated watertank, 50,000 lit	1	1
11.	Plan printer	1	1
12.	Fuel storage tank, 25,000 lit	1	1
13.	Fuel dispensing bowser	1	1
14.	Hand drum pumps with meters	10	6
15.	Oxygen welding equipment	2	2
16.	Heavy duty tool kits	8	8
17.	Hand tools and equipment		
18.	General items for stock holding (bolts, nuts, electrodes, gasket materials, etc.)		
19.	Lubrication equipment		
20.	Chainsaw 26" cutter bar	2	2
21.	Circular saw bench 24"	2	2

(Reference in text: page 1, para. 4; page 3, para. 10)

Appendix 3

LIST OF ROAD CONSTRUCTION EQUIPMENT
Procured under Loan No. 643-LAO(SF)

4	Units	Komatsu D65-A bulldozer
3	Units	Komatsu GD505R grader
3	Units	Komatsu WA300 loader
1	Unit	Komatsu PC200 excavator
3	Units	Sakai rubber tire rollers
2	Units	Sakai vibrating roller
2	Units	Sakai pedestrian roller
3	Units	Sakai rammer
1	Unit	Fuso Mitsubishi service truck
28	Units	Fuso Mitsubishi dump truck
3	Units	Fuso Mitsubishi watertanker truck, 8,000 lit
1	Unit	Fuso Mitsubishi crane truck, 8 mt
1	Unit	Fuso Mitsubishi fueltanker truck, 8,000 lit
2	Units	Fuso Mitsubishi flattop truck, 8 mt
1	Unit	Isuzu Niigata bitumen distributor truck
2	Units	Heating, decanting and storage unit, 4,000 lit
5	Units	Aggregate spreader
1	Unit	Rotary broom, towed
4	Units	Toyota twin cab pickup
2	Units	Toyota single cab pickup
6	Units	Motorcycle 75/100 cc
1	Unit	Air compressor 120 lit/sec
4	Units	Concrete vibrator, flex tool
4	Units	Concrete vibrator, pneumatic
1	Unit	Industrial farm tractor
2	Units	Water pump, 75 mm
3	Units	Concrete mixers, 250 lit
1	Unit	Gravel barge

(Reference in text; page 1, para. 4)

Appendix 4

LIST OF WORKSHOP EQUIPMENT
(Procured under Loan No. 643-LAO(SF))

1	Lathe complete with tooling and measuring instruments
1	Power hacksawing machine
1	Grinder 200 mm, bench mounted
1	Pedestal grinder, 250 mm
1	Pedestal drill, 25 mm, including drill bits
2	Mobile electric welding units complete with accessories
1	Air compressor (stationary) 10-14 lit/sec
1	High pressure water cleaner, diesel powered, trailer mounted
1	Electric drill portable, 10 mm
1	Electric drill portable, 13 mm
1	Electric drill portable, 19 mm
1	Angle grinder, 180 mm, heavy duty
1	Straight grinder portable, 150 mm, heavy dury
2	Hydraulic floor jacks, 1.5 and 4 mt
8	Safety stands, 10 mt
2	Floor creeper
1	Floor crane, 500 kg
1	Hydraulic press, hand operated, 30 mt
1	Battery fast charger
6	Mechanics' tool kits
26	Units stores shelving
1	Submersible water pump, including all electrics and well casing
1	Unit generating set
1	Field workshop trailer, complete with tools and equipment, including 3 kVA generator, drill stands, oxygen welding set, hand tools and hydraulic puller set
2	Sets welding equipment, including oxygen and acetylene bottles and general welding tools and equipment
4	Steel workshop benches
	Assorted hand tools, socket sets, stock and die sets and test equipment
	Lubrication equipment
	Tire shop equipment
	Electric test and repair equipment
	General materials
	Spare parts to suit all project plant, equipment and vehicles
	Workshop office equipment, including tables, chairs, fans, book shelves and cabinets
	Spare parts, maintenance and reference manuals to suit all project plant, vehicles and equipment

(Reference in text: page 1, para. 4)

TOTAL PROJECT COSTS BY PROCUREMENT YEAR
AND ALLOCATION OF LOAN PROCEEDS a/

ITEM	1988	1989	1990	1991	1992	1993	TOTAL COST ($)	TOTAL INFLATED COST ($)
Kip Exchange Rates	400	500	700	700	710	720		
Inflator Index (G5MUV)	1.20	1.15	1.13	1.07	1.07	1.00		
1) LOAN AMOUNTS ($)								
Equipment, Spare parts, Tools and Vehicles	5,528,800	1,588,838	1,248,867	350,651	452,391	222,819	9,392,366	10,955,017
Materials, Supplies, Fuel, Ancillary Items	156,678	1,110,989	1,913,165	960,776	2,647,671	1,433,516	8,222,795	8,922,082
Local Expeditures	72,200	160,841	20,901	393,565	751,643	370,212	1,769,362	1,890,810
Service Charge During Const							429,975	483,197
Sub Total Loan Expenditures	5,757,678	2,860,668	3,182,933	1,704,992	3,851,705	2,026,547	19,814,498	22,251,106
2) GOVERNMENT COSTS -- KIP Sub Total Local Expenditures	7,347,185	414,659,299	756,530,000	464,807,000	373,644,216	471,852,695	3,774,066	4,125,954
TOTAL PROJECT COSTS ($)	5,776,046	3,689,987	4,263,690	2,369,002	4,377,964	2,681,898	23,588,564	26,377,060
MAINTENANCE COMPONENT AND SERVICE CHARGE							4,680,465	5,259,811
TOTAL COSTS WITHOUT MAINTENANCE COMPONENT AND SERVICE CHARGE							18,908,099	21,117,249

a/ Excluding cost ($1.67 million) of consulting services financed by UNDP.

CHRONOLOGY OF MAIN EVENTS IN PROJECT IMPLEMENTATION

Date	Event
1984	
Mar	Government requested TA for Road 13 North and Boloven Plateau Roads.
20 Jul-2 Aug	TA Fact-Finding Mission visited Lao PDR.
29 Aug	TA was approved by the President for $250,000.
1986	
Jan	TA feasibility studies was completed for roads that were included under Loan Nos. 788-LAO(SF) and 866-LAO(SF).
1987	
7 May	Bank approved engagement of a staff consultant (mechanical) to assist the Fact-Finding Mission.
12-29 Jun	Loan Fact-Finding Mission visited Lao PDR.
31 Jul	Management Review Meeting was held.
23-31 Aug	Appraisal Mission visited Lao PDR.
30 Sep	Staff Review Committee meeting was held.
21-23 Oct	Loan negotiations were held in Vientiane, Lao PDR.
30 Oct	Consultant's Selection Committee meeting was held for approval of short list.
24 Nov	Loan of SDR 14.752 million ($19.0 million equivalent) from Bank's Special Funds resources was approved.
26 Nov	Government approved shortlist of consulting firms proposed by the Bank.
27 Nov	Loan documents were signed in the Bank.
2 Dec	Invitations issued to shortlisted consultants.

(Reference in text: page 5, para. 16)

Date	Event
1988	
27 Jan	Project Document approved by UNDP.
31 Jan	General Notice for procurement was advertised in the Development Business.
2 Mar	Bank approved the use of tender documents for equipment as utilized for earlier Bank-financed procurement in Lao PDR.
3 Mar	Consultants Selection Committee Meeting was held for evaluation of consultants proposals.
14-16 Mar	Contract negotiations with first ranked consulting firm under TA No. 924-LAO were held.
25 Mar	Loan was declared effective.
28 Mar	Received telex advice that the tender for the supply of construction equipment had been issued on 25 March 1988 and would be closed on 1 June 1988.
19 Apr	Project Document signed by UNDP.
13 May	Contract signed with consultant.
19 May	Notice to proceed issued to consultant.
20 May	Consulting services commenced.
19-26 May	Special Loan Administration Mission in field, including staff consultant for evaluation of bids for construction equipment.
11 Jun	Consultant's personnel in field.
4 Aug	Bank received final bid evaluation report for Package IFB 001.
30 Aug	Bank approved the award of contracts for six of seven packages of construction and maintenance equipment (Packages A to F).
7 Sep	Bank approved the Government's request that MCTPC negotiate contract with the Institute for Communication Projects (ICP) to undertake engineering surveys to be charged against local expenditures.
29 Sep	Bank approved award of contract for the supply of Group G -

Date	Event
	miscellaneous equipment.
29 Sep	Bank received draft negotiated contract for the provision of services to the project by the Communication, Design & Research Institute (CDRI), formerly ICP.
8 Oct	Bank approved draft negotiated contract with CDRI.
17 Oct	Bank received signed copies of contract for topographical survey and materials investigations with CDRI.
18 Nov	Bank approved procurement of additional inspection vehicles.
1989	
7 Jan	Bank approved procurement of two additional units of water trucks.
17-22 Feb	First Review Mission in field.
20 Mar	Bank approved draft contract for construction of base workshop and support facility.
13 Apr	Bank approved construction of prestressed concrete bridges as an alternative for Bailey steel trusses and reinforced concrete bridges.
19 Apr	Bank received copies of signed contract for construction of the base workshop and support facility.
23 Apr	Bank's comments on financing of local cost for civil works was sent.
25 May	The road maintenance engineer financed under TA 923-LAO arrived in the Lao PDR.
21 Jun-7 Jul	Second Review Mission in field.
22 Jun	Bank advised by telex on procurement of bitumen using the IS procedure.
6 Jul	Bank received contract for purchase of spare parts for bulldozer equipment.
18 Jul	Bank approved procurement of cement, reinforcing steel and spare parts for bulldozers.
9 Aug	Bank approved revised contract for construction of base workshop which would be financed by the Bank at 95 per cent of the contract amount.

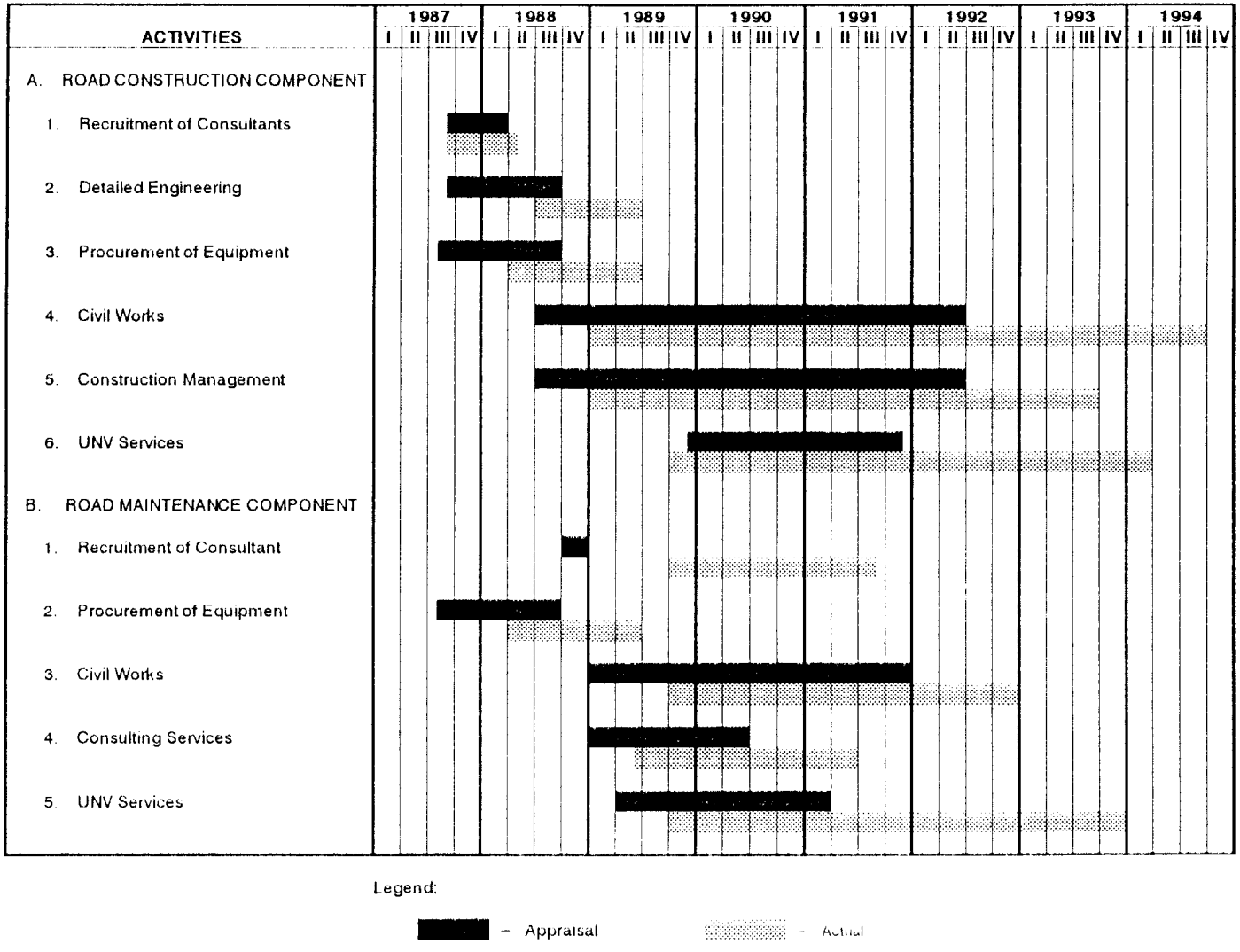
Date	Event
22 Aug	Bank received audited financial statement for FY 1988.
25 Aug	Bank approved award of contract for spare parts for inspection vehicles.
25 Aug	Bank approved procurement of various equipment and materials (Groups A to H).
21 Sep	Bank approved procurement of spare parts for the Tha Ngon ferry, laboratory equipment, and spare parts for asphalt distributor.
13 Oct	Bank approved procurement of spare parts for inspection vehicles and motorcycles.
15 Nov	Bank approved the use of remaining funds in Category 3B, Engineering Surveys and Workshop Construction, to finance construction of pipe manufacturing plant, and also approved procurement of concrete laboratory testing equipment.
16 Nov	Bank approved procurement of spare parts for crushing/screening plant and for other equipment.
15 Dec	Bank approved procurement of spare parts for bitumen equipment, suction hoses for gravel pump, and for various project equipment.
21 Dec	Bank approved procurement of main water pipes and tires, tubes and batteries.
26 Dec	Bank advised by letter the Ministry of Finance on procedures for establishing and operating an imprest account.
27 Dec	Bank approved procurement of spare parts for motor graders.
1990	
8 Jan	Imprest account effective.
8-18 Jan	Third Review Mission in field.
1 Feb	Bank approved procurement of cement and spare parts for ferry.
5 Feb	Bank approved inspection procedures by Consultant and Project Manager for concrete beam moulds.
7 Feb	Bank telex regarding MCTPC's proposal for reallocation of loan proceeds from workshop equipment to spare parts for maintenance equipment.

Date	Event
7 Feb	Bank telex on procurement of portable weigh scales under imprest account.
7 Feb	Received telex requesting Bank's approval to increase the quantity of pedestrian rollers from five to eight units for the maintenance component.
13 Feb	Telex from MCTPC justifying proposed reallocation of loan proceeds from workshop to spare parts for maintenance equipment.
15 Feb	Bank approved procurement of bridge beam moulds, structural steelwork, prestressing consumables, concrete mixers and miscellaneous tools required for bridge construction.
21 Feb	Bank telex to MCTPC regarding findings of the review mission and approval to the proposed change in reallocation of proceeds between workshop equipment and spare parts for maintenance equipment; $200,000 planned for spare parts to be increased to $300,000 and $150,000 planned for workshop equipment to be reduced to $50,000.
28 Feb	Bank approved inspection report for prestressing materials, etc. carried out in Singapore.
12 Mar	Received withdrawal application for initial deposit to imprest fund in the amount of $50,000 together with the list of estimated expenditures.
22 Mar	Bank approved procurement of pedestrian vibrating rollers and drilling rig.
27 Mar	Bank approved procurement of reinforcing bars, spare parts for bulldozers and other requipment, and 100 sets of tires and tubes.
13 Apr	Arrival in Vientiane of consultant's concrete bridge expert.
17 Apr	Bank approved procurement of bitumen products for maintenance component.
23 Apr	Bank approved procurement of spare parts for low loader, industrial tractors, water pumps, concrete mixers, generators and piling rig, and compaction equipment.
6 May	Arrival in Vientiane of consultant's mechanical expert.
17-27 May	Fourth Review Mission.
1 Jun	Bank approved award of contract for construction of building for pipe making plant.

Date	Event
29 Jun	MCTPC proposed procurement of four lubrication trailers in the amount of $49,720.
5 Jul	Consultant's team leader departed from Project.
20 Jul	Bank approved purchase of four lubrication trailers for maintenance component.
15-28 Aug	Fifth Review Mission in field.
17 Sep	Bank approved reallocation of $518.585 from Category V to Category IA.
2 Oct	Consultant's construction management expert arrived in Vientiane.
5 Oct	Telex from MCTPC requesting extension of the length of National Road No. 10 (NR 10) in Champassak Province from 20 km to its entire length of 39 km for maintenance.
9 Oct	Bank approved extension of NR10 works under maintenance component.
23 Nov	Government requested approval to proceed with tendering process for supply of steel panel type bridge to span the Nam Lik River.
1991	
17 Jan	Bank approved tendering process for Nam Lik bridge.
19 Apr-1 May	Sixth Review Mission in field.
28 May	Bank approved MCTPC's proposed change in the periodic maintenance program to reseal a 2-km section of ring road in Vientiane.
12-15 Nov	Loan Disbursement Mission in the field.
5 Feb	Telex from MCTPC requesting approval to purchase bitumen for $500,000.
2-11 Apr	Seventh Review Mission in the field.
1993	
10 May	Government requested extension of loan closing date to 30 June 1994.
7 Jun	Bank approved extension of loan closing date by 12 months to 30 June 1994.

Date	Event
16 Jun	Bank approved MCTPC's request to demobilize the Bank-financed equipment from the Project.
6-14 Jul	Eighth Review Mission in the field.
21 Sep	Fax from MCTPC informing that Bridge No. 36 had been closed because of displacement of central pier and requesting a Bank representative to visit the site.
27 Sep	Bank advice to MCTPC on assistance in rectifying measures for the damaged bridge.
12-18 Oct	Bank Mission in Vientiane to discuss measures to be undertaken for the damaged bridge.
3 Nov	Letter from MCTPC requesting reallocation of SDR371,249 from Category 03A to Category 01A.
11 Nov	Bank approved reallocation of loan proceeds from Category 03A to Category 01A.

IMPLEMENTATION SCHEDULE



(Reference in text; page 5, para. 16)

STATUS OF COMPLIANCE WITH LOAN COVENANTS

	Particular Covenants	Status
1.	Make available funds, facilities, services, land and other resources required in addition to loan proceeds (Sec. 4.02).	Complied with.
2.	Submission of annual audited accounts and financial statements not later than nine months after the end of each related fiscal year (Sec. 4.06(b)).	Complied with.
3.	The Road Maintenance Units (RMUs) of the provinces of Champassak, Saravane and Vientiane, and of Vientiane Municipality shall continue to retain adequate and qualified staff and be assisted by consultants and by two United Nations Volunteers (UNVs) (Sch. 6, para.2(b)).	Complied with.
4.	Upon completion of the Project, the Borrower shall agree upon arrangements for the use of the construction equipment and the construction-related workshop equipment procured under the Project and the First Road Project (Sch. 6, para.7(a)).	The equipment is being used for construction of the Vang Vieng-Kasi section under the Fourth Road Improvement Project. Upon completion of that project, the equipment will be transferred to CU 10 for possible work under the Sixth Road Improvement Project, as approved by the Bank on 25 May 1993.
5.	After the Project is completed, the Borrower shall use the maintenance equipment and the maintenance-related workshop equipment primarily for road maintenance purposes in the provinces of Champassak, Saravane and Vientiane and in the Vientiane Municipality. The Borrower shall obtain the consent of	Complied with.

	Particular Covenants	Status
	the Bank prior to transferring any of such equipment from these areas (Sch. 6, para.7(b)).	
6.	The Borrower shall keep the Bank informed on annual detailed road maintenance programs and adequate funding for maintenance purposes (Sch. 6, para.8(b)).	Complied with.
7.	The Borrower shall keep the Bank informed of action taken to approve planned maximum permissible axle loads and related enforcement legislation (Sch. 6, para.8 (b)).	Complied with.
8.	PBME will be carried out by compiling and analyzing the necessary traffic and socioeconomic data in the Project area (Sch. 6, para.10).	Complied with.

Appendix 9

ESTIMATED AVERAGE DAILY TRAFFIC

Road No/ Road Section	Vehicle Type	Feasibility Estimate June 85	Feasibility Estimate June 87	Actual Estimate March 93	Annual Traffic Growth (%) 1987–1993 Forecast	Annual Traffic Growth (%) 1987–1993 Actual
NR 13S Vientiane – Paksane Km 7 *	Car/Jeep		615	2,090	4.8	22.6
	Van/Pickup		420	1,180	4.8	18.8
	Bus		85	150	5.0	10.0
	Truck		915	760	7.7	–3.1
	Motorcycle		1,120	5,340	4.8	29.7
	Total		3,155	9,520	5.7	20.2
NR 13N Vientiane – Phone Hong Km 8	Car/Jeep	320	365	1,245	4.8	22.7
	Van/Pickup	430	430	1,210	4.8	18.8
	Bus	55	75	130	5.0	9.6
	Truck	425	410	340	7.7	–3.1
	Motorcycle	650	765	3,655	4.8	29.8
	Total	1,880	2,045	6,580	5.4	21.5
NR 13N Vientiane – Phone Hong Km 35	Car/Jeep			285		
	Van/Pickup			430		
	Bus			90		
	Truck			220		
	Motorcycle			620		
	Total			1,645		
NR 13N Vientiane – Phone Hong Km 69	Car/Jeep	75	65	190	4.8	19.6
	Van/Pickup	145	155	335	4.8	13.7
	Bus	20	25	60	5.0	15.7
	Truck	115	135	135	7.7	0.0
	Motorcycle	170	110	465	4.8	27.2
	Total	525	490	1,185	5.6	15.9
NR 13N Phone Hong Houei Mo Km 71	Car/Jeep	10	10	95	3.4	45.5
	Van/Pickup	25	20	230	3.4	50.2
	Bus	15	15	20	4.0	4.9
	Truck	130	75	170	5.0	14.6
	Motorcycle	55	55	285	3.4	31.5
	Total	235	175	800	4.1	28.8
NR 13N Phone Hong Houei Mo Km 94	Car/Jeep		5	45	3.4	44.2
	Van/Pickup		15	95	3.4	36.0
	Bus		10	20	4.0	12.2
	Truck		75	150	5.0	12.2
	Motorcycle		15	60	3.4	26.0
	Total		120	370	4.5	20.6
NR 13N Houei Mo – Vang Vieng Km 150	Car/Jeep		5	45	3.4	44.2
	Van/Pickup		5	85	3.4	60.4
	Bus		5	15	4.0	20.1
	Truck		35	105	5.0	20.1
	Motorcycle		10	75	3.4	39.9
	Total		60	325	4.4	32.5

* km from Vientiane.

(Reference in text; page 10, paras. 37 and 38)

ECONOMIC SURVEY

(Field Survey Completed from 8 to 25 November 1993)

GENERAL

Public transport has shown considerable improvement in quantity and extent over the life of the Project. Lao - Japan buses operate regular services the full extent of the Project from Vientiane to Vang Vieng transporting both passengers and goods.

Over the last two years private buses have also begun operating on this same route, expanding the services provided.

The sections from Nam Lik south to Vientiane are also traversed by the converted pick-ups which carry passengers, goods and livestock.

The longer routes between Vientiane-Vang Vieng-Kasi-Luang Prabang are serviced by converted trucks, which carry passengers in the rear lower section and goods and livestock on the upper levels.

The predominate activity, particularly in the Vientiane Plain is rice farming, but fish farms, cattle production, goats, and some tree type crops are developing.

SURVEY DATA

KM FROM VIENTIANE	
004.8	Wattay Airport junction. New developments along the section to Sikhai Market includes two new gas stations, two snooker halls, furniture outlet, two new office buildings, five small restaurants, five mechanical repair/car motorcycle parts stores, several building supply shops and two substantial new shopfront house blocks.
006.4	Sikhai markets have developed considerably over the course of the project, two major gas stations have been established, one refurbished and one new. Also motor bike and bicycle spare parts stores have proliferated together with a much enlarged fresh and packaged food section. Recently stores selling building materials including cement, tiles, iron sheeting and reinforcement etc. havebeen established. Refreshment and local fast food stalls have mushroomed.
006.7	A number of saw mills have been established or refurbished together with a large rice milling establishment. A large Shell gas station has been established. New housing (brick render, two level) has been built along this section.

(Reference in text: page 10, para. 38; page 11, para. 43)

007.2 Furniture manufacturing establishments and new housing as above.

007.7 Drinking water factory.

008.3 Furniture manufacturing and saw mills.

009.3 New outlets for sawn timber.

009.7 New fish ponds and housing.

010.7 New market area with new gas station on the left side.

011.0 End of Vientiane City area, farming areas begin. Rice paddies predominate but areas next to the road have been filled to create blocks for housing and roadside commercial enterprises.

011.8 Large area with new housing.

012.2 Logging trucks carrying unsawn timber are parked here waiting to take the heavy load detour around Vientiane to Thanaleng.

012.8 Large parquet factory under construction, consisting of two buildings, major about 40m x 10m, another 30m x 10m, and housing in the rear.

013.5 Former Swedish workshop is now a facility to assemble Chinese farm implements, 4WD cars, and small trucks. New shop front housing is developing, selling refreshments, building materials and other miscellaneous goods. Predominant activity is agriculture, rice farming, fish farms, buffalo, and cattle.

015.4 New fuel station and refreshment outlet.

016.0 Post Office newly refurbished with new telephone exchange. Up to ten new houses, some substantial in this area, together with commercial establishments selling farm implements, building materials, packaged and fresh food and refreshments.

017.5 New Shell gas station and outdoor restaurant. Outside of the village areas farming continues to predominate.

019.5 New restaurant and new housing. New school with hundreds of bicycles lined up in the parking area. At school opening and closing times the road is jammed with children on bicycles.

021.2 Lot of new development including a school and housing.

022.0 Two new rice mills, and new housing.

022.9 New sawmill and housing.

025.1 Brick manufacturing yard, built in 1991, has been very active for a couple of years but seems to be in decline. Farming continues to be the predominate activity between the villages and areas of commercial enterprise. In this area rice farming has given way somewhat to cattle and goat production with some establishment of tree type crops. A major development over the last three years has been the construction of fencing around most of the plots of land. Fences range from post and barbed wire to bamboo.

025.9 KM26 market is a large fresh fruit and vegetable market which has now become a mandatory stopover for the public transport along the road. New school on the left.

027.2 New parquet factory under construction, about 50m x 20m in floor area - quite a substantial facility.

027.3 Shell gas station. Substantial housing improvement, four or five new dwellings opposite the Shell station.

028.8 The new power line from Thalat to Luang Prabang comes in from the right at this point and with some minor deviations follows the road alignment through to Vang Vieng and beyond.

029.1 New school under construction - brick rendered construction.

029.6 Numbers of new dwellings, roadside shops selling farm implements, building materials, refreshments. Rice mill.

030.6 Nam Oum irrigation development area. New fresh food and hard goods market.

031.2 Farming areas - some paddy areas have been converted to vegetable plots, growing beans, tomatoes, cucumbers, melons etc. New rice mill.

032.3 Older irrigated area

032.6 New school buildings. A small forest area abuts the road with rice paddies behind.

033.4 School with hundreds of bicycles parked in the yard.

035.1 Another new school. Village is a ribbon adjacent to the road with farming areas in the rear. Farms have been fenced and some tree crops are being established. Housing improvements are substantial and almost every house appears to have a refreshment stall out front.

035.7 Farming moves more to tree crops, cattle and fish farms. Fencing is quite extensive in this area.

036.8 Service facility of an old professional nature including substantial dwelling and refreshments stall. Farming reverts to rice paddies.

038.0 Turn off to the Silviculture research facility. Approximately 40 per cent of the housing in this village is new.

039.2 Substantial fish pond developments on both sides of the road. New school with hundreds of bicycles.

040.2 New gas station.

041.8 Brick production facility

045.3 Extensive saw mill operation has been developed. Development of resort, including restaurant, to the rear and side of the saw mill. Landscaping is in progress and the restaurant appears to be air conditioned. The accommodation units are individual cottages. Another new school. New housing of the traditional wooden style on concrete posts - about twenty new dwellings in this village.

046.9 New gas station.

047.6 Large new fresh food market area.

048.3 New bamboo processing facility to produce toothpicks and chopsticks for the Japanese market.

049.5 Fish ponds, new housing (brick rendered), about five or six units.
Cattle and rice farming activities predominate between the village areas.

051.2 Village known as "Mong". Fires have destroyed large sections of this village over the past three years. It has been virtually rebuilt and shows considerable development of the fresh food market area, the building supplies shops, bicycle and motor cycle repair and spare parts areas. There must be fifty small shops adjacent to the main market area. Several rice mills are located on the edge of the village. Substantial housing just outside the village - two storey brick render type.

052.3 Substantial new fish farms established. Cattle production is substantial. Several more overloaded log trucks from Nam Ngum heading south.

057.2 New housing; about twenty units.

057.7 New gas station. New school block in brick render - hundreds of bicycles.

New fish ponds and fruit tree production.

058.5 New State Fuel gas station. Pipe production facility established. Fish ponds on the right and vegetable plots have again been established in the rice paddies.

060.9 Access road to a new tourist resort with waterfall, elephants etc.

063.3 Fish ponds, vegetables, pineapples, rice and fruit trees have been established.

066.2 Fish ponds and new housing developed. Four storey office/residence for the saw mill on the opposite side of the road.

067.1 Furniture factory and gas station under construction. Medical clinic, transport company headquarters, at outskirts of Phone Hong. State fuel gas station. Phone Hong has developed substantially - mechanical repair shops, bank, motor cycle dealer, new housing, restaurants, multitude of building material suppliers, furniture shops, and refreshment stalls. Hospital, Public Health Office, building construction offices, pharmacies, and police area headquarters are all recently established in new or refurbished accommodation.

070.8 Mechanical repair shop and new housing - three storey brick render.

072.2 Shop front houses selling general goods are all newly established.

072.8 Headquarters of RBCE No. 10. Workshop, pipe plant, offices and housing.

074.3 Brick making facility 2 km on right. Basically rice production area.

075.8 Several new dwellings. Site of motor cycle parts factory to be developed jointly by four companies, two Lao, one Thai and one Japanese. Export to neighboring countries planned.

076.4 New school blocks in brick render.

080.4 Last village before the climb over the first mountain has developed substantially with new housing, gas station, shop front stalls etc.

084.8 Cattle production in the mountain area. New village established with traditional housing. Rice, vegetables, cattle, and buffalo are the principal activities in this valley area immediately beyond the first mountain.

088.2 Hilly area into Nam Lik is developing under the influence of the Upland Development Project which has a demonstration farm in the area. Farm plots are being established from the bush, which was previously subject to

slash and burn practices. Areas have been established and fenced for cattle grazing with stock yards, fenced areas for tree crops where the trees are now being established, and areas for other non-rice crops. Minor dams have been built and fish ponds established.

090.4 Headquarters and demonstration farm - Upland Development Project. This project appears to be influencing farm development over substantial areas to the south and north of Nam Lik. Post and barbed wire fences are substantial with gate accesses. Substantial areas have been cleared and fruit trees have been planted. Rice paddies still exist in the valley areas, but fish ponds are being developed here as well.

092.3 Depot area for the transshipment of limestone from Vang Vieng.

094.3 Nam Lik Bridge. Two new rice mills, new housing and restaurants on the north side of the bridge. Clearing of land for permanent farming continues north of Nam Lik.

099.0 Clearing of small plots for cash cropping - tree type crops. Substantial numbers of goats are now being produced along with increased numbers of cattle.

104.2 Development around bridge number 16 has been substantial. Fencing, roadside refreshment stalls, new wooden houses and large fish ponds to the right. Cattle and goat production continues to be the major activity in this area, but slash and burn agriculture has occurred here in the last few years. Large numbers of children use the road to travel to and from school.

104.4 Village with five new wooden houses.

106.0 Adjacent areas have been subject to slash and burn agriculture over the past years but it appears that better access and improved agricultural techniques are rectifying this situation.

110.6 The area has been developed with fences being erected and areas cleared for permanent farming. Stockyards and shelters have been constructed and young trees have been planted.

113.5 Cattle and goat production has increased markedly.

114.1 Refreshment stalls appearing on the roadside.

116.7 New fresh food market. Four or five new wooden houses and roadside stalls.

121.9 Logging site where timber has been cut over the last six to eight months. Cattle and goats graze in the regrowth areas after past slash and burn practice. Over about 2 km there were about 4 herds of cattle numbering

about 20 to 30 animals per herd. Top end of Nam Ngum dam approaching Houay Mo, the hills continue to be subject to slash and burn agriculture. The lake is the source of fish which are transported from the Houay Mo market on a daily basis, south to Vientiane. There is also some logging of the trees in the top end of the lake and these are transported south on the Project road. Cattle production around the banks of the lake is quite intensive when the new grass grows as the water level recedes. Houay Mo has become a major stopping point for all forms of transport along the Project road. Consequently the fresh food market has spread along the entire lake side of the village; restaurants have been established together with a guest house. A complete new school has also recently been constructed. Entertainment in the form of snooker halls and video viewing shops have also been established.

141.5 Nam Ngart. Barbed wire fencing being installed around the school. Numbers of new houses and commercial enterprise serving the passing trade.

142.5 Southern bank of the Nam One river has seen some development in the form of a fresh food market, roadside stalls, and ten or twelve new houses. The area is basically for rice and cattle production and fencing has been erected over the last three years. New post and wire fencing is being installed in the village and a new school has been established.

149.6 New cement factory under construction with a production of 70,000 metric tons per year. The investment is $14 million by a consortium from Lao PDR and PRC. The plant is expected to be operational shortly and will use local limestone as feedstock, electricity from the new Thalat-Luang Prabang line and the Project road to transport the product to markets. Housing for labour and management is also under construction.

151.0 A number of new house both wooden and brick render construction. A small enterprise selling ice cream from a bicycle/cart is also in operation.

152.0 The limestone rock areas abutting the road are being mined in increasing quantity for burning into lime and for sale as decorative building materials in the areas south to Vientiane.

154.0 Vang Vieng township area. New Shell gas station at the road junction into the town. Major tourist resort under construction at the base of the beautiful limestone mountains behind the town. Restaurant, accommodation units, ferry service over the river to walking paths up to the limestone caves. About twenty accommodation units each of two guest rooms. Several guest houses have been established in the town proper. Agriculture has not changed much in this area - rice, cattle and buffalo being the main production. Fencing of farm plots is, however, a new development - mainly made of bamboo but increasing amounts of post and barbed wire. A main

electricity substation is under construction with local distribution in progress. The lines are about 50 per cent complete south to the cement factory.

ECONOMIC REEVALUATION

A. Methodology

1. The methodology adopted for the economic reevaluation is in line with the system used for appraisal of the Project, except that modifications in modelling techniques, developed since 1987, have been applied. The quantifiable benefits of the Project consisted of savings in vehicle operating costs (VOCs) and reductions in road maintenance costs. A number of other benefits have not been quantified, including passenger time savings, possible benefits to generated passenger traffic, and induced agricultural and industrial development.

2. For reevaluation purposes, the 159.2 km road (improvement component) was divided into three sections, which again were subdivided into seven segments, each one with uniform traffic volumes:

Section I: 16.0 km, Vientiane suburbs (Km 6 - Km 12 South, Km 5 - Km 15 North)
S1: 6.0 km long. Traffic count station at Km 7 South
S2: 10.0 km long. Traffic count station at Km 8 North

Section II: 55.2 km, Vientiane-Phone Hong (Km 15 - Km 70.2 North)
S3: 27.0 km long. Traffic count station at Km 35 North
S4: 28.2 km long. Traffic count station at Km 69 North

Section III: 88.0 km, Phone Hong-Vang Vieng (Km 70 - km 158 North)
S5: 10.0 km long. Traffic count station at Km 71 North
S6: 58.0 km long. Traffic count station at Km 94 North
S7: 20.0 km long. Traffic count station at Km 150 North

The internal rate of return (EIRR) was estimated for each section and for the entire Project.

3. Constant end-1993 prices were used in the economic evaluation. The G-5 manufacturing unit value (MUV) price index[1] was applied to inflate the actual construction costs[2] by year (see Appendix 5, which also shows the exchange rates used to convert the local costs to US dollars). Traded inputs and outputs were valued at international prices in US dollars. All Project procurement was exempted from taxation in Lao PDR.

B. Traffic and Traffic Growth

4. The original traffic surveys were undertaken in June 1985 under TA No. 621-LAO[3]. In June 1987, prior to appraisal, MCTPC undertook fresh traffic surveys over one full week at five locations along the Project road. Following substantial completion of the Project, in February/March 1993 MCTPC carried out new traffic counts at seven key locations along the Project road to establish a comparative traffic data base for each road segment. The counts were conducted over a period of one week at each count station using automatic counting equipment, and supplemented with manual classified counts for two 24-hour periods within the count cycle. The station locations and the traffic survey results are given in Appendix 9.

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[1] MUV is a price index in US dollars terms of manufactured products exported from the G-5 countries (France, Germany, Japan, the United Kingdom and the United States).

[2] MUV is considered a representative index for the Project, for which 85 per cent of all procurement was for internationally manufactured goods.

[3] Second Road Improvement Project, for $250,000, approved in August 1984.

(Reference in text: page 10, para. 38; page 12, para. 15)

5. The methodology used for projecting traffic volumes was the same at appraisal and at post-construction reevaluation. The forecast of normal traffic was based on the present and future planned economic activities, and on population and income changes in the Project influence area.

6. The annual traffic growth rates (appraisal estimates) of 3.4 to 5.0 per cent for passenger vehicles and 5.0 to 7.7 per for trucks were substantially exceeded during the period from 1987 to 1993 (see Appendix 9). The reasons for this higher growth are particularly related to (i) a considerable improvement in the economic conditions (see Appendix 10) around Vientiane brought about by the Government's reform program; and (ii) generated traffic. The latter component is estimated to account for about 50 per cent of normal passenger traffic between Vientiane and Phone Hong and for about 90 per cent of normal passenger traffic north of Phone Hong. The resulting elasticity (percentage generated passenger traffic of normal passenger traffic over percentage transport cost decrease) was calculated at -1.5 for the entire Project road.

7. The pattern of truck growth rates did not follow that of passenger vehicles. The observed negative or nil growth on the road sections near Vientiane can be explained by the higher proportion of large trucks in 1993 compared to a more mixed traffic flow in 1987. Actual truck traffic growth north of Phone Hong is three times the expected pattern caused by a higher than expected economic development; no figures are available on the increased volume of production induced by the road improvements.

8. For the purpose of the economic reevaluation, the actual traffic volumes as observed in 1993 on the representative seven segments were combined into three sections, using the segment road lengths as weights. The annual traffic growth rates (1993-2012) were also reassessed in the light of the recent and forecast economic development in the Project area as follows:

Annual Traffic Growth Percentage, 1993-2012

	Cars, Jeeps, Buses	Vans, Trucks	Motorcycles
Section I	8	6	8
Section II	7	5	7
Section III	5	4	5

C. Vehicle Operating Costs

9. Vehicle operating costs (VOCs) were calculated for six representative vehicle categories commonly used on the Project road, namely cars and jeeps, vans, buses, trucks (two-axle types), multi-axle trucks and motorcycles. VOCs were calculated for composite vehicle types representative of the vehicle sizes, models and weights observed from the field data. Unit prices relating to VOCs were obtained from surveys of retailers, and the financial values were converted to economic prices to reflect border prices net of taxes and subsidies. VOCs for the "without" and "with" Project situations were calculated using the Highway Design and Maintenance Standards Model III (HDM III) developed by the World Bank on the basis of the findings from the comprehensive VOC studies carried out in Kenya (1975), Brazil (1981) and India (1982). The model estimates VOC for each vehicle type, taking into account several parameters concerning the road and its traffic loadings, the most important of which is the surface condition in terms of roughness, which varies over time and which is dependent on the original construction standard, maintenance regime, type of surface and axle loads.

10. The resulting VOCs by vehicle type for a sample of surface roughness values in accordance with the International Roughness Index (IRI) are given in Table 1, and the IRI values

by road section and year in Table 2. The pace of road deterioration, and thus the IRI values, depends on the modified structural number, which is an expression for pavement strength (the higher the number the stronger the pavement), the future maintenance regime, the observed IRI values in 1993 and the time elapsed since construction or reconstruction of the road segment.

Table 1: Economic Vehicle Operating Costs[a]
(US cents per vehicle-km)

IRI (m/km)	Car, Jeep[b]	Van Pickup[c]	Bus[d]	Truck (Composite)[e]	Motorcycle[f]
2.0	5.39	8.54	13.01	13.66	1.35
2.5	5.80	9.21	13.97	14.77	1.45
3.0	6.22	9.89	14.95	15.91	1.56
4.0	7.08	11.31	16.97	18.26	1.77
10.0	12.71	20.48	30.12	33.54	3.18
15.0 (gravel)	17.75	28.70	41.89	47.22	4.44

a Net of taxes and customs duties.
b $VOC = 3.94 + 0.665\ IRI^{1.12}$
c $VOC = 6.18 + 1.085\ IRI^{1.12}$
d $VOC = 9.63 + 1.554\ IRI^{1.12}$
e $VOC = 9.73 + 1.806\ IRI^{1.12}$
f $VOC = 0.99 + 0.166\ IRI^{1.12}$

Table 2: Pavement Roughness Deterioration (IRI)
(m/km)

Year	Section (without Project) I & II	Section (without Project) III	All Sections (With Project)
1987	4.4	15.0	-
1993	4.4	15.0	2.2
1994	4.8	15.0	2.5
1995	5.3	15.0	2.8
1996	5.8	15.0	3.0
1997	6.3	15.0	3.3
1998	6.9	15.0	3.6
1999	7.5	15.0	3.9
2000	8.1	15.0	4.0
2001	8.8	15.0	2.2
2002	9.5	15.0	2.5
2003	10.0	15.0	2.8
2004	10.0	15.0	3.0
2005	10.0	15.0	3.3
2006	10.0	15.0	3.6
2007	10.0	15.0	3.9
2008	10.0	15.0	4.0
2009	10.0	15.0	2.2
2010	10.0	15.0	2.5
2011	10.0	15.0	2.8
2012	10.0	15.0	3.0

D. Construction Costs

11. Construction costs as built and the cost of consulting services were based on the records of the Bank and the Executing Agency. The updated construction and consultancy

costs by disbursement year are shown in Appendix 5. Apart from the direct costs included in the economic analysis, the construction and workshop equipment and spare parts transferred from the Bank's first road project in the country[1] were taken into account at their inflation-adjusted depreciated value in 1988 of $770,000, which were assumed to be consumed over 1989-1992. The residual values of the old Bailey bridges on the Project road at $250,000 and of the newly procured equipment ($3,600,000) were also included in the economic evaluation (see Table 3, for the breakdown by road section.) The economic costs are equal to the financial costs in the absence of taxes and customs duties on Project inputs.

Table 3: Economic Project Costs[a]
($'000 in end-1993 prices)

Section No.	1988/1989	1990	1991	1992	1993	Total
I	840	467	245	461	-110	1,905
II	2,899	1,613	846	1,592	-378	6,572
III	4,622	2,571	1,349	2,537	-602	10,477
Total	8,361	4,652	2,441	4,591	-1,090	18,954

a Including civil works costs for the construction component, costs of consulting services and residual values.

E. Road Maintenance Costs

12. For road maintenance works it was assumed, for the purpose of economic evaluation, that the existing road surfaces would require routine and emergency maintenance. The paved road sections in the "with" Project situation would, apart from routine maintenance, require resealing with a single bituminous layer every eight years, considering the forecast traffic. The resulting economic maintenance costs, based on unit rates derived from ongoing operations and estimated quantities, would be as shown in Table 4.

Table 4: Economic Road Maintenance Costs
($ per km)

Item	With Project (Paved Road)	Without Project (Paved Road) (Sections 1 & 2)	Without Project (Gravel/Earth Road) (Section 3)
Routine Maintenance (Annually)	1,050	1,250	1,330
Periodic Maintenance	8,300[a]	8,300[b]	9,600[c]

a Every 8th year.
b Every 5th year.
c Every 3rd year.

F. Economic Evaluation

13. Reestimation of the economic internal rate of return (EIRR) was undertaken for all three road sections over a 20-year benefit stream period. The resulting EIRRs and those estimated at appraisal are given in Table 5. The economic cost and benefit streams for the base case of the entire Project (the individual streams are in the Project File) are given in Table 6. A similar evaluation procedure as for the road improvement works was followed for the road maintenance component, which at Project completion yielded an EIRR of 39 per cent compared with 31 per cent at appraisal.

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[1] Loan No. 643-LAO(SF): Vientiane Plain Road Improvement Project, approved for $8.0 million in October 1983.

14. The reestimated EIRRs are higher than those calculated at appraisal, mainly because of higher than expected traffic growth.

Table 5: EIRRs At Appraisal and at Project Completion
(Per Cent)

Section No.	Appraisal	Project Completion
I	{29.1	35.9
II	{	22.4
III	16.2	23.0
All Sections	22.3	24.7

Table 6: Economic Cost and Benefit Streams
($'000)
Entire Project (159.2 km)

Year	Project Cost[a]	Vehicle Operating Costs	Net Benefits
1989	8,361		(8,361)
1990	4,651		(4,651)
1991	2,440		(2,440)
1992	4,590		(4,590)
1993	(1,090)	3,982	5,072
1994	(39)	4,203	4,242
1995	(884)	4,806	5,690
1996	(39)	5,550	5,589
1997	(39)	6,242	6,281
1998	(630)	7,083	7,713
1999	(884)	7,992	8,876
2000	(39)	9,282	9,321
2001	1,282	13,912	12,629
2002	(39)	15,556	15,595
2003	(1,475)	16,990	18,464
2004	(39)	17,796	17,834
2005	(39)	18,367	18,406
2006	(39)	18,885	18,924
2007	(884)	19,347	20,231
2008	(630)	20,288	20,917
2009	1,282	26,483	25,201
2010	(39)	27,220	27,259
2011	(884)	27,905	28,789
2012	(39)	28,862	28,900
			EIRR: 24.7%

a Including maintenance costs.