



Performance Evaluation Report

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Project Number 30255
Loan Number: 1795-LAO(SF)
December 2009

Lao People's Democratic Republic: Rural Access Roads Project

Independent Evaluation Department

Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – kip (KN)

		Appraisal (12 July 2000)	Project Completion (30 April 2007)	Independent Evaluation (30 June 2009)
KN1.00	=	\$0.00012	\$0.00010	\$0.00012
\$1.00	=	KN8,163	KN9,620	KN8,527.5

ABBREVIATIONS

ADB	–	Asian Development Bank
ADTA	–	advisory technical assistance
DOR		Department of Roads
DPWT	–	Department of Public Works and Transport
EA	–	Executing Agency
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EMDP	–	ethnic minority development plan
EMP	–	environmental management plan
ESD	–	Environmental and Social Division
ESOM	–	Environmental and Social Operations Manual
ETD	–	Environmental and Technical Division
IED	–	Independent Evaluation Department
IEM	–	Independent Evaluation Mission
IUCN	–	International Union for Conservation of Nature
Lao PDR	–	Lao People’s Democratic Republic
MCTPC	–	Ministry of Communications, Transport, Post, and Construction
MPWT	–	Ministry of Public Works and Transport
NBCA	–	national biodiversity conservation area
NGPES	–	National Growth and Poverty Eradication Strategy
NSEDP	–	National Socioeconomic Development Plan
OFID	–	The Organization of Petroleum Exporting Countries Fund for International Development
PBM	–	Phu Bia Mining Limited
PCR	–	project completion report
PPER	–	project performance evaluation report
PWTI	–	Public Works Transport Institute
RMF	–	road maintenance fund
SDR	–	special drawing rights
TA	–	technical assistance
UNODC	–	United Nations Office on Drugs and Crime
UXO	–	unexploded ordnance
VOC	–	vehicle operating cost
vpd	–	vehicles per day

NOTES

- (i) The fiscal year (FY) of the Government of the Lao People's Democratic Republic is from 1 October to 30 September. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2000 ends on 30 September 2000.
- (ii) In this report, "\$" refers to US dollars.
- (iii) For an explanation of rating descriptions used in ADB evaluation reports, see ADB. 2006. *Guidelines for Preparing Performance Evaluation Reports for Public Sector Operations*. Manila.

Key Words

lao rural access roads, regional integration, adb, asian development bank, lao, poverty reduction, accessibility, roads, road maintenance, performance evaluation, transport, infrastructure

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The guidelines formally adopted by the Independent Evaluation Department (IED) on avoiding conflict of interest in its independent evaluations were observed in the preparation of this report. Ruel Janolino, James Chamberlain, Khamsay Hongsouvanh, and Marga Domingo-Morales were the consultants. To the knowledge of the management of IED, there were no conflicts of interest of the persons preparing, reviewing, or approving this report.

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BASIC DATA
Loan 1795-LAO(SF): Rural Access Roads Project

Project Preparation/Institution Building

TA No.	TA Name	Type	Person-Months	Amount (\$'000)	Approval Date
2889	Rural Access Roads Improvement Project (JSF)	PPTA	39	600.00	6 Oct 1997
3070	Road Infrastructure for Rural Development (JSF)	ADTA	42	720.00	17 Sep 1998
3557	Strengthening Social and Environmental Management Capacity in the Department of Roads	ADTA	18	200.00	7 Dec 2000

Key Project Data (\$ million)	As per ADB	
	Loan Documents	Actual
Total Project Cost	37.50	38.01
Foreign Exchange Cost	27.00	29.43
Local Currency Cost	10.50	8.57
ADB Loan Amount/Utilization	25.00	27.48
ADB Loan Amount/Cancellation (SDR million)	19.26	19.03
ADB Loan Amount/Cancellation (SDR million)		0.37
		0.23

Key Dates	Expected	Actual
Fact-Finding		Mar 2000
Appraisal		12–26 Jul 2000
Loan Negotiations		9–10 Oct 2000
Board Approval		7 Dec 2000
Loan Agreement		16 Feb 2001
Loan Effectiveness	16 May 2001	16 May 2001
First Disbursement		30 Jul 2001
Project Completion	31 Oct 2004	31 Aug 2006
Loan Closing	30 Apr 2005	9 Apr 2008
Months (effectiveness to completion)	41	63

Economic Internal Rates of Return (%)	Appraisal	PCR	PPER
Attapeu–Senamnoy (22 km) – C1	14.5	13.7	10.4
Na Sack–Khoc Khao Do (48 km) – C2	34.5	20.1	21.0
Thong Khoun–Longsan (76 km) – C3	12.3	11.0	12.5
Huay Hung–Xam Tai (72 km) – C4	13.1	3.9	0.8
Total Project	19.7	12.0	11.8

Borrower Lao People's Democratic Republic
Executing Agency Ministry of Public Works and Transport (formerly Ministry of Communication, Transport Post, and Construction)

Mission Data

Type of Mission	No. of Missions	No. of Person-Days
Fact-Finding	1	—
Appraisal	1	14
Project Administration		
Inception	1	12
Review ^a	11	61
Midterm Review	1	10
Special Loan Review	1	2
Project Completion	1	24
Independent Evaluation	1	21

— = not calculated, ADB = Asian Development Bank, ADTA = advisory technical assistance, JSF = Japan Special Fund, km = kilometer, LAO = Lao People's Democratic Republic, PCR = project completion report, PPER = project performance evaluation report, PPTA = project preparatory technical assistance, SDR = special drawing rights, TA = technical assistance.

^a Excluding midterm review.

EXECUTIVE SUMMARY

Improvement of rural roads makes an important contribution to economic growth in isolated areas. The Rural Access Roads Project was designed to improve welfare and reduce poverty by providing access to markets and livelihood opportunities in various parts of the Lao People's Democratic Republic (Lao PDR). The Asian Development Bank (ADB) provided a loan of \$25 million to cofinance the project with the Organization of Petroleum Exporting Countries Fund for International Development. The project had three main components funded by ADB: (i) improvement of 245.8 kilometers (km) of rural roads, (ii) improvement of 66.7 km of feeder roads (connecting remote areas to main roads), and (iii) periodic maintenance of 163 km of selected national roads. Besides this, ADB assistance included a technical assistance (TA) project for strengthening the social and environmental management capacity of the Department of Roads. The project was completed in August 2006.

The project was selected for postevaluation in the 2009 work program of the Independent Evaluation Department (IED) because 3 years had passed since project completion. This project performance evaluation report, which takes into consideration the project's social and environmental impact, identifies lessons to further improve ADB's future assistance for rural roads, and provides inputs to broader evaluations at the sector and country levels.

In addition to the completion of targeted outputs, the project achieved additional road improvements using loan savings generated by the appreciation of the special drawing rights, depreciation of the Lao PDR kip, and the low civil works contract bids. The project faced several implementation issues caused by weak institutional capacity, contractor problems, and adverse weather conditions. Despite this, the quality of the road improvements was acceptable.

The project is rated *relevant* in view of its consistency with the sector strategies of both the Government of the Lao PDR, as well as ADB. It was in line with the rural development objectives of the government since it included subprojects in the northern and central regions of the country. Although the project was based on the rationale that it would help reduce poverty, it was not formulated in a way that would directly achieve this goal. The appraisal process did not include an appropriate baseline poverty assessment. Moreover, the project design had some deficiencies. First, the report and recommendation of the President could have been more precise in its definition of roads to be covered under the project. Half of the subprojects selected were national roads, i.e., Contract C1: the Attapeu–Senamnoy road, as well as Contract C2: the Na Sack–Khoc Khao Do road. However, they contributed positively to the rural accessibility objective. Second, these two subprojects were not located in the high priority poor districts. Only the other two subprojects, which were rural roads, were located in high priority poverty areas. Finally, the geographical spread of the subprojects in four different parts of the country resulted in implementation issues.

The project is rated *effective* in achieving its targeted outcomes. All subprojects except Contract C4: Huay Hung–Xam Tai road are rated effective since they were successful in improving the access between farm-based communities, national and provincial roads, and market centers. Transport costs and travel times on all the subproject roads have declined considerably. However, Contract C4 showed that road use has not increased as envisaged. Traffic on this road was below the forecast levels owing to the dearth of economic activities and investments in the project area. This indicates that road improvement is a necessary but not sufficient condition for economic development. The feeder road component was effective in achieving the main target outcome of reducing opium production in the Houaphan area. Finally,

the periodic maintenance component was effective in supporting the ongoing maintenance program of the national roads.

The project is rated *less efficient* owing to the lower economic returns generated, as well as to the poor implementation performance. Overall, the project's economic internal rate of return (EIRR) was estimated to be 11.8% for all the subprojects or lower than 9.5% if adjustment and maintenance cost of the mining company is considered. Two of the four subprojects had an EIRR less than the benchmark 12%, and for one of these two (Contract C4), the EIRR was 0.8%. Such low returns were mainly due to the low growth in traffic, indicating lower than expected uptake of the benefits. While lack of sufficient economic activities was the main reason, other factors contributing to the lower traffic growth are difficult terrain and the associated road safety issues. Project implementation was also characterized by delays and cost overruns, some of which could have been avoided by better project management.

The project is rated *less likely to be sustainable* owing to the risks associated with the inadequate allocations for maintenance by the respective provincial governments as well as institutional constraints. On a sector-wide basis, the roads sector in the Lao PDR faces a resource crunch owing to limited allocations from the central budget and limitations on the current institutional capacity. The C3 subproject is particularly high risk because the road is being used by mining trucks, which has resulted in damage to several sections. In the absence of the enforcement of maintenance responsibility on the Phu Bia Mining Company, this road is not likely to provide long-term benefits to other users.

Overall, the project is assessed *partly successful*, although it remains on the borderline between *partly successful* and *successful*. Although it provided all-weather access to remote areas, the quality-at-entry had room for improvement. Not only was the realization of economic benefits slow, but, because of sector constraints, the project continues to run the risk of attrition unless adequate maintenance allocations are made by the government.

The project impact is rated *moderate to significant* based on institutional, socioeconomic, and environment criteria. The attached TA had limited institutional impact since it was found to be less effective and less likely to be sustainable. The project has led to an overall improvement in household income, as well as general economic growth in the project impact area. A socioeconomic assessment carried out by IED indicated that, although the project impact area benefited in terms of aggregate economic development, the positive impact has not been uniform across the various ethnic communities. In other words, economic growth cannot be equated with poverty reduction.

The project was assessed against its stated justification of poverty reduction. The per capita incomes for villages on C1 and C2 sections were high before and after the road improvement, implying that they were above the poverty line before and after the road improvement. These villages could not be categorized as poor, as per the Lao PDR's National Growth and Poverty Reduction Strategy. On the other hand, C3 and C4 sections are located in less economically developed districts. Some of the villages alongside these sections witnessed poverty reduction, albeit on a differential basis. These villages (on C3 and C4) are located in areas populated by different ethnic groups. A socioeconomic assessment carried out by IED found that some of these groups (e.g., Hmongic groups) were able to take advantage of the road improvement. However, other groups such as the Khmuic and Bahnaric groups had limited incremental economic benefits. In particular, the Khmou segment of Dam Xam village in C4 subproject remained poor before and after road improvement. The benefits of the rural road improvement typically take longer to materialize owing to the slow growth in economic activities,

especially among those communities that do not have the capacity to capture the benefits. The project had a positive impact on gender development, since it resulted in increased frequency of travel by women as well as diversification of their livelihoods.

Two conclusions emerge from the impact assessment: (i) more time is needed for the project's benefits to be captured by the residents in rural areas; and (ii) other interventions are essential for economic benefits to be captured by the people, i.e., improvement in policies for land allocation, village consolidation, opium cultivation eradication, and eradication of swidden cultivation; agriculture development in terms of improvement of quantity, quality, and diversity of crops; encourage crop substitution; and provision of health and education services. Other ongoing projects could enhance the impact of the project in the future by considering some of these aspects.

Opium eradication in Houaphan was a key justification for the feeder road component of the project. Monitoring by the United Nations Office on Drugs and Crime in the Lao PDR indicated that opium cultivation was controlled during the recent years but not entirely eliminated. Although the feeder road improvements in Houaphan contributed to reduction in the opium cultivation in the project area, it could be increasing in other areas of the province. This could be attributed to the increase in the price of opium and a fall in the prices for alternative commodities such as tea, rubber, and fruits, as a result of the recent global financial crisis.

The project had a moderate environmental impact. After completion of the road improvement component, the continued conversion of forested areas, as seen on the C2 section, remains a concern. The broader food production objective needs to be reconciled against conservation of forested areas. The presence of an external monitor during construction was effective in monitoring the impacts during project implementation, as well as in ensuring that appropriate mitigation measures were implemented. The institutional constraints of the Department of Roads created difficulties in monitoring the implementation of environmental and social safeguards. The attached TA had a modest impact in terms of developing manuals and guidelines for environmental and social reviews. Taking into account the complex project design and the remote project locations, the performances of ADB, the borrower, and the executing agency are rated *satisfactory*. However, capacity building within the government could be further improved.

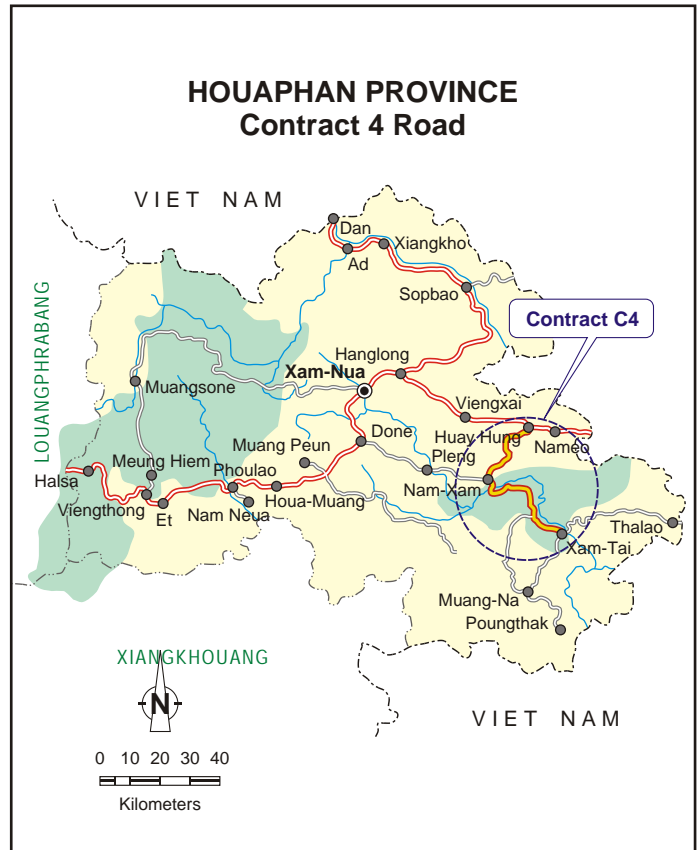
The following issues and lessons have been identified for future projects: (i) appropriate allocation for road maintenance by the government; (ii) improvement of the government's capacity to implement social and environmental safeguards; (iii) conservation of natural resources by limiting the conversion of secondary forests into farmlands; (iv) improved project designs that focus on a particular province or area to achieve implementation synergies and to maximize project impact; (v) development of alternative livelihoods for people in Houaphan to reduce opium addiction and hence opium cultivation; (vi) improved road designs that address safety issues linked to steep terrain; (vii) improved quality of contractors by ensuring that prequalification is carried out more carefully; (viii) responsiveness to the differential impacts of road improvement on various ethnic communities; and (ix) continued improvement in the quality of environmental assessment and monitoring.

Follow-up actions are identified for consideration by the Southeast Asia Department:

Follow-Up Action	Institution Responsible	Time Frame	Monitoring
<p>Enforce the Maintenance Agreement for C3 Road. The existing agreement between the government and the mining company, Phu Bia Mining, for the maintenance and upgrading of the C3 road between Thong Khoun and Longsan needs to be enforced appropriately. The Asian Development Bank (ADB) needs to coordinate with the Ministry of Public Works and Transport (MPWT) and the Ministry of Industry to identify a specific plan of action, legal or administrative, which will lead to an improvement of the C3 road section.</p>	ADB	Dialogue to begin in 2010	Lao Resident Mission to confirm progress
<p>Strengthen Capacity for Safeguards-Related Work. Short- to medium-term capacity development programs should be implemented to systematically strengthen and/or restore capacity to handle work on social and environmental safeguards. One option would be to hire new staff with relevant education and training. ADB could also include training components in its future assistance to cover central as well as provincial institutions.</p>	ADB	Continued ADB assistance	Country partnership strategy
<p>Strengthen Axle Load Monitoring and Controlling. Vehicle overloading leads to road damage. The project roads do not yet have a systematic mechanism for controlling vehicle loads. ADB should work closely with the MPWT to develop appropriate procedures for this and also to ensure that weigh stations are installed at selected locations to check heavy trucks plying national and mountain roads, e.g., C3 road.</p>	ADB	Continued ADB assistance	Country partnership strategy

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LAO PEOPLE'S DEMOCRATIC REPUBLIC
RURAL ACCESS ROADS PROJECT
 (as implemented)



I. INTRODUCTION

A. Evaluation Purpose

1. The primary objective of the Rural Access Roads Project was to assist the poverty reduction efforts of the Government of the Lao People's Democratic Republic (Lao PDR) by improving transport infrastructure in the country. The project was expected to increase agricultural production and improve productivity, develop human capital, and reduce poverty. It was designed to benefit isolated beneficiary communities by improving their access to markets, social services, and health facilities, and by expanding their livelihoods to cover off-farm jobs including provision of transport services and road maintenance.

2. The Independent Evaluation Department (IED) selected the project for evaluation in 2009 to provide inputs to two broader evaluations in the Lao PDR: (i) a transport sector assistance program evaluation, and (ii) a country assistance program evaluation. The preparation of this project performance evaluation report (PPER) 3 years after project completion in 2006 allows sufficient time for impacts to be visible. The PPER, which follows IED's evaluation guidelines,¹ makes use of updated data on road roughness, traffic and origin–destination surveys, and a rapid socioeconomic impact assessment of the four main road contracts.² The attached map shows these contract sections. The PPER focuses on (i) an environmental and social safeguards assessment, and (ii) road maintenance performance. A copy of the draft PPER was shared with the Southeast Asia Department of the Asian Development Bank (ADB) and the Lao PDR Government, and their comments have been incorporated where relevant.

3. The project completion report (PCR), which was finalized in November 2008 rated the project *successful*.³ The project was rated highly relevant, effective, efficient, and less likely to be sustainable. The PCR stated that the advisory technical assistance (ADTA) accompanying the loan contributed to the outcome of increasing capacity within the Environmental and Social Division (ESD) of the Department of Roads (DOR). Self-evaluation rated the technical assistance (TA) *successful*. Taking into account the data provided and analyzed in the PCR, a validation report prepared by IED found the quality of the PCR to be *partly satisfactory*.⁴

B. Expected Results

4. The overall impact targeted by the project was to improve welfare and promote economic growth in isolated areas by improving rural access roads in four provinces. The project aimed to (i) provide rural communities with all-weather access to agricultural markets; (ii) increase competitiveness in transport services, thereby inducing more efficient movement of goods and passengers; (iii) reduce poverty by providing access to markets, extension services, and income and employment opportunities for the poor; (iv) develop human resources by providing reliable access to education and health facilities; and (v) strengthen the domestic road contracting industry by providing opportunities in civil works construction.

5. The project was designed to (i) improve about 220 kilometers (km) of rural access roads (footnote 2); (ii) build about 100 km of feeder roads in Houaphan province;⁵ (iii) support road

¹ Asian Development Bank (ADB). 2006. *Guidelines for Preparing Performance Evaluation Reports for Public Sector Operations*. Manila.

² These are Contract C1: Attapeu (now Samakhhixai)–Senamnoy road in Attapeu province, Contract C2: Na Sack–Khoc Khao Do road in Vientiane province, Contract C3: Thong Khoun–Longsan road in Xaisomboun Special Zone, and Contract C4: Huay Hung–Xam Tai road in Houaphan province.

³ ADB. 2008. *Project Completion Report on the Rural Access Roads Project*. Manila.

⁴ ADB. 2009. *Project Completion Report Validation Report on the Rural Access Roads Project*. Manila.

⁵ These were identified with community assistance under the Alternative Development Program of the Lao National Commission for Drug Control–United Nations Drug Control Programme.

construction and the improvement of an environmental impact monitoring program in ecologically sensitive areas, particularly national biodiversity conservation areas (NBCAs),⁶ (iv) support the objectives of a road maintenance fund (RMF) set up by the World Bank-financed Road Maintenance Program through the periodic maintenance of selected subprojects; and (v) strengthen community development through participatory approaches to road construction and maintenance, particularly under a feeder roads component. An attached ADTA for \$200,000 was provided to (i) strengthen the ESD of DOR, and (ii) continue support for social development and environmental management and monitoring activities.⁷

6. The selection criteria for the feeder roads component in Houaphan province were required to be approved by ADB.⁸ The main criterion used for selection of the feeder roads was that the road should improve access to areas where opium production was prevalent. This was expected to lead to new forms of livelihood for the people living in these areas. It relied on the premise that road connectivity will lead to development of such livelihoods.

7. An action plan developed by the government in conjunction with its development partners to implement the RMF aimed to (i) establish the RMF Board; (ii) set up the secretariat to the RMF, which was to include representatives of the private sector; and (iii) draft the regulatory framework. These actions were to take place before the RMF decree was issued, after which formal appointments, opening of bank accounts, and technical and financial audits were to become operational. The project included financing for periodic maintenance of subprojects selected through the parameters for quantified or estimated needs under the road maintenance management system in DOR.

8. Appendix 1 provides the design and monitoring framework (DMF) for the project. It is based on the DMF included in the report and recommendation of the President (RRP) and the PCR, which were found to contain rather broad indicators, e.g., the impact indicator stated that the "social indicators in the project area improved." It did not provide good baseline data. At project completion, the PCR merely confirmed that the incomes in motorized households were consistently higher in 2007 than the overall average for 1999 in all four provinces. This indicates inadequate efforts at appraisal and at completion to identify appropriate indicators. For this PPER, IED carried out a rapid social survey to measure the indicators provided in Appendix 1. It had to rely on secondary sources to establish baseline data.

II. DESIGN AND IMPLEMENTATION

A. Rationale and Formulation

9. Poverty reduction was an explicit and primary objective in the design of this project (i.e., classified by ADB as a poverty intervention). The project intended to provide rural access roads that would enhance transportation in rural areas, reduce poverty, and assist in the development of ethnic minority areas. It was formulated using a feasibility study⁹ prepared under an ADB TA, the Road Infrastructure for Rural Development Study,¹⁰ and detailed engineering carried out under the

⁶ This was to be done with assistance from an internationally recognized biodiversity conservation institution.

⁷ ADB. 2000. *Technical Assistance to the Lao People's Democratic Republic for Strengthening Social and Environmental Management Capacity in the Department of Roads*. Manila (TA 3557-LAO, for \$200,000, approved on 7 December).

⁸ The criteria were developed by the Lao National Commission for Drug Control and Supervision and the United Nations Drug Control Programme with the participation of district and provincial authorities.

⁹ ADB. 1997. *Technical Assistance to the Lao People's Democratic Republic for Rural Access Roads Improvement Project*. Manila (TA 2889-LAO, for \$600,000, approved on 7 October).

¹⁰ ADB. 1998. *Technical Assistance to the Lao People's Democratic Republic for Road Infrastructure for Rural Development Project*. Manila (TA 3070-LAO, for \$720,000, approved on 17 September).

Xieng Khouang Road Improvement Project.¹¹ Project formulation also drew from ADB-financed TA projects for poverty reduction,¹² social and environmental management,¹³ and enhancing the government accounting¹⁴ and management information systems.¹⁵ Lessons from the implementation of past ADB national road (NR) projects in the Lao PDR were taken into account in the project preparation, design, and implementation arrangements.

10. A review of ADB projects implemented from 1984 to 2005 indicates that poverty reduction was not a specified objective for ADB's road improvement projects until this Rural Access Roads Project. Prior to that, the typical objectives for road improvement projects were limited to reduction of transport costs and provision of all-weather access to important locations, especially provincial capitals. The rationale for this project's poverty intervention activity was consistent with the country's National Growth and Poverty Eradication Strategy (NGPES), which called for an access-oriented rural development strategy focused on providing access to markets and social services (i.e., health and education) and on strengthening economic development, including drug eradication and helping ethnic minorities.¹⁶

11. Poverty reduction was expected to be achieved by providing access to markets and employment opportunities. The feeder roads component was based on the rationale that opium production would be reduced by providing physical infrastructure that would improve the nonexistent or difficult access to markets for traditional produce. This reasoning was developed in response to increased emphasis placed by the Lao PDR in its infrastructure development plans on improving the national and provincial network to allow effective access to rural areas. The rural road network was identified as one of the key areas requiring ADB assistance.¹⁷ Most government funding for the road sector had been allocated to major national links, usually as counterpart funding for aid-assisted projects. In contrast, the rural road network had been underfunded. Very few of the existing roads are passable year-round, many of which are earth tracks. Improving these roads would provide basic access in rural areas. By providing all-weather access, the project would (i) contribute to poverty reduction by providing access to markets and employment opportunities, and (ii) improve rural human resources by providing access to social services.

12. The feasibility study generally provided a sound basis for project appraisal. However, the design and value engineering review carried out by the supervision consultant identified several key weaknesses in the formulation process that required corrective action; in particular, improvements were needed in the design of pavements, drainage structures, submersible crossings, and bridge crossings.¹⁸ These included, (i) vertical alignment design (contracts C2, C3, and C4); (ii) pavement redesign in C2; and (iii) replacement of gravel pavements by paved gravel.

¹¹ ADB. 1997. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Lao People's Democratic Republic for the Xieng Khouang Road Improvement Project*. Manila.

¹² ADB. 2000. *Technical Assistance to the Lao People's Democratic Republic for Participatory Assessment of Poverty in Lao PDR*. Manila.

¹³ ADB. 2001. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Lao People's Democratic Republic for the Environment and Social Program*. Manila.

¹⁴ ADB. 1999. *Technical Assistance to the Lao People's Democratic Republic for Enhancing Government Accounting Regulations and Procedures*. Manila.

¹⁵ ADB. 2000. *Technical Assistance to the Lao People's Democratic Republic for Management Information Systems (Phase II), Supplementary*. Manila.

¹⁶ Government of Lao PDR. 2004. *National Growth and Poverty Eradication Strategy*. Available: <http://www.undplao.org/newsroom/ngpes.php>

¹⁷ ADB's focus in the transport sector was to (i) develop strategic corridors and subsequent economic zones, and (ii) provide rural roads to support poverty reduction efforts.

¹⁸ The road design was constrained by the steep slopes in the hilly terrain. Typical road gradients should not exceed 8%. However, there have been cases in the Lao PDR where the gradient is higher than 10%. This causes road safety issues linked to ability of heavy vehicles to operate on such roads. It is difficult to optimize the road design, given the fact that reducing the slope is often economically unviable. In the case of the project, gradients up to 22% were initially designed. This design was subsequently modified to reduce the gradient, although this incurred additional cost and time.

B. Cost, Financing, and Executing Arrangements

13. A comparison of actual project costs with those estimated at appraisal is in Appendix 2. The total project cost at completion was \$38.0 million or 1.4% above the appraisal estimate of \$37.5 million. The cost of civil works for the road improvement and feeder road components increased to \$33.1 million from \$27.7 million estimated at appraisal. More specifically, the rural road improvement component faced a 12% increase in cost linked to the design changes. Consultant costs increased to \$4.1 million or by 28.1% from the appraisal estimate because of additional design and supervision requirements.

14. The project generated savings of \$4.2 million owing to three factors: (i) appreciation of the special drawing rights (SDR) relative to the US dollar, (ii) depreciation of the Lao PDR kip, and (iii) some low bids. These savings were used to finance variations and additional works under the road improvement and feeder road components (i.e., mainly increased length of the road improvements) and the associated increase in consultant inputs. Table 1 provides a comparison of outputs and costs at appraisal and at completion.

Table 1: Outputs and Costs: Planned and Actual

Category	Performance Targets			Costs (\$ million)		
	At Appraisal (A)	At Completion (B)	Ratio (%, B/A)	At Appraisal (A)	At Completion (B)	Ratio (%, B/A)
Road Improvement	NR+PR: 218 km FR: 100 km	246 km 67 km	112.8	23.70	29.28	123.5
Periodic Maintenance	—	163 km	NC	2.00	1.78	89.0
Feeder Roads	100 km	67 km	67.0	2.00	2.08	104.0
Consulting Services	IC: 196 PM NC: 624 PM	—	—	3.20	4.10	128.1

— = not estimated, FR = feeder road, hh = household, IC = international consultant, km = kilometer, NC = national consultant, NR = national road, PM = person-month, PR = provincial road, UXO = unexploded ordnance.

Sources: Asian Development Bank. 2008. *Project Completion Report: Rural Access Roads Project*. Manila; and Maunsell Limited/AECOM. 2007. *Rural Access Roads Improvement Project (ADB/9) Project Completion Report*. Auckland.

15. The actual amount of ADB financing was \$27.5 million (SDR19.0 million equivalent) as compared to \$25.0 million (SDR19.3 million) at loan approval. The Organization of Petroleum Exporting Countries Fund for International Development (OFID) provided \$5.0 million equivalent (for Contract C3 only) as envisaged at approval, while the government financed the balance of \$5.6 million comprising local currency costs. The government share of the total cost fell from 20.0% as estimated at appraisal to 14.6% at completion. The government faced difficulties in providing counterpart funds during implementation, which contributed to contractor problems. The loan savings provided some relief to the government by lowering the need for counterpart funds. As such, ADB's share of total costs increased to 72.3% at completion from 66.7% as envisaged at appraisal. OFID's share of the total cost comprised the balance of 13.0%.

16. The Ministry of Public Works and Transport (MPWT) was the executing agency and was responsible for guiding, supervising, and executing the project. The implementing agency was DOR. The project was managed by a project management unit headed by a project manager accountable to the director general of DOR. The feeder roads component in Houaphan province was implemented by DOR under the general guidance of the Lao Commission for Drug Control and Supervision and United Nations Drug Control Programme.

C. Procurement, Construction, and Scheduling

17. Procurement was carried out in line with ADB's *Guidelines for Procurement* dated February 1999.¹⁹ The project faced a 17-month delay at the start owing to additional time taken for completion of the engineering designs (para. 20). This delayed the procurement activities. All four major civil work contracts (following international competitive bidding procedures) were awarded in July 2001 and began mobilization activities in July 2002. Only C1 was completed on time on 30 June 2005. The others required 12-month extensions for various reasons including (i) delays in government kip payments (on C1, C2, C3, and C4); (ii) adverse weather conditions including landslides (on C2, C3, and C4); (iii) increase in volume of earthworks (on C2 and C3); (iv) additional works or supplementary instructions from the engineer (on C3 and C4); (v) delays in OFID US dollar payments (on C3); (vi) problems related to unclear joint venture agreements (on C2 and C4); and (vii) design discrepancies and restricted site conditions (on C4). Project completion was delayed by about 2 years, but the loan closure was delayed by 3 years pending contractor payments.

18. Although most implementation issues were resolved on time, the prevalence of technical and financial difficulties points to lax prequalification requirements and raises questions about the quality and ability of the contractors.²⁰ This weak capacity was evident in terms of (i) a lack of experienced staff to manage the subprojects, which contributed to poor planning and organization of works and quality control problems that affected smooth execution of works (on C1, C2, and C4); and (ii) limited access to equipment combined with cash flow problems, which resulted in insufficient or nonfunctional equipment.²¹ The absence of timely disbursements of required counterpart funds aggravated the contractors' limited financial resources. Para. 85 describes ADB's response to these issues.

19. The three feeder road contracts (following local competitive bidding procedures) were awarded in June 2004 and work started soon after that. Implementation was affected by a lack of understanding by MPWT of ADB's guidelines on resettlement.²² Construction was delayed by about 1 year due to resettlement issues, including delayed approval of the resettlement plan and subsequent implementation. Contract awards could not be approved until the resettlement plan for the feeder roads had been accepted and implemented.

D. Design Changes

20. Project implementation was marked by many engineering design changes in the project scope (Appendix 3). These were mainly done to correct deficiencies identified by the supervision consultant during detailed design review. These include, among others, (i) steep grades in the original design, (ii) nonavailability of suitable road material along the road alignment, and (iii) lack of coordination between different government agencies. The design changes were made possible by flexible use of major loan savings from currency fluctuations (para. 14). Additional sections for

¹⁹ ADB. 1999. *Guidelines for Procurement under Asian Development Bank Loans*. Manila.

²⁰ The Independent Evaluation Mission (IEM) noted remnant contractor issues on C4 section. For C1, C2, and C3 roads, villagers were reportedly hired for roadworks and the contractors paid them all. But in the case of C4 road, information received by the IEM indicated that two villages stated nonpayment for services (i.e., local people were hired to dig drainage ditches along portions of the road near their villages).

²¹ Rather than mobilizing multiple sets of equipment to work in parallel on different sites, a contractor relied on one set of equipment, resulting in a sequential implementation. This added to the delays. In other cases, there were inadequate funds to maintain a continuous supply of fuel or pay workers' salaries (Maunsell Limited/AECOM. 2007. *Rural Access Roads Improvement Project (ADB/9) Project Completion Report*. Auckland).

²² ADB. 1998. *Handbook on Resettlement: A Guide to Good Practice*. Manila; ADB. 1975. *Involuntary Resettlement: Policies and Strategies*. Manila.

periodic maintenance were also included as part of the road improvement and feeder road improvement components using contract savings. While all these changes were approved by ADB, they did not go through the same appraisal rigor, e.g., economic analysis. More importantly, at completion, these additional works were not subjected to adequate economic analysis, resulting in difficulties in assessing whether they were economically sound investments.

21. In the road improvement component, changes were made to the design, including the realignment of road sections, and the design and reinforcement of box culverts. The road realignments were relatively minor and lay within the areas covered by the summary environmental impact assessment (EIA). Under the C2 contract, soil cement-stabilized base was introduced since natural gravel and rock were not easily available. The natural terrain of some sections of the C2 road alignment is very steep and the approved design permitted grades up to 22%. The MPWT recognized that such steep grades would cause difficulties to road users, and so the consultants made considerable efforts to reduce gradients to a more acceptable 16%.²³ The latter is considered adequate based on road conditions, as a further reduction in gradient increases the risk of landslides in the area. There remain three sections on contract C3 where the gradient is high at 19%, which is a point of concern for road safety.

E. Outputs

22. The project outputs were implemented as envisaged at appraisal with additional road constructed on the road network during implementation. A summary of physical achievements, including design changes and accomplishments at completion, is presented in Appendix 3.

23. **Road Improvement.** The overall results of the civil works component generally exceed project appraisal targets. A total of 245.8 km of road was completed compared to 218.0 km as planned. The main civil works road contracts were (i) Attapeu (now Samakkhixai)–Senamnoy road section (C1), (ii) Na Sack–Khoc Khao Do road section (C2), (iii) Thong Khoun–Longsan road section (C3), and (iv) Huay Hung–Xam Tai road section (C4).

24. **Feeder Road Improvement.** Feeder road construction/improvement works were carried out for 66.7 km instead of the expected 100 km at appraisal.²⁴ This reduction in project road length (i.e., removal of the Xam Tai–Moung Nam section from FR3) was due to lack of funds under the component (PCR, page 5, para. 20).

25. **Periodic Maintenance.** Periodic maintenance was conducted for 163 km of selected road sections under five local competitive bidding (LCB) contracts for (i) repair and regravelling, NR13 North–Xaibouly; (ii) periodic maintenance, Road 6A–Houaphan; (iii) resealing and repair work, Road 13 North–Vientiane; (iv) resealing and repair work, Road 13 North–Oudomxai; and (v) regravelling on Road 5B, at a final cost of \$1.8 million, compared with an estimate of \$2.0 million at appraisal.

26. The project included a TA for strengthening social and environmental management capacity in the DOR. Details of the TA are provided in paras. 87–89.

²³ Despite the grade reduction, the local government of Xanakham remains concerned over future road safety on C2 road. With traffic increasing, C2's narrow road and sections of high gradient is seen to result in further fatal accidents.

²⁴ The feeder road component roads were selected after the initial resettlement implementation plan was approved. After detailed design, a resettlement implementation plan was prepared and paired with an ethnic minority development plan (EMDP). This was especially important because these areas were located in or near opium planted areas. The EMDP helped develop livelihood alternatives to opium cultivation and improved health and medical services. The EMDP was implemented in 2003.

27. **Unexploded Ordnance.** Unexploded ordnance (UXO) was cleared for 313.0 km of roads as compared to 220.0 km of national and provincial roads and 100.0 km of feeder roads as envisaged at appraisal. This was done by the Lao Army at their direct cost.

F. Consultants and Contractors

28. Services of the construction supervision consultant began in July 2002 and amounted to \$4.1 million. Consulting services were increased by about 30.0% to accommodate additional design and supervision works along with other important activities. Taking into account the factors mentioned in Section II.C above, the performance of the supervision consultant is rated *satisfactory*. For the attached TA on strengthening social and environmental management capacity, international and domestic consultants were recruited. Despite delays in mobilizing domestic consultants, the training and workshop activities were carried out effectively. Although the TA was found to have less than satisfactory outcomes and impact (paras. 88–89), the outputs were satisfactory. Inherent institutional constraints have prevented the achievement of the full benefits of the TA.

29. Third party environmental monitoring consulting services were required under the project loan (para. 32). MPWT engaged the International Union for the Conservation of Nature (IUCN) to undertake this independent monitoring of road works in ecologically sensitive areas, especially for the NBCAs which fell within the project impact area. The performance of IUCN was effective in this role. It submitted regular reports to ADB and MPWT, including recommendations for addressing environmental issues. These recommendations were adopted by the contractors after some delay.

30. While the resultant quality of works was good in general, contractor performance during implementation was *partly satisfactory*²⁵ (para. 18 provides more details to substantiate this assessment).

G. Loan Covenants

31. The PCR stated that all the 24 loan covenants were complied with in a *satisfactory or highly satisfactory* manner. However, this PPER rates three of these loan covenants as partly complied with. There were also delays in meeting the requirements related to the provision of counterpart funds, implementation of resettlement plans, and environmental impact mitigation measures.

32. Two environmental loan covenants are found to have been partly complied with. The first environmental covenant relates to mitigating and monitoring environmental impacts during implementation, i.e., (i) preparation of the EIA, (ii) preparation of the environmental management plan (EMP), and (iii) monitoring activities of IUCN. The Independent Evaluation Mission (IEM) team found that the EMP was weak. Based on several IUCN reports, it also appears that the contractors were not sufficiently sensitive to environmental issues. Discussions with IUCN indicated that the contractors had repeatedly ignored their recommendations and that of the project's supervision consultant in relation to the implementation of appropriate mitigating measures. The second environmental covenant that was partly complied with relates to the strengthening of the ESD of DOR through staff appointments. Although steps were taken to build the capacity of the division during project implementation, this was not sustained. The recent reorganization of the MPWT, including the change in the roles and responsibilities of DOR, has resulted in the transfer of this division to the Public Works and Transport Institute (PWTI), which has yet to define its role (paras. 88–89). Moreover, the capacity of the transferred division remains weak and this is reducing the effectiveness of ADB's loan covenant.

²⁵ Contractor performance was satisfactory in contracts C1 and C3 and unsatisfactory in C2 and C4.

33. Finally, the loan covenant on axle load monitoring is considered partly complied with. For C1, there are two weigh stations located near Pakxe; for C2, a World Bank-funded heavy vehicle weigh station is located at KM5 along NR11. However, no permanent weigh stations are available for C3 and C4. In addition, there are no weigh stations between Vientiane capital and C2 road since the connecting roads are mostly under construction. For C3 and C4 roads, discussions with local officials indicated that there was insufficient budget allocation for setting up permanent weigh stations. However, MPWT stated that portable weigh stations have been made available.

H. Policy Framework

34. **Poverty Reduction.** With the adoption of ADB's poverty policy in 2000 and the subsequent emergence of NGPES in 2004, poverty reduction became a priority for all sectors in the Lao PDR, including infrastructure and transport.²⁶ The NGPES placed poverty eradication and acceleration of social development as the primary long-term strategic goals. The three pillars of the strategy are (i) economic growth with equity, (ii) sociocultural development, and (iii) sustainable environment preservation. The four priority sectors for ensuring poverty reduction are agriculture, health, education, and infrastructure. Thus, the government aims to improve transport infrastructure among its efforts to reduce poverty. At the same time, the sixth National Socioeconomic Development Plan (NSEDP)²⁷ also identifies the lack of transport development as a cause for negative impacts linked to village relocations, swidden cultivation, and opium production. Poverty as measured quantitatively fell from 39% to 33% for the Lao PDR as a whole from 1997–1998 to 2002–2003. This is based on data analyzed from the Lao Expenditure and Consumption Surveys 2 and 3 (LECS). Addressing the issue of poverty reduction, the government issued Prime Ministerial Decree 10, identifying 72 poor districts, out of which 47 have been designated as priority poor districts. The latter represent approximately 20% of the total population of the country, but 55% of the country's poor. Large percentages of the poor districts' population are non-Lao ethnic groups living in remote areas.

35. **Environmental Safeguards.** The Lao PDR has put in place appropriate policies and laws on environmental protection and management. The inclusion of environmental considerations in road projects has been mandated since 1999. The Road Law requires road construction to be undertaken in accordance with public safety and environmental protection considerations, while the Environmental Protection Law has been the main instrument for environmental protection and management. An EIA has been required for roads and other development projects under the Environmental Protection Law. The requirements and procedures for the EIA of development projects were further clarified in 2000 with the issuance of the Environmental Assessment Regulations.

36. In 2003, MCTPC (now MPWT) issued the regulations for the EIA of road projects including provisions on screening, scoping, public involvement, environmental management plan and implementation, content, review, and approval of the EIA. Recently, MPWT has moved further to strengthen its commitment on environmental protection in road projects by releasing its 2008 Environmental and Social Operations Manual (ESOM). Preparation of this manual is a positive step in mainstreaming further the social and environmental aspects in the Lao PDR's road sector. However, the ESOM has yet to be pilot-tested prior to its approval by the minister.

37. **Road Maintenance.** The government established an RMF in January 2001. The RMF receives its revenues through taxes on fuel, road tolls, and vehicle overloading fines. Table 2

²⁶ Poverty reduction policies are specifically set forth in the NGPES and the NSEDP, 2006–2010, which now subsumes the NGPES. Deficiencies in infrastructure are identified as the major constraints to development by the NSEDP.

²⁷ Committee for Planning and Investment. 2006. *National Socio-Economic Development Plan (2006–2010)*. Vientiane. Available: <http://www.undplao.org/official%20docs/NSEDP%20part1.pdf>

shows that these sources are insufficient to finance the required maintenance activities. The government sought to borrow funds from the World Bank and the Swedish International Development Cooperation Agency for the RMF. This indicates a dependency on the donor support until 2010. Subsequently, it is expected that the fuel levy will be increased to an extent that will make the RMF self-sufficient. However, it remains to be seen whether sharp and frequent increases in the fuel levy will be possible in the future. As a result, there remains a certain element of risk in the funds available for road maintenance.

Table 2: Expected Funding Level from the Road Maintenance Fund and Forecast Road Maintenance Requirements (\$ million)

Item	2001	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08
A. Revenue	4.95	13.90	7.64	10.46	14.42	15.89	19.66
1. Fuel levy ^a	0.72	1.32	1.90	3.26	6.10	10.23	14.89
2. Other local	0.74	1.20	1.49	1.77	2.00	2.25	2.87
3. Donor support ^b	3.50	11.38	4.25	5.43	6.32	3.42	1.90
B. Expenditure	3.26	13.47	8.85	9.99	15.59	15.56	19.87
1. Maintenance	3.19	13.03	8.42	9.53	13.11	14.95	19.03
2. Others ^c	0.07	0.44	0.42	0.46	0.47	0.61	0.84
C. Balance	1.69	0.43	(1.21)	0.46	0.83	0.34	(0.21)
Exchange Rate: KN/\$	10,810	10,460	10,860	10,843	10,002	9,600	8,529
Item	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
A. Revenue	26.16	31.16	35.10	39.51	44.00	48.46	52.54
1. Fuel levy ^a	20.47	26.15	30.08	34.29	38.57	42.82	46.67
2. Other local	3.94	4.83	5.02	5.22	5.43	5.65	5.87
3. Donor support ^b	1.76	0.18	0.00	0.00	0.00	0.00	0.00
B. Expenditure	25.50	34.29	35.98	38.90	42.03	45.40	49.04
1. Maintenance	24.39	33.42	35.09	37.90	40.93	44.20	47.74
2. Others ^c	0.81	0.87	0.89	1.00	1.10	1.20	1.30
C. Balance	0.66	(3.13)	(0.88)	0.61	1.98	3.06	3.50
Exchange Rate: KN/\$	8,508	8,508					

^a The Ministry of Public Works and Transport expects to increase the fuel levy unit charge in the future. There remains a risk over the extent of increase.

^b The World Bank has provided funds under its Road Maintenance Program. Similarly, funds have been provided by the Swedish International Development Cooperation Agency.

^c Administrative and other expenses.

Source: Data provided by the Ministry of Public Works and Transport.

III. PERFORMANCE ASSESSMENT

A. Overall Assessment

38. Overall, this project is on the borderline between *partly successful* and *successful*. Although the PCR rated it *successful*, the PPER has downgraded this rating to *partly successful* for reasons explained below. It remains relevant to the development needs of the country, especially the provision of all-weather access for remote areas. However, the quality-at-entry was found to have room for improvement linked to project design issues. Although the project was effective in achieving most of the targeted outputs, the benefits have been slow to become apparent. This, together with implementation delays, has reduced the efficiency of the project, since traffic growth has been slow. Funding of road maintenance has been a perennial issue in

the Lao PDR and the project roads continue to suffer from a lack of funding from the government. Although traffic volume has been low on these roads, they have been subjected to flooding, landslides, and in some cases vehicle overloading. A combination of these impacts has resulted in lowering the sustainability of the project roads. On the positive side, while the project had associated environmental risks, it generated a positive impact in terms of socioeconomic development. Typically, impacts of rural roads are slow to materialize in some cases. The outcome of other interventions could have a bearing on the future impact of the project. This brief summary explains why IED has downgraded the project. Appendix 3 lists the project's main achievements. The section below substantiates this rating in further detail.

39. Table 3 provides a summary of the project rating based on IED's four-category evaluation criteria of relevance, effectiveness, efficiency, and sustainability.

Table 3: Overall Performance Assessment

Criterion	Rating	Rating Description
Relevance (20%)	2	Relevant
Effectiveness (30%)	2	Effective
Efficiency (30%)	1	Less efficient
Sustainability (20%)	1	Less likely
Overall Rating	1.5	
Partly Successful		

Note: Highly successful ≥ 2.7 ; successful $2.7 > S \geq 1.6$; partly successful $1.6 > PS \geq 0.8$; unsuccessful < 0.8 .

Source: Independent Evaluation Mission.

B. Relevance

40. The project is rated *relevant* based on an assessment of its strategic consistency, as well as its formulation and design.

41. **Consistency of the Project with the Development Strategies.** The project was consistent with the respective sector strategies of both the government and ADB. Rural development was a key element of the fourth socioeconomic development plan of the government. It included development of rural infrastructure, including providing access to villages. However, the government's focus remained on developing links with the neighboring countries in a bid to boost economic growth. Similarly, ADB's assistance on transport was focused on the development of link roads with other subregional countries and secondary and feeder roads. Having said this, the underlying development objectives of both the government and ADB were consistent with the rural development agenda, which has continued in subsequent years. The project supported ADB policy on poverty²⁸ and the government's strategic objectives to reduce poverty by providing all-weather road access in rural areas. By focusing on the north and central regions of the country, it also complemented the government's program in rural development.

42. **Assessment of Project Formulation and Design.** Although the project rationale was based on poverty reduction, it could be debated whether the project was appropriately formulated.²⁹ The poverty assessments at appraisal could have been more comprehensive and

²⁸ ADB adopted poverty reduction as an overarching operational objective (November 1999), and its country assistance strategy focused on a very strong poverty reduction direction.

²⁹ At project approval, the impact of infrastructure developments on poverty reduction had not been mapped for national and provincial roads. The government gave assurances that evidence of poverty along the roads, and impact of the project on the poor in the zone of influence would be provided through surveys and analysis. However, IED has not found substantive evidence of this.

should have taken on board the need for complementary activities and services in broadening livelihood opportunities in the project area.³⁰

43. The project design could have been improved in three areas. First, the RRP could have been more precise in its definition of roads to be covered under the project. The project roads defined by the RRP were selected roads that comprised provincial and major local roads, which fed into the national road network. Out of the four subprojects selected for inclusion in the project, only two were rural roads in terms of providing access for remote locations. The other two subprojects comprised NRs as defined by MPWT.³¹ The rural roads were the Thong Khoun–Longsan road (Contract C3) that connects to NR13 in the Xaisomboun Special Zone; and the Huay Hung–Xam Tai road (Contract C4) that connects to NR6 in Houaphan province in the northeast Lao PDR. The NRs were Attapeu–Senamnoy road (Contract C1) on the NR16 in south Lao PDR; and the Na Sack–Khoc Khao Do road (Contract C2) on the NR11 in Vientiane province. It is noted that the latter two subprojects did contribute positively to the rural accessibility objective. However, the RRP should have been more transparent in its description of the project roads.

44. Second, only two of selected subproject roads (C3 and C4) were located in priority poor districts, i.e., those with ethnic communities and economically less developed. While the selection of road locations was made prior to the identification of such poor districts by the government, the selection of subprojects could have been improved, especially since the project was rationalized along the lines of poverty reduction and development of ethnic minority areas. Although C1 and C2 roads were located in rural areas, most of the villages in these areas were not poor even before the project (para. 65). This indicates the importance of collecting good baseline data at appraisal to ensure that the project design is sound.

45. Third, the geographical spread of the subprojects in four different parts of the country resulted in implementation issues.³² The dispersed subproject locations resulted in logistical and administrative difficulties for the supervision consultant and for oversight by MPWT and ADB. It also removed opportunities for synergy among the contractors and the consultants. This indicates that ADB should have focused on a particular province or area to achieve implementation synergies as well as to maximize project impact. For example, the Na Sack–Khoc Khao Do road (Contract C2) in Vientiane province is a part of the NR11 from Vientiane capital to southern Xaignabouli. The road improvement project could have been better formulated to connect Xaibouly province all the way to Vientiane capital rather than only until Khoc Khao Do. Such a focus could have enabled better implementation and a more effective attribution of the impacts.

C. Effectiveness

46. The project is rated *effective* in achieving its targeted outcomes. By providing vital improvements in the rural road network in four provinces, the project provided access between farm-based communities, national and provincial roads, and market centers. Transport costs

³⁰ Although it has been observed that improved road access did result in economic growth, there is no consistent pattern linking it to poverty reduction, especially since there is no consistency in the definition and identification of poor groups. The complexity of this process is reflected in ADB's Operation Manual C1 (Poverty Reduction Policy), which recognizes poverty measurement as technically complex and urges greater use of qualitative measures to complement quantitative indicators.

³¹ The MPWT clarified that at pre-feasibility phase ADB and MPWT had agreed that the project should look to improve roads in 7 provinces. The feasibility study (TA 2889) examined 22 candidate roads, out of which 16 sections were prioritized and assessed. Out of these, four subprojects were selected based on economic analysis and budget criteria.

³² This is the same set up for the subsequent rural roads project, whose subprojects were prepared by the same project feasibility study (ADB. 2004. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Lao People's Democratic Republic for the Roads for Rural Development Project*. Manila [Loan 2085-LAO{SF}, for \$17.7 million, approved on 28 June]).

and travel times on the project roads have declined significantly. Appendix 1 provides the design and monitoring framework for the project. Appendix 4 provides the results of the technical surveys that assessed the current road condition.

47. **Road Improvement and Feeder Road Components.** Except for C4 road, which is *less effective*, all contract roads are rated *effective* in achieving their intended results (Table 4). Traffic, in particular nonmotorcycle traffic, has developed more slowly than expected on most of the project roads. Traffic on all subproject roads has been below their design capacity of 300–1,000 vehicles per day (vpd) (Appendix 5). The variations or additional works were *effective* and helped enhance the effectiveness of the main civil works component.

Table 4: Subproject Assessments on Effectiveness

Road	Rating	Surface Condition	Assessment
C1	Effective	Good	<p>Project results. Total traffic from 73 vpd in 1999 (before project) to 386 vpd in 2009 (after project). The estimated average travel time of 1.5 hours before the project was reduced to 0.5 hours after the project or a travel time saving of 1 hour. The average travel speed of 15 kph (before project) increased to 45.7 kph (after project).</p> <p>Benefits. Considering the travel time benefits achieved from the project and the fact that the national highway between Pakxe and Attapeu is paved and in good condition, traffic on this short link has been slow to build up and remains low relative to the design capacity of 300–1,000 vpd (for a Class IV road).</p>
C2	Effective	Fair–Good	<p>Project results. Total traffic from 65 vpd in 1999 (before project) to 808 vpd in 2009 (after project). The estimated average travel time from Na Sack to Khoc Khao Do was about 6 hours before the project. After the project, this was reduced to 1.5 hours, providing a savings in travel time of 4.5 hours. Average travel speed increased from 10 km/hr before the project to 42.1 km/hr after the project.</p> <p>Benefits. The project has enabled interprovincial connectivity. Prior to road improvement, Xanakham was relatively isolated and traded mainly with Thailand. The project road provides access to Paklay in Xaibouly province. After the completion of the ongoing project linking Vientiane to Ban Vang, the effectiveness of the project road will increase. Total traffic currently between Xanakham and Paklay area is close to the C2 design capacity of 300–1,000 vpd and increasing. This is expected to increase further with the opening up of the Vientiane–Ban Vang road.</p>
C3	Effective	Poor–Bad (km 18–km 48) Fair–Poor (km 48–km 71) Fair–Good (km 0–km 18, km 71–km 82)	<p>Project results. The total traffic was 481 vpd in 2009, which accounted for the second highest traffic among the four subproject roads. It has the highest share of nonmotorcycle traffic. The presence of Phu Bia Mining Limited has been instrumental in the traffic growth. On the plus side, it has created industrial traffic in the area and has boosted the country's exports. On the other hand, the road has generally changed into a mining road and this has also accelerated serious deterioration in some road sections. The estimated average travel time before the project was 10 hours compared to only 2.5 hours after the project. Average travel speed increased from 8 kph before the project to 35 kph after the project.</p> <p>Benefits. The project contributed to national level benefits by enabling the export of mining ore to Thailand. But the original project design did not aim to generate these benefits, since the basic consideration had been to build a farm-to-market road for the agricultural areas in Meuang Hom, a priority poor district. Since 2006, the Phu Bia Mining Limited has been using the route to deliver copper concentrate to Thailand for export processing. About 68 km or 77% of the alignment is being used by Phu Bia, which reportedly invested about \$12 million for maintenance and modification of the road for industrial traffic.</p>
C4	Less effective	Fair–Good	<p>Project results. Total traffic increased from 20 vpd in 1999 (before project) to 338 vpd (after project) in 2009. The estimated average travel time was reduced from about 12 hours before the project to 2 hours or a travel time savings of nearly 10 hours. Before the project, average travel speed in this area was only 6 kph. After the project, average travel speed picked up to 37.7 kph. The road had the smallest traffic and a negligible share of nonmotorcycle traffic. The slow development of traffic is partly due to the absence of a growth center to encourage economic activities and stimulate additional traffic. Likewise, more investments are needed to promote complementary development in the area.</p>

Road	Rating	Surface Condition	Assessment
			Benefits. Like C3, this road (located mostly in Xam Tai district) is in a priority poor district. The low growth in traffic indicates that road improvement is a necessary but not sufficient condition for economic development. In other words, the project has not yet produced a sufficient level of impacts as indicated by the usage.

km = kilometer, kph = kilometer per hour, m = meter, vpd = vehicle per day.

Note: Roughness levels based on international roughness index (IRI): Good = 4–5 m/km, Fair = 5–6 m/km, Poor = 6.5–8 m/km, Very Poor = >8 m/km.

Source: Independent Evaluation Mission.

48. The feeder roads component in Houaphan was *effective* in achieving their targeted outcomes within the project area. Besides eliminating production and consumption of opium in the areas of Ven and Ham Long in Houaphan province, the project contributed to improvement in the livelihood opportunities owing to improved access to markets and social services in this area. However, the project covered 52 villages out of approximately 400 that used to grow opium poppy in Houaphan province. UNODC's recent surveys indicate that opium poppy cultivation could be increasing in the other remote areas of the country including some of the more remote regions of districts of Houaphan province that were not covered by the project.³³ This could be attributed to the increase in the price of opium and a fall in the prices for alternative commodities such as tea, rubber, and fruits, as a result of the recent global financial crisis.³⁴ In addition, the recent increase in opium production in other areas could also be caused by the lack of other interventions identified in para. 72. Other reasons for the increase in opium production are (i) the impacts of crop substitution activities are not yet visible; (ii) opium as a medicine is hard to replace, creating a demand for the product; and (iii) the opium addiction within Houaphan has continued, creating a sustained domestic demand.

49. **Periodic Maintenance Component.** Periodic maintenance was carried out on 163 km for five subprojects. This supported the RMF's activities. Based on a sample of subprojects inspected by the IEM, this component was found to be *effective* in improving the quality of the roads and producing the benefits of a reduction in travel time and faster vehicle speed.

D. Efficiency

50. The project is rated *less efficient* in view of the reevaluation of the economic analysis and an assessment of the project implementation. The PCR had rated the project *efficient*. Appendix 6 explains the process and results of the economic internal rate of return (EIRR) reestimation. Overall EIRR for the entire project was calculated to be 11.8%. However, if additional cost of adjustments and maintenance on the C3 road to accommodate the benefits of mining trucks is taken into account, the overall EIRR would reduce at least to 9.5% (para. 51). On this basis, the project is rated *less efficient*. The EIRR ranges between 0.8% for C4 and 21% for C2 (see para. 51 on the assumptions considered in calculating the EIRR for C4 section). The low EIRR can be attributed to the cost overruns on 3 out of 4 rural road contracts and lower-than-expected growth in traffic (Table 5). The low growth in traffic indicates slower than expected uptake of the benefits. The lack of sufficient incremental economic activities in the project area has been a major factor affecting traffic growth. Other factors include difficult terrain and the associated road safety issues. The assessment of economic performance of the feeder roads was not carried out by the IEM, since there was no baseline data to compare it with, i.e., there was no economic analysis of the feeder roads at appraisal or at completion.

³³ Surveys have been conducted by UNODC in 2008 and 2009. Results of the surveys were discussed during the field visits with UNODC staff.

³⁴ Average price of dry opium increased from \$974 per kilogram in 2007 to \$1,227 per kilogram in 2008 (Source: UNODC. 2008. *Opium Cultivation in South East Asia Lao PDR, Myanmar, and Thailand*. Manila).

Table 5: Capital Costs and Traffic at Appraisal and at Postevaluation

Subproject	Capital Cost of Rural Road Improvement (\$ million) ^a		Vehicle Traffic (AADT in 2009)	
	RRP	PPER	RRP ^b	PPER ^c
C1	3.3	4.5	189	172
C2	5.7	5.4	158 ^d	120
C3	7.5	8.9	116	192
C4	6.9	7.5	82	37

AADT = annual average daily traffic, PPER = project performance evaluation report, RRP = report and recommendation of the President.

^a Excludes additional works and/or variations.

^b Based on growth rate of 10% from 2003. Assumes generated traffic (as percent of normal traffic) of 50% in C1 and 100% for C3 and C4.

^c Based on PPER traffic survey results in 2009.

^d Excluding diverted traffic.

Source: Independent Evaluation Mission.

51. The economic analysis for C3 section has been complicated by the use by Phu Bia Mining Limited (PBM) of the project road originally designed as a rural road capable of handling light vehicle traffic (Appendix 7). The plying of mining trucks on the road resulted in the rapid deterioration of the pavement. The PPER base case finds C3 road at borderline efficient with an EIRR of 12.5% being weighed down by the size of investment, a small traffic base, and the accelerated road deterioration from PBM use. However, this does not take into consideration the additional investments by PBM to expand the pavement width and reinforce it in some places. When this additional investment of over \$12 million is taken into account, the recalculated EIRR drops to 7.3%. In this analysis, benefits are conservatively limited to direct road user benefits and do not consider macroeconomic benefits from exports or related government revenues.³⁵ This indicates that the overall project EIRR has benefited with the inclusion of the traffic generated by PBM's activities and by the exclusion of the additional investment by PBM.

52. The completion of the physical works of the project was delayed by 22 months,³⁶ while the loan closed almost 3 years late. On an ADB-wide basis, project closures have been delayed by an average of 2 years.³⁷ This indicates that the project has room for improvement. Para. 17 analyzes the causes of these delays. The efficiency of implementation was affected by the poor performance of the contractors (para. 18). Although the total project cost at completion was only 1.4% above the appraisal estimate, the rural roads improvement component faced a cost overrun of 12% excluding the cost of additional works (Appendix 2). This cost overrun was mitigated by the SDR appreciation relative to the US dollar and by the depreciation of the Lao PDR kip. In other words, this could be seen as fortuitous. In view of the above, the implementation efficiency is assessed to be on the lower side.

E. Sustainability

53. On a sector-wide basis, the transport sector of the Lao PDR continues to experience constraints in two major areas: (i) adequate funding for maintenance as evident from the current levels of the RMF and provincial budget allocations, and (ii) limitations of the current institutional

³⁵ The mining benefits are unintended and attributable to a completely different project. It was not within the original scope of this project, which was to provide access to rural communities.

³⁶ The project was expected to be completed by 31 October 2004, while the actual completion of all the physical works took place on 31 August 2006.

³⁷ ADB. 2008. *Annual Report on 2007 Portfolio Performance*. Manila.

capacity. The levels of the RMF's revenues have increased in the last 2 years (Table 2).³⁸ However, only 10% of the RMF revenues are deployed for provincial and rural roads.³⁹ This increases the risk of inadequate maintenance of the rural roads since they depend on allocations from the provincial governments, which continue to be much less than the requirements (Appendix 8). The figures of budget allocations for Attapeu, Vientiane, and Houaphan provinces show that the average allocation for routine maintenance is about \$52 per km for maintaining roads. This does not include the incremental expenditure required on earth roads. Moreover, the institutional capacity of the MPWT and the departments of public works and transport (DPWTs) continue to be constrained by the lack of adequate resources. The dependence on consultants for project preparation as well as implementation continues. With the recent policy of decentralization, the DPWTs are expected to become centers for planning and budgeting activities for the district's socioeconomic plans. This requires a definitive building of technical and administrative capacities at the district and provincial levels, especially in the DPWTs. Planning and implementing maintenance programs at the district level will require additional resources—manpower and funding, both of which are currently falling short.

54. At the project level, the completed project is less likely to be sustainable owing to the risks associated with the maintenance of C2, C3, and C4 sections. Since C1 section is part of the ADB-financed national highway linking Pakxong and Attapeu (para. 43), it is likely to receive priority in terms of maintenance.⁴⁰ As of now, 3 years after project completion, the road surface and structure remain in a good condition owing to the good quality of civil works during project implementation. In addition, the traffic on this road has been mainly small and light vehicles.

55. From a long-term perspective, the demand for C2 section is likely to remain high as it is part of the national road network, in particular Road 11 (west of Vientiane to Paklay in Xaignabouli province). Traffic is likely to pick up further upon improvement of the connecting roads between Xanakham and Vientiane capital. This indicates that the demand for the C2 section will be sustained. However, the maintenance of this section is a source of concern. Three years since completion, the current condition of C2's road surface is assessed as fair to good. The connecting road between Ban Vang and Xanakham, which was improved as part of the additional road works under the C2 contract, has already started to deteriorate and will need appropriate maintenance again. This section is currently maintained by a private contractor under a performance-based maintenance contract and a resealing contract. It is expected that the quality of the road will be improved in the short term.

56. The risk of inadequate road maintenance remains high for C2. Routine and periodic maintenance received lesser priority (relative to construction and emergency works) in the budget allocation of Vientiane province's DPWT (Appendix 8). About 33% of the DPWT budget is allocated for routine and periodic maintenance of its 2,369 km of local roads. The larger 67% of the budget is allocated for emergency maintenance (i.e., landslides and flooding), which cannot be used for other maintenance activities. In view of this, the sustainability of C2 road is rated *less likely*.

³⁸ The government has increased the fuel levy, which is a key source of funds for the RMF. This indicates a commitment to improving the RMF's revenues. However, it needs to be noted that majority of funds from the RMF are allocated for national roads and the rural roads depend mainly on allocations from the provincial governments.

³⁹ The allocation for rural roads could be further enhanced in the future with additional revenues coming in from the Nam Theun 2 Hydroelectric Project. As per the July 2009 project update, revenues from this project will be deployed for capital expenditures on rural roads in addition to other poverty reduction programs. While this will help in building new roads, there remains an uncertainty on how the expanded road network will be maintained.

⁴⁰ The route is also part of the government's priority international linkages to neighboring countries, i.e., Road 16 from Xekong–Dak Cheung–Viet Nam border.

57. Similarly, road maintenance is an issue for C3 and C4 roads. For C3 section, road maintenance is largely dependent on the commitment of PBM. Despite major investments by PBM in maintenance and modification of the road to suit its trucks, heavy vehicle traffic has accelerated the deterioration of C3 road. The road was originally designed as a rural road, but is currently being used as a mining road. The C3 road surface has deteriorated since project completion and is now assessed to be fair-poor (km 48–km 71) or poor-bad (km 18–km 48).⁴¹ The reservoir to be created for the proposed Nam Ngum 2 Hydropower Project (near Nam Cha Village in C3 road) will overlap with about 10 km of C3 road. If construction of the hydropower project pushes through, the entire 10 km will be inundated. This will require realigning the road to a new location, which could disrupt the accessibility benefits of the local residents.

58. Of the three DPWTs that are responsible for maintenance of the project roads, the DPWT for Houaphan province (C4 section) has received the smallest budget allocation for road maintenance on a per kilometer of length of local roads in FY2008/2009. The allocation for Houaphan (C4 section) is KN7.5 million per km as compared to KN34.6 million per km for Attapeu (C1 section) and KN44.0 million for Vientiane (C2 and C3 sections). In view of the above, the sustainability of both C3 and C4 sections is rated *less likely*.

59. Based on the above observations, the project as a whole is rated *less likely* to be sustainable. For all four roads, it appears that the level of maintenance is low.

IV. OTHER ASSESSMENTS

A. Impact

60. The project impact is rated *moderate to significant*. Field assessments showed that people who had assets benefited from the project since they could improve the productivity of those assets. But those who lacked such assets or livelihoods could not benefit sufficiently. Parallel interventions are necessary to create such assets and livelihoods.

1. Impact on Institutions

61. The project included an attached TA on Strengthening Social and Environmental Management Capacity in DOR (footnote 7). Paras. 87–89 provide details of this TA. The TA contributed to the institutional building activities of the MPWT (formerly called MCTPC). It achieved its outputs in terms of developing manuals and guidelines for project implementation as well as training. However, the TA has had limited impact on capacity building, especially in the social and environmental areas, and so dependence on consultants continues. The TA's main contribution was the creation of manuals and guidelines for environmental and social reviews, which were adopted by MPWT. In view of this, the impact of the TA is assessed as *moderate*.

62. The project contributed to institutional strengthening by bringing in international best practices that improved project implementation.⁴² In terms of the private sector, the project contributed to the development of the contracting industry in the region, with local contractors learning new techniques from international contractors.

2. Socioeconomic Impact

63. The socioeconomic benefits of rural roads usually take longer to materialize owing to slow growth in economic activities in the rural areas. A social survey carried out by IED showed a

⁴¹ Road surface ratings are provided in Table 3.

⁴² For example, the use of international competitive bidding for the consulting and civil works contracts exposed the MPWT, as well as local contractors, to international standards for better access to advanced technologies.

general improvement in (i) household income, (ii) standard of living, (iii) access to social services, (iv) access to markets, and (v) opium eradication. Appendix 9 provides details of the survey. Based on the general satisfaction of the villagers with the advantages and convenience brought about by road improvements, the project is credited with success. Moreover, based on aggregate economic growth and modernization, the project gets a satisfactory rating. Appendix 9 provides details to substantiate this. It is important to note that economic growth does not necessarily translate into poverty reduction. With inequality remaining high, the positive impact of economic growth on poverty reduction is diluted. Moreover, economic growth and poverty reduction are also impacted by other interventions by the government, as well as by other development partners, that have contributed to this success. In other words, the project could be justified to have contributed to these broad impacts; however, the project's impact gets diluted when compared against its original rationale.

64. Several issues crop up when the impact analysis assesses the achievement of the project's key justification—poverty reduction. This was identified by the RRP as a critical theme of the project. Using a trickle-down effect analysis, the project could be stated to have contributed to poverty reduction in the areas adjacent to the subprojects. It could also be stated that development of ethnic communities has improved on an aggregate basis. The development indicators used by the RRP for these groups are inappropriate—enrollment rates in schools (as opposed to attendance) and distance from health clinics (as opposed to services provided).⁴³ In the absence of a clear baseline data, it is difficult to analyze the impacts on these indicators.

65. **Poverty Reduction.** Poverty in the Lao PDR is defined by a poverty line based on the level of per capita household consumption considered necessary to meet minimum dietary needs, e.g., the level of per capita food consumption necessary to purchase a typical food basket, and this allows for a biochemical determination of the minimal average number of calories necessary to adequately sustain life. C1 is located in Xaisettha district, the only nonpoor district in Attapeu province. C2 is located in Xanakham district of Vientiane province. The two villages in the project area are relatively well developed economically. On the other hand, C3 and C4 are located in less economically developed districts of Meuang Hom and Xam Tai, respectively. Appendix 9 shows an increase in household income based on cash sales of livestock, agriculture produce, forest products, handicrafts, small business, and hiring out of labor. This indicates a general improvement in poverty reduction. However, these figures also show that the per capita incomes for villages on C1 and C2 sections were relatively higher before and after the road improvement, implying that they were above the poverty line before and after the road improvement.⁴⁴

66. While the biggest source of income (i.e., livestock and agriculture produce) in Khoc Khao Do and Na Sack villages of C2 road remained unchanged after road improvement, annual household income from agriculture products in the two villages increased 10–15 times from preconstruction levels. Livestock numbers in Na Sack village were up by 10–15 times. Except for forest produce, kip income from other household income sources in the two villages was up. Appendix 9 shows that people living along C2 were better able to capture the benefits of road improvement, as compared to people living along C3 and C4 sections.

⁴³ In the PCR (footnote 3) project framework, even these indicators are lacking. Where the target is stated as “improved access to schools and health facilities,” the achievements column mentions only the lowering of the roughness of the road and the total number of households. The Maunsell (2007) PCR on which this is based (footnote 21) further notes that the conclusion is based on trip purpose data. If accurate, these data show, for example, that in Houaphan, trips for school/education purposes have not changed between 1999 and 2007, but that in both periods the frequency of trips by nonmotorized households was three times that of motorized households. The IEM's field assessment found that half of the villages visited had no school prior to the road improvement, and in villages where schools did exist, the number of teachers increased dramatically after road improvement.

⁴⁴ Government of the Lao PDR. 2004. National Growth and Poverty Reduction Strategy.

67. Income diversification included conversion of forested areas into farmlands. Para. 81 elaborates on the consequent environmental impacts of this activity.

68. The majority of villagers surveyed considered the roads as a mixed blessing. Despite the improvement in parameters mentioned above, the villagers indicated the entry of migrants, who had taken over various pieces of land in the project impact areas. Such migrants are usually well-positioned and influential individuals, who come to avail themselves of natural resources, e.g., forest products and fish.

69. Discussion with road users on the value of the road improvement indicated that for the “progressive” segment of the village population, roads have value because of the added convenience in buying and selling, and for this group, most of the responses, about 80%, are positive.⁴⁵ On the other hand, after road improvement, the entry of external merchants has often put smaller-sized entrepreneurs in the villages out of business. A summary of positive and negative road perception of villagers on the improved road is found in Table 5. This indicates a dilution of the positive impacts attributable to the road improvement.

Table 5: Villager Perceptions on the Positive and Negative Impacts of Road Improvement

Before Road Improvement		After Road Improvement	
Negative	Positive	Negative	Positive
<ul style="list-style-type: none"> • Travel was difficult • Few visitors to village • Commerce limited • Lack of health care 	<ul style="list-style-type: none"> • Natural resources intact • No dust • No accidents • No theft • More small shops and restaurants 	<ul style="list-style-type: none"> • Natural resources being depleted by outsiders • Air pollution due to dust • Accidents have increased (livestock and people) • Petty thievery has increased • Fewer small shops • Traditions are changing and being lost • Land costs have escalated 	<ul style="list-style-type: none"> • Travel is more convenient • Incomes have increased • Easier to hire out labor • More commerce • Sales of handicrafts, especially textiles, increased • Electrification (except Houaphan) • Clean water supply • More tourists and NGOs visit • Have good access to health clinics • More permanent houses (i.e., availability of concrete and other construction materials) • Merchants go to the villages to buy and sell, reducing the need to travel

NGO = nongovernment organization.
 Source: Independent Evaluation Mission socioeconomic survey.

70. In the case of C3 section, the project was useful in contributing to the development of geological resources in Vientiane province (Appendix 10). This mining investment has contributed to growth and industrial development in the C3 area. The benefits include (i) job creation for local people in the mines and employment opportunities in related industries; (ii) merchandise exports of copper and gold, and government revenues through duties, taxes, royalties, and rent; and (iii) improved access to basic services (i.e., transport and communication, housing, health, and education).

71. The above discussion indicates that the indirect socioeconomic impacts of the project in terms of growth and economic development have been significant. However, when the project is assessed against its stated justification of poverty reduction, the project impact is assessed as *moderate*. The improved roads do not assure reduced poverty for those identified as poor, as this depends on the ability of the poor to make significant economic use of the road (Box 1). Responses to economic opportunity in the Lao PDR are ethnicity specific. In other words,

⁴⁵ Livelihoods of “progressive” villagers (not more than 20% at maximum of the village population), who are more commercially-minded persons, have become more dependent on commerce than on agricultural production.

general economic growth does not necessarily imply poverty reduction among the entire community in the project impact area.

Box 1: Rural Roads and Poverty Reduction

This evaluation study confirms that better rural roads are a necessary but not sufficient condition for poverty reduction in the case study areas. The ability of the "poor" to make significant economic use of a road will depend on (i) their asset base, (ii) their entitlements to resources and opportunities, and (iii) the passage of time. A few of the poor that invest savings in small businesses or use their skills have managed to exit poverty using benefits from the road. But, the majority of the poor and very poor primarily benefit from indirect impacts of road improvements (i.e., better access to state services; improved provision of services to the village; and opportunities in alternative livelihood income streams) where the preconditions for their development are right. The "poor" can also benefit from improvements to the rural economy through increased opportunities for agricultural wage labor, which again is contingent on favorable preconditions being set in place.

There are two groups of preconditions for shaping development of an area. The first group relates to external conditions around which projects must be designed. These are macro factors, which are taken to be given, such as (i) spatial position in particular remoteness from existing or major market centers, (ii) climatic conditions and the natural environment, and (iii) terms of trade for agricultural produce. The second group covers structural poverty problems in particular issues on resource allocation and distribution and prevailing social structure. The capacity of investments to shape or influence the political landscape or the social and cultural structure of communities may be limited and not likely to change through rural road investments.

Source: Hettige, H. 2006. *When Do Rural Roads Benefits the Poor and How? An In-depth Analysis Based on Case Studies*. Manila: Asian Development Bank.

72. **Potential Future Impact.** The above analysis brings out two major conclusions: (i) more time is needed for the project's benefits to be captured by the residents in rural areas, and (ii) other interventions are essential for project benefits to be captured by the people. As regards the time element, the growth of economic activities in remote rural areas is typically slower as compared to that in urban areas.⁴⁶ This indicates that project impact could be more positive in the future. However, this optimism is based on the assumption that there will be other interventions that will compliment the road improvement. Box 2 identifies other interventions that could add value to the development process in the project impact area. These are in addition to the ongoing efforts at alternative livelihood development.

Box 2: Other Interventions Important for Economic Development in Rural Areas

- (i) Improvement in policies for land forest allocation, village consolidation, opium cultivation eradication, and eradication of swidden cultivation;
- (ii) Agriculture development in terms of improvement of quantity, quality, and diversity of crops;
- (iii) Encourage crop substitution; and
- (iv) Provision of health and education services.

Source: Independent Evaluation Mission.

73. It is noted that ongoing projects in other sectors could enhance the impact of the project. For example, there are two projects in Houaphan province that could contribute to positive impacts in the future. The Alternative Livelihood for Upland Ethnic Groups in Houaphan

⁴⁶ In addition, the impacts could be variable. The economic development in the areas around C2 section was more visible as compared with those around C3 and C4 sections since the drivers for economic activities were stronger. This underlines the need for other interventions to boost economic activities.

Province project (Grant 9117)⁴⁷ and the Shifting Cultivation Stabilization Pilot Project (Loan 1688).⁴⁸ These projects are designed to improve alternative sources of livelihood for ethnic groups in 31 villages of Xamneua and Xam Tai districts in Houaphan province. It is envisaged that these projects could improve the project's impacts in the future.

74. Opium eradication in Houaphan was a key justification for the project. Thus, (i) the feeder roads component was effective, and (ii) the ethnic minority development plan aimed at developing livelihood alternatives to opium cultivation and improved health and medical services. Opium cultivation depends to a certain extent on demand. During the recent years, opium addiction had been controlled, although not eliminated. While opium was cultivated in approximately 4,862 hectares of land in Houaphan province in 1998, it has been reduced to 281 hectares in 2009 (footnote 33). UNODC confirmed that while opium addiction remained stable, addiction levels for other addictive substances such as methamphetamine have increased in recent months. Appendix 9 provides further details.

3. Impact on Ethnic Community Development and Gender

75. **Ethnic Community Development.** Two of the three ethnic groups in the project zones of influence are considered "ethnic communities" (Mon-Khmer and Hmong-Mien), which are categorized as indigenous people according to ADB's safeguards policy. Some villages on C3 and C4 roads are populated purely with ethnic communities. These villages witnessed mixed results in terms of capturing the benefits of road improvement. The Hmongic groups were able to take advantage of the economic benefits offered by the road, while some of the Mon-Khmer family, such as the Khmuic and Bahnaric groups, were unable to benefit to the same extent (Appendix 9). In particular, the Khmou segment of Dan Xam Village in C4 road was poor before the road improvement and continued to remain so at the time of this evaluation (see para. 65 for a definition of poverty). The ethnic groups covered by the IED surveys are listed in Table 6.

Table 6: Size of Ethnic Communities in the Main Villages Surveyed

Roads Villages	Approximate Percent of People Classified as Ethnic Communities							
	C1 Samakxhixai		C2 Xanakham		C3 Meuang Hom		C4 Xam Tai	
	Sok Kham	Beng Phoukham	Na Sack	Khoc Khao Do	Phon Lao	Meuang Long	Dan Xam	Phiang May
Village Population	919	628	1,711	1,051	535	616	368	390
Percent Distribution								
Ethnic Groups								
A. Lao–Tai								
Thay Neua/Phouan (%)					10		25	
Lao (%)	88	20	99	100				
B. Mon–Khmer								
Khmou (%)			1		90		58	
Nya Heuñ (%)	12							
Hrlak (%)		72						
Tarieng (%)		8						
C. Hmong–Mien								
White Hmong (%)						100		100
Green Hmong (%)							17	

Source: Independent Evaluation Mission.

⁴⁷ ADB. 2008. *Proposed Grant Assistance: Lao People's Democratic Republic: Alternative Livelihood for Upland Ethnic Groups in Houaphan Province (Financed by the Japan Fund for Poverty Reduction)*. Manila (Grant 9117-LAO, for \$1.8 million, approved on 13 February).

⁴⁸ ADB. 1999. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Lao People's Democratic Republic for the Shifting Cultivation Stabilization Pilot Project*. Manila (Loan 1688-LAO[SF], for \$5.6 million, approved on 11 May).

76. The social assessment carried out in 1999 had two methodological issues: (i) inappropriate classification of the ethnic groups, and (ii) incomplete surveys and oversimplification of livelihood descriptions.⁴⁹ This indicates that the quality of the assessment leading up to the project could have been better. These errors could have led to a heightened risk of inappropriate planning and monitoring of impacts. The indirect consequence is that ethnic groups were lumped together into a single category: a relatively backward, uneducated farmer, whose livelihood is based on illegal swidden farming and opium. The information provided in the safeguard documents for the Houaphan feeder roads component of the project has a relatively better ethnic group identification, but it does not analyze the social structure and cultural patterns that are important for a pre-project assessment and subsequently for a postevaluation impact assessment.⁵⁰

77. **Gender Development.** Road improvement has resulted in increased frequency of travel by women, resulting in a higher level of economic activity. Likewise, women appreciate the added convenience of hand tractors to haul firewood and water and for transport of rice to the mill. These activities are now mostly done by men and their tractors, rather than by women who used to handcarry water, firewood, and rice.

4. Resettlement Impact

78. Since the project improved existing roads, resettlement was minimal. With ADB assistance, resettlement activities were satisfactory and no pending resettlement issues were reported. Discussions with the villagers along the project roads yielded only one instance of resettlement wherein a Hmong house in Meuang Long (C3) had to be moved. This was done, and compensation was agreed upon in the form of lumber, which has yet to be received by the affected person. Other villages simply reported that the resettlement was insignificant.

5. Environmental Impact

79. Environmental concerns and management of environmental impacts during construction were monitored by IUCN, a recognized international organization. The assessment of environmental impacts and safeguards is presented in Appendix 10. The environmental safeguard requirements, as stated in the 2000 EIA, were complied with during project preparation. However, the EMP could have been better, since it only provided a general framework for environmental protection without specifying the measures. This resulted in a less than adequate implementation of environmental mitigating measures during construction. The EMP did not contain enough details to be translated into effective contract specifications for environmental requirements. The inability of MPWT to correct the deficiency during preparation

⁴⁹ For example, the four-way system of ethnic classification employed in the documents was never in use, and the three-way system on which it is based was officially abandoned in 1991 with the ratification of the constitution. Groups such as “Soay” are classed as “Lao Loum” when they are actually Mon-Khmer and do not reside in the places listed along C1 road in Attapeu, and along the C4 road in Houaphan. Probably, “Soay” in Attapeu is meant to be Souay, a well-known group found in the more western parts of southern Lao PDR, which is sometimes used by uneducated Lao PDR people to refer to any Mon-Khmer group. In Houaphan, this same term was confused with the Thay of Meuang Soy in the project area, a Lao-Tai group. Another group, the Kalom, listed as being in Attapeu, is found only in Louang Namtha and Bokeo in the far northwestern part of the country. This indicates errors in the methodology of the assessment (Volume III, Chapter 5, page 24 of the Consultant’s report for TA 2889-LAO – Summary Initial Social Assessment, Initial Social Assessment, and Interim Social Analysis Report). Further on, the same document (page 28) refers to ethnic minorities who practice “shifting cultivation sometimes without a permanent residential location,” which is in fact never the case. The use of “shifting” is in itself a misnomer—the proper technical term is swidden. There remain other cases of inaccuracy on the subject of swidden agriculture. Apart from the tables of ethnonyms that are incorrect, no detailed descriptions are provided for the individual groups and their distinctive characteristics, and they are treated as a single homogenous “ethnic minority.” Subsequent ADB documents continue to use this incorrect information.

⁵⁰ The resettlement implementation plans for the main roads in the project could not be located by the IEM.

of contract specifications contributed to poor safeguards compliance during construction. The use of international third party environmental monitoring was effective, since IUCN was able to observe the non-implementation of some mitigating measures, despite the limited time for monitoring during annual missions. It would be difficult to attribute problems in implementing mitigation measures to the lack of a policy framework, because the Lao PDR has appropriate policies and laws on environmental protection and management. These problems could be more attributable to shortcomings in the contractors' capabilities and in MPWT's capacity to supervise safeguards implementation. ADB's review missions did highlight these issues, but had to rely on MPWT to rectify them.

80. DOR had difficulty in addressing problems of compliance with environmental safeguards during operation because of inadequate institutional capacity. The recent reorganization at DOR has adversely affected its efforts in building a dedicated safeguards unit, which needs to be strengthened to handle work related to safeguards.

81. After the completion of road improvement, the continued land conversion of forested areas remains a concern. The reconciling of the broader food production objective against forest resource conservation leads to a further macro level issue of how far land conversion should be allowed to intrude into the remaining forested areas and cause further habitat fragmentation and habitat loss. These issues need to be discussed during project planning. Environmental changes that the roads have caused or induced along their routes vary (Table 7). Overall, the C2 route exhibits the most pronounced change among the four subproject roads. C3 and C4 routes have relatively moderate changes compared to the pre-construction conditions. C1 route has very little change, since it has been used intensively during the pre-construction period and has been connecting two road sections previously upgraded under an earlier ADB loan.

Table 7: Change in Environmental Settings

	C1 Road	C2 Road	C3 Road	C4 Road
Change	Negligible	Significant	Moderate	Moderate
Visible Impacts	Induced land use change and the associated ecological consequences. The routes are presently dotted with swidden (slash-and-burn) fields. The increasing number of people living near the road has increased the need for food production and income generation. The conversion of swidden areas into intensively cultivated lands and tree plantations along all the routes has already changed the landscapes.			
	Increased sedimentation of streams due to soil materials from road erosions and landslides. Sediments reaching the streams could increase long-term turbidity and adversely affect aquatic ecology.			
	Continued land conversion of forested areas into farmlands, such as in C2 road has reduced the area of available habitat. The improved road undoubtedly contributes to increased accessibility into the remaining forested areas. Strict land use control is necessary and requires appropriate legislation and enforcement.			
Environmental Risk	This refers to the mountainous section of C2 road and the section of C4 road cutting through the Nam Xam National Biodiversity Conservation Area. For the C2 road, the significant increase in environmental risk is highlighted for the mountainous section. With industrial development in Xaignabouli province, there is a risk linked to transportation of chemicals and hazardous materials (pesticides, oil, etc.) through an area previously not passable to vehicular traffic. Accidents involving spills of such materials could threaten the environment adjacent to the road. The impact can be experienced even up to far places where runoffs of the streams could carry the spilled materials. C4 road has a similar situation since it cuts through a protected area with a major stream located immediately below the road. This requires an accident response plan for C2 and C4 sections.			

Source: Independent Evaluation Mission.

82. After a few years of being operational, the occurrence of landslides and erosion calls for improved road maintenance and corrective action. These have affected public safety and are also becoming significant sources of sediment loads to streams. In addition to environmental impacts, increased environmental risk is now a concern in roads cutting through sensitive sites

such as NBCAs adjacent to C2 and C4 sections. The main risk relates to the transport of hazardous materials on these roads, triggered by further economic development.

6. Communicable Diseases

83. Sexually transmitted disease is not considered a major issue in the project areas, although the risk of infection continues to be high. A rapid survey by IED noted cases of acquired immunodeficiency syndrome (AIDS) involving two ethnic Lao PDR persons in Attapeu and Xanakham. In the case of Xanakham, the infection is not likely to be project-related since cross-border travel to Thailand was easy and frequent even before road improvement. In Attapeu, the villagers do not travel so frequently to Thailand owing to the longer distance to the international border. The AIDS infection could be considered as a one-off case involving contact with a visitor or travel to Thailand.

7. Road Safety

84. Appendix 11 provides a summary of the road safety record of the subprojects. The incidence of road accidents has increased since project completion. This is more apparent on C1 section that has seen a high growth in traffic. As traffic continues to grow, road safety is expected to deteriorate owing to (i) increased vehicle speeds due to fair–good road conditions, (ii) narrow road width and steep grades in mountain sections of the roads, (iii) the presence of people and livestock either crossing or walking near the road edge, (iv) increased motorcycle traffic, and (v) adverse weather conditions including landslides and flooding. Despite efforts to lower the steep road gradients (para. 21 and footnote 18), several sections on C2, C3, and C4 continue to be high risk and prone to accidents.

B. ADB Performance

85. Taking into account the complexity of project design and scope and the dispersed locations of the subproject roads, ADB performance is rated *satisfactory*. This confirmed the PCR's rating. From fact-finding to Board approval, the loan was processed within 9 months. This indicates a short time for loan processing. This has a bearing on the weaknesses in project design that could have been corrected. During project implementation, ADB gave adequate attention to the project through 14 project administration missions or about 2.7 missions per years. These included 11 review missions, which satisfactorily dealt with several key issues on the environment, resettlement, risk of sexually transmitted diseases, and timely disbursement of counterpart funds. In June 2005, ADB headquarters delegated the project to the Lao Resident Mission. ADB missions visited the project sites to supervise implementation in conjunction with MPWT. However, ADB's efforts could have been more effective in resolving specific issues such as the use of the C3 road by PBM. Even after project completion, ADB could have played a more proactive role by following up with MPWT to ensure that the agreement between the government and PBM for road maintenance was appropriately enforced. ADB still needs to work closely with the government to enforce this agreement.

C. Borrower and Executing Agency Performance

86. The performance of the borrower and MPWT is rated *satisfactory*. This confirmed the PCR's rating. Although there were some delays in implementation, the completed works were of satisfactory quality and met the project requirements. The project management unit effectively managed physical implementation of the project with help from the project supervision consultant. It is noted that counterpart payment of the local currency portion of contracts was delayed for 2 years, resulting in project delays because of cash flow problems for the contractors. MPWT

made efforts through the Ministry of Finance to resolve this issue by offsetting the tax liabilities of the contractors and reducing their fuel costs. This issue of delayed counterpart funds appears to have been resolved in subsequent ADB road projects. As mentioned in para. 57, the issue of the poor quality of maintenance of the C3 road indicates lack of enforcement by the government of the agreement with PBM. This needs to be rectified by appropriate and concerted action by MPWT and the Ministry of Industry.

D. Technical Assistance

87. The attached TA on Strengthening Social and Environmental Management Capacity in DOR (footnote 7) was designed to strengthen the work of ESD in social and environmental management and monitoring.⁵¹ At completion, the TA completion report rated it *generally satisfactory*.⁵² This PPER finds the TA *relevant* but *less effective* and *less likely to be sustainable* owing to reasons given below.

88. **MPWT Social and Environmental Capacity.** The IEM discussions with PWTI indicate that the social side of its mandate has effectively been abandoned. The name of the division has been altered since it moved from DOR in February 2009 when it was formerly ESD. It is now called the Environmental Division, implying the lower importance of the social aspect.⁵³ While the TA on Strengthening Social and Environmental Management Capacity in DOR (footnote 7) included training on social and environmental assessment, the ESD's social side remained deficient and less effective owing to the lack of human resources in the social discipline. This issue is linked to wider sector-level issues: (i) the local university needs to have a structured program so that basic capacity in social and environmental disciplines is built, and (ii) capacity building efforts have not led to human resource development and have been relegated to training in implementation of specific safeguard procedures.⁵⁴ Even if a master's degree program in social sciences was initiated at the local university, it would need at least 3 years before the training can be applied. Master's-level degree programs in anthropology or rural sociology should be considered, as the need is now urgent if MPWT is sincere in its desire to improve its safeguard procedures.⁵⁵ In the environmental field, the new Environmental Division has a total of 8 personnel, out of which only 2 are educationally qualified with a degree in an environment related field; 4 are engineers by training; and 2 are non-engineers (though not social scientists). Although the division expects to improve its resources in the short term,

⁵¹ TA contribution to institutional development was assessed as satisfactory based on the effectiveness of the capacity building work shared with other donors. The TA was considered highly relevant and effective by the TCR. It was assessed partly efficient due to a minor implementation delay. The sustainability of the TA was satisfactory based on the practicality of the guidelines and the anticipation that these guidelines, together with the TA recommendations, will be used by DOR in the long term.

⁵² ADB. 2000. *Technical Assistance Completion Report on Strengthening Social and Environmental Management*. Manila.

⁵³ There are, in fact, two deputy directors one for social and one for the environment, but the deputy director for social is apparently the lone person responsible for all social matters in the Ministry.

⁵⁴ At the university, the Faculty of Social Science consists of three departments, and only the Department of History (now called History and Anthropology) offers coursework in sociology and anthropology, and these are very limited in scope and quality. Development agencies such as ADB or the Swedish International Development Cooperation Agency have supported capacity building, but due to the lack of requisite educational foundation in the government personnel, it has been less than successful from an educational perspective. The training provided focuses narrowly on the safeguard documents rather than on providing any real background in the social sciences. Understanding of the reasoning and rationale for the social safeguards is not included, so what is actually produced in the end graduates are merely able to help ADB or others in their bureaucratic procedures. But this does not help the division become more independent and self-reliant.

⁵⁵ For the price of TA 3557 (\$200,000), estimating the cost of one masters degree program in adjacent Khon Kaen University in Thailand at \$20,000 each (this is a conservative estimate), 10 persons could be educated. The Center for Research on Cultural Pluralism in the Mekong Region and the Mekong Institute are also located at this university and would be an added benefit.

the current situation prevents it from adding value to the implementation of projects in the country. This has resulted in a continued reliance on external consultants.

89. **DOR Social and Environmental Capacity.** Following a reorganization of DOR and the creation of PWTI, efforts under the TA on Strengthening Social and Environmental Management Capacity in DOR (footnote 7) to establish long-term safeguards capacity (through a dedicated unit with staff equipped in skills for directing and supervising social and environmental work) suffered a major setback. The new Environmental and Technical Division (ETD) in DOR is now responsible for mainstreaming the social and environmental aspects in the road sector.⁵⁶ With the transfer of its specialists from the former ESD to the PWTI, ETD has negligible staff with the necessary skills to monitor safeguards implementation on road projects. ETD needs adequate institutional capacity to be able to work with other government agencies and local officials on several issues previously identified by the project's EIA report: (i) oil spills and hazardous materials transport, (ii) induced development into ecologically sensitive areas, (iii) impairment of fisheries and aquatic ecology, and (iv) increased pressure on nontimber forest products. According to the ETD director, DOR plans to correct the situation by hiring new staff, but as yet no action has been taken.

V. ISSUES, LESSONS, AND FOLLOW-UP ACTIONS

A. Issues and Lessons

90. **Road Maintenance.** Appropriate allocation for road maintenance continues to be an issue in the Lao PDR (para. 53). There is no easy solution to address this issue. The development partners, including ADB, have been discussing this with the government at periodic intervals. Although the government has expressed willingness to strengthen its maintenance regime, the lack of funds continues to be a dissuading factor. In the case of the project, the use of the C3 section by the PBM trucks has increased the risk of continued deterioration. This issue can be resolved by a strong initiative from the government.

91. **Capacity to Implement Social and Environmental Safeguards.** The Lao PDR lacks adequately trained personnel in the country in general and in MPWT in particular. The capacity to plan, implement, and monitor social aspects of projects is currently insufficient. The need for external monitoring and preparation of environment and social assessments, resettlement plans, and ethnic minority development plans by foreign experts is likely to continue in the medium term unless steps are taken to rectify this problem (paras. 88–89).

92. **Conversion of Forests into Farms.** While acknowledging the need to increase food production, the continued conversion of secondary forests to farmlands has become a major issue linked with the improvement of roads (Table 7). The need to conserve natural resources remains high but is now competing with the need for broad-based food security. This requires robust land use control laws that need to be enforced appropriately.⁵⁷ As indicated in para. 81, project appraisals should include land use planning to reduce the depletion of forests.

93. **Focus on Specific Province or Area.** The project was characterized by a geographical spread of its subprojects in four different parts of the country (para. 45). This created several implementation issues and diluted the impact of the project. In the future, ADB should focus on

⁵⁶ It merges the former ESD with the Planning and Technical Division. During reorganization, staff specialists of the former ESD were transferred to PWTI as a new unit that will handle policy-level work for the entire ministry. This move left the new ETD without any staff that has the necessary skills for safeguards work. It is a big setback in the efforts of building the long-term capacity in DOR for a dedicated safeguards unit with staff equipped in skills for directing and supervising social and environmental work.

⁵⁷ The Law on Land (Law 01/97 NA as amended in 2003) serves as reference to this concern, which provides in its Article 6 that land use shall not have a negative impact on the natural or social environment.

a particular province or area to achieve implementation synergies, as well as to maximize project impact.

94. **Opium Control.** Although the project was effective in reducing opium cultivation in the project impact area, there has been a rise in opium cultivation in other parts of Houaphan (para. 48). Although this is admittedly outside the control of the project, it implies that there is a need to put in place economic structures that create alternative livelihoods for the people in this province. In other words, improving roads alone is insufficient to create new economic activities. The government and other development partners need to address this issue in a more comprehensive manner. Para. 72 notes the ongoing projects that could provide benefits in the future.

95. **Physical Road Designs.** Taking into account the steep terrain in the Lao PDR (para. 21), construction of roads remains a challenging task owing to steep slopes and landslides. The use of slope stabilization techniques for reducing landslides need to be mainstreamed. Moreover, at the appraisal stage, the preliminary road designs need to incorporate slope reduction measures to ensure road safety. It is noted that there needs to be an appropriate balance of economic viability of such measures. ADB and MPWT need to work together to identify low cost structures.⁵⁸ Overall, road designs need to be improved taking into account the local context.

96. **Contractors.** Prequalification of contractors should be done more carefully to ensure that only qualified contractors with the required capacity are awarded contracts (para. 17). ADB should make every effort to ensure that MPWT staff is familiar with ADB procedures and requirements.

97. **Social Assessment and Monitoring.** Roads may increase inequality between ethnic groups since benefits do not accrue equally to all groups. Such impacts can be addressed only if the assessment at appraisal is carried out efficiently. In the case of the project, all the ethnic communities were grouped into one category (para. 76). This negates any differential interventions to resolve inequality among the communities. In other words, there is a need to ensure that assessment of social groupings are carried out correctly, so that propensities for differential economic development are identified correctly at the feasibility stage. The use of IUCN was effective to monitor environmental safeguards. It would be useful to introduce similar external monitors for social safeguards also. Finally, as indicated in para. 44, the quality of the project design depends on the collection of baseline data at appraisal.

98. **Environmental Assessment and Monitoring.** Rehabilitation of roads passing through conservation areas is likely to impact the ecology. Such projects require robust EMPs that are based on an in-depth assessment of the local ecosystem.⁵⁹ This needs to be followed up by appropriate monitoring. The use of IUCN as an external monitor has been effective in ensuring that the environmental safeguards were implemented appropriately. Given the lack of capacity within MPWT, such monitoring by an external agency has been useful and needs to be continued.

⁵⁸ The global Transport Knowledge Partnership has brought out a draft *Low Cost Structures for Rural Roads: A Practical Planning, Design, Construction & Maintenance Guide* by Paul Larcher, et al. (available: <http://www.gtkp.com/default.asp>). Such guides could be adapted to suit the Lao PDR context.

⁵⁹ Such assessment needs to include (i) an EMP that provides a clear and detailed description of proposed mitigating measures that could easily be translated into specific requirements in the contract specifications and operations manual; (ii) detailed project-specific contract clauses for environmental protection and management that could be included in the bidding documents; and (iii) a requirement that contractors of future road projects must submit a contractor's EMP detailing the environmental mitigating measures to be implemented. This requirement should be clearly stated in the contract documents for road construction.

B. Follow-Up Actions

99. **Enforce the Maintenance Agreement for C3 Road.** The agreement between the government and PBM for the maintenance and upgrading of the C3 road between Thong Khoun and Longsan needs to be enforced appropriately. ADB needs to coordinate with MPWT and the Ministry of Industry to identify a specific plan of action, legal or administrative, which will lead to an improvement of the C3 road section.

100. **Strengthen Capacity for Safeguards-Related Work.** PWTI and ETD should develop a short- to medium-term capacity development program to systematically strengthen and/or restore capacity to handle work on social and environmental safeguards. This could be done by hiring new staff with relevant education and training. ADB could include training components in its future assistance to cover central as well as provincial institutions.

101. **Strengthen Axle Load Monitoring and Controlling.** Vehicle overloading leads to road damage. The project roads do not yet have a systematic mechanism for controlling vehicle loads. ADB should work closely with MPWT to develop appropriate procedures for this and also ensure that weigh stations are installed at selected locations to check heavy trucks plying national and mountain roads, e.g., C3 road.

PROJECT ACHIEVEMENTS AGAINST INTENDED IMPACTS, OUTCOMES, AND OUTPUTS

Design Summary	Performance Targets	Assessment	Project Achievements
Impact: Improve welfare and promote economic growth in isolated areas by improving rural access roads in four provinces	GDP growth rate in the project area increased	Achieved but on a differential basis.	<p>The social survey team of the Independent Evaluation Mission (IEM) found annual per capita cash income from sales (KN million) to have significantly increased in eight sample villages in the four project districts. For C1 (Samakkhixai), per capita cash income per year increased from KN0.78–2.9 million or \$96–\$355 equivalent (before) to KN7.6–18.8 million or \$790–\$1,954 equivalent (after). In C2 (Xanakham), this increased from KN6.3–19.7 million or \$772–\$2,413 equivalent (before) to KN65.8–153.3 million or \$6,840–\$15,936 equivalent (after). For C3 (Hom), per capita income increased from KN1.3–10.7 million or \$159–\$1,310 equivalent (before) to KN7.4–33.9 million or \$769.2–\$3,523.9 equivalent (after). Lastly, in C4 (Xam Tai), the per capita income per year increased from KN1.3–5.6 million or \$159–\$686 to KN13.1–29.5 million or \$769–\$1,362 (after).</p> <p>As regards the differential impacts, see analysis of poverty reduction below.</p>
	Social indicators in the project area improved	Achieved on a non-uniform basis.	<p>Current assets of surveyed households (Appendix 9) show a wide variety of high price consumer items. In addition, villager interviews also indicate positive impacts related to the road improvement including (i) houses becoming more permanent (with availability of concrete and other construction materials), (ii) electrification (except in Houaphan province), and (iii) improved access to health and education services.</p> <p>Such impacts cannot be expected to be uniform across all subprojects. In case of C4, these impacts have been relatively slow to become visible. The low traffic on the project road indicates the low level of economic activity. Moreover, the continuation of the livelihood patterns in these areas also shows the slow pace of change, which is typical in rural areas.</p>
Outcome: Effective access between farm-based communities, national and provincial roads, and market centers	<p>All-weather access to agricultural markets</p> <p>Increased competitiveness in transport services thereby inducing more efficient movement of goods and passengers</p>	<p>Achieved but usage is low on C3 and C4.</p> <p>Achieved but maintenance is necessary to sustain realized benefits.</p>	<p>Based on the sample of villager perceptions, there is an indication that a key positive impact of the project is travel convenience (with strengthened or introduced motorized travel visibly benefiting women in most project areas) and improved household access to markets. Except for the feeder road from Sop Bao–Moung Nam (not passable on heavy rainy days or about 1 month per year), all roads comprising the project are reportedly passable the whole year round.</p> <p>Villagers interviewed by the IEM social survey team thought that travel time is now convenient compared to before project conditions. From average roughness of 15 m/km (or 12–20 m/km) before road improvements in the four main contract roads, road roughness was reduced to about 3 m/km at completion (2006). In 2009, the IEM national road expert visually estimated road roughness to be about 4–5m/km in C1, 5–6 m/km in C2, 6–6.5 m/km in C3, and 5–6 m/km in C4.</p> <p>For C1 and C2, average travel speed improved from 10–15 kph (before project) to 42–46 kph (at evaluation). For C3 and C4, average travel speed improved from 6–8 kph (before project) to 35–38 kph (at evaluation).</p>

Design Summary	Performance Targets	Assessment	Project Achievements
			<p>With the completion of C1 road, there was an increase in the frequency of bus trips. Before the project, there were two trips per day (one from each direction) between Attapeu and Pakse. At the time of evaluation, there are about eight trips per day (four from each direction).</p> <p>On the C2 road section, benefits were visible in terms of both transport cost and travel time reduction. Before the improvement of C2 road, there was no bus service on the Paklay–Xanakham–Vientiane route. This has been introduced now. Paklay residents take the long 600 km route through Xaibouly–Louangphrabang to Vientiane. This takes 1.5 days for KN70,000 by big truck and KN30,000 by small car. By boat, Paklay–Xanakham was KN70,000. After improvement of the C2 road, boat and bus fares are KN50,000 and KN30,000, respectively. Before the project, Paklay to Vientiane by boat was KN130,000. After the project, boat and bus fares were KN90,000 and KN75,000, respectively. By boat, travel time for Paklay–Vientiane is 1 day downstream and 1.5 day upstream. After road completion, travel time by bus service one way is 6–7 hours. There are now about seven buses based in Paklay for plying the Paklay–Vientiane route. But only two buses (one direction each) are being used each day owing to the small demand along the route.</p> <p>Interprovincial trade has increased the supply of goods and improved consumer choice. Before project completion, Paklay residents bought rice from Thailand. This now costs KN250,000/50-kilo bag. The road enabled Xanakham to sell rice to Paklay. This costs KN200,000/60-kilo big or savings of KN1,667 per kilo. For Paklay, the price for pig and chicken from Xanakham and Vientiane is more or less same. But still, supply is not enough from one source alone.</p>
	<p>Reduced poverty by providing access to markets, extension services, and income and employment opportunities to the poor</p>	<p>Achieved but on a differential basis.</p>	<p>Before the road improvement, the IEM social survey team found that villagers in its eight study villages travel to markets to purchase rather than to sell produce. After the road improvement, the villagers (except for the two villages in Xam Tai) now travel to markets to both purchase and sell goods. At the same time, roads have reduced travel to other locations because of market access to villages, i.e., merchants now come to buy and sell things in the village. Villager perceptions on positive impacts of the road improvements include (i) increased incomes, (ii) more commerce, (iii) increased sales of handicrafts especially textiles, (iv) more tourists, (v) easier to hire out labor, and (vi) more visits by nongovernment organizations.</p> <p>While all these indicators show positive impact, the poverty reduction aspect needs to be analyzed in the context of some areas that could not be categorized as poor before road improvement. In other words, the poverty reduction cannot be an appropriate term to describe these areas. Economic growth would be more appropriate.</p> <p>As described in the main text, some of the ethnic groups could not capture the benefits of the road improvement since they needed to acquire productive assets to enable such capture. Field assessments showed that people who had assets benefited from the project since they could improve the productivity of those assets. But those who lacked such assets</p>

Design Summary	Performance Targets	Assessment	Project Achievements
			could not benefit sufficiently since they did not have productive assets or livelihoods. Parallel interventions are necessary to create such assets and livelihoods.
	Reliable access to education and health facilities	Achieved.	<p>Villagers interviewed by the IEM social survey team indicated that there was a lack of health care before road improvement. Following road improvement, they now have good access to health clinics. Health behavior is changing and more frequent use of clinics and hospitals was reported.</p> <p>The IEM social survey found educational indicators showed major improvement. Before the road improvements, half of the eight sample villages had no schools. At the time of evaluation, all villages have schools. The number of teachers has increased as it is now easier for teachers to access their assigned villages. The number of grades has also risen and all villages have at least some students continuing their education beyond grades available in the village. But cost of education has also risen considerably, more than double in communities where costs before the road improvement were remembered.</p>
	Domestic road contracting industry strengthened by providing opportunities in civil works construction	Partly achieved.	One international competitive bidding contract was awarded to a Lao PDR joint venture contractor. Feeder road contracts under LCB were the implemented by Laotian contractors. In C2, the Lao PDR joint venture partner, which was least experienced of the group, undertook the work by itself. As a result, contractor organization, management, and planning of works were considered inadequate. The contractor also encountered problems in receiving local counterpart funds from the government for over 2 years. This has since been resolved through a tax offset arrangement, which is now being applied in all contracts under ADB projects.
Outputs: Road Improvement	About 220 km of rural access roads improved	Fully achieved.	Exceeded physical targets with variations/additional works. See Appendix 3 for details.
Feeder Road	About 100 km of feeder roads in Houaphan province built	Partly achieved.	This was reduced to 67 km following the removal of the Xam Tai–Moung Nam section from Feeder Road 3. See Appendix 3 for details.
Periodic Maintenance	Periodic maintenance of selected subprojects in support of the road maintenance fund (RMF) set up by the World Bank-financed Road Maintenance Program	Achieved.	<p>ADB financed periodic maintenance of a total of 163 km of roads in five subprojects. The RMF was established by the Prime Minister Decree 09/PM in January 2001. The RMF advisory board was established by the Prime Minister Decree 05/PM in January 2001. The secretariat was appointed on 21 July 2001. Regulations were issued in January 2002.</p> <p>Progress in the area of road maintenance is considered promising. Two key issues here relate to (i) a continuing need for a fund to fill the financial gap so the Lao PDR roads do not lose asset value, and (ii) the capacity of RMF.</p>

Design Summary	Performance Targets	Assessment	Project Achievements
Unexploded ordnance (UXO) clearance	UXO pathfinding and clearance completed	Achieved.	This was carried out by the Lao PDR army in Attapeu (2003).
Environmental management action plan and environmental monitoring program	Environmental impact monitoring program in ecologically sensitive areas, particularly NBCAs improved	Partly achieved.	The performance of IUCN was <i>effective</i> in this role. It submitted regular reports to ADB and the EA with the request that the EA act on their recommendations. On the other hand, the larger process of third party monitoring of project implementation is considered <i>less effective</i> . The quality of the action plans had room for improvement. There was inadequate response from the contractors to IUCN's recommendations during implementation.

ADB = Asian Development Bank, EA = executing agency, GDP = gross domestic product, IUCN = International Union for the Conservation of Nature, km = kilometer, kph = kilometer per hour, Lao PDR = Lao People's Democratic Republic, LCB = local competitive bidding, m = meter, NBCA = national biodiversity conservation area, UNODC = United Nations Office on Drugs and Crime.

Source: Independent Evaluation Mission.

PROJECT COST AND FINANCING

Table A2.1. Appraisal and Actual Project Cost and Financing
(\$ million and %)

Item	At Appraisal			Actual			Actual / Appraisal (%)
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost	
A. Project Costs							
1. Base Cost							
a. Land Acquisition	0.00	0.30	0.30	0.00	0.04	0.04	13.33
b. Road Improvement							
i. Attapeu–Senamnoy (C1)	2.60	0.70	3.30	3.90	0.98	4.88	147.88
ii. Na Sack–Khoc Khao Do (C2)	4.60	1.10	5.70	5.24	1.31	6.55	114.91
iii. Thong Khoun–Longsan (C3)	6.00	1.50	7.50	7.68	1.92	9.60	128.00
iv. Huay Hung–Xam Tai (C4)	5.50	1.40	6.90	6.56	1.65	8.21	118.99
c. Periodic Maintenance	0.80	1.20	2.00	0.76	1.02	1.78	89.00
d. Feeder Roads	0.40	1.60	2.00	0.43	1.65	2.08	104.00
e. Environmental Monitoring	0.20	0.05	0.25	0.20	0.00	0.20	80.00
f. Construction Supervision	2.70	0.05	3.20	4.10	0.00	4.10	128.13
g. UXO Clearance	0.00	0.60	0.60	0.00	0.002	0.002	0.33
h. Project Management	0.05	0.60	0.65	0.00	0.007	0.007	1.08
2. Contingencies							
a. Physical	2.00	0.60	2.60	0.00	0.00	0.00	0.00
b. Price	1.10	0.35	1.45	0.00	0.00	0.00	0.00
3. Service Charge During Construction	1.05	0.00	1.05	0.56	0.00	0.56	53.33
Subtotal (A)	27.00	10.05	37.50	29.43	8.58	38.01	101.36
B. Project Financing							
1. Asian Development Bank			25.00			27.48	109.92
2. Government			7.50			5.53	73.73
3. Other External Financing			5.00			5.00	100.00
Subtotal (B)	27.00	10.05	37.50			38.01	101.36

km = kilometer, UXO = unexploded ordnance.

Source: Asian Development Bank.

Table A2.2: Cost per Kilometer of Roads at Appraisal vs. Actual

Item	At Appraisal			Actual					
	Cost (\$ mn)	Km	Cost (\$ mn) /Km	Without Additional Works			With Additional Works ^a		
				Cost (\$ mn)	Km	Cost (\$ mn) /Km	Cost (\$ mn)	Km ^b	Cost (\$ mn) /Km
1. Road Improvement									
a. Attapeu–Senamnoy (C1)	3.3	22.0	0.15	4.51	22.9	0.20	4.88	25.9	0.19
b. Na Sack–Khoc Khao Do (C2)	5.7	48.0	0.12	5.36	63.2	0.08	6.55	123.1	0.05
c. Thong Khoun–Longsan (C3)	7.5	76.0	0.10	8.86	87.5	0.10	9.60	171.5	0.06
d. Huay Hung–Xam Tai (C4)	6.9	72.0	0.10	7.52	72.3	0.10	8.21	110.3	0.07
Subtotal	23.4	218.0	0.11	26.25	245.9	0.11	29.24	430.8	0.07
2. Periodic Maintenance	2.0	163.0	0.01	1.78	163.0	0.01	1.78	163.0	0.01
3. Feeder Roads	2.0	100.0	0.02	2.08	66.7	0.03	2.08	66.7	0.03
Total	27.4	481.0	0.06	30.11	475.6	0.06	33.10	660.5	0.05

km = kilometer.

^a Under C1, additional work included upgrade of Xekong Bypass road and construction of new Huay Lamphan bridge.^b Include km of roads constructed and rehabilitated.Source: Asian Development Bank. 2008. *Project Completion Report on the Rural Access Roads Project*. Manila.

SUMMARY OF PHYSICAL ACHIEVEMENTS

As Per Loan Documents	Design Changes	At Completion	Remarks
1. Road Improvement	Minor changes in scope to address steep grades in original design, and nonavailability of suitable road material along the road alignment.	Upgraded/constructed a total of 245.8 km in addition to 182 km maintained/rehabilitated.	
a. Improve about 218 km of rural access roads as follows:			
i. C1: Attapeu–Senamnoy (22 km)	<ul style="list-style-type: none"> • Cancellation of 0.9 km section of the project road at Attapeu, which was financed under Sixth Road Improvement Project and deleted from the project scope • Resulting cost savings were used to upgrade the Xekong Bypass road and construction of new Huay Lamphan bridge 	<ul style="list-style-type: none"> • Upgraded 22.85 km 	<ul style="list-style-type: none"> • Additional work was justified in the consultant's reports submitted to MPWT and ADB. There were cost savings after deleting 0.85 km and including savings gained from the favorable SDR/USD exchange rate used for these variation orders. • No economic analysis done on the additional works. • Complied with safeguard guidelines.
ii. C2: Na Sack–Khoc Khao Do (48 km)	<ul style="list-style-type: none"> • Reduction of maximum grades, which increased roadway excavation • Revision of pavement design to cement-stabilized base—a cheaper and more effective design • Increase of 15.2 km from the original target • Upgrading of the 15 km stretch to single bituminous surface originally designed as gravel • Maintenance or rehabilitation of additional 60 km 	<ul style="list-style-type: none"> • Constructed 63.2 km in addition to 60 km maintained/rehabilitated 	<ul style="list-style-type: none"> • The selection of the additional 60 km was justified in the consultant's reports submitted to MPWT and ADB and also in the preambles of the variation orders. • Soil cement was used as a technically viable alternative because of the absence of suitable materials. • No economic analysis done on the additional works. • Complied with safeguard guidelines.
iii. C3: Thong Khoun–Longsan (76 km)	<ul style="list-style-type: none"> • Change to single bituminous surface treatment for 14 km section from the original design of gravel pavement • Maintenance or rehabilitation of additional 84 km 	<ul style="list-style-type: none"> • Constructed 87.5 km in addition to 84 km maintained/rehabilitated 	<ul style="list-style-type: none"> • The selection of the additional 84 km was justified in the consultant's reports submitted to MPWT and ADB and also in the preambles of the variation orders. • There were considerable savings from the original design because of the consultant's optimization of bridge design/value engineering after design review and the favorable SDR/USD exchange rate. • No economic analysis done on the additional works. • Complied with safeguard guidelines.

As Per Loan Documents	Design Changes	At Completion	Remarks
iv. C4: Huay Hung–Xam Tai (72 km)	<ul style="list-style-type: none"> Variation order changed pavement design to double bituminous surface treatment pavement Maintenance or rehabilitation of additional 38 km 	<ul style="list-style-type: none"> Constructed 72.25 km in addition to 38 km maintained or rehabilitated 	<ul style="list-style-type: none"> The selection of the additional 38 km was justified in the consultant's report submitted to MPWT and ADB and also in the preambles of the variation orders. No economic analysis done on the additional works. Complied with safeguard guidelines.
2. Periodic Maintenance a. Finance periodic maintenance of subprojects selected	<ul style="list-style-type: none"> Maintenance of additional sections as part of the road improvement and feeder road improvement components utilizing savings from contracts 	<p>Periodic maintenance conducted for 163 km of selected road sections under five local competitive bidding contracts for (i) repair and regravelling, National Road 13 North–Xaibouly; (ii) periodic maintenance, Road 6A–Houaphan; (iii) resealing and repair work, Road 13 North–Vientiane; (iv) resealing and repair work, Road 13 North–Oudomxai; and (v) regravelling on Road 5B.</p> <p>Additional sections were included as part of the road improvement and feeder road improvement components.</p>	This was completed.
3. Feeder Road Improvement a. Improve about 100 km of feeder roads with gravel wearing course, drainage, and slope protection works as follows: i. FR1: Sop Lao–Sop Peun, Section 1 ii. FR2: Sop Lao–Sop Peun, Section 2 iii. FR3: Sop Bao–Moung Nam	<ul style="list-style-type: none"> Removal of the 36.5 km Xam Tai–Moung Nam section 	Completed 66.7 km	

ADB = Asian Development Bank, C = contract, FR = feeder road, km = kilometer, MPWT = Ministry of Public Works and Transport, SDR = Special Drawing Rights, TA = technical assistance.

Source: Independent Evaluation Mission.

TECHNICAL ASSESSMENT OF SUBPROJECT ROAD CONDITIONS

Table A4.1: Road Improvement Component

Item	Contract C1 Road	Contract C2 Road	Contract C3 Road	Contract C4 Road
Length	22.85 kilometers (km)	63.20 km	87.50 km	72.25 km
Surface Type	Double Bituminous Surface Treatment (DBST)	Single Bituminous Surface Treatment (SBST)-DBST	SBST-DBST in steep terrain and village	DBST
Road Width	6.5-7.0 meters (m)	5.0 m	5.0-8.0 m	4.5-5.0 m
Topography	Flat-Rolling	Flat-Rolling-Mountainous	Flat-Rolling-Mountainous	Flat-Rolling-Mountainous
Accessibility	Open 12 months per year	Open 12 months per year	Open 12 months per year	Open 12 months per year
Surface Condition	Good: No ruts with no large potholes and no area of corrugation. The average riding speed is 65 kilometers per hour (kph) or between 40 kph and 90 kph. The estimated roughness value is 4-5 m/km.	Fair-Good: Ruts and ruts near the road edge, small and large potholes, and some areas with corrugation. The average riding speed is 40 kph or between 20 kph and 60 kph. The estimated roughness value is 5-6 m/km.	Fair-Good: From Km 0.0 to Km 18, there are no ruts, just some potholes and some areas with corrugation. Riding speed is 30-45 kph. Roughness value of 5-6 m/km. From Km 71.0 to Km 82.0, no ruts, just some potholes and some areas with corrugation. Riding speed is 40-60 kph. Roughness value of 5-6m/km. Fair-Poor. From Km 48.0 to Km 71.0, some sections damaged by the use of Phu Bia Mining trucks, no ruts, just some potholes, and some areas with corrugation. Riding speed is 35-55 kph. Roughness value of 6-7.5/km. Poor-Bad. From Km 18 to Km 48, damaged pavement because of use by Phu Bia Mining heavy trucks, ruts, some large potholes, and some areas with corrugation. Riding speed is 25-44 kph. Roughness value of 7-9 m/km.	Fair-Good: Paved surface is 25%-30% damaged and is missing for a short distance. Ruts and ruts near the road edge, small and some large potholes, and some areas with corrugation. Minor land slides between 5-15 m long. Heavy land slide at Km 38 between 120-150 m long. Average riding speed is 35 kph (25-60 kph). Roughness value of 5-6 m/km.
Drainage	Fair-Good: No blockage, minor erosions, some bushes, and no standing water in the ditch. Culverts are partly silted.	Fair-Good: Blockage by landslides, minor erosion, some bushes, and no standing water in the ditch. Culverts are partly silted.	Fair-Good: Blockage by land slides, minor erosion, some bushes, and no standing water in the ditch. Culverts are partly silted.	Fair-Good: Masonry lined ditch, blockage by landslides, minor erosion, bushes along almost the whole road and no standing water in the ditch. Culverts are partly silted.
Structure Condition	Good	Good in general	Good in general	Good in general. RC PC and RC BC are in fair to good condition. Bridges in good condition, in particular, the bridge across Nam Xam river at Km 45.

BC = box culvert, PC = pipe culvert, RC = reinforced concrete.
Source: Independent Evaluation Mission.

Table A4.2: Feeder Roads/Variations and Other Additional Works

Item	Contract C1: Bypass Road in Xekong District	Contract C1: Feeder Road to Ban Sakhaeo from Attapeu 21 Km	Contract C2: Rehabilitated Xanakham District Road	Contract C2: Surfacing of Xanakham District Urban Road
Length	3.5 kilometers (km)	3.4 km	16.0 km	8.5 km
Surface Type	Single Bituminous Surface Treatment (SBST)	SBST	Double Bituminous Surface Treatment	SBST
Road Width	5.0 meters (m)	4.5–5.0 m	5.0 m	5.0 m
Topography	Flat	Flat	Flat–Rolling	Flat
Accessibility	Open for 12 months per year	Open for 12 months per year	Open for 12 months per year	Open for 12 months per year
Surface Condition	Fair–Good: Rut and ruts near the road edge, small and large potholes, and some areas with corrugation. The average riding speed is 60 kilometers per hour (kph) or between 35 kph and 80 kph. The estimated roughness value is 5–6 m/km.	Fair–Good: Ruts, small potholes, and some areas with corrugation. The average riding speed is 55 kph (50–70 kph). The estimated roughness value is 5–6m/km.	Fair–Good: Ruts, small potholes, and some areas with corrugation. The average riding speed is 60 kph (50–70 kph). The estimated roughness value is 5–6 m/km.	Fair–Poor: Damaged, ruts and ruts near the road edge, small and large potholes, and some areas with corrugation.
Drainage	Fair: Blockage, minor erosion, some bushes, and standing water in the ditch. Culverts are partly silted.	Fair: Blockage, minor erosion, some bushes, and standing water in the ditch. Culverts are partly silted.	Fair: Blockage, minor erosion, and some bushes in the ditch.	Fair: Blockage and standing water in the ditch.
Structure Condition	Poor: Blockage and bushes at in-outlet of culverts, minor erosion.	Fair: Minor erosion.	Fair: Culverts are partly silted.	No inspection.
Item	Contract C2: Rehabilitated Ferry Ramp to Paklay Road	Contract C2: Paklay Bypass Road in Paklay District	Feeder Roads Sop Lao–Sop Peun (sections 1 and 2)	Feeder Road Sop Bao–Moung Nam
Length	1.8 km	3.5 km	27.0 km	26.0 km
Surface Type	DBST	Gravel	Gravel	Gravel
Road Width	6.0 m	5.5 m	3.5 m	3.5 m
Topography	Flat	Flat–Rolling	Flat–Rolling–Mountainous	Rolling–Mountainous
Accessibility	Open for 12 months per year	Open for 12 months per year	Open for 12 months per year	Passable whole year round except heavy rain days (< 1 month per year)
Surface Condition	Fair–Good: The paved section is in fair to good condition, but some of the paved surface is missing for a short distance. The first 0.25 km is gravel road. It is in fair to poor condition. Average riding speed is 50 kph (30–65 kph) The estimated roughness value is 506 m/km.	Poor: Rut and ruts near the edge, small and large potholes, and some areas with corrugation. Average riding speed is 60 kph (35–80 kph). The estimated roughness value is 5–6 m/km	Fair–Poor: Damaged, ruts, small and large potholes and some areas with corrugation, some sections lacking wearing course in steep gradient, and poor riding comfort. The average riding speed is 25 kph (20–40 kph). The estimated roughness value is more than 12 m/km	No inspection (evaluation of road condition was not possible because ferry crossing Nam Ma river was broken. Visual inspection at the start of the feeder road was done by running a district motorcycle).
Drainage	Fair: Blockage and some bushes in the ditch.	Fair: Blockage, minor erosion, some bushes, and standing water in the ditch. Culverts are partly silted.	Fair: Blockage by soil and by landslides, minor erosion, and some bushes in the ditch.	Fair: Blockage and some bushes in the ditch.
Structure Condition	No inspection	Poor: Blockage and bushes at in-outlet of culverts, minor erosion.	Fair: Culverts are silted.	Good: Based on inspection of three cells RC BC at the start of the road.

BC = box culvert, RC = reinforced concrete.

Source: Independent Evaluation Mission.

TRAFFIC PERFORMANCE

1. **Background.** This section presents the findings of traffic data collection activities carried out by the Independent Evaluation Mission (IEM) during 14 May–1 June 2009.¹ Two kinds of traffic surveys were undertaken: (i) manual classified count, and (ii) origin-destination (OD) survey. The manual traffic counts comprised 12 hour and 24 hour counts in both directions. These were conducted for 5 days and 2 days, respectively, over 7 continuous days. The OD survey was conducted from 6:00 am to 6:00 pm at the same traffic count stations with a sample size of not less than 50% of the 12-hour traffic count volume. Six traffic count stations were selected.

2. The traffic count locations were in accordance with the traffic count stations at the time of the Project Completion Review in August 2007. These are (i) C1 road: (a) Count Station 1 at Ban Soak near T junction to Ban Kengxai (about 30 kilometers [km] from Attapeu City); and (b) Count Station 2 at Ban Beng Phoukham Checkpoint (about 50 km from Attapeu City); (ii) C2 road: Count Station 1 at Ban Na Sack, about 1.5 km from the start of the project; (iii) C3 road: (a) Count Station 1 at Huay Khea Checkpoint (about 33 km from Ban Thaboc, Road 13S); and (b) Count Station 2 at Ban Vangluang (about 12 km from end of the project); and (iv) C4 road: Count Station 1 at Ban Namsoy (about 10 km from the start of the project).

3. **Registered Motor Vehicles.** In recent years, the national economy grew at a rate of around 7% per year, and this has influenced a significant increase in the number of registered vehicles. Table A5.1 shows time series data on historical motor vehicle registration from the Office of Roads and Bridges at the respective provincial department of the Ministry of Public Works and Transport of each subproject road. From 2003, the number of registered motorcycles has increased significantly owing to the entry of cheap motorcycles from the People's Republic of China (Table A5.1).

Table A5.1: Registered Motor Vehicles, 2002–2008

C1 Road	MC+Tuk ²	Car	Truck	Bus	Total	Non-MC as % of Total
2002	453	36	37	5	531	14.7
2003	962	86	54	11	1,113	13.6
2004	1,515	145	81	14	1,755	13.7
2005	1,745	216	104	16	2,081	16.2
2006 (Project Completion)	2,573	294	128	19	3,014	14.6
2007	3,107	366	139	24	3,636	14.6
2008	3,800	480	161	26	4,467	14.9
Average Growth Rate, 2002–2006	54.4	69.0	36.4	39.6	54.4	
Average Growth Rate, 2006–2008	21.5	27.8	12.2	17.0	21.7	
C2 Road	MC+Tuk ²	Car	Truck	Bus	Total	Non-MC as % of Total
2002	3,560	6	5	0	3,571	0.3
2003	4,846	7	7	0	4,860	0.3
2004	5,245	8	20	0	5,273	0.5
2005	6,789	15	26	0	6,830	0.6
2006 (Project Completion)	8,469	22	45	1	8,537	0.8
2007	10,075	35	53	2	10,165	0.9
2008	14,265	42	79	2	14,388	0.8
Average Growth Rate, 2002–2006	24.2	38.4	73.2	100.0	24.3	
Average Growth Rate, 2006–2008	29.8	38.2	32.5	41.4	29.8	

¹ Hongsouvanh, Khamsay. 2009. *Report on Traffic Surveys and Inputs to Economic Model (Draft)*. Manila: ADB.

C3 Road	MC+Tuk²	Car	Truck	Bus	Total	Non-MC as % of Total
2002	1,551	142	5	0	1,698	8.7
2003	2,462	192	8	0	2,662	7.5
2004	3,468	253	14	0	3,735	7.1
2005	4,336	346	18	0	4,700	7.7
2006 (Project Completion)	6,074	496	25	1	6,596	7.9
2007	7,584	627	32	2	8,245	8.0
2008	11,324	805	41	4	12,185	7.0
Average Growth Rate, 2002–2006	40.7	36.7	37.3	100.0	40.4	
Average Growth Rate, 2006–2008	36.6	27.4	27.6	100.0	35.9	

C4 Road	MC+Tuk²	Car	Truck	Bus	Total	Non-MC as % of Total
2002	2,225	203	14	0	2,442	8.9
2003	3,519	354	18	3	3,894	9.6
2004	5,090	498	23	5	5,616	9.4
2005	6,185	657	27	5	6,874	10.0
2006 (Project Completion)	8,668	824	38	5	9,535	9.1
2007	10,818	991	46	5	11,860	8.8
2008	19,019	1,149	73	6	20,247	6.1
Average Growth Rate, 2002–2006	40.5	41.9	28.4	100.0	40.6	
Average Growth Rate, 2006–2008	48.1	18.1	38.6	9.5	45.7	

MC = motorcycle, tuk² = tuk tuk.

Source: Independent Evaluation Mission.

4. Table A5.2 compares the number of registered nonmotorcycle vehicles in 2008 with the overall results of the 2009 traffic count. The ratio of vehicle traffic to registered vehicles ranged from a minuscule 0.029 for the C4 road to a range of 0.23–0.26 for the C1 and C3 roads.

Table A5.2: Comparison of Motor Vehicle Registration

Vehicle Class	C1 Road		C2 Road		C3 Road		C4 Road	
	MVR	TC	MVR^a	TC	MVR	TC	MVR	TC
Car	480	109	42	49	805	72	1,149	23
Truck	161	22	79	10	41	16	73	4
Bus	26	41	2	61	4	107	6	9
Total	667	172	123	120	850	195	1,228	36

C = contract, MVR = motor vehicle registration (2008), TC = traffic count (2009).

^a Xanakham district only.

Source: Independent Evaluation Mission.

5. **Average Daily Traffic.** At Attapeu–Senamnoy (C1), the profiles of vehicles at both checkpoints (near the start and end of the project road) are the same. A survey of average daily traffic conducted showed that more than half of the vehicles are motorcycles (54%). A quarter of the vehicles consist of pick-ups (25%). Other vehicles include light trucks (7%) and heavy buses (5%). Compared to C1, there are more motorcycles (61%) in the Na Sack–Khoc Khao Do project area (C2). Hand tractors comprise about a quarter (24%). There are also pick-ups (6%) and light trucks (5%). At Thong Khoun–Longsan (C3), the main vehicles observed at the Huay checkpoint are motorcycles (28%), pick-ups (23%), and heavy trucks-3axles (16%). At Ban Vangluang checkpoint (also under C3), the majority of the vehicles observed are motorcycles (68%), pick-ups (10%), and truck trailers (5%). The project area in Huay Hung–Xam Tai (C4) has the most motorcycles (84%). The remaining vehicles consist of hand tractors (6%), pick-ups (5%), and others (Table A5.3).

Table A5.3: Summary of Average Daily Traffic

Vehicle Class	C1/Attapeu–Senamnoy ^a				C2/Na Sack–Khoc Khao Do ^b		C3/Thong Khoun–Longsan ^b				C4/Huay Hung–Xam Tai ^c	
	Ban Beng Phoukham		Ban Kengxai		Ban Na Sack		Huay Khea		Ban Vangluang		Ban Namsoy	
	ADT	%	ADT	%	ADT	%	ADT	%	ADT	%	ADT	%
Hand tractor	7	2	3	1	192	24	4	1	41	6	16	5
Motorcycle	213	54	205	54	496	61	85	28	447	68	286	84
Tuk tuk	0	0	1	0	0	0	0	0	1	0	0	0
Car, jeep, and taxi	10	3	15	4	1	0	5	2	3	0	3	1
Pick-up	99	25	93	25	48	6	70	23	66	10	20	6
Small bus and modified pick-up (maximum 14 seats)	3	1	3	1	7	1	9	3	10	2	2	1
Medium bus (maximum 25 seats)	1	0	0	0	0	0	4	1	3	1	0	0
Heavy bus (> 25 seats)	18	5	18	5	3	0	2	1	1	0	2	1
Light truck (<4 T)	27	7	27	7	44	5	22	7	23	4	7	2
Medium truck 2 axles	4	1	4	1	13	2	10	3	6	1	2	1
Heavy truck 3 axles	3	1	4	1	3	0	50	16	22	3	0	0
Truck-trailer	7	2	5	1	1	0	45	15	34	5	0	0
Total Motorized Vehicles	394	100	379	100	808	100	304	100	657	100	339	100

ADT = average daily traffic.

^a Attapeu Province.

^b Vientiane Province.

^c Houaphan Province.

Source: Independent Evaluation Mission.

6. **Comparison of 1999, 2007, and 2009 Traffic.** In 1999, the general trend of traffic in almost all of the project roads² was low. Using this as baseline, actual traffic in 2007 and 2009 showed that overall traffic count of vehicles increased. The comparison of traffic counts in 1999, 2007 (at project completion), and 2009 (at independent evaluation of the project performance evaluation report) is shown in Table A5.4. The results for each of the project roads are as follows:

- (i) **C1 road.** On C1, the average daily traffic (ADT) increased from 1999 at appraisal to 2007 at project completion but decreased from 2007 to 2009. Nonetheless, the number of heavy buses increased by 125% (from 8 in 2007 to 18 in 2009). The number of light trucks also increased by 39% and motorcycles by 17%.
- (ii) **C2 road.** On C2, there was a continuous increase in ADT from 1999 to 2007 and from 2007 to 2009. From 1999 to 2007, the rise was attributed to an increase in the number of pick-ups, motorcycles, and heavy buses. In 2009, the rise in ADT was for almost all types of vehicles. Notably, there was a sharp increase in the ADT of light trucks from 3 in 2007 to 44 in 2009.
- (iii) **C3 road.** There was no traffic data on C3 in 1999 at appraisal. From 2007 to 2009, ADT continued to increase, particularly, with the heavier traffic flow of pick-ups; medium buses; trucks (light, medium, and heavy); truck trailers; and motorcycles. There was a decline in ADT of cars/jeeps/taxis and small buses from 2007 to 2009.

² There was no traffic survey data in 1999 for C3.

- (iv) **C4 road.** Traffic increased from 1999 at appraisal to 2007 at project completion and remained at that level in 2009. However, the number of pick-ups traveling on C4 increased in 2009 compared to the 1999 and 2007 levels.

Table A5.4: Comparison of Average Daily Traffic for Motorized Vehicles (1999, 2007, and 2009)

Subprojects	Average Daily Traffic													Total (excl. HT, MC, and TT)
	HT	MC	TT	Car, Jeep, and Taxi	Pick- Up	Small Bus (max 14 seats)	Medium Bus (max 25 seats)	Heavy Bus (> 25 seats)	Light Truck (<4 T)	Medium Truck 2 axles	Heavy Truck 3 axles	Truck- Trailer	Total	
C1/Attapeu–Senamnoy^a														
Actual 1999	0	27	0	10	4	1	7	0	13	9	1	1	73	46
Actual 2007	0	178	0	50	100	27	26	8	19	7	12	23	450	272
Actual 2009	5	209	0	12	96	3	1	18	27	4	4	6	386	172
Station 1	7	213	0	10	99	3	1	18	27	4	3	7	394	174
Station 2	3	205	1	15	93	3	0	18	27	4	4	5	379	171
C2/Na Sack–Khoc Khao Do^b														
Actual 1999	0	24	0	1	1	8	4	1	26	0	0	0	65	41
Actual 2007		118		0	25	5	0	3	3	5	1	0	160	42
Actual 2009														
Station 1	192	496	0	1	48	7	0	3	44	13	3	1	808	120
C3/Thong Khoun–Longsan^c														
Actual 1999														
Actual 2007	0	197	0	10	53	12	1	0	7	7	18	8	313	116
Actual 2009	23	266	0	4	68	10	4	1	22	8	36	39	481	192
Station 1	4	85	0	5	70	9	4	2	22	10	50	45	304	216
Station 2	41	447	1	3	66	10	3	1	23	6	22	34	657	168
C4/Huay Hung–Xam Tai: B. Namsoy^d														
Actual 1999	0	13	0	1	0	1	4	0	0	1	0	0	20	7
Actual 2007	0	293	0	3	11	4	2	1	6	3	2	1	326	33
Actual 2009														
Station 1	16	286	0	3	20	2	0	2	7	2	0	0	339	37

HT = hand tractor, MC = motorcycle, TT = tuk tuk.

^a Percent of traffic outside 0600–1800 hours (Pc of NT): 15%.

^b Percent of traffic outside 0600–1800 hours (Pc of NT): 28%.

^c Percent of traffic outside 0600–1800 hours (Pc of NT): 27%.

^d Percent of traffic outside 0600–1800 hours (Pc of NT): 46%.

Source: Independent Evaluation Mission.

7. **Distribution of Origin–Destination Trips.** The main origin–destinations in the project roads are as follows (Table A5.5):

- (i) **C1 road.** In Ban Beng Kengxai checkpoint, most of the vehicles come to or from Samakkhixai (57%), Xaisettha (11.7%), and Lamam (11.4%). Those coming from Samakkhixai were mostly motorcycles, pick-ups, heavy buses, and light trucks. At Ban Beng Phoukham checkpoint, most of the vehicles surveyed were traveling to or from Samakkhixai (48.4%), Lamam (20.6%), Pakxe (6%), and Xaisettha (5.9%).
- (ii) **C2 road.** Most of the vehicles travel to or from Xanakham and Paklay. About 80% of motorists come to or from Xanakham and 8.8% to or from Paklay. In addition to motorcycles, there are hand tractors, light trucks, and pick-ups traveling in the area.
- (iii) **C3 road.** The main origin–destinations of vehicles surveyed are Hom (57.8%), Thapabat (14.8%), Xaithani (8.1%), and Hatxayfong (6.3%). Aside from the usual motorcycles in the area, there are a lot of other types of vehicles used such as pick-ups, heavy trucks, and truck trailers.

- (iv) **C4 road.** In the C4 project area, more than half of the vehicles surveyed are going to or from Viengxai (67.3%). A number of vehicles are also traveling to or from Xam Tai (19.4%). The most common vehicle is the motorcycle (84%).

Table A5.5: Summary of Origin–Destinations and Vehicle Types in Project Roads

Project Road	Major Origin–Destination	Dominant Vehicle Type
C1: Attapeu–Senamnoy	<ul style="list-style-type: none"> • Samakkhixai 	<ul style="list-style-type: none"> • Motorcycle
<ul style="list-style-type: none"> • Beng Ban Kengxai checkpoint: 	<ul style="list-style-type: none"> • Xaisettha • Lamam 	<ul style="list-style-type: none"> • Small bus • Pick up
<ul style="list-style-type: none"> • Ban Beng Phoukham checkpoint: 	<ul style="list-style-type: none"> • Samakkhixai • Lamam • Pakxe • Xaisettha 	<ul style="list-style-type: none"> • Light truck
C2: Na Sack–Khoc Khao Do	<ul style="list-style-type: none"> • Xanakhham • Paklay 	<ul style="list-style-type: none"> • Motorcycle • Hand tractor • Light truck • Pick-up
C3: Thong Khoun–Longsan	<ul style="list-style-type: none"> • Hom • Thapabat • Xaithani • Hatxayfong 	<ul style="list-style-type: none"> • Motorcycle • Pick up • Heavy truck • Truck trailer
C4: Huay Hung–Xam Tai	<ul style="list-style-type: none"> • Viengxai • Xam Tai 	<ul style="list-style-type: none"> • Motorcycle • Hand tractor • Pick-up

Sources: Independent Evaluation Mission and traffic count origin–destination survey.

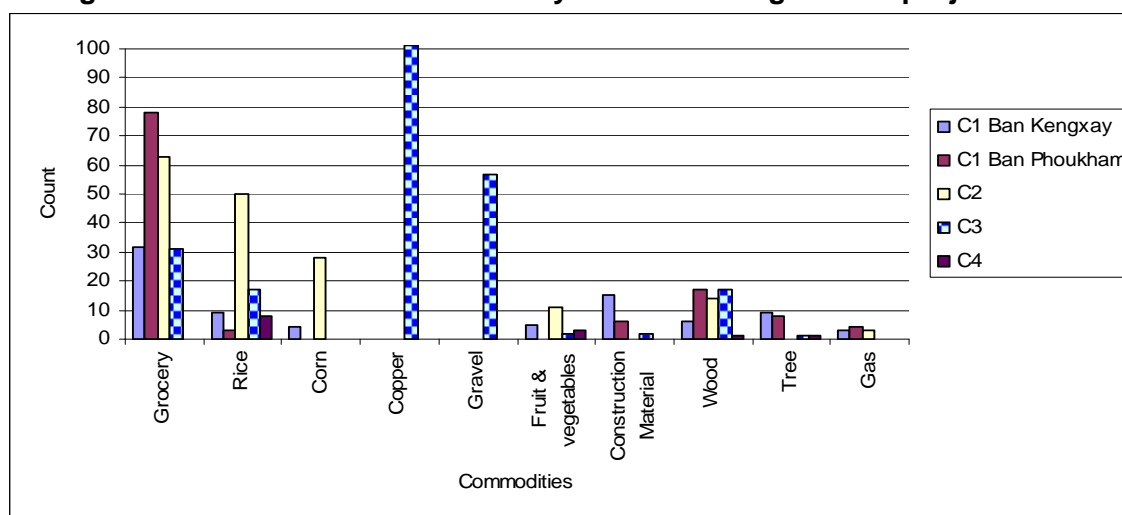
8. **Distribution of Trips by Plate Types.** Private vehicles account for a major part of the total trips made, followed by public transport vehicles. No plate vehicles, as well as official vehicles, represent less than 10%. Most of the vehicles passing through Ban Kengxai and Ban Beng Phoukham checkpoints include private vehicles (71%) and taxis (20–23%). In Na Sack–Khoc Khao Do (C2), private vehicles constitute about 44% (the percentage share is less than for C1) and taxis 25%. A significant 28% of vehicles have no plate. More than half of the vehicles plying the C3 project road are private vehicles (60%), followed by taxis (37%), and official and no plate vehicles (3%). Similar to contracts 1, 2, and 3, the number of private vehicles on C4 was also the highest, constituting more than half of the traffic (58%), followed by no plate vehicles (22%), taxis (about 17%), and official vehicles (3%).

9. **Distribution of Trips by Purpose.** In general, private trips form the major component in the project roads, followed by family/social trips and employers' business. On C1 Ban Kengxai checkpoint, most people travel for the purpose of attending to personal business (70.3%), employers' business (8.4%), and family or social activities (10%). At the Ban Beng Phoukham checkpoint, the main reasons for travel include personal business (79%), family or social activities (8.1%), and employers' business (7.1%). Most of the people surveyed in C1 were traveling to or from Samakkhixai, Lamam, Pakxe, and Xaisettha. On C2, more than half of those surveyed travel for personal business (65.2%). About 20% travel to attend family and social activities, and the rest for other reasons. On C3, about three-fourths of motorists travel to attend to personal business (75.6%). The next major reasons include family or social activities (14.7%) and employers' business (2.5%). On C4, the main purpose of travel is personal business (29.7%), in addition to family or social activities (22.7%), and travel to or from work (14.5%). Those coming to or from work are mostly in the Viengxai area.

10. **Distribution of Trips by Load.** There is no overloading of vehicles on the project roads, except on the C3 contract road, where vehicles for about 2% of the total number of trips are overloaded. In C1, most vehicles surveyed in Ban Kengxai checkpoint were either half-full (31%) or only one-fourth full (24.6%). Of these vehicles, the majority are traveling to or from Samakkhixai, Lamam, Pakxe, and Xaisettha. Near the end of the project road, about 34% of vehicles travel half-full, 23% empty, 14% full or one-fourth full, and 14% three-fourths full. On C2, about 29% of vehicles travel half-full, 28% one-fourth full, or 26% empty. Only 7% of vehicles are full. Unlike C1 and C2, there are more vehicles traveling on C3 that are full (44%). Most of these vehicles are traveling to or from Hatxayfong, Thapabat, and Xaisomboun. Notably, the number of empty vehicles traveling on C3 is also high at 32%, mostly going to or from Hom. At least half of the vehicles traveling on C4 are empty (51%), with only a small percentage (7%) full. About 38% of vehicles are half-full or three-fourths full.

11. **Distribution of Trips by Commodity.** There are a variety of goods and/or commodities transported along the project roads. In C1, travelers mostly carry grocery items (43.5%) and construction materials (10.2%) with the majority of motorists coming to or from Samakkhixai (48.3%), Pakse (12.9%), and Xaisettha (10.2%). At the near end of the project road (Ban Beng Phoukham checkpoint), more than half of the vehicles surveyed transport grocery items (57%). About 18% of vehicles transport wood or trees, and the remainder, construction materials, beer, and other items. The prime commodities transported along the C2 project road include grocery items (29.6%), rice (23.5%), and corn (13.1%). The main commodity transported along C3 is copper (35%), with about 93.6% of the commodity coming to or from Hatxayfong. The second largest commodity being transported is gravel (20.1%), with more than half of motorists traveling to or from Thapabat, followed by grocery items (10%), and rice and wood (about 6% each). On C4, rice is the main commodity (61.5%), followed by fruits (23.1%), and trees or wood (7.7% each) (Figure A5.1).

Figure A5.1: Commodities Carried by Vehicles Using the Subproject Roads



Sources: Independent Evaluation Mission and traffic count origin–destination survey.

12. **Travel Time Before and After the Project.** A comparison of travel time along the project roads (C1, C2, C3, and C4) appears in Table A5.6. The following are the major findings:

- (i) **C1 road.** The short stretch from Attapeu to Senamnoy is about 22.85 km, the shortest of the four contracts. Average travel time before the project was 1.5 hours which was reduced to 0.5 hour after the project, thereby having a travel

- time saving of 1 hour. Before the project, the average travel speed was 15 km per hour. This was increased to 45.7 km per hour after the project.
- (ii) **C2 road.** The actual length of the roadworks is 63.2 km, including about 48 km between Na Sack to Khoc Khao Do. Before the project, average travel time from Na Sack to Khoc Khao Do was about 6 hours. After the project, average travel time was reduced to 1.5 hours, obtaining savings in travel time of 4.5 hours. Average travel speed increased from 10 km per hour before the project to 42.1 km per hour after the project.
- (iii) **C3 road.** The actual length of roadworks for the C3 road is the longest at 87.5 km. Average travel time before the project was 10 hours compared to only 2.5 hours after the project was completed, saving a total of 7.5 hours in travel time. Average travel speed increased from 8 km per hour before the project to 35 km per hour after the project.
- (iv) **C4 road.** The distance from Huay Hung to Xam Tai is 75.3 km. Before the project, compared to contracts 1, 2, and 3, this road was the longest to travel with average travel time of about 12 hours. After the project, the average travel time has been drastically reduced to 2 hours, obtaining the largest savings in travel time (i.e., 10 hours). Before the project, average travel speed in this area was also the lowest (compared to contracts 1, 2, and 3) at only 6 km per hour. After the project, average travel speed increased to 37.7 km per hour.

Table A5.6: Comparison of Travel Time along the Project Roads

Road Section	Distance (km) a	Average Travel time		Travel Time Savings		Average Travel Speed	
		Before (hour) b	After (hour) c	(hour) d=b-c	(hour/km) e=d/a	Before (km/h)	After (km/h)
Attapeu–Senamnoy (C1)	22.85	1.50	0.50	1.00	0.04	15	45.7
Na Sack–Khoc Khao Do (C2)	63.20	6.00	1.50	4.50	0.07	10	42.1
Thong Khoun–Longsan (C3)	87.50	10.00	2.50	7.50	0.09	8	35.0
Huay Hung–Xam Tai (C4)	75.30	12.00	2.00	10.00	0.13	6	37.7

Sources: Independent Evaluation Mission and traffic count origin–destination survey.

ECONOMIC REEVALUATION

1. **General.** The economic analysis was carried out on the basis of a comparison of the with- and without-project situations and using the world price numeraire. The basic methodology follows the *Guidelines for the Economic Analysis of Projects* of the Asian Development Bank (ADB). The Rural Access Roads Project was evaluated through 2025 allowing a 5-year implementation period starting in 2001 and a benefits period of 20 years (which was the economic life assumed at appraisal). All benefits and costs are in constant 2009 prices. The financial benefits and costs were converted to economic prices by applying a standard conversion factor of 0.90 for nontradeable goods. Project benefits are assumed to have commenced in 2006.

2. The approach used to reevaluate the subprojects is similar to that used at appraisal and project completion. The reevaluation covers 245.85 kilometers (km) of completed road works under the road improvement component of the project. The economic internal rate of return (EIRR) was recalculated for the four subprojects: (i) Contract C1—Attapeu—Senamnoy (22.85 km); (ii) Contract C2—Na Sack—Khoc Khao Do (63.20 km); (iii) Contract C3—Thong Khoun—Longsan (87.50 km); and (iv) Contract C4—Huay Hung—Xam Tai (72.25 km).

3. **Estimation of Capital and Maintenance Costs.** The economic costs comprise capital costs and maintenance costs. The financial costs are in Table A6.1. The base case costs relate to the four subprojects and excludes the cost of variations and additional works done. Actual capital costs comprise civil work costs of road improvement and associated environmental monitoring, construction supervision and land acquisition, unexploded ordnance clearance, and project management costs. The capital cost data were updated using the latest disbursement data available in the ADB loan financial information system. For the C3 road, base case costs exclude significant investments made by Phu Bia Mining Limited (PBM) to maintain or modify road sections to enable it to effectively carry mining-related traffic.

Table A6.1: Financial Costs (Capital and Maintenance Costs)

Item	C1 Road		C2 Road		C3 Road		C4 Road	
	PCR	PPER	PCR	PPER	PCR	PPER	PCR	PPER
Capital Costs (\$ million)	4.51	5.19	5.42	6.28	8.92	10.20	7.84	8.66
2001	0.00	0.10	0.00	0.13	0.00	0.19	0.00	0.16
2002	0.20	0.21	0.10	0.12	0.15	0.18	0.15	0.17
2003	1.50	1.57	0.80	0.89	3.15	3.27	1.10	1.18
2004	1.75	1.92	0.95	1.16	2.40	2.71	1.45	1.67
2005	1.06	1.23	3.15	3.35	2.10	2.42	1.80	2.01
2006	0.00	0.14	0.42	0.60	1.12	1.39	3.34	3.44
2007	0.00	0.02	0.00	0.03	0.00	0.04	0.00	0.04
Maintenance Costs								
Routine (\$ per km)	530	600	530	600	530	900	530	300
Periodic (\$ per km)	16,000	17,000	16,000	17,000	16,000	26,250	16,000	1,750

km = kilometer, PCR = project completion report, PPER = project performance evaluation report.

Source: Independent Evaluation Mission estimates.

4. Maintenance costs comprising routine and periodic maintenance costs were assumed to start in 2007 or the first year after completion of the construction works. For C1 and C2, maintenance costs are assumed at \$600 per km for routine maintenance and \$17,500 per km for periodic maintenance. Maintenance costs are assumed to be 50% higher for C3 (which has been transformed into a key mining road). On the other hand, it is assumed that maintenance costs will be lower on C4 road due to light traffic and budget constraints.

5. The roughness values used to measure benefits and to determine timing of maintenance interventions are shown in Table A6.2.¹ For C1, C2, and C4, investments in periodic maintenance were assumed as the roads reached an average roughness grade of 7 meter (m) per km. Roughness is assumed to rise by 0.5 m per km from the roughness grade in 2009 as estimated during a visual survey carried out by the Independent Evaluation Mission (IEM) team. Because of the high heavy vehicle traffic and a lingering issue on PBM's commitment for long-term maintenance financing for C3 road, periodic maintenance was assumed to be done when the road reached an average roughness grade of 11 m per km. Roughness is assumed to increase by at least 1 m per km per year from the estimated roughness grade in 2009. An average roughness grade of 15 m per km is assumed in the "without" project scenario.²

Table A6.2: Sample Roughness Values Used
(meter per kilometer)

Year	C1 Road				C2 Road			
	PCR		PPER		PCR		PPER	
	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project
2006	15.0	2.0	15.0	2.5	15.0	2.0	15.0	3.0
2007	15.0	3.0	15.0	3.0	15.0	4.0	15.0	4.0
2008	15.0	3.5	15.0	3.5	15.0	4.5	15.0	4.5
2009	15.0	4.0	15.0	4.5	15.0	5.0	15.0	5.5
2010	15.0	4.5	15.0	5.0	15.0	5.5	15.0	6.0
2012	15.0	5.5	15.0	6.0	15.0	6.5	15.0	7.0
2015	15.0	7.0	15.0	3.0	15.0	8.0	15.0	4.0
2017	15.0	3.0	15.0	4.0	15.0	3.0	15.0	5.0
2020	15.0	4.5	15.0	5.5	15.0	4.5	15.0	6.5
2022	15.0	5.5	15.0	6.5	15.0	5.5	15.0	3.0
2024	15.0	6.5	15.0	3.0	15.0	6.5	15.0	4.0

Year	C3 Road				C4 Road			
	PCR		PPER		PCR		PPER	
	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project
2006	15.0	2.0	15.0	3.0	15.0	2.0	15.0	3.0
2007	15.0	4.0	15.0	4.0	15.0	4.0	15.0	3.5
2008	15.0	4.5	15.0	6.5	15.0	4.5	15.0	4.0
2009	15.0	5.0	15.0	7.5	15.0	5.0	15.0	5.5
2010	15.0	5.5	15.0	8.5	15.0	5.5	15.0	6.0
2012	15.0	6.5	15.0	11.0	15.0	6.5	15.0	7.0
2015	15.0	8.0	15.0	6.0	15.0	8.0	15.0	4.0
2017	15.0	3.0	15.0	8.0	15.0	3.0	15.0	5.0
2020	15.0	4.5	15.0	11.0	15.0	4.5	15.0	6.5
2022	15.0	5.5	15.0	5.0	15.0	5.5	15.0	3.0
2024	15.0	6.5	15.0	7.0	15.0	6.5	15.0	4.0

PCR = project completion report, PPER = project performance evaluation report.

Source: Independent Evaluation Mission estimates.

6. **Estimation of Benefits.** Direct benefits quantified by the reevaluation comprised vehicle operating cost (VOC) savings and travel time savings. For C1, C3, and C4 roads, VOC savings are taken from normal and generated traffic. In the case of C2 road, normal and diverted traffic (from the existing long route to this new motorable road) accounted for VOC benefits. In addition to the data on roughness grades, VOC benefits from normal traffic are based on updating data collected by the IEM team on (i) VOC, and (ii) traffic. Table A6.3 shows sample unit VOC used in the evaluation. For generated traffic, benefit per unit is assumed at half of existing normal traffic.

¹ Roughness data for 2007 were based on a roughness survey carried out in 2007. Roughness data for 2008 were obtained from the World Bank-funded national roughness survey done in July 2008.

² The project completion report (PCR) assumed an average roughness of 15 m per km. It was reported that existing roads were in poor to very bad condition, with roughness levels between 12 and 20 m per km.

Table A6.3: Vehicle Operating Costs (Financial)
(\$ meter per vehicle-kilometer)

Category	PCR			PPER		
	IRI 2.0	IRI 5.0	IRI 15.0	IRI 2.0	IRI 5.0	IRI 15.0
Car/Jeep/Taxi	0.172	0.180	0.271	0.157	0.254	0.596
Pick Up	0.179	0.191	0.353	0.238	0.385	0.905
Light Bus	0.134	0.141	0.221	0.131	0.229	0.542
Medium Bus	0.239	0.259	0.459	0.184	0.287	0.646
Heavy Bus	0.239	0.259	0.459	0.324	0.502	1.171
Light Truck	0.314	0.344	0.604	0.168	0.279	0.662
Medium Truck (2-axle)	0.314	0.344	0.604	0.238	0.373	0.880
Heavy Truck (3 axle)	0.391	0.426	0.718	0.355	0.541	1.243
Truck Trailer (4 axle)	0.391	0.426	0.718	0.355	0.541	1.243
Hand Tractor	...	...	...	0.065	0.108	0.195
Motorcycle	...	...	...	0.026	0.053	0.079

... = not available, IRI = international roughness index, km = kilometer PCR = project completion report, PPER = project performance evaluation report

Source: Independent Evaluation Mission estimates.

Table A6.4: Incremental VOC Savings for Nonmotorcycle Traffic (Economic)
(\$ meter per vehicle-kilometer)

Road	Year	PCR						PPER					
		Car	PUP	LB	MB	MT	HT	Car	PUP	LB	MB	MT	HT
C1	2009	0.086	0.150	0.074	0.188	0.533	0.275	0.322	0.490	0.296	0.339	0.476	0.660
	2010	0.085	0.148	0.073	0.184	0.527	0.269	0.308	0.468	0.282	0.323	0.456	0.632
	2015	0.061	0.106	0.053	0.134	0.400	0.197	0.366	0.556	0.341	0.385	0.537	0.743
	2020	0.087	0.153	0.075	0.19	0.508	0.275	0.293	0.446	0.267	0.308	0.436	0.604
	2024	0.066	0.115	0.058	0.145	0.422	0.212	0.366	0.556	0.341	0.385	0.537	0.743
C2	2009	0.082	0.144	0.071	0.177	0.516	0.256	0.293	0.446	0.267	0.308	0.436	0.604
	2010	0.081	0.142	0.069	0.173	0.511	0.250	0.278	0.424	0.252	0.293	0.415	0.576
	2015	0.051	0.089	0.045	0.113	0.354	0.168	0.337	0.512	0.311	0.354	0.497	0.688
	2020	0.087	0.153	0.075	0.190	0.508	0.275	0.264	0.402	0.238	0.277	0.395	0.548
	2024	0.066	0.115	0.058	0.145	0.422	0.212	0.337	0.512	0.311	0.354	0.497	0.688
C3	2009	0.082	0.144	0.071	0.177	0.516	0.256	0.233	0.355	0.210	0.245	0.349	0.484
	2010	0.081	0.142	0.069	0.173	0.511	0.250	0.202	0.308	0.182	0.212	0.302	0.419
	2015	0.051	0.089	0.045	0.113	0.354	0.168	0.278	0.424	0.252	0.293	0.415	0.576
	2020	0.087	0.153	0.075	0.190	0.508	0.275	0.124	0.189	0.112	0.130	0.186	0.258
	2024	0.066	0.115	0.058	0.145	0.422	0.212	0.248	0.379	0.224	0.261	0.372	0.516
C4	2009	0.082	0.144	0.071	0.177	0.516	0.256	0.293	0.446	0.267	0.308	0.436	0.604
	2010	0.081	0.142	0.069	0.173	0.511	0.250	0.278	0.424	0.252	0.293	0.415	0.576
	2015	0.051	0.089	0.045	0.113	0.354	0.168	0.337	0.512	0.311	0.354	0.497	0.688
	2020	0.087	0.153	0.075	0.190	0.508	0.275	0.264	0.402	0.238	0.277	0.395	0.548
	2024	0.066	0.115	0.058	0.145	0.422	0.212	0.337	0.512	0.311	0.354	0.497	0.688

C = contract, HT = hand tractor, LB = light bus, MB = medium bus, MT = medium truck, PCR = project completion report, PPER = project performance evaluation report, PUP = pickup,

Sources: Project completion consultant report and Independent Evaluation Mission estimates.

7. Table A6.4 compares incremental VOC savings benefit (from "without" and "with" conditions) for normal traffic. Time savings benefits (i.e., reduced travel times of passengers) is assumed to be 10% of VOC savings for normal and generated/diverted traffic for each of the four subprojects.³

³ Due to lack of data, the project performance evaluation report (PPER) followed the PCR approach for valuation of time savings. This base case recalculation, however, used a lower valuation factor compared to the PCR assumption of 15% of VOC benefits, which is relatively optimistic. Rough estimates of passenger time savings on the four subprojects show that these benefits could be very small (i.e., 1.2% of cumulative VOC benefits from 2006 to 2025 as compared to 13.1% using the factor of 15%). This is partly due to the low traffic and low per capita income of road users.

8. Traffic forecasts are based on the traffic count and origin–destination (OD) survey carried out in May 2009 on the four subproject roads. A summary of the results of the traffic count and survey are presented in Appendix 5. Total nonmotorcycle traffic is assumed to reach 706 vehicles per day (vpd) on C1, 305 vpd on C2, 503 vpd on C3, and 91 vpd on C4 by 2025 or an average annual increase of 6% per year for all vehicle types from their 2009 levels (Table A6.5). Traffic on all 4 roads is well within the design capacity of 300–1,000 vpd.

Table A6.5: General Trend in Total Traffic
(excluding motorcycles and hand tractors)

Year	C1 Road				C2 Road			
	PCR		PPER		PCR		PPER	
	Without	With ^a	Without	With	Without	With ^{a,b}	Without	With
1999	...	46	46	46	...	41	41	41
2006	...	170	60	170	...	138	41	138
2007	...	272	62	272	...	110	42	110
2008	...	326	64	221	...	118	43	115
2009	...	351	66	171	...	126	44	120
2010	...	378	68	294	...	135	44	127
2015	...	527	78	394	...	187	49	170
2020	...	718	91	527	...	253	54	228
2024	...	920	102	666	...	323	59	288
Period Average 2009–2024	...	600	83	439	...	212	51	193

Year	C3 Road				C4 Road			
	PCR		PPER		PCR		PPER	
	Without	With ^a	Without	With	Without	With ^a	Without	With
1999	...	46	46	46	...	7	7	7
2006	...	98	65	98	...	22	9	22
2007	...	117	67	116	...	34	9	33
2008	...	137	69	154	...	62	10	35
2009	...	167	71	193	...	90	10	36
2010	...	179	73	210	...	105	10	38
2015	...	248	95	281	...	145	12	51
2020	...	337	98	354	...	197	14	68
2024	...	431	111	474	...	252	15	86
Period Average 2009–2024	...	282	89	317	...	165	12	58

... = not available, C = contract, PCR = project completion report, PPER = project performance evaluation report.

^a Incremental traffic.

^b Revised estimate of 2007 actual.

Sources: Project completion consultant report and Independent Evaluation Mission estimates.

9. Generated traffic is assumed at 40% of total traffic for C1 and C4 roads, while diverted generated traffic in C2 and C3 roads is assumed at 60% of total traffic.⁴ Total traffic is assumed to rise at an average annual growth of 2%–3% per year in the "without" project scenario to account for population growth in the subproject areas. Incremental traffic carried is below expectations. Only traffic on C3, largely because of traffic from the PBM, is seen to eventually exceed estimates at project completion. Traffic on C2 is below expectations because poor road conditions to the project road from Vientiane continue to constrain full traffic diversion.

10. **Results of the Economic Reevaluation.** The EIRR recalculations for each subproject are presented in Tables A6.6–A6.10.⁵ Further analyses are provided in this section. The EIRR

⁴ All traffic in C2 road is assumed to be diverted traffic that would otherwise have used the Louangphrabang route to and from Xaibouly Province.

⁵ While this evaluation generally follows the PCR approach, there are several differences between the EIRRs at project completion and as estimated for the PPER: (i) a small nonmotorcycle traffic base and its slow maturation, (ii) higher unit VOC estimates at the time of PPER; and (ii) methodological differences including, among others, (a) the PCR calculation based only on civil works costs of road improvement component; (b) the PCR analysis applying the standard conversion factor only on cost side; and (c) the PCR analysis assuming "zero" traffic in the "without" project analysis.

for the whole project is 11.8% as compared to 19.7% at appraisal and 12.0% at project completion (Table A6.11). Taking out the benefits from the predominant motorcycle traffic, the recalculated EIRR for the whole project is 10.1%. Based on the quantified economic benefits, only C2 road is comfortably ahead of the benchmark opportunity cost of capital of 12% for ADB projects. The results of C1 and C3 roads are marginal. While C3 road breaks even, this result is relatively optimistic considering that base case assumptions do not account for the additional investments made by PBM to enable this farm-to-market road to function effectively as a mining road. The result of C1 road is slightly below the 12% cutoff owing to its short road length and the low vehicle traffic that characterizes the Thateng to Attapeu national link. Lastly, the result for C4 road is poor and falls below the PCR estimate of 3.9% because of the negligible nonmotorcycle traffic in the area nearly 3 years after road completion.

**Table A6.6: Recalculation of Economic Internal Rate of Return
(Contract C1: Attapeu–Senamnoy) (\$ million in constant 2009 prices)**

Year	Costs				Benefits					Net Benefits	
	Capital Costs	O&M Costs			Total Costs	VOC Savings			Time Savings		Total Benefits
		Periodic	Routine	Total		Normal	Generated	Total			
2001	0.124	0.000	0.000	0.000	0.124	0.000	0.000	0.000	0.000	0.000	(0.124)
2002	0.283	0.000	0.000	0.000	0.283	0.000	0.000	0.000	0.000	0.000	(0.283)
2003	1.937	0.000	0.000	0.000	1.937	0.000	0.000	0.000	0.000	0.000	(1.937)
2004	2.206	0.000	0.000	0.000	2.206	0.000	0.000	0.000	0.000	0.000	(2.206)
2005	1.420	0.000	0.000	0.000	1.420	0.000	0.000	0.000	0.000	0.000	(1.420)
2006	0.159	0.000	0.000	0.000	0.159	0.251	0.180	0.431	0.043	0.474	0.315
2007	0.022	0.000	0.012	0.012	0.035	0.514	0.262	0.776	0.078	0.854	0.819
2008	0.000	0.000	0.012	0.012	0.012	0.347	0.198	0.545	0.054	0.599	0.587
2009	0.000	0.000	0.012	0.012	0.012	0.209	0.146	0.355	0.036	0.391	0.379
2010	0.000	0.000	0.012	0.012	0.012	0.428	0.217	0.645	0.065	0.710	0.698
2011	0.000	0.000	0.012	0.012	0.012	0.437	0.218	0.655	0.065	0.720	0.708
2012	0.000	0.000	0.012	0.012	0.012	0.442	0.218	0.660	0.066	0.726	0.714
2013	0.000	0.000	0.012	0.012	0.012	0.445	0.217	0.662	0.066	0.728	0.716
2014	0.000	0.360	0.000	0.360	0.360	0.448	0.215	0.663	0.066	0.729	0.369
2015	0.000	0.000	0.012	0.012	0.012	0.728	0.344	1.072	0.107	1.179	1.167
2016	0.000	0.000	0.012	0.012	0.012	0.743	0.347	1.091	0.109	1.200	1.187
2017	0.000	0.000	0.012	0.012	0.012	0.757	0.350	1.107	0.111	1.218	1.205
2018	0.000	0.000	0.012	0.012	0.012	0.769	0.352	1.121	0.112	1.233	1.221
2019	0.000	0.000	0.012	0.012	0.012	0.779	0.353	1.132	0.113	1.245	1.233
2020	0.000	0.000	0.012	0.012	0.012	0.787	0.353	1.140	0.114	1.254	1.242
2021	0.000	0.000	0.012	0.012	0.012	0.796	0.354	1.150	0.115	1.265	1.253
2022	0.000	0.000	0.012	0.012	0.012	0.803	0.353	1.156	0.116	1.272	1.259
2023	0.000	0.360	0.000	0.360	0.360	0.808	0.353	1.161	0.116	1.277	0.917
2024	0.000	0.000	0.012	0.012	0.012	1.313	0.567	1.881	0.188	2.069	2.056
2025	(0.615)	0.000	0.012	0.012	(0.603)	1.343	0.575	1.919	0.192	2.111	2.714
Economic Internal Rate of Return (%) =											10.4%
Net Present Value (\$ million) =											(0.6)

O&M = operation and maintenance.

Source: Independent Evaluation Mission estimates.

**Table A6.7: Recalculation of Economic Internal Rate of Return
(Contract C2: Na Sack–Khock Khao Do)**
(\$ million in constant 2009 prices)

Year	Costs				Benefits					Net Benefits	
	Capital Costs	O&M Costs			Total Costs	VOC Savings			Time Savings		Total Benefits
		Periodic	Routine	Total		Normal	Diverted	Total			
2001	0.167	0.000	0.000	0.000	0.167	0.000	0.000	0.000	0.000	0.000	(0.167)
2002	0.155	0.000	0.000	0.000	0.155	0.000	0.000	0.000	0.000	0.000	(0.155)
2003	1.096	0.000	0.000	0.000	1.096	0.000	0.000	0.000	0.000	0.000	(1.096)
2004	1.339	0.000	0.000	0.000	1.339	0.000	0.000	0.000	0.000	0.000	(1.339)
2005	3.850	0.000	0.000	0.000	3.850	0.000	0.000	0.000	0.000	0.000	(3.850)
2006	0.682	0.000	0.000	0.000	0.682	0.429	1.360	1.789	0.179	1.967	1.285
2007	0.030	0.000	0.034	0.034	0.064	0.194	1.016	1.210	0.121	1.331	1.266
2008	0.000	0.000	0.034	0.034	0.034	0.394	0.967	1.361	0.136	1.497	1.463
2009	0.000	0.000	0.034	0.034	0.034	0.384	0.979	1.363	0.136	1.500	1.465
2010	0.000	0.000	0.034	0.034	0.034	0.376	1.016	1.392	0.139	1.531	1.497
2011	0.000	0.000	0.034	0.034	0.034	0.367	1.065	1.432	0.143	1.575	1.541
2012	0.000	0.995	0.000	0.995	0.995	0.377	1.229	1.606	0.161	1.766	0.771
2013	0.000	0.000	0.034	0.034	0.034	0.800	1.282	2.083	0.208	2.291	2.257
2014	0.000	0.000	0.034	0.034	0.034	0.806	1.338	2.145	0.214	2.359	2.325
2015	0.000	0.000	0.034	0.034	0.034	0.802	1.396	2.198	0.220	2.418	2.384
2016	0.000	0.000	0.034	0.034	0.034	0.801	1.456	2.257	0.226	2.483	2.449
2017	0.000	0.000	0.034	0.034	0.034	0.795	1.519	2.314	0.231	2.545	2.511
2018	0.000	0.000	0.034	0.034	0.034	0.783	1.585	2.368	0.237	2.604	2.570
2019	0.000	0.000	0.034	0.034	0.034	0.766	1.653	2.418	0.242	2.660	2.626
2020	0.000	0.000	0.034	0.034	0.034	0.741	1.724	2.465	0.246	2.711	2.677
2021	0.000	0.995	0.000	0.995	0.995	0.753	1.995	2.749	0.275	3.024	2.028
2022	0.000	0.000	0.034	0.034	0.034	1.513	2.092	3.606	0.361	3.966	3.932
2023	0.000	0.000	0.034	0.034	0.034	1.525	2.194	3.719	0.372	4.090	4.056
2024	0.000	0.000	0.034	0.034	0.034	1.532	2.300	3.832	0.383	4.215	4.181
2025	(0.732)	0.000	0.034	0.034	-0.698	1.530	2.684	4.214	0.421	4.636	5.333

Economic Internal Rate of Return (%) = 21.0%

Net Present Value (\$ million) = 3.9

O&M = operation and maintenance.

Source: Independent Evaluation Mission estimates.

**Table A6.8: Recalculation of Economic Internal Rate of Return
(Contract C3: Thoung Khoun–Long Xane)
(\$ million in constant 2009 prices)**

Year	Costs				Benefits					Net Benefits	
	Capital Costs	O&M Costs			Total Costs	VOC Savings			Time Savings		Total Benefits
		Periodic	Routine	Total		Normal	Generated	Total			
2001	0.244	0.000	0.000	0.000	0.244	0.000	0.000	0.000	0.000	0.000	(0.244)
2002	0.232	0.000	0.000	0.000	0.232	0.000	0.000	0.000	0.000	0.000	(0.232)
2003	4.028	0.000	0.000	0.000	4.028	0.000	0.000	0.000	0.000	0.000	(4.028)
2004	3.120	0.000	0.000	0.000	3.120	0.000	0.000	0.000	0.000	0.000	(3.120)
2005	2.785	0.000	0.000	0.000	2.785	0.000	0.000	0.000	0.000	0.000	(2.785)
2006	1.574	0.000	0.000	0.000	1.574	0.210	0.460	0.670	0.067	0.737	(0.837)
2007	0.044	0.000	0.071	0.071	0.115	0.410	0.490	0.900	0.090	0.990	0.875
2008	0.000	0.000	0.071	0.071	0.071	0.679	0.515	1.194	0.119	1.314	1.243
2009	0.000	0.000	0.071	0.071	0.071	0.969	0.603	1.572	0.157	1.730	1.659
2010	0.000	0.000	0.071	0.071	0.071	0.927	0.557	1.483	0.148	1.632	1.561
2011	0.000	0.000	0.071	0.071	0.071	0.849	0.501	1.350	0.135	1.485	1.414
2012	0.000	2.067	0.000	2.067	2.067	0.665	0.387	1.052	0.105	1.157	(0.910)
2013	0.000	0.000	0.071	0.071	0.071	1.984	1.131	3.115	0.311	3.426	3.355
2014	0.000	0.000	0.071	0.071	0.071	1.931	1.086	3.017	0.302	3.319	3.248
2015	0.000	0.000	0.071	0.071	0.071	1.857	1.032	2.889	0.289	3.178	3.107
2016	0.000	0.000	0.071	0.071	0.071	1.765	0.970	2.734	0.273	3.008	2.937
2017	0.000	0.000	0.071	0.071	0.071	1.654	0.898	2.552	0.255	2.807	2.736
2018	0.000	0.000	0.071	0.071	0.071	1.518	0.814	2.332	0.233	2.565	2.494
2019	0.000	0.000	0.071	0.071	0.071	1.353	0.718	2.071	0.207	2.278	2.207
2020	0.000	2.067	0.000	2.067	2.067	1.157	0.607	1.765	0.176	1.941	(0.126)
2021	0.000	0.000	0.071	0.071	0.071	3.461	1.783	5.244	0.524	5.769	5.698
2022	0.000	0.000	0.071	0.071	0.071	3.363	1.720	5.084	0.508	5.592	5.521
2023	0.000	0.000	0.071	0.071	0.071	3.230	1.642	4.873	0.487	5.360	5.289
2024	0.000	0.000	0.071	0.071	0.071	3.069	1.550	4.619	0.462	5.081	5.010
2025	(1.203)	0.000	0.071	0.071	-1.132	2.878	1.441	4.319	0.432	4.751	5.883
Economic Internal Rate of Return (%) = 12.5%											
Net Present Value (\$ million) = 0.4											

O&M = operation and maintenance.

Source: Independent Evaluation Mission estimates.

**Table A6.9: Recalculation of Economic Internal Rate of Return
(Contract C4: Huay Hung–Xam Tai)
(\$ million in constant 2009 prices)**

Year	Costs				Total Costs	Benefits				Net Benefits	
	Capital Costs	O&M Costs		Total Costs		VOC Savings		Time Savings	Total Benefits		
		Periodic	Routine			Normal	Generated				
2001	0.209	0.000	0.000	0.000	0.209	0.000	0.000	0.000	0.000	0.000	(0.209)
2002	0.220	0.000	0.000	0.000	0.220	0.000	0.000	0.000	0.000	0.000	(0.220)
2003	1.451	0.000	0.000	0.000	1.451	0.000	0.000	0.000	0.000	0.000	(1.451)
2004	1.923	0.000	0.000	0.000	1.923	0.000	0.000	0.000	0.000	0.000	(1.923)
2005	2.317	0.000	0.000	0.000	2.317	0.000	0.000	0.000	0.000	0.000	(2.317)
2006	3.894	0.000	0.000	0.000	3.894	0.093	0.117	0.210	0.021	0.231	(3.663)
2007	0.038	0.000	0.020	0.020	0.057	0.173	0.155	0.328	0.033	0.361	0.303
2008	0.000	0.000	0.020	0.020	0.020	0.164	0.137	0.301	0.030	0.331	0.311
2009	0.000	0.000	0.020	0.020	0.020	0.168	0.119	0.287	0.029	0.315	0.296
2010	0.000	0.000	0.020	0.020	0.020	0.169	0.113	0.282	0.028	0.311	0.291
2011	0.000	0.000	0.020	0.020	0.020	0.171	0.108	0.279	0.028	0.307	0.288
2012	0.000	0.114	0.000	0.114	0.114	0.172	0.108	0.280	0.028	0.308	0.194
2013	0.000	0.000	0.020	0.020	0.020	0.278	0.216	0.493	0.049	0.543	0.523
2014	0.000	0.000	0.020	0.020	0.020	0.284	0.213	0.497	0.050	0.547	0.527
2015	0.000	0.000	0.020	0.020	0.020	0.289	0.210	0.499	0.050	0.549	0.529
2016	0.000	0.000	0.020	0.020	0.020	0.294	0.205	0.499	0.050	0.549	0.530
2017	0.000	0.000	0.020	0.020	0.020	0.298	0.200	0.498	0.050	0.548	0.528
2018	0.000	0.000	0.020	0.020	0.020	0.302	0.193	0.495	0.049	0.544	0.524
2019	0.000	0.000	0.020	0.020	0.020	0.304	0.185	0.489	0.049	0.538	0.518
2020	0.000	0.000	0.020	0.020	0.020	0.306	0.175	0.481	0.048	0.529	0.509
2021	0.000	0.114	0.000	0.114	0.114	0.308	0.175	0.482	0.048	0.530	0.417
2022	0.000	0.000	0.020	0.020	0.020	0.496	0.352	0.847	0.085	0.932	0.912
2023	0.000	0.000	0.020	0.020	0.020	0.507	0.349	0.857	0.086	0.942	0.923
2024	0.000	0.000	0.020	0.020	0.020	0.518	0.345	0.864	0.086	0.950	0.930
2025	(1.005)	0.000	0.020	0.020	(0.986)	0.528	0.340	0.868	0.087	0.955	1.940
Economic Internal Rate of Return (%) = 0.8%											
Net Present Value (\$ million) = (4.2)											

O&M = operation and maintenance.

Source: Independent Evaluation Mission estimates.

**Table A6.10: Recalculation of Economic Internal Rate of Return
(Contracts C1, C2, C3, and C4 Combined)**
(\$ million in constant 2009 prices)

Year	Costs					Benefits					
	Capital Costs	O&M Costs			Total Costs	VOC Savings			Time Savings	Total Benefits	Net Benefits
		Periodic	Routine	Total		Normal	Diverted/ Generated Traffic	Total			
2001	0.744	0.000	0.000	0.000	0.744			0.000		0.000	(0.744)
2002	0.890	0.000	0.000	0.000	0.890			0.000		0.000	(0.890)
2003	8.512	0.000	0.000	0.000	8.512			0.000		0.000	(8.512)
2004	8.588	0.000	0.000	0.000	8.588			0.000		0.000	(8.588)
2005	10.371	0.000	0.000	0.000	10.371			0.000		0.000	(10.371)
2006	6.308	0.000	0.000	0.000	6.308	0.983	2.117	3.099	0.310	3.409	(2.899)
2007	0.135	0.000	0.137	0.137	0.271	1.290	1.923	3.214	0.321	3.535	3.264
2008	0.000	0.000	0.137	0.137	0.137	1.584	1.817	3.401	0.340	3.741	3.604
2009	0.000	0.000	0.137	0.137	0.137	1.730	1.848	3.578	0.358	3.936	3.799
2010	0.000	0.000	0.137	0.137	0.137	1.900	1.903	3.803	0.380	4.183	4.046
2011	0.000	0.000	0.137	0.137	0.137	1.823	1.892	3.715	0.372	4.087	3.950
2012	0.000	3.176	0.012	3.189	3.189	1.656	1.941	3.598	0.360	3.957	0.769
2013	0.000	0.000	0.137	0.137	0.137	3.507	2.845	6.353	0.635	6.988	6.851
2014	0.000	0.360	0.125	0.484	0.484	3.469	2.852	6.321	0.632	6.953	6.469
2015	0.000	0.000	0.137	0.137	0.137	3.676	2.982	6.658	0.666	7.324	7.187
2016	0.000	0.000	0.137	0.137	0.137	3.603	2.979	6.582	0.658	7.240	7.103
2017	0.000	0.000	0.137	0.137	0.137	3.504	2.967	6.471	0.647	7.118	6.981
2018	0.000	0.000	0.137	0.137	0.137	3.372	2.943	6.315	0.632	6.947	6.810
2019	0.000	0.000	0.137	0.137	0.137	3.202	2.908	6.110	0.611	6.721	6.584
2020	0.000	2.067	0.066	2.133	2.133	2.991	2.859	5.850	0.585	6.435	4.302
2021	0.000	1.109	0.083	1.192	1.192	5.318	4.307	9.625	0.963	10.588	9.395
2022	0.000	0.000	0.137	0.137	0.137	6.175	4.518	10.693	1.069	11.762	11.625
2023	0.000	0.360	0.125	0.484	0.484	6.070	4.538	10.609	1.061	11.669	11.185
2024	0.000	0.000	0.137	0.137	0.137	6.433	4.763	11.195	1.120	12.315	12.178
2025	(3.555)	0.000	0.137	0.137	(3.418)	6.280	5.040	11.320	1.132	12.453	15.871
Economic Internal Rate of Return (%) = 11.8%											
Net Present Value (\$ Million) = (0.4)											

O&M = operation and maintenance.

Source: Independent Evaluation Mission estimates.

Table A6.11: Recalculation of Subproject EIRRs

Subproject	Without Time Savings			With Time Savings			Without Motorcycles	With Additional Work Variations
	LAPP	PCR	PPER	LAPP	PCR	PPER	PPER	PPER
C1		12.0	9.4	14.5	13.7	10.4	9.0	9.7
C2		18.0	19.3	34.5	20.1	21.0	18.2	18.4
C3		9.8	11.5	12.3	11.0	12.5	11.1	11.9
C4		3.0	negative	13.1	3.9	0.8	negative	negative
Overall	17.8	10.6	10.7	19.7	12.0	11.8	10.1	10.9

LAPP = loan approval, MC = motorcycle, PCR = project completion report, PPER = project performance evaluation report.

Sources: Project completion consultant report and Independent Evaluation Mission estimates.

11. Overall, this project is borderline *less efficient* and reemphasizes the need to support developmental road projects that promote basic access in rural areas with little traffic. At the same time, the project at completion also appears as a jumble of subprojects whose circumstances or developmental objectives do not readily allow a consolidated assessment of efficiency. A case may be argued that C3 has been transformed into a mining road under the purview of PBM, resulting in additional and significant investments in the area. Without C3 road, the EIRR for the three remaining roads is 11.3% (Table A6.12). Of the three roads, C1 and C2 are both considered national roads with a combined EIRR of 16.1%. In the case of C1, being a missing link of the Xekong to Attapeu road, it may be argued that a standalone assessment underestimates quantified benefits from it and that generated benefits can be best subsumed in a reassessment of the larger Sixth Road Improvement Project. Without C1, the overall project EIRR breaks even at 12.1%.

Table A6.12: Overall Project EIRR

Subproject	EIRR (%)	NPV (\$ million)	B/C Ratio
Base Case			
C1 and C2	16.1	3.3	4.64
C1, C2, and C3	14.4	3.7	4.11
C1, C2, and C4	11.3	(0.8)	3.30
C2, C3, and C4	12.1	0.1	3.44
All Contracts	11.8	(0.4)	3.42
Sensitivity Test			
With additional works and variations	10.9	(2.4)	3.18
Total Traffic Growth at 9% per year	14.0	4.7	4.66

B/C = benefit/cost, C = contract, EIRR = economic internal rate of return, NPV = net present value.

Source: Independent Evaluation Mission estimates.

12. **Attapeu–Senamnoy (C1).** The base case EIRR is 10.4% as compared to 14.5% at project approval and 13.7% at completion. This marginal performance is explained by the level of capital cost attributed to C1 taken against the short nature of the link.⁶ Unit capital cost is double that of the three other sections (Table A6.13).

⁶ C1 is the shortest project road as it aimed to complete the unfinished portion (between Xekong and Attapeu) of the completed ADB Sixth Road Improvement Project.

Table A6.13: Comparison of Capital Cost and Projected Traffic by Contract

Road	Capital Cost ^a (\$)	Road Length (kilometer)	\$ Cost Per Kilometer	Forecast Nonmotorcycle Traffic (average Number of Vehicles per Day, 2009–2025)
C1	5,195,817	22.9	227,388.05	455
C2	6,274,978	63.2	99,287.62	199
C3	10,200,312	87.5	116,574.99	328
C4	8,664,005	72.3	119,917.02	60

^a Exclude additions and/or variations.

Source: Independent Evaluation Mission estimates.

13. Compounding the short road length is the fact that nonmotorcycle traffic on C1 road has been slow to develop. Incremental traffic in 2009 is estimated at only 30.2% of the PCR forecast. While nonmotorcycle traffic increased from 46 vpd in 1999 (before project) to 172 vpd in 2009, it was only 63.2% of the 2007 estimate of 272 vpd. For the EIRR to meet the benchmark opportunity cost of capital of 12% for ADB projects, nonmotorcycle traffic on C1 will need to grow to around 1,013 vpd by 2025 or by 11.7% per year from 2009. In this case, average annual nonmotorcycle traffic is estimated at 564 vpd between 2009 and 2025 or 1.28 times the base case scenario. Table A6.14 presents sensitivity tests taken on various variables including inclusion of capital costs from additional works and variations. Overall, C1 road is considered to be borderline *less efficient*.

Table A6.14: Sensitivity Analysis on C1 Road

Case	EIRR (%)
1. Base Case	10.4
1. Base Case with additional works and variations	9.7
2. Incremental VOC are 20% higher	11.8
3. Incremental VOC are 20% lower	8.7
4. Incremental traffic is 20% higher	11.4
5. Incremental traffic is 20% lower	9.2
6. Times savings is assumed at 5% of VOC savings	9.9

C = contract, EIRR = economic internal rate of return.

Source: Independent Evaluation Mission estimates.

14. **Na Sack–Khoc Khao Do (C2).** On only one of the project roads was the recalculated EIRR found to be comfortably above the benchmark opportunity cost of capital of 12%. For C2 road, the base case EIRR of 21.0% approximates the PCR estimate of 20.1% but is well below the appraisal target of 34.5% (the latter target being quite optimistic). This remarkable performance is attributed to both its low capital cost and the magnitude of favorable development impacts in the road influence areas. C2 road accounted for the lowest unit investment cost (i.e., \$99,288 per km) among the four contracts. Complementing this was a surge in agriculture development as the road opened up trade and communications between Xanakham and Xaignabouli Province (i.e., Paklay). This is reflected in an increase in nonmotorcycle traffic from 41 vpd in 1999 to 120 vpd in 2009.

15. Yet, despite its general success, C2 has yet to meet its primary intent of improving road connections between Vientiane Capital and Xaignabouli via Xanakham. The condition of the roads from Vientiane Capital to Xanakham continues to constrain the full traffic diversion potential of the project road from being achieved.⁷ Based on a rise in nonmotorized traffic of about 12% per year from 120 vpd in 2009 to 736 vpd by 2025 (or an average of 345 vpd from 2009 to 2025), the recalculated EIRR is around 24.7%.

⁷ The ongoing ADB road improvement subproject covering the Pakton to Ban Vang is not expected to be completed until 2010.

16. Overall, C2 road is *highly efficient*. The base case result is fairly robust as drawn from two sensitivity tests. The first assumes that average annual growth in nonmotorized traffic for all vehicle types is reduced by half to 3% per year. The EIRR result remains high at 19.0%. The second sensitivity test finds that the EIRR is 17.0% even if the level of nonmotorcycle traffic remains at the 2009 level of 120 vpd during the period 2009–2025. Table A6.15 presents sensitivity tests taken on various variables including inclusion of capital costs from additional works and variations.

Table A6.15: Sensitivity Analysis on C2 Road

Case	EIRR (%)
1. Base Case	21.0
1. Base Case with additional works and variations	18.4
2. Incremental VOC are 20% higher	21.6
3. Incremental VOC are 20% lower	20.3
4. Incremental traffic is 20% higher	21.3
5. Incremental traffic is 20% lower	20.6
6. Times savings is assumed at 5% of VOC savings	20.1

EIRR = economic internal rate of return.
Source: Independent Evaluation Mission estimates.

17. **Thong Khoun–Longsan (C3)**. This analysis is muddled by a government decision to allow Phu Bia Mining (PBM) to take over most of the road and transform the once farm-to-market route into a mining road. About 90% of PBM trucks and trailer trucks are reported to have used the C3 contract road. The reevaluation examines three cases with the first two representing "with" PBM conditions (Table A6.16). Case 1 is taken to represent the base case scenario for comparison with the appraisal and PCR analysis. It shows realized economic benefits from actual traffic on the road against capital costs from project financing. Case 2 modifies the base case by reflecting the additional investments reportedly made by PBM for (i) road widening to allow better passage of heavier trucks, (ii) some strengthening to handle heavier traffic, and (iii) additional works for traffic diversion.⁸ Case 3 examines "without" PBM conditions wherein the mining firm discontinues use of C3 road.⁹ In all three cases, benefits are conservatively limited to direct road user benefits and do not consider macroeconomic benefits from exports or related government revenues.

Table A6.16: EIRRs on C3 Road

Case	EIRR (%)	B/C Ratio
1. Base case	12.5	3.60
2. With Phu Bia Mining investments	7.3	2.15
3. No Phu Bia Mining traffic	2.0	1.25

B/C = benefit/cost, EIRR = economic internal rate of return.

Source: Independent Evaluation Mission estimates.

18. Case 1 conditions find C3 road to be borderline *efficient* with an EIRR of 12.5%. This approximates earlier estimates of 12.3% at project approval and 11% at completion. C3's marginal performance is weighed down by the amount of capital expenditure required (i.e., accounted for the largest capital outlay of the four roads) and a small traffic base. In particular,

⁸ PBM has undertaken to improve sections of the road for use by loaded trucks. It reportedly spent over \$12 million to upgrade the roads and build three new bridges.

⁹ The difference between Case 3 and the base case scenario are (i) exclusion of 80% of pick-up and truck traffic from 2010 to 2025, which are assumed to be from PBM; and (ii) road roughness and maintenance program in line with C2 performance.

capital cost (excluding additional works) is 1.65 times than that of C2. The silver lining here is the fact that C3 accounts for the second largest traffic of the four roads. In addition, there is major heavy vehicle traffic coming from PBM (which unfortunately also contributes to the accelerated deterioration of some road sections).

19. A second yet more practical scenario reflects PBM action to enable the former farm-to-market road to effectively handle mining traffic. Under Case 2, a total of \$12 million was assumed to have been spent for this purpose between 2006 and 2009. The added investments reduce the EIRR to 7.3% and lower the benefit to cost ratio to 2.15 (as compared to the base case of 3.60). It shows C3 road to be generally *less efficient* owing to (i) its small traffic base; (ii) the additional cost of making the road available for mining traffic; and (iii) the accelerated road deterioration (caused by mining and logging traffic), which reduces economic benefits as well as increases the need for more road maintenance financing.

20. Case 3 is a hypothetical scenario that PBM stops using the C3 road from 2010. While the resulting reduction in road deterioration provides some positive stimulus, the larger implication is that the loss of PBM benefits (from associated light and heavy vehicle traffic) will significantly reduce the EIRR, perhaps to negative results. Assuming that 65% of light vehicles (i.e., pick-ups, small buses) and trucks (i.e., light trucks, heavy trucks, and truck trailers) using the road are from PBM and lost, the reestimated EIRR drops significantly to 2%. Higher PBM-related traffic on the ground would simply push the EIRR to negative. Without PBM, nonmotorcycle traffic is assumed to average 143 vpd between 2010 and 2025 (with less heavy vehicles in the mix). For the EIRR to be able to meet the 12% cutoff for ADB projects, nonmotorcycle traffic on C3 road will need to recover and average around 268 vpd between 2010 and 2025.

21. Based on the above observations, C3 is rated *less efficient* because of its relatively high investment cost and low traffic base. Table A6.17 presents sensitivity tests taken on various variables including inclusion of capital costs from additional works and variations.

Table A6.17: Sensitivity Analysis on C3 Road (Base Case)

Case	EIRR (%)
1. Base Case	12.5
1. Base Case with additional works and variations	11.9
2. Incremental VOC are 20% higher	14.2
3. Incremental VOC are 20% lower	10.6
4. Incremental traffic is 20% higher	13.8
5. Incremental traffic is 20% lower	11.1
6. Times savings is assumed at 5% of VOC savings	12.0

Source: Independent Evaluation Mission estimates.

22. **Huay Hung–Xam Tai (C4).** The performance of C4 road is assessed as *inefficient* with negligible nonmotorcycle traffic about 3 years from road completion. The subproject EIRR is 0.8% as compared with the PCR estimate of 3.9%. This is explained by (i) a capital cost that is the second largest among the four roads or 1.38 times the amount spent on C2 road, and (ii) a forecast nonmotorcycle traffic level of about 30.2% of C2 from 2009 to 2025. While motorcycle traffic has been robust, increasing by 36.2% per year from 13 vpd in 1999 (before project) to 286 vpd in 2009 (about 3 years after completion), nonmotorized traffic remains scant. Its remote location, security issues, and the absence of a nearby growth center to stimulate traffic demand have resulted in the slow development of nonmotorcycle traffic. The latter grew by only 5.9% from 33 vpd in 2007 to 37 vpd in 2009. Table A6.18 presents sensitivity tests taken on various variables including inclusion of capital costs from additional works and variations.

Table A6.18: Sensitivity Analysis on C4 Road

Case	EIRR (%)
1. Base Case	0.8
1. Base Case with additional works and variations	negative
2. Incremental VOC are 30% higher	2.6
3. Incremental VOC are 10% lower	negative
4. Incremental traffic is 30% higher	1.9
5. Incremental traffic is 10% lower	negative
6. Times savings is assumed at 5% of VOC savings	negative

C = contract, EIRR = economic internal rate of return, Neg = negative, VOC = vehicle operating cost.

Source: Independent Evaluation Mission estimates.

23. If C4 road fails to generate a nonmotorcycle traffic level of 60 vpd from 2009 to 2025, then sensitivity tests show the EIRR to be negative. For the EIRR to meet the standard 12% return, nonmotorcycle traffic on C4 will need to increase by 22.5% per year to 926 vpd by 2025 or an annual average of 287 vpd from 2009 to 2025. The latter is 4.8 times the annual average traffic of 60 vpd under the base case scenario. For C4 road to meet the PCR estimate of 3.9%, nonmotorcycle traffic on C4 will need to increase by 10.4% per year to 175 vpd by 2025 or an annual average of 89 vpd under the base case scenario.

PHU BIA MINING LIMITED

1. **Background.** Phu Bia Mining Limited (PBM) is a Lao registered exploration and mining company established in 1994. It is located 100 km north of Vientiane in Vientiane and Xieng Khouang provinces, with company activities covering 2,600 square kilometers (km). It has a mineral exploration and production agreement with the government, signed in 1994, and is majority owned by Pan Australian Resources Limited.
2. **Benefits to the Lao People's Democratic Republic.** The presence of PBM has generated several benefits for the area around the C3 road section. This mining investment has contributed to growth and industrial development in the C3 area. The benefits include (i) job creation for local people in the mines and employment opportunities in related industries; (ii) merchandise exports of copper and gold and government revenues through duties, taxes, royalties, and rent; and (iii) access to basic services (i.e., transport and communication, housing, health, and education).
3. PBM's gold mine started production in November 2005 with a \$15 million investment. In mid-2006, it employed 300 local people and created 1,800 jobs in related industries. It was the largest employer in Xaisomboun District. PBM's gold ore sales to Thailand increased from \$1.1 million in 2005 to \$17.4 million in 2008 (Table A7.1).

Table A7.1: Phu Bia Gold Mine Gold Exports

Year	Weight (grams)	Value (\$)
2005	73,110	1,115,505.07
2006	778,727	13,153,159.26
2007	1,219,568	21,859,748.00
2008	960,734	17,454,064.00

Source: Ministry of Industry.

4. Construction on PBM's Phu Kham open pit mine started in 2006. It commenced operations in January 2008 at a construction cost of \$240 million. It is set to operate for 10–15 years. It was expected to create 1,000 jobs at the mine and a further 6,000 jobs in related industries. PBM sends its copper concentrate to Thailand for refining (25% recovery rate) via the C3 road. In 2008, copper concentrate production amounted to 103,359,480 kilograms. For 2009, it estimated at 276,000 tons. PBM operations faced initial difficulties due to the global financial crisis.
5. **PBM Use of C3 Road.** PBM was stated to have spent over \$12 million to upgrade the roads, including building three new bridges and undertaking road maintenance to keep it operational even during the rainy season. PBM determined that in several sections of the road upgraded by the Asian Development Bank, the actual civil works were of poor quality for a standard road to be used by its loaded trucks. More importantly, PBM and the government had agreed that it would maintain this road during the life of the mine.
6. While the road was partly damaged during the construction phase of the mine, PBM is of the view that the haulage trucks for the concentrate will not impact on the road to any major degree. There are many timber trucks also operating on the road during the rainy season, and this is the primary reason for the major damage to the road and will continue to be the major problem for the future. As cited above, the alignment and construction of upgraded sections of

the road did not achieve the necessary quality for use by loaded trucks (including trucks loaded to Lao Road Regulations).

7. **Independent Evaluation Mission Findings.** PBM has been the main heavy user of the road since 2008. The numerous daily trips of its large trailer trucks have already destroyed the road pavements. The Independent Evaluation Mission team found that PBM has virtually converted the asphalted road into a gravel road and has also realigned some road sections to suit its own purpose. The road is very dusty during dry periods, and there are no indications whether PBM will restore the pavement. The Ministry of Public Works and Transport revealed that PBM will restore the pavement after ceasing operations in the area. Since PBM has a mining license for more than 10 years, the other road users will be facing the hardship of having to use a poor quality road.

**BUDGET ALLOCATION FOR THE PROVINCIAL DEPARTMENTS OF THE MINISTRY OF
PUBLIC WORKS AND TRANSPORT
FY2008–2009**

Item	Unit	Attapeu Province (C1 section)	Vientiane Province (C2 and C3 sections)	Houaphan Province (C4 section)
A. Allocated Budget				
1. Construction	KN million	517,321	41,614	12,881
2. Maintenance	KN million	23,188	104,252	22,148
Routine	KN million	1,217	961	2,052
Periodic	KN million	12,349	33,427	2,271
Emergency	KN million	9,622	69,864	17,825
Total	KN million	540,509	145,866	35,029
B. Length of Local Roads				
1. Provincial	km	189	959	441
2. District	km	60	493	344
3. Rural	km	386	780	1721
4. Specific Road	km	36	137	446
Total	km	671	2,369	2,952
C. Maintainable Sections				
1. Provincial	km	23	959	441
2. District	km	0	413	154
3. Rural	km	22	542	145
4. Specific Road	km	0	0	446
Total	km	45	1,914	1,186

km = kilometer, KN = Lao PDR kip, M = million.

Source: Ministry of Public Works and Transport's provincial departments in Attapeu, Vientiane, and Houaphan.

SOCIOECONOMIC ASSESSMENT

1. **Methodology.** The Independent Evaluation Mission (IEM) carried out a rapid socioeconomic assessment on the four main project roads.¹ The assessment was in the form of qualitative survey, which used a purposive sampling.² Two villages for each project road were selected to (i) capture ethnic diversity, and (ii) residency (old and new—or with some resettled sector). The main data collection activities were village meetings and/or focus groups using a semistructured interview instrument that allows probing of any particular issues that arise. This in-depth method was used in eight villages (Table A9.1).

Table A9.1: Surveyed Villages and Ethnicity

Road	Surveyed Villages	Ethnicity
C1	Sok Kham	Lao, Nya Heun
	Beng Phoukham	Lao, Hrlak, Tarieng (Mon Khmer)
C2	Khoc Khao Do	Lao
	Na Sack	Lao, Khmou
C3	Phon Lao	Phouan, Khmou
	Meuang Long	White Hmong
C4	Dan Xam	Thay Neua, Khmou, Green Hmong
	Phiang May	White Hmong

Source: Independent Evaluation Mission.

2. To complement this, brief visits were also made to 19 other villages to get a more general idea of perceptions on the road from a wider variety of people and to confirm what more in-depth interviews had revealed. While this is not a quantitative household survey, some statistical information was also gathered for the income and poverty analysis below.

3. **Ethnicity.** The socioeconomic assessment revealed that the project has ethnic minorities belonging to two internationally recognized ethno-linguistic families of Mon-Khmer and Hmong-Mien, who are considered indigenous peoples (IP) under ADB's Operations Manual F3 on Indigenous Peoples. These ethnic minorities are the (i) Khmou, Nya Heun, Hrlak, and Tarieng of the Mon-Khmer family; and (ii) White Hmong and Green Hmong of the Hmong-Mien family.

4. Some of the villages covered by the socioeconomic assessment are populated with purely ethnic minorities, such as on C3 and C4 roads with a population of 100% White Hmong. C1 road had a village with a population of 72% Hrlak. A village with a population of 90% Khmou was also surveyed on C3 road. C2 road has very few people from an ethnic minority, with only 1% Khmou in one village.

5. **Differential Impacts on the Ethnic Groups.** Some of the groups included under this project were not poor to begin with. However, two groups were correctly identified as poor (i) the Tarieng section of Beng Phoukham on C1, where this group had recently resettled from Dak Cheung, ostensibly to be near the road, though it turned out that the village was planning to establish a rubber plantation and it is possible that the Tarieng were viewed as a ready source of labor; and (ii) the Khmou section of Dan Xam on C4, where, even though the Khmou were the original inhabitants, they are unable to compete economically with the Thay Neua and the Hmong, who have moved more recently into the village and have begun to take advantage of

¹ Chamberlain, James. 2009. *Socioeconomic Report: Rural Access Roads Project Evaluation (Draft)*. Manila: ADB.

² The purposive sampling of villages was done in consultation with district officials to capture as much diversity of conditions as possible so that the full range of parameters in terms of local populations would be accessible.

the road benefits. This is not an atypical situation, but one that is found throughout northern Lao PDR, and one which provides an indicator of the poverty situation. The main reason for this has been attributed to the lack of capacity within the Khmou community in terms of agricultural and other livelihoods development.

6. The structural issue with Mon-Khmer societies needs further in-depth study from a development perspective. The general absence of planning and programming to focus on specific ethnic groups leads to their being stereotyped as less economically developed. In fact, they are more conservative in the use of natural resources.

7. When Mon-Khmer villages are more isolated and independent, they are usually robust and well-off by their own definitions. But when joined with other ethnic groups whose utilization of resources is more aggressive and efficient, an inferiority complex surfaces and they begin to see themselves, as they believe the ethnic Lao see them, as “*Kha*,” the pejorative ethnonym, that has come to mean “servant” or even “slave.” This indicates the level of complexity in dealing with the ethnic groups.

8. **Livelihood.** Livelihoods in villages of the project area are agriculture-based, but supplemented with the collection of forest products, hunting and fishing to a greater or lesser degree depending upon the proximity of forest and water resources. Villages assessed were found to be comparatively well-off, considering themselves to be “about average” in terms of relative wealth (Table A9.2).

Table A9.2: Socioeconomic Profile of Subproject Roads Zone of Influence

Road	Location	Assessment
C1 Road: Attapeu–Senamnoy	<ul style="list-style-type: none"> • Located in Xaisettha District • Road parallels the Xekong river beside which many old Lao PDR villages are found 	<ul style="list-style-type: none"> • The only nonpoor district in Attapeu province. • With the completion of the road, a number of villages established satellite extensions along the road as a strategy, both to take advantage of the economic benefits of the road and to prevent others, especially influential VIPs from making claims to land on the road. • Other villages on the road are mainly relocated ethnic minority villages, mostly not poor, though there are exceptions, but generally unable to compete economically with ethnic Lao PDR people. • At this point in time, however, competition is not an issue since land is plentiful, and as yet has no monetary value. Vacant land may still be claimed for use by anyone who may be interested.
C2 Road: Na Sack–Khoc Khao Do	<ul style="list-style-type: none"> • Located in Xanakham District of Vientiane Province • Road follows a route used to supply military forces during the clashes over the three villages in 1984, and the Thailand–Lao PDR Border War of 1987–1988 at Botèn, Xaignabouli and Chatrakon District of Phitsanulok in Thailand 	<ul style="list-style-type: none"> • There are only two villages, both ethnic Lao and both very well-off economically. • For economic purposes, local people would have preferred linking the villages along the Mekong River. Presently, there are ongoing efforts by these villages to build feeder roads to C2 in order to get better access to Vientiane. • The land close to the two villages at either end of the road is allocated, but the land in between, though it had been cultivated in the past, is no longer used.
C3 Road: Thong Khoun–Longsan	<ul style="list-style-type: none"> • Located in Meuang Hom District of Vientiane Province, but was originally under the administration of the Xaisomboun Special Zone 	<ul style="list-style-type: none"> • Villages in the catchment of this road are mainly Hmong from Northeastern Louangphrabang and Houaphan, who moved away from the fighting during the Viet Nam war as part of an evacuation effort and resettled in this area. • The lowlanders here are Thay Neua and Phouan speakers and are likewise from the same location, especially Meuang

Road	Location	Assessment
		<p>Hiam (nowadays referred to as Viengkham District).</p> <ul style="list-style-type: none"> • There are also Khmou villages along the road that are less engaged economically than the Hmong or the Neua-Phouan, though they are not poor. • Currently, the main economic activity of the Hmong is planting rubber trees, caring for them for 1 or 2 years, and then selling them to Vientiane entrepreneurs, many of whom then pay the Hmong to continue caring for the trees. The sales are ostensibly for the trees, but land is included in the transaction by tacit agreement.
C4 Road: Huay Hung–Xam Tai	<ul style="list-style-type: none"> • Located mostly in Xam Tai District of Houaphan Province, passing through the Nam Xam National Biodiversity Conservation Area (NBCA) • Road provides an important administrative link between Xam–Nua, the provincial capital, and the district of Xam Tai 	<ul style="list-style-type: none"> • A number of villages found along the road are ethnic minorities who moved here prior to the establishment of the NBCA when restrictions were imposed on land use for agricultural purposes • Land for cultivation is now overexploited • Though there is some sale of corn to Viet Nam, the main economic beneficiaries of the road are businesses in Xam Tai town rather than the villages along the road. Many of these are Chinese. • Villages along the road are not poor, despite visibly poor agricultural conditions; so while no evidence was forthcoming on sales of opium or wildlife, or of unreported swiddening, observational evidence points to additional income from unknown sources.

C = contract, Lao PDR = Lao People's Democratic Republic, VIP = very important person.

Source: Independent Evaluation Mission.

9. Two villages on C2 road were found to be very well-off, having several families who purchased large tractors worth in excess of \$100,000 in some cases. At the other extreme, two poor groups were identified—the Khmou group (comprising 57% of the village population) of Ban Dan Xam in Houaphan; and the Tarieng group (comprising 7% of the village population) of Ban Beng Phoukham in Attapeu. Furthermore, based on income from cash sales only before the roads were improved, the villages assessed were not "poor" in the strict sense, and these villages, from interviewer's observations and brief interviews at 10 other villages on the road, were not atypical. It may be concluded that the poverty reduction objective of the project was superfluous (Box A9.1).

Box A9.1. Perspectives on Assessing Poverty Reduction in Lao PDR

Socioeconomic impacts of rural roads can be seen in the effect on poverty reduction. Although the quantitative relationship between road improvement and poverty reduction is not well understood, the project targeted areas where the poor could profit from the presence of an improved road. In the Lao PDR, issues surrounding ethnicity are intimately linked to poverty. Most districts classified as poor by the government are in nonlowland areas populated by non-Lao-Tai speakers or ethnic minorities.

In the Lao PDR, to examine the response of villagers to the roads requires an appreciation for local social structures and how people relate to their land and territories. In specific details, these structures will vary between ethnic groups, but some aspects are held in common, such as the sense of ownership of land customarily used by the village for everyday necessities, firewood, fish, bamboo shoots, and so on. Also the sense of respect does not violate the space of other villages in gathering and collecting these same items is a sacred mutual understanding and one governed by spirits of place. Another aspect of local societies held in common with other peoples in Southeast Asia (and perhaps less so by the Hmong who are more Confucian) is what anthropologists refer to as achronicity (Bateson, Gregory. 1963. *Bali: The Value System of a Steady State*, in M. Forbes, ed., *Social Structure: Studies Presented to A.R. Radcliffe-Brown*. New York: Clarendon Press) or the detemporalization of time (Geertz, Clifford. 1973. *The Interpretation of Culture*. New York: Basic Books), that is, time is not something that can be saved or spent, or lost, not part of the equation in determining the value of activities.

Time was never mentioned by any of the villagers as a factor in the valuation of roads. Typical responses to questions on access to health, which specifically inquires as to length of time for travel to clinics and hospitals, were "5 hours walk" before the road, and "10 minutes by motorcycle" after the road. Here, the active words are "walk" and "motorcycle" as savings in energy, rather than savings in time. Structural perspectives such as these are important as explanatory principles, for example in the PCR (Asian Development Bank. 2008. *Project Completion Report: Rural Access Roads Project*. Manila), which concludes that "travel times have been reduced significantly," a good indicator of effective road construction but of little relevance to the villagers, and that, "traffic has developed more slowly on some of the project roads than was forecast at appraisal," not surprising in light of the finding here that one of the benefits of the road is that it reduces the amount of travel for villagers, a positive benefit from their perspective. Market access to villages as opposed to village access to markets seems not to have been measured in project reports.

Lao PDR = Lao People's Democratic Republic, PCR = project completion report.
Source: Independent Evaluation Mission.

10. **Change in Household Income.** Income levels in the influence area have increased considerably compared to preconstruction levels (Table A9.3). The limited survey revealed a wide income range from KN7.4 to KN153.3 million/year/capita based upon cash sales of livestock, agriculture produce, forest products, handicrafts, small businesses, and the hiring out of labor.³ Estimated preconstruction income levels, although less reliable, had a range from KN0.78 to KN19.7 million/year/capita. These present income figures paint a positive picture of the poverty situation, since the values are much higher than the calculated 2003 poverty line of the Lao PDR. This supports the villagers' perception that income has increased.

Table A9.3: Per Capita Income from Cash Sales

Road	Village	Farm Size	Annual Per Capita Cash Income from Sales (KN million)	
			Before	After
C1	Sok Kham	5.00	.78 – 1.9	7.6 – 10.8
	Beng Phoukham	4.80	1.2 – 2.9	12.5 – 18.8
C2	Khoc Khao Do	5.12	6.3 – 12.3	65.8 – 87.9
	Na Sack	4.46	12.8 – 19.7	117.3 – 153.3
C3	Phon Lao	6.22	1.3 – 2.8	7.4 – 10.6
	Meuang Long	5.40	4.5 – 10.7	23.7 – 33.9
C4	Dan Xam	5.66	4.2 – 5.6	23.1 – 29.5
	Phiang May	9.28	1.3 – 1.9	13.1 – 19.4

C = contract, KN = Lao People's Democratic Republic kip.
Source: Independent Evaluation Mission.

11. Livestock and agricultural produce are the two main sources of income. For all four roads, there was no change in their respective top two sources of village income for the "before" and "after" project conditions (Table A9.4). There was also a general and significant increase within all income source categories. Except for C4 road, there was also a change or diversification in village income sources. These shifts relate to the entry of or increased contributions to each village's income sources from (i) small businesses, (ii) hiring out of labor, and (iii) handicrafts.

³ These figures are derived from household interviews in each village and are for cash transactions only, without factoring consumption indicators, own consumption, livestock holdings, other savings, heirlooms, land holdings, commercial trees, etc.

Table A9.4: Comparison of Top Three Income Sources

Road	District	Village	Before	After	Remarks
C1	Samakkhixai	Sok Kham	Livestock, agriculture produce, small businesses	Livestock, agriculture produce, hiring out of labor	Growth in hiring out of labor income
		Beng Phoukham	Livestock, agriculture produce, forest products	Agriculture produce, livestock, small businesses	Agriculture produce becomes top income earner. Growth in small business and hiring out of labor income
C2	Xanakham	Khoc Khao Do	Agriculture produce, livestock, small businesses	Agriculture produce, livestock, small businesses	Growth in hiring out of labor income
		Na Sack	Agriculture produce, livestock, handicraft	Agriculture produce, livestock, handicraft	No change in top three earners. Growth in handicraft and small business income
C3	Hom	Phon Lao	Livestock, hiring out of labor, agriculture produce	Livestock, hiring out of labor, agriculture produce	No change. Growth in small business and handicraft income
		Meuang Long	Livestock, agriculture produce, forest products	Livestock, agriculture produce, small businesses	Growth in small business and hiring out of labor income
C4	Xam Tai	Dan Xam	Livestock, forest products, handicraft	Livestock, forest products, handicraft	No change
		Phiang May	Livestock, agriculture produce, forest products	Livestock, agriculture produce, forest products	No change

C = contract.

Source: Independent Evaluation Mission.

12. **Change in Living Standards.** Before and after changes in durables are difficult to assess because (i) a long time had elapsed since completion, and (ii) villagers had acquired many such items prior to the road improvement. Despite this, the village interviews indicate that current assets show a wide variety of high priced consumer items. These include (i) rice mill; (ii) bicycle and motorcycles; (iii) tractors; (iv) pick-ups; and (v) televisions, satellite dishes, and compact discs (Table A9.5). While only few of these items were visible in select villages before road improvement, the emerging consumerism is widely and distinctly visible now. Of the eight study villages, only those along C4 road do not have electricity. Five of the eight villages received electrification after project completion (although lack of electrification has proven to be no barrier since generators and batteries have been in use for many years).

Table A9.5: Emerging Consumerism

Item	Samakkhixai		Xanakham		Hom		Xam Tai	
	Sok Kham	Beng Phoukham	Khoc Kao Do	Na Sack	Phon Lao	Meuang Long	Dan Xam	Phiang May
Rice mill	X	X	X	X	X	X	X	X
Bicycle	X	X	X	X	X	X	X	X
Motorcycle	X	X	X	X	X	X	X	X
Hand tractor	X	X	X	X	X	X	X	X
Large tractor			X					
Hyundai pick-up	X		X	X	X	X	X	
TV, satellite dish, and CD	X	X	X	X	X	X	X	X
Boat			X	X				
Electrification	2007	2005	2008	2001	2005	2006		

X = acquisition of durable items by villager, — = CD = compact disc, TV = television.

Source: Independent Evaluation Mission.

13. Table A9.6 illustrates the diminishing reliance on wild food except for fish. In the recent participatory poverty assessment where only poor villages were selected, a similar trend was

noted. While the wild meat portion of the diet had decreased, the wild vegetable portion had remained the same. Prices for fish have risen considerably since the road was completed.⁴ Some wildlife also continues to appear with market prices, especially wild pigs and deer, as well as squirrels and other small animals.

Table A9.6: Sources of Food

District	Village	Kind	Before		After	
			Wild (%)	Domestic (%)	Wild (%)	Domestic (%)
Samakkhixai	Sok Kham	Fish	90	10	50	50
		Meat	50	50	20	80
		Vegetable	70	30	40	60
		Fruit	60	40	20	80
	Beng Phoukham	Fish	100	0	50	50
		Meat	60	40	30	70
		Vegetable	30	70	30	70
		Fruit	60	40	10	90
Xanakham	Khoc Khao Do	Fish	100	0	95	5
		Meat	30	70	1	99
		Vegetable	50	50	40	60
		Fruit	30	70	10	90
	Na Sack	Fish	100	0	95	5
		Meat	30	70	10	90
		Vegetable	50	50	50	50
		Fruit	20	80	10	90
Hom	Phon Lao	Fish	100	0	80	20
		Meat	50	50	10	90
		Vegetable	50	50	30	70
		Fruit	30	70	10	90
	Meuang Long	Fish	100	0	80	20
		Meat	50	50	30	70
		Vegetable	50	50	30	70
		Fruit	30	70	20	80
Xam Tai	Dan Xam	Fish	100	0	80	20
		Meat	60	40	20	80
		Vegetable	50	50	30	70
		Fruit	30	70	10	90
	Phiang May	Fish	100	0	90	10
		Meat	50	50	30	70
		Vegetable	50	50	30	70
		Fruit	20	80	10	90

Source: Independent Evaluation Mission.

14. **Access to Social Services.** Health care was found generally not to be a major problem in the areas surveyed. Health-related behavior is changing, in particular, more frequent use of clinics and hospitals has been reported (Table A9.7). The roads have contributed to the accessibility of health services. During preconstruction periods, people opted for traditional healing because of the difficulty of reaching a clinic or hospital. The occurrence of sexually transmitted diseases is not a concern in the project areas. Only two isolated cases were reported of women who traveled to Thailand and died from HIV/AIDS.⁵

⁴ Fish are divided into species with scales (*ket*), such as carp or tilapia, and fish without scales (*nang*), such as catfish or snakeheads. The latter are more valuable because they are considered to have a better taste.

⁵ Human immunodeficiency virus/acquired immunodeficiency syndrome.

Table A9.7: Access to Health Services

District	Village	Health-Related Observations	Before	After
Samakkhixai	Sok Kham	1. Time to clinic or hospital 2. Use of health care facilities 3. Healing preference 4. Opium addiction 5. Latrines 6. Water supply	2 hours (car) No facilities More traditional No No No	Health care in the village Many facilities Go to clinic or hospital No No Yes
	Beng Phoukham	1. Time to clinic or hospital 2. Use of health care facilities 3. Healing preference 4. Opium addiction 5. Latrines 6. Water supply 7. HIV/AIDS	2 hours (car) No facilities More traditional No No No No	Health care in the village Facilities Go to hospital No 15 families 5 pumps 1 pers, girl, 22 years died 2008
Xanakham	Khoc Khao Do	1. Time to clinic or hospital 2. Use of health care facilities 3. Healing preference 4. Opium addiction 5. Latrines 6. Water supply	1 hour (boat) Infrequent More traditional No No No	10 minutes (motorcycle, boat) Infrequent More traditional No All families All families
	Na Sack	1. Time to clinic or hospital 2. Use of health care facilities 3. Healing preference 4. Opium addiction 5. Latrines 6. Water supply 7. HIV/AIDS	3 hours (boat) Infrequent More traditional No No No No	10 minutes (motorcycle, car) Infrequent More traditional No All families All families 1 pers, girl 23+, died 2008
Hom	Phon Lao	1. Time to clinic or hospital 2. Use of health care facilities 3. Healing preference 4. Opium addiction 5. Latrines 6. Water supply	1 hour (walk) Infrequent More traditional Yes None No	10 minutes (motorcycle, hand tractor) More frequent Less traditional Not sure 36 families 5 pumps
	Meuang Long	1. Time to clinic or hospital 2. Use of health care facilities 3. Healing preference 4. Opium addiction 5. Latrines 6. Water supply	12 hours (walk) Infrequent More traditional About 40 No No	1 hour (motorcycle, hand tractor, car) More frequent Less traditional About 25 persons 10 families No
Xam Tai	Dan Xam	1. Time to clinic and hospital 2. Use of health care facilities 3. Healing preference 4. Opium addiction 5. Latrines 6. Water supply	5 hours (walk) Infrequent More traditional Some No No	20 minutes (motorcycle, hand tractor, car) More frequent Go to hospital About 10 persons 50 families 3 pumps
	Phiang May	1. Time to clinic and hospital 2. Use of health care facilities 3. Healing preference 4. Opium addiction 5. Latrines 6. Water supply	5 hours (walk) Infrequent More traditional Some No No	20 minutes (motorcycle, hand tractor, car) More frequent Go to hospital About 10 persons All families 5 pumps

Source: Independent Evaluation Mission.

15. Education indicators have shown significant improvement.⁶ Four of the surveyed villages had no school prior to road improvement whereas all of them do now (Table A9.8). The number of grades available has also risen, and all villages have at least some students continuing their education beyond the grades available in the village. Likewise, the number of teachers has increased and now it is easier for teachers to access villages where they have been assigned. But the costs of sending a child to school have now risen considerably, more than double in communities where costs from before the road improvement were remembered. Thus, while incomes have risen, so too have costs.

Table A9.8: Access to Education Services

District	Village	Education	Before	After
Samakkhixai	Sok Kham	1. School building	1	1
		2. Grade	3	5
		3. Teacher	2	3/1 female
		4. Student	Cannot recall	84/39 female
		5. Cost	100,000	250,000/year
		6. Continue education	—	15/7 female
	Beng Phoukham	1. School building	No school	1
		2. Grade		5
		3. Teacher		5/2 female
		4. Student		89/42 female
		5. Cost		400,000/year
		6. Continue education		20/8 female
Xanakham	Khoc Khao Do	1. School building	1	1
		2. Grade	5	6
		3. Teacher	Cannot recall	7/2 female
		4. Student	Cannot recall	183/69 female
		5. Cost	Cannot recall	700,000/year
		6. Continue education		50/26 female
	Na Sack	1. School building	1	2
		2. Grade	5	12
		3. Teacher	3	26/8 female
		4. Student	Cannot recall	534/327 female
		5. Cost	200,000/year	1,000 000/year
		6. Continue education		80/48 female
Hom	Phon Lao	1. School building	No school	1
		2. Grade		3
		3. Teacher		3/2 female
		4. Student		70/40 female
		5. Cost		500,000/year
		6. Continue education		15/7 female
	Meuang Long	1. School building	No school	1
		2. Grade		6
		3. Teacher		7/2 female
		4. Student		161/70 female
		5. Cost		350,000/year
		6. Continue education		18/5 female
Xam Tai	Dan Xam	1. School building	1	3
		2. Grade	5	9
		3. Teacher	5 teachers	13/4 female
		4. Student	Cannot recall	87/42 female
		5. Cost	100,000	300,000
		6. Continue education		15/7 female

⁶ What is not provided here are attendance figures because these numbers are not recorded. Enrollment is often deceptive. It would also be good to know dropout rates since these are often high in areas with minority populations, especially when teachers do not speak the language of the students. More study would be needed to address these issues, and they are important when assessing the ultimate impacts of the roads on ethnic minorities.

District	Village	Education	Before	After
	Phiang May	1. School building 2. Grade 3. Teacher 4. Student 5. Cost 6. Continue education	No school	1 2 1 32/17 female 250,000/year All students

Source: Independent Evaluation Mission.

16. **Access to Markets.** Road improvement has led to changes in travel purpose and patterns (Table A9.9). Before road improvement, villagers travel to markets primarily to make purchases rather than to sell produce. Following road improvement, villagers, with the exception of those on C4 road, now travel to markets to both buy goods and sell produce. The roads have increased the mobility of women despite the fact that transport costs have also increased considerably. In most areas, women now make more trips to the markets than men, unlike before road construction. The exception is in Houaphan, where men still make market trips more often than women. In some instances, women make purchases in order to resell things in the local village market. Costs of transportation from before were not available, but from the project completion report of the consultant,⁷ costs were reported to have increased by 75% on the average. Nothing to contradict this was found during the assessment.

17. The socioeconomic assessment also found that travel time was not a major factor in establishing the value of roads for the Lao PDR villagers. Level of energy, cost, and convenience are more important as indicators. Road presence is associated with savings in energy rather than savings in time since they have been able to use vehicles instead of walking. The important distinction is between walking and motorized transport.

Table A9.9: Access to Markets

District	Village	Before	After
Samakkhixai	Sok Kham–Attapeu Market (36 km)	Men. By walking. For minor purchases.	Men and women. By motorcycle and bus. Both to sell vegetables and NTFPs and to purchase miscellaneous condiments and foods. Travel cost is KN5,000.
	Beng Phoukham–Xekong (25 km) and Attapeu (40 km)	Men. By bus. For minor purchases.	More women than men. By bus and motorcycle. Both to buy salt, MSG, clothing, etc., or to sell in the village market. Travel cost is KN10,000 (Xekong), KN20,000 (Attapeu).
Xanakham	Khoc Khao Do to Non Savanh (1 km)	Men. By bus. To buy salt, MSG, clothing, etc.	More women than men. By walking, motorcycle, and hand tractor. Both to sell vegetables and NTFPs and to purchase miscellaneous condiments and foods.
	Na Sack–Paklay Market (7 km across the Mekong River)	Men. By motorcycle and boat (more often by boat). For minor purchases.	More women than men. By motorcycle and hand tractor (by the barge) and boat (sometimes). Both to sell vegetables and to purchase miscellaneous condiments and foods.
Hom	Phon Lao to Hom Market (3 km)	Women. By walking. To buy salt, MSG, etc.	More women than men. By motorcycle and walking (women walk). Both to sell vegetables and NTFPs and to purchase miscellaneous condiments and foods.
	Meuang Long to Hom Market (45 km)	Male. By walking and bus. To buy condiments, clothing, etc.	More men than women. By bus, motorcycle, and hand tractor. Both to sell vegetables and NTFPs and to purchase miscellaneous condiments and foods.
Xam Tai	Dan Xam to Xam Tai (20 km)	Men. By walking. To buy salt, MSG, clothing, etc.	More men than women. By motorcycle, hand tractor, and bus. To purchase miscellaneous condiments and foods. Travel cost is KN10,000.

⁷ Maunsell Limited/AECOM. 2007. *Rural Access Roads Improvement Project (ADB/9) Project Completion Report*. Auckland.

District	Village	Before	After
	Phiang May to Xam Tai (21 km)	Men. By walking. To buy salt, MSG, clothing, etc.	More men than women. By motorcycle, hand tractor, and bus. To purchase miscellaneous condiments and foods. Travel cost is KN10,000.

km = kilometer, KN = Lao People's Democratic Republic kip, MSG = monosodium glutamate, NTFP = nontimber forest product.

Source: Independent Evaluation Mission.

18. **Opium Eradication.** The feeder road 1 (FR1) extending south from Xam Tai to Moung Nam was not passable and so could not be visited during the IEM. The other feeder roads lead to villages where opium is being cultivated as well (Box A9.2), although the area of cultivation has been reduced. Attempts to discuss issues related to opium production were unsuccessful since this is a sensitive issue.

19. The project covered 52 villages out of approximately 400 that used to grow opium poppy in Houaphan province. UNODC's recent surveys indicate that opium poppy cultivation could be increasing in the other remote areas of the country including some of the more remote regions of districts of Houaphan province that were not covered by the project.⁸ This could be attributed to the increase in the price of opium and a fall in the prices for alternative commodities such as tea, rubber, and fruits, as a result of the recent global financial crisis.⁹ In addition, the recent increase in opium production in other areas could also be caused by the lack of other development interventions. Other reasons for the increase in opium production are (i) the impacts of crop substitution activities are not yet visible; (ii) opium as a medicine is hard to replace, creating a demand for the product; and (iii) the opium addiction within Houaphan has continued, creating a sustained domestic demand. UNODC notes that the price of dry opium has almost doubled in Myanmar since 2004 from \$153 per kilogram (kg) to \$301 in 2008.¹⁰ In the Lao PDR, the price of dry opium has increased from \$974 per kg in 2007 to \$1227 per kg in 2008.¹¹ This indicates higher demand for opium in the Lao PDR.

Box A9.2: Conditions on Feeder Roads

The area visited consists of two *khets* or clusters of villages located in Xam Tai District of Houaphan Province in northeastern Laos. The soils here are very good for upland or dry rice production and even on a strict return-on-land basis measuring yields per hectare, that is, without factoring the higher labor demands of rice cultivation, the swidden yields are considerably higher than those from the rice. Because of the good soils, the area was formerly noted for its quality opium production as well, which motivated the government and international organizations to undertake eradication of opium production, a move that has negatively impacted the lives and well-being of the local people.

The approach to opium eradication has involved relocation and consolidation of villages into focal zones and village clusters and the official stance is now that the territory is opium-free, and none of the villagers present at our discussions would contradict that statement. On the other hand, they provided numbers of opium addicts, some of which were very high, so we can only assume that some opium is still being produced to cater to the needs of the addicts and no doubt for medicinal purposes.

Many addicts have participated in detoxification programs sponsored by UNODC, but the rate of recidivism is high if not total, and in some villages the number of addicts is on the increase. This is to be expected when the root social-psychological conditions leading to addiction have not changed and may, in the face of land and water shortages, become worse in the near future.

⁸ Surveys have been conducted by UNODC in 2008 and 2009. Results of the surveys were discussed during the field visits with UNODC staff.

⁹ Average price of dry opium increased from \$974 per kilogram in 2007 to \$1,227 per kilogram in 2008 (Source: UNODC. 2008. *Opium Cultivation in South East Asia Lao PDR, Myanmar, and Thailand*. Manila).

¹⁰ Jagan, Larry. 2009. *Burma's Opium Poppy Growers Return to their Fields*. Mizzima. 3 February.

¹¹ UNODC. 2008. *Opium Cultivation in South East Asia Lao PDR, Myanmar and Thailand*.

Opium is measured in weights called *bak*, where 10 *bak* equal one *hong* and 10 *hong* equal one *pông*. One kilogram is equal to 2.6 *pông*. Depending on frequency, an addict consumes one *bak* every 1–3 days, at a cost of KN35,000 per *bak*. The combined cost, including the apparatus, lamp oil, and so on, is between KN3 and KN5 million per year per addict.

Addiction has given rise to petty thievery in a social setting that is otherwise free from social problems. Most of these are said to be Hmong. It should be stressed that although villages of different ethnic groups have been consolidated into one, the ethnic groups still strongly maintain their own ethnic identity, and live in ethnically distinct quarters of the village. That is, while there has been consolidation, there has been no integration. That being said, relations between the groups are mostly peaceful and respectful, each group participating in, and contributing to, the religious festivals of the others. The situation, however, needs to be closely monitored, as there are some signs of growing discontent. The Tai-Thay groups, for example, accuse the Hmong of overfarming the mountains, which affects the water supply in the lowlands (the Hmong cultivate more land per family, 3 hectares each on the average, compared to one hectare for the Khmou and Tai groups.)

So while in the past the project area was always considered to be relatively prosperous, today, following the concentration of populations into smaller areas where production land is fast becoming a scarce commodity, economic conditions are deteriorating. Concentration of population means depletion of natural resources, and this is especially evident in the percentages of wild versus domestic meat sources in the diets, which have now shifted dramatically to regimes that rely on domestic livestock for meat, whereas in the not too distant past wild animals and mammals provided the bulk of the meat for home consumption.

KN = Lao People's Democratic Republic kip, UNODC = United Nations Office for Drugs and Crime.
Source: Independent Evaluation Mission.

20. The attempt to eradicate opium growing in the Lao PDR shows mixed results. A measure of success can be concluded, since very little opium in the Lao PDR has ever reached the international market. In fact, only 5% of the world's opium originates from Southeast Asia and 90% of that comes from Myanmar's Northeastern Shan State.¹² Only 0.45% of the combined production from the Lao PDR, Viet Nam, and Thailand reaches the international market.

22. **Industrial Development.** As stated in Appendix 7, the development of PBM's mines in the C3 road area has contributed to growth and industrial development in the C3 area. The benefits include (i) job creation for local people in the mines and employment opportunities in related industries; (ii) merchandise exports of copper and gold and government revenues through duties, taxes, royalties, and rent; and (iii) access to basic services (i.e., transport and communications, housing, health, and education).

¹² Bell, Bethany. 2007. *Burmese Opium Production Soaring*. BBC News. 10 October; and footnote 10.

ASSESSMENT OF ENVIRONMENTAL IMPACTS AND SAFEGUARDS

1. **Background.** This section provides an assessment of the environmental impacts and safeguards during preparation, construction and postcompletion of the Rural Access Roads Project.^{1,2} The review is part of an Independent Evaluation Mission (IEM) conducted during the period 10 to 29 May 2009 in the Lao People's Democratic Republic. Field visits were made to the four subproject roads, namely, C1 Road (Attapeu–Senamnoy), C2 Road (Na Sack–Khoc Khao Do), C3 Road (Thong Khoun–Longsan, and C4 Road (Huay Hung–Xam Tai). The evaluation is based on the following: (i) field visits, (ii) discussions with local people, (iii) discussions with government officials, and (iv) a review of project documents.

2. **Changes in Environmental Setting.** The present environmental setting of each subproject road is briefly compared with the preconstruction situation as described in the environmental impact assessment (EIA) report prepared in 2000.³ This comparison will help determine if there are environmental changes that the roads have caused or induced along their routes (Table A10.1).

Table A10.1: Changes in Environmental Settings

Road	Environmental Setting		Significance of Change
	Before Construction	Present	
C1	Villages, rice fields, swidden areas, flood-prone sections, reforestations, no sightings of large wild animals	Villages, rice fields, swidden areas, flood-prone sections, reforestations dominated by young trees, no sightings of large wild animals	Insignificant
C2	Secondary forest, villages at both ends, sightings of large wild animals	Mostly farmland conversion from secondary forest, secondary forest, villages at both ends, sightings of large wild animals	Significant
C3	Largely settled with several villages, rice fields, swidden areas, some reforestation areas	Largely settled with several villages, rice fields, swidden areas, some swidden areas converted to tree plantations, some reforestation areas, road alignment of some sections modified by Phu Bia Mining Limited	Moderate
C4	Several villages, road section through NBCA, rice fields, swidden areas, reforestation	Several villages, road section through NBCA, rice fields, swidden areas, some swidden areas under intensive cultivation, little secondary forest, no sightings of large wild animals	Moderate

C = contract, NBCA = national biodiversity conservation area.

Source: Independent Evaluation Mission.

3. Overall, the C2 route exhibits the most pronounced change among the four subproject roads. C3 and C4 routes have relatively moderate changes compared to the preconstruction conditions. C1 route has changed very little, since it had been used intensively during the

¹ ADB. 2000. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant to the Lao People's Democratic Republic for the Rural Access Roads Project*. Manila (Loan 1795-LAO[SF], for \$25 million, approved on 7 December).

² Janolino, Ruel. 2009. *Evaluation of Environmental Impacts and Safeguards of Loan 1795-LAO (Draft)*. Manila: ADB.

³ ADB. 2000. *Summary Environmental Impact Assessment of the Proposed Rural Access Roads Project*. Manila.

preconstruction period and had connected two road sections previously upgraded under the Sixth Road Improvement Project.⁴

4. **Present Situation of Quarry Sites.** Quarry sites of aggregates used during the construction of the roads were visited. Quarry sites in C1 and C3 roads have been operated by new owners and are supplying aggregates to the local construction industry. Phu Bia Mining Limited, a heavy road user of the C3 road, is using the aggregates from the original quarries in maintaining the road. Quarry sites at C2 and C4 roads are land-based and no longer being used. Presently, these sites do not pose hazards to people and animals.

5. **Environmental Impacts and Risks.** The present environmental impacts of the subproject roads are examined in order to derive inputs for (i) better road management, and (ii) effective planning for environmental safeguards of future road projects. Environmental issues include the following: (i) land use and ecological changes, (ii) erosion and sediments, and (iii) environmental risk (Table A10.2).

6. **Environmental Safeguards Compliance.** An environmental safeguards review of the Rural Access Roads Project was made with due regard to the available guidance documents during its preparation and construction. The project's EIA was completed in 2000 at a time when ADB did not have an environment policy. However, environmental assessments of projects were then guided by ADB's 1998 guidelines on environmental assessment.⁵ During project implementation, ADB's Environmental Policy became operational in 2002,⁶ while the subproject roads were completed only in 2006. Construction contracts of all subproject roads were only awarded in July 2002. Hence, ADB's Operations Manual F1 (Environmental Considerations in ADB Operations), issued on 29 October 2003, applies.

7. Table A10.3 presents snapshots of what transpired regarding environmental safeguards. Information can be gleaned from project documents, which include the following: (i) EIA and environmental management plan (EMP), (ii) contract documents, and (iii) environmental monitoring reports.

8. **Recommendations and Follow-Up Actions.** Recommended follow-up actions include:

- (i) A clear and detailed description of proposed mitigating measures should be provided in the EMP so that they can easily be translated into specific requirements in the contract specifications and operations manual of future road projects.
- (ii) Detailed project-specific contract clauses for environmental protection and management should be included in the bidding documents of future road projects. This proposal is echoed by ADB's *Environmentally Responsible Procurement (2007)*,⁷ which recommended that technical specifications shall include a subsection on project-specific environmental protection and mitigation requirements and responsibilities.
- (iii) Contractors of future road projects should be required to submit a contractor's environmental management plan (CEMP) detailing the environmental mitigating measures to be implemented. This will enable the construction management

⁴ ADB. 1993. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance to the Lao People's Democratic Republic for the Sixth Road Improvement Project*. Manila (Loan 1234-LAO[SF], for \$26 million, approved on 1 June).

⁵ ADB. 1998. *Environmental Assessment Requirements of the Asian Development Bank*. Manila.

⁶ ADB. 2002. *Environment Policy of the Asian Development Bank*. Manila.

⁷ ADB. 2007. *Environmentally Responsible Procurement: A Reference Guide for Better Practices*. Manila.

team to easily check the implementation of the mitigating measures, since the CEMP will specify what to implement, how to implement, where to implement, and when to implement. The requirement to submit a CEMP should be clearly provided in the contract documents for road construction.

- (iv) The Environmental and Technical Division should quickly restore its capacity to handle safeguards work by hiring new staff with the necessary skills in social and environmental safeguards. More funding is necessary for a capacity-building program.
- (v) While acknowledging the need to increase food production, the continued conversion of secondary forests to farmlands should be evaluated carefully against the need to conserve natural resources for the use of future generations. The Law on Land (Law 01/97 NA as amended) serves as reference to this concern, which provides in its Article 6 that land use shall not have a negative impact on the natural or social environment. Strict land use control is necessary to avoid further habitat fragmentation and loss.
- (vi) Avoidance of landslides should be one of the primary concerns in designing and constructing road cuts in mountainous sections. Displaced materials in landslides should be removed as quickly as possible to avoid sending tons of soil materials to streams and clogging the road ditches.
- (vii) Drainage turnouts or tail ditches should be designed and constructed not simply to release runoffs but also with a view to avoiding soil erosion by providing adequate outlet protection.
- (viii) The Ministry of Public Works and Transport (MPWT), together with the local officials, should prepare a spills response plan specific to C2 and C4 roads. It should contain, at least, procedures on how to (a) stop the flow of spills, (b) contain spills to prevent them from spreading, including the storage of absorbent material, (c) clean up spills, and (d) notify the authorities concerned. MPWT could start by preparing a list of who are transporting hazardous materials and the quantities being transported along these routes. For now, the most obvious transporters are those transporting fuel.

Table A10.2: Environmental Impacts and Risks of Subproject Roads

Land Use and Ecological Changes	Erosion and Sediments	Environmental Risk
<p>Land use change and the associated ecological consequences are important issues for the postconstruction period of the subproject roads.</p> <p>Presently, the presence of swidden areas along all the routes is a prime catalyst for land use change and has great influence on the long-term ecological changes. The increasing number of people living near the road has also increased the need for food production. This necessitates the intensive use of the swidden fields resulting in a purely slash-and-burn farming practice without due regard for the secondary forest. This practice, particularly on steep slopes, has a long-term negative impact on the fertility of the land since the topsoil will slowly be eroded. It will also affect the surface water quality due to the sediments released from these fields that will ultimately reach the streams.</p> <p>Some swidden areas are already converted into plantations of trees and plants with higher commercial values such as along C3 and C2 roads. With the good access provided by the improved roads, more swidden areas are expected in the future as the population along the road increases. Consequently, the ecological setting of the entire routes will ultimately change.</p> <p>The continued land use conversion of a once forested area into farmlands, such as the C2 road, is a concern. This will further reduce the available habitat for wildlife. The improved road undoubtedly contributes to increased accessibility into the remaining forested areas.</p>	<p>Water quality of streams receiving storm runoffs from roads are adversely affected by the amount of sediments carried by storm runoffs. Sediments could come from road erosion and landslides. The sediments can quickly destroy aquatic habitats, smother bottom-dwelling animals, and damage fish-spawning areas. Large quantities of loose soil materials can also block the road drainage system and threaten road stability.</p> <p>Landslides occurred in the cut slopes of C2, C3, and C4 roads. Although there are various causal factors in landslides, the steepness of the cuts of these roads has considerable influence on their occurrence. In some sections, and landslides are threatening to block the road. A particular section in the C4 road has been reported to have had landslides on several occasions in the past. There are also landslides at the mountainous section of the C2 and C3 roads and several have occurred previously. C1 road is free of landslides because it is on a relatively flat terrain.</p> <p>Another major source of sediments is the erosion of the drainage turnouts or tail ditches. Turnouts help maintain a stable velocity and proper flow capacity within the road ditches by releasing the storm runoffs in a timely manner from the ditches before its erosive force increases to levels that will destroy the unlined ditches and outlets. However, a turnout without protection from the erosive force of the storm runoffs could lead to gully erosion such as the one on C1 road. This can continuously release sediments during rainy periods.</p>	<p>Roads have an associated environmental risk caused by the transport of materials. This is more pronounced in new road sections. A very significant increase in environmental risk is highlighted for the mountainous section of C2 road since it is now possible to transport chemicals and hazardous materials (pesticides, oil, etc.) through an area previously not passable to vehicular traffic. Accidents involving spills of such materials can seriously threaten the environment near the accident sites and the receiving streams. The impact can be experienced even up to far places where runoffs can carry the spilled materials. The negative impact could be significant since wildlife in downstream areas will be affected such as those drinking in streams. Aquatic organisms, such as fish, are very vulnerable to such risk. This mountainous section of C2 road is contiguous with a large forested area inhabited by wildlife. Increased environmental risk is also highlighted in C4 road since it cuts through a protected area with a major stream located immediately below the road.</p>

C = contract.

Source: Independent Evaluation Mission.

Table A10.3: Developments in Environmental Safeguards Compliance under the Rural Access Roads Project

Environmental Safeguards in Planning and Design	Environmental Safeguards During Construction	Environmental Safeguards During Operation	Environmental Loan Covenants Compliance
<p>Sound environmental planning should start at the earliest stages of project preparation with a good environmental assessment study. The environmental protection to be provided during the construction phase is highly dependent on the appropriateness and effectiveness of mitigation measures identified during the environmental assessment. Providing good details of the mitigating measures in the EMP is essential in developing effective contract specifications for environmental protection. For Loan 1795-LAO, the EMP was weak in this aspect. It only provided a general framework for environmental protection. It did not contain enough details to be translated into effective contract specifications for environmental requirements.</p> <p>Some of the mitigating measures are discussed to illustrate the weakness of the EMP. For example, with regard to mitigation measures for construction-related noise and vibration in the C4 road, the EMP simply required sound attenuating devices for the equipment but did not provide more detailed requirements for the road section traversing the protected area. Animals are known to be sensitive to construction noise. Use of heavy machinery during construction produces intermittent and localized noise, but can be tremendous and sustained during equipment operation that can adversely affect wildlife. This is the same situation for the C2 road where the mountainous section will cut through an existing wildlife habitat. There were no detailed requirements for construction-related noise and vibration in the mountainous section of C2 road. Similarly, the required mitigation measure for vibration in sensitive zones was simply a general statement requiring vibration attenuation.</p> <p>A cursory review of the EMP during the preparation phase may have failed to notice that it addresses</p>	<p>Information concerning the project's compliance with the requirements for environmental safeguards during the construction period was obtained from previous reports of the International Union for the Conservation of Nature (IUCN) and from random interviews of people living along the roadsides. IUCN was the third party monitor engaged by the previous Ministry of Communication Transport, Post, and Construction (MCTPC) now called the Ministry of Public Works and Transport (MPWT), to conduct annual missions for reviewing the implementation of environmental mitigating measures.</p> <p>IUCN's environmental monitoring reports during the construction period revealed the project's poor compliance with environmental safeguards. IUCN reported in its third Environmental Monitoring Mission conducted in December 2005 that it was disappointed with the implementation level of the environmental mitigation measures suggested in previous monitoring missions. Most of IUCN's recommendations were not implemented during road construction. The problem was raised by IUCN as early as the inception stage of its monitoring wherein the environmental concerns and recommendations of the project's supervision consultant were not being implemented by the contractors.</p> <p>Based on IUCN's reports, it appears that the construction management team was not sensitive to environmental issues or the situation may have been beyond their control since the contractors were able to</p>	<p>Compliance with environmental safeguards during operation hinges mainly on the institutional capacity of the Department of Roads (DOR) of MPWT, particularly the Environmental and Technical Division (ETD). It is a new division created by the ongoing reorganization at DOR and responsible for mainstreaming the social and environmental aspects in the road sector. It merges the former Environment and Social Division (ESD) with the Planning and Technical Division.</p> <p>During reorganization, staff specialists of the former ESD were transferred to MPWT's Public Transport Institute (PTI) as a new unit that will handle policy level work for the entire ministry. This move left the new ETD without any staff that has the necessary skills for safeguards work. It is a big setback in the efforts of building the long-term capacity in DOR for a dedicated safeguards unit with staff equipped in skills for directing and supervising social and environmental work.</p> <p>Adequate institutional capacity is necessary since ETD has to work with other government agencies and local officials on the following issues previously identified by the EIA report: (i) oil</p>	<p>Three out of five environmental loan covenants were fully complied with, while there was only partial compliance with the other two.</p> <p>The first environmental covenant entailed minimizing the project's environmental impacts and required their monitoring during implementation. This was partly complied with through the (i) EIA preparation, (ii) EMP preparation, and (iii) IUCN monitoring activities. However, the EMP was weak and the contractors were able to repeatedly ignore the recommendations of IUCN and that of the project's supervision consultant concerning mitigating measures implementation.</p> <p>With regard to increasing the staff of DOR's environmental and social unit (environmental covenant 2), this was initially complied with by appointing additional staff. However, the present reorganization at DOR has negated this compliance since its newly created ETD, responsible for social and environmental aspects in the road sector, has been left without any staff that has the necessary skills for safeguards work when staff specialists of the former ESD were transferred to PTI. According to the ETD director, DOR will correct the situation by</p>

Environmental Safeguards in Planning and Design	Environmental Safeguards During Construction	Environmental Safeguards During Operation	Environmental Loan Covenants Compliance
<p>some issues inappropriately. The EMP presented some inadequate mitigating measures giving the impression that technical aspects of road construction were not fully examined for its potential environmental impacts. For example, the mitigating measure for interference with wildlife migration routes simply requires the contractor to maintain forest cover as close to the edge of the road as possible. This mitigating measure failed to recognize that in mountainous sections, such as on C2 road, cuts on slopes will virtually make it impossible for some large animals to cross the road at that particular section. In addition, wildlife migration is a complex ecological phenomenon that requires detailed study to ascertain if the route will cause impediments. A comprehensive review of the EMP will surely not miss this particular issue.</p> <p>The lack of more details of the mitigation measures for construction-related impacts in an EMP can still be corrected during the design stage where more specific information is available for particular sections of each road. However, for Loan 1795-LAO, this was not done and the summary table of mitigation measures from the EMP was simply attached to the contract specifications of bidding documents. The outright inclusion of the entire summary table in the contract specifications was confusing, since it included a statement that mitigation measures are to be implemented on the construction contract when not all of those measures are the responsibility of the contractor.</p>	<p>repeatedly ignore the recommendations of IUCN and that of the project's supervision consultant. Knowledge and sensitivity to environmental issues are essential for the application of environmentally sound construction management practices in order to reduce significantly or avoid the environmental impacts of road construction.</p> <p>Random interviews of the people living along the roads revealed that during the construction period there were no significant construction problems. The people remembered few instances of dusty road conditions during construction, but according to them these were corrected by the contractors through water spraying in the sections near the villages. In general, the people deemed the level of inconvenience during the construction period to be acceptable. They are very happy to have a paved road.</p>	<p>spills and hazardous materials transport, (ii) induced development into ecologically sensitive areas, (iii) impairment of fisheries and aquatic ecology, and (iv) increased pressure on nontimber forest products (NTFP).</p>	<p>hiring new staff.</p>

C = contract, LAO = Lao People's Democratic Republic.
Source: Independent Evaluation Mission.

ROAD SAFETY

1. Tables A11.1 and A11.2 are based on road accident statistics provided by the Office of Roads and Bridges of the respective provincial department of the Ministry of Public Works and Transport of each subproject road. Overall, motorcycles accounted for highest accident rates followed by cars, pick-ups and others. From 2000 to 2008, the average number of fatalities per 10,000 vehicles was between 9 and 15 persons per year. Most of the victims were between 19 and 31 years of age with the highest rate between 25 and 30 years old.

2. The incidence of road accidents in the subproject roads increased from an average of 161.5 accidents per year during 2004–2005 to 179.6 accidents per year between 2006 and 2008 (Table A11.1). In 2007, the proportion of subproject road accidents to the total road accidents in the country was 0.038: 1. This ratio was slightly above the period average of 0.030: 1 during 2004–2005 before road completion. The high incidence is largely due to traffic accidents on the C1 road.

Table A11.1: Road Accident Statistics
(number)

Item	2002	2003	2004	2005	2006	2007	2008
A. Number of Accidents							
C1 Road	50	33	31	87	33	135	148
C2 Road	...	...	5	8	7	8	4
C3 Road	...	...	6	9	10	21	26
C4 Road	...	...	106	71	47	54	46
All Subproject Roads (a)	...	...	148	175	97	218	224
Lao PDR (b)	4,634	5,177	5,296	5,337	5,579	5,713	...
Ratio (a)/(b)	...	...	0.028	0.033	0.017	0.038	...
B. Number of Injuries							
C1 Road	53	47	54	125	41	212	150
C2 Road	...	...	4	20	37	17	24
C3 Road	...	...	14	21	37	86	68
C4 Road	...	...	193	156	74	99	86
All Subproject Roads (a)	53	47	265	322	189	414	328
Lao PDR (b)	6,313	6,699	7,162	7,485	8,037	8,279	...
Ratio (a)/(b)	...	...	0.004	0.043	0.024	0.050	...
C. Number of Fatalities							
C1 Road	3	5	4	5	6	9	7
C2 Road	...	...	1	2	5	3	4
C3 Road	...	...	1	2	4	12	14
C4 Road	...	...	18	7	5	10	12
All Subproject Roads (a)	...	...	24	16	20	34	37
Lao PDR (b)	387	426	459	494	517	548	...
Ratio (a)/(b)	...	...	0.052	0.032	0.039	0.062	...
D. Number of Vehicles Damaged							
C1 Road	78	59	31	126	47	186	150
C2 Road	...	...	3	3	8	6	9
C3 Road	...	...	3	3	8	17	30
C4 Road	...	...	110	108	98	101	76
All Subproject Roads (a)	...	...	147	240	161	310	265
Lao PDR (b)	...	...	...	...	...	...	...
Ratio (a)/(b)	...	...	...	...	...	...	...

... = not available, C = contract, Lao PDR = Lao People's Democratic Republic.
Source: Official Road-Bridge, Department of Public Works and Transport.

3. The highest number of reported traffic accidents is on C1, which has significantly increased from 33 in 2006 to 148 in 2008. Not surprisingly, the flat terrain of C1 road allows the

highest average travel speed, of about 46 kilometers per hour (kph), of the four subproject roads. It also carries the largest traffic of the four roads. On the other hand, more severe or fatal traffic accidents are reported on C2 and C3 roads (Table A11.2). While the frequency of reported accidents during 2006–2008 is lowest on C2 road, these have resulted in more serious and fatal accidents. C2 road accounts for the highest fatality rate of 0.70 per accident and injury rate of 4.47 per accident among the four subproject roads. Because of the low traffic volume, vehicles are able to travel at an average speed of 42 kph or second among the project roads. The result from C3 road follows with a fatality rate of 0.50 deaths per accident and 3.47 injuries per accident. While C3 road has the lowest average travel speed at about 35 kph, it accounts for the second largest traffic of the four roads, not to mention a large heavy vehicle presence. Both C2 and C3 roads are above the national average (2006–2007) of 0.10 fatalities per accident and 1.45 injuries per accident.

Table A11.2: Severity of Road Accidents

Item	2002	2003	2004	2005	2006	2007	2008
A. C1 Road							
Fatalities per Accident	0.06	0.15	0.13	0.06	0.18	0.07	0.05
Injuries per Accident	1.06	1.42	1.74	1.44	1.24	1.57	1.01
Fatality per Injury	0.06	0.11	0.07	0.04	0.15	0.04	0.05
Vehicle Damaged per Accident	1.56	1.79	1.00	1.45	1.42	1.38	1.01
B. C2 Road							
Fatalities per Accident	...	...	0.20	0.25	0.71	0.38	1.00
Injuries per Accident	...	...	0.80	2.50	5.29	2.13	6.00
Fatality per Injury	...	...	0.25	0.10	0.14	0.18	0.17
Vehicle Damaged per Accident	...	...	0.60	0.38	1.14	0.75	2.25
C. C3 Road							
Fatalities per Accident	...	...	0.17	0.22	0.40	0.57	0.54
Injuries per Accident	...	...	2.33	2.33	3.70	4.10	2.62
Fatality per Injury	...	...	0.07	0.10	0.11	0.14	0.21
Vehicle Damaged per Accident	...	...	0.50	0.33	0.80	0.81	1.15
D. C4 Road							
Fatalities per Accident	...	...	0.17	0.10	0.11	0.19	0.26
Injuries per Accident	...	...	1.82	2.20	1.57	1.83	1.87
Fatality per Injury	...	...	0.09	0.04	0.07	0.10	0.14
Vehicle Damaged per Accident	...	...	1.04	1.52	2.09	1.87	1.65
All Subproject Roads							
Fatalities per Accident	...	...	0.16	0.09	0.21	0.16	0.17
Injuries per Accident	...	...	1.79	1.84	1.95	1.90	1.46
Fatality per Injury	...	...	0.09	0.05	0.11	0.08	0.11
Vehicle Damaged per Accident	...	...	0.99	1.37	1.66	1.42	1.18
Lao PDR							
Fatalities per Accident	0.08	0.08	0.09	0.09	0.09	0.10	...
Injuries per Accident	1.36	1.29	1.35	1.40	1.44	1.45	...
Fatality per Injury	0.06	0.06	0.06	0.07	0.06	0.07	...
Vehicle Damaged per Accident	...	...	...	...	...	...	...

... = not available, C = contract, Lao PDR = Lao People's Democratic Republic.

Source: Official Road-Bridge, Department of Public works and Transport.

4. While accidents are more frequent on C1 road (2006–2008), these are relatively less severe. C1 road's fatality rate of 1.10 per accident and injury rate of 1.27 per accident is the lowest of the four subproject roads and closer to the countrywide average (2006–2007). The frequency of accidents on C4 road has declined from 88.5 during 2004–2005 to 49 during 2006–2008. The estimated average travel speed on C4 road is about 38 kph. Of the four roads, C4 road accounts for the largest motorcycle ownership (2006–2008) of 12,835 per year followed by C2 at 10,936.