Technical Assistance Consultant's Report

Project Number: 47085
September 2015

Lao People's Democratic Republic: Road Sector Governance and Maintenance Project
(Financed by the Asian Development Bank)

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Asian Development Bank

Lao Peoples Democratic Republic (Lao PDR)

Ministry of Public Works and Transport

ADB TA-8492 LAO:

ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085-001)

Final Report

September, 2015

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Lao Kip (LAK)

USD 1.00 = LAK 8,116

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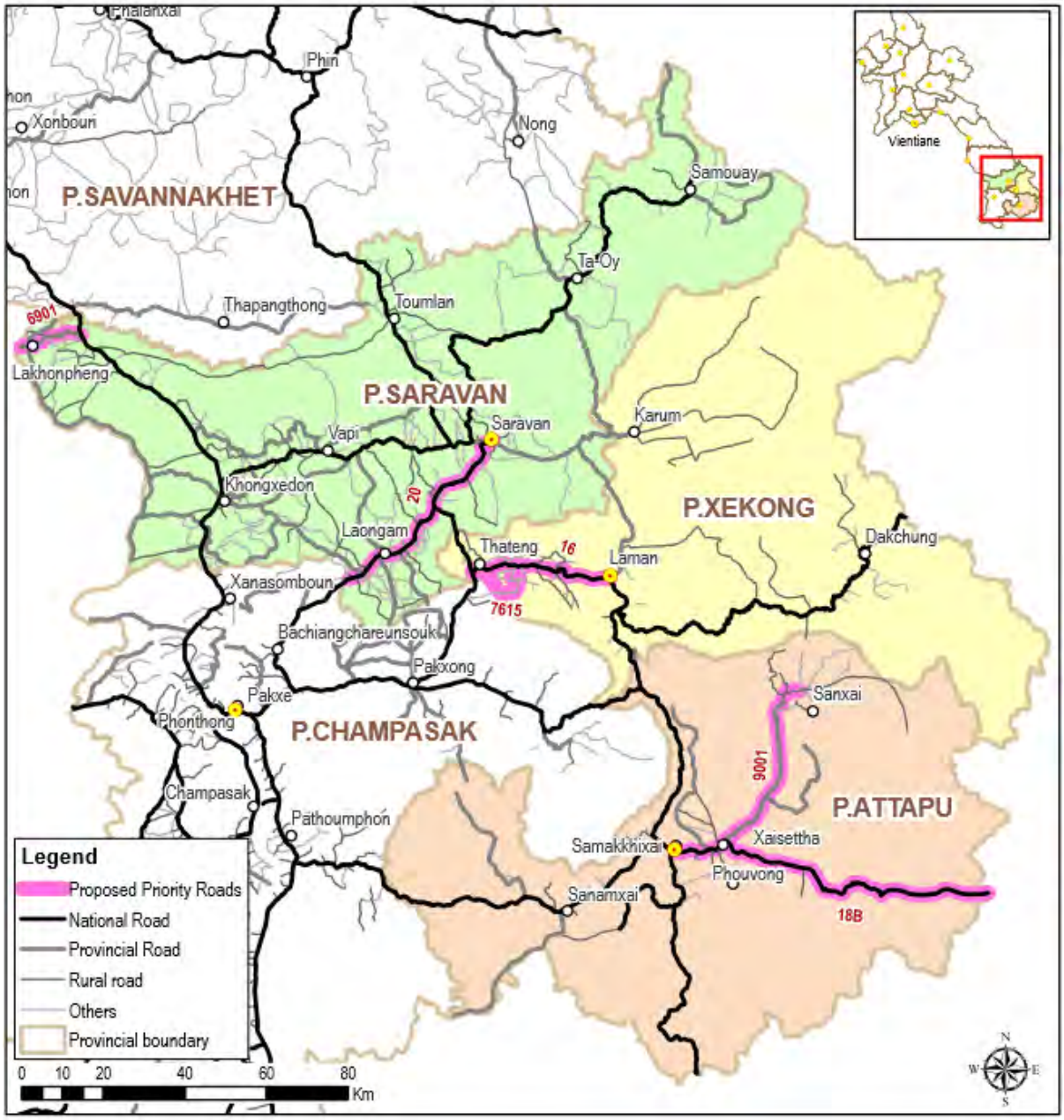


ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphaltic Concrete
ACGR	Annual Compound Growth Rate
ADB	Asian Development Bank
ADT	Average daily traffic
AIDS	Acquired Immunodeficiency Syndrome
AM	Accounting Manual
APCF	Asian Pacific Community Fund
ASEAN	Association of Southeast Asian Nations
ASR	Assessment, Strategy and Road Map
BA	Bachelor Degree
BMS	Bridge Management System
BOO	Build Own Operate
BoQ	Bill of Quantity
BOT	Build-Operate-Transfer
CaRoL	Capacity Building for Road Maintenance in Laos
CBM	Component Based Maintenance
CBR	California Bearing Ratio
CCA	Climate Change Adaptation
CDCP	Communicable Diseases Control Project
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CEFPF	Clean Energy Financing Partnership Facility
CPMU	Central Project Management Unit
CPS	Country Partnership Strategy
CPMU	Central Project Management Unit
CPU	Central Processing Unit
CSWs	Commercial Sex Worker
DAF	Department of Agriculture and Forestry
DAFO	District Agriculture and Forestry Office
DBST	Double Bituminous Surface Treatment
DCP	Dynamic Cone Penetrometer
DDG	Deputy Director General
DEF	Department of External Finance
DG	Director General
DMF	Design Monitoring Framework
DOF	Department of Finance
DOI	Department of Inspection
DONRE	Department of Natural Resource and Environment
DOR	Department of Roads
D/OPWT	District Official and Public Work and Transport

DOP	Department of Personnel
DoT	Department of Transportation
DPC	Department of Planning and Cooperation
DPWT	Department of Public Works and Transport
EA	Executing Agency
EBA	Endemic Bird Area
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
EPL	Environmental Protection Law
ESAL	Equivalent Single Axle Load
FDI	Foreign Direct Investment
FGD	Focus Group Discussion
FIDIC	International Federation of Consulting Engineers Fédération Internationale Des Ingénieurs-Conseils
FMA	Financial Management Assessment
FMM	Financial Management Manual
FMS	Financial Management System
FRP	Financial Rules and Procedures
GAP	Gender Action Plan
GIS	Geographic Information System
GMS	Greater Mekong Sub-region
GoL	Government of Lao
GPS	Global Positioning System
GRID	Gender Resource information and Development
GRM	Grievance Redress Mechanism
GVW	Gross Vehicle Weight
HDM-4	Highway Development and Management Model
HGV	Heavy Goods Vehicle
HH	Household
HO	Head Office
HIV	Human Immunodeficiency Virus
HRD	Human Resources Department
IA	Implementing Agency
IARS	Imprest Account Reconciliation Statement
ICB	International Competitive Bidding
ICD	Internal Control Division
ICT	Information and Communication Technology
IEE	Initial Environmental Examination
IOU	I-Owe-You
IP	Indigenous People
IPSAS	International Public Sector Accounting Standard
IR	Involuntary Resettlement

IRI	International Roughness Index
IRR	Implementing Rules and Regulations
ISA	International Standards on Auditing
IT	Information Technology
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau
KII	Key Informant Interview
Lao PDR	Lao People's Democratic Republic
LDV	Light Delivery Vehicle
LFA	Logical Framework Analysis
LGV	Light Goods Vehicle
LR	Local Road
LRSP	Lao Road Sector Project
LWU	Lao Women Union
MA	Master Degree
MAC	Maintenance Activities and Codes
MAF	Ministry of Agriculture and Forestry
MBD	Master Bidding Documents
MC	Motor Cycle
MCA	Multi-Criteria Analysis
Mc-LIM	Mini-contract Labor Intensive Maintenance
MCTPC	Ministry of Communication, Transport, Post and Construction
MDG	Millennium Development Goals
M&E	Monitoring and Evaluation
MGV	Medium Goods Vehicle
MOF	Ministry Of Finance
MONRE	Ministry of Natural Resource and Environment
MPWT	Ministry of Public Works and Transport
MPI	Ministry of Planning and Investment
MTPW	Masters of Technical and Professional Writing
MTR	Midterm Report
NBCA	National Biodiversity Conservation Area
NCAW	National Commission for the Advancement of Women
NCB	National Competitive Bidding
NGO	Non-Governmental Organization
NGPES	National Growth and Poverty Eradication Strategy
NPAs	National Protected Areas
NPV	Net Present Value
NR	National Road
NRSC	National Road Service Commission
O/D	Origin/ Destination
ODA	Official Development Assistance
OJT	On-The-Job Training

O&M	Operation & Maintenance
OPWT	Office of Public Works and Transport
PAM	Project Administration Manual
PAU	Project Accounting Unit
PBC	Performance Based Contract
PC	Procurement Committee
PC	Passenger Car
PCCA	Provincial Committee for Control of AIDS
PCU	Passenger Car Unit
PDD	Planning and Disbursement Division
PDH	Provincial Department of Health
PIU	Project Implementation Unit
PM	Prime Ministry
PMC	Project Management Consultant
PMS	Project Monitoring System
PMU	Project Management Unit
PPMU	Provincial Project Management Unit
PPP	Public–Private Partnership
PPTA	Project Preparatory Technical Assistance
PRA	Procurement Risk Assessment
P-RAMP	Procurement Risk Assessment and Management Plan
PRC	People's Republic of China
PrMO	Prime Minister's Office
PRoMMS	Provincial Road Maintenance Management System
PSA	Poverty and Social Assessment
PTI	Public Works and Transport Institute
PTTC	Public Works and Transport Training Center
PWT	Public Works and Transport
PWTI	Public Works and Transport Institute
RAM	Road Asset Management
REA	Rapid Environmental Assessment
RIP	Rural Infrastructure Programme
RMF	Road Maintenance Fund
RMFB	Road Maintenance Fund Board
RMP	Road Maintenance Program
RMS	Road Management System
RoW	Right of Way
RRMP	Regional Road Maintenance Project
RRMPO	Regional Road Maintenance Project Office
RRP	Report and Recommendation of the President
SAO	State Audit Organization
SAPE	Sector Assistance Program Evaluation
SBD	Standard Bidding Documents
SIDA	Swedish International Development Cooperation Agency

SOE	Statement of Expenditure
SOP	Standard Operation Procedure
SPA	Special Protection Area
SPS	Standard Procurement System
STI	Sustainable Transport Initiative
STIs	Sexually Transmitted Infections
TA	Technical Assistance
TBM	Temporary Bench Mark
ToR	Terms of Reference
TOT	Training-of-Trainers
TRL	Transport Research Laboratory
U.K	United Kingdom
UNICEF	United Nations International Children's Emergency Fund
US	United States
USD	United States Dollar
UXO	Unexploded Ordnance
VDF	Vehicle Damage Factor
VHGV	Very Heavy Goods Vehicle
VIMS	Vehicle Information Management System
VMC	Village Maintenance Committee
VMC-M	Village Maintenance Committee Modified
VOC	Vehicle Operating Cost
VUDAA	Vientiane Urban Development Administration Authority
WB	World Bank
WP	Working Paper

EXECUTIVE SUMMARY

Introduction

i. This Final Report for ADB TA 8492-LAO, "Road Sector Governance and Maintenance Project" (RSGMP) has been prepared by a project team drawn from a joint venture of *Oriental Consultants Global Co Ltd* and *International Development Center of Japan Inc.* (both companies from Japan) together with a local Lao partner *Mekong Consultants Co Ltd*, referred to hereinafter as the Consultant. The Consultant commenced the PPTA in Laos at the beginning of June 2014.

ii. A primary output of this PPTA is to identify feasible measures for strengthening the governance and institutional capacity of the MPWT and its Provincial DPWTs in undertaking road maintenance, together with identifying roads for maintenance in the 3 target provinces of Salavan, Xekong and Attapeu. The ensuing project is expected to contribute to improved road asset management at all levels of MPWT and that sustainable road asset management is implemented in the 3 southern provinces. During the assessments and preparations needed for the ensuing project, due care has been taken for fulfilling the Lao Government and ADB requirements.

iii. During the course of the PTTA, extensive consultations has been conducted with the MPWT, DPWTs, ADB, other financiers/ donors and other projects. A number of interim reports have been prepared, preceding this final report

Lao PDR Context

iv. Lao PDR is a land-locked country with the smallest population (about 6.3 mil.) of the countries in the region. The economy of Lao PDR has been growing strongly over the last decade, with the leading sectors being in hydro-power, mining, foreign assistance inflows, tourism. Forestry products exports and garment industries are also significant. In order to sustain and accelerate the economic growth transport infrastructure with sufficient standard is required.

v. The institutional arrangements for MPWT are not yet fully resolved, which is complicating the coordination between the central and local authorities. In addition MPWT/ DPWTs are not adequately using proper maintenance procedures for road maintenance management. Other constraints are lack of staff's technical capacity and experience in road maintenance management. Weak institutional capacity and poor governance contribute to MPWT and DPWT's inability to carry out necessary road maintenance works to acceptable quality, resulting in poor road conditions.

vi. Financial constraints for undertaking road maintenance is another major problem. Currently MPWT is lacking a long term strategy for self-reliable financing mechanism for road maintenance.

vii. Overloading on Lao roads is frequent, and the problem has been aggravated by the closing down of weigh stations by a Government decree in June 2011. Related to this issue is the lack of updated policies and procedures, enforcement capability and lack of equipment for axle load control.

viii. Road safety is another area where Laos has poor records. This can be addressed through road safety campaigns for the communities living along roads, improving road design manuals and specifications as well as incorporating road safety components in the detail design of maintenance contract packages.

ix. Contractors' capacity in Laos is generally low, both in preparing responsive tenders as well as in implementation, which often results in poor quality works. Their capacity can be improved by providing training to them.

Selection of project roads

x. A multi-criteria analysis process was used for selecting the project roads for maintenance. The analysis involved an evaluation of existing road conditions, potential for regional development and social/ environmental factors. The analysis resulted in that following roads were selected:

- Salavan National Road 20 and Local Road 6901;
- Xekong National Road 16 and Local Road 7615;
- Attapeu National Road 18B and Local Road 9001.

Engineering

xi. The engineering component included a considerable amount of field work on road inventories, topographical and geotechnical surveys as well as visual assessments of the present road conditions. This work provided the data for deciding the needed maintenance activities on the 6 project roads, together with required quantities of works (BoQ) as shown below. Possible climate change effects were also included in the design.

- backlogged rehabilitation and routine- and periodic maintenance;
- replacement of 4 bridges along NR 20; and
- stabilizing work on slopes along NR 18B and LR 9001.

xii. MPWT's standard Maintenance Activity Codes was adopted for preparing the respective BoQs for each road. This facilitated smooth maintenance planning and should be used also during the detail design.

xiii. Above listed works are to be implemented during the first year of the 3-years PBC, which will then be followed by the routine maintenance works that will decided during the weekly inspections of the on-going contracts.

xiv. Traffic counts and Destination/ Origin surveys were conducted for future traffic forecasts and for expected axle loads, used in the economic analysis.

Environmental

xv. For the selected project roads for maintenance, the environmental categorization was conducted utilizing the Rapid Environmental Assessment (REA) Checklist developed by ADB for the road sector. According to the assessment the project roads are classified as Category "B", as the projects are small or create few impacts on the environment and society. Based on this categorization Initial Environmental Examinations (IEEs) for the six project roads were prepared, which includes Environmental Mitigation Measures and Environmental Monitoring Plans.

Social

xvi. The Consultant has prepared a Poverty and Social Assessment (PSA) and an Indigenous Peoples Plan (IPP) for subprojects. The social safeguard for Indigenous People is categorized as "B.

xvii. The poverty reduction and social benefits for both the non-indigenous and indigenous people are perceived as outweighing the disbenefits, and mitigating measures to any potential disbenefits are proposed. Resettlement and land acquisition is not anticipated following project interventions as the projects are implemented along existing road alignments. The project will expand social and economic opportunities linking rural and urban areas in the project provinces, and creates job opportunities by involving the local communities in the maintenance works.

Cost Estimates and Financing

xviii. The project investment cost is estimated at $ 29.9 million, out of which $27.0 million is a loan from ADB and $2.9 million is financed by the Lao Government in form of counterpart staff salaries, office space and taxes/ duties (through exemption). Details of the costs are shown below

Item	**Total Cost ($ million)**
A Base Cost	
1. Civil Works	16.32
2. Consultants	6.31
3. Equipment	0.55
4. Administration	0.46
Subtotal (A)	*23.64*
B. Contingencies	*5.71*
C. Financial Charges During Implementation	*0.61*
TOTAL Project Cost (A+B+C)	**29.96**

Transport Economics

xix. The planned interventions were found to be well worthwhile. With all the costs included, the economic internal rate of return for the recommended project will comfortably exceed the chosen 12% discount rate. As benefits of the capacity-building have not been quantified, the real economic benefit is going to be even higher. The economy of the area is very dynamic and the traffic levels more than warrant the planned level of investment for maintaining the roads.

Financial Management Assessments and Analyses

xx. For the project financial management MPWT can utilize the existing institutional knowledge and ADB/ WB project experience of the Department of Finance (DOF) and the staff of the DOF's Budget, Accounting, Treasury, Assets, and Inspection Divisions. The provincial DPWTs don't have the same level of knowledge and experience, due to not having been exposed to donor funded projects in the same extent as the central level has. As such, the provinces involvement in financial management will be limited.

xxi. The State Audit Organization (SAO) is responsible to audit all financial activities of MPWT/DPWT. If there is insufficient capacity in SAO to audit, the audit is procured from the private sector.

xxii. The Lao Government is demonstrating a commitment to fully funding maintenance priorities and providing budgetary support to the RMF to meet all maintenance needs. It has also demonstrated a commitment for increases in the fuel levy that will enable a fully sustainable cost recovery mechanism for road maintenance.

Procurement

xxiii. The procurement in the ensuing project comprises of following main components:

- Rehabilitation/Maintenance works on 6 roads - $16.32 million;
- Consultants (PMC and Auditor) - $6.31 million;
- Equipment/ Tools - $0.55 million.

xxiv. MPWT/ DOR as EA/ IA has a low to medium procurement risk as they have implemented previous ADB funded projects and have adequate knowledge in ADB Procurement as well as sufficient staffing. As such, DOR-MPWT is capable of handling the procurement in the ADB funded project. On the other hand the DPWTs as Implementing Units (IUs) have medium to high procurement risk assessment as they don't have previous experience in ADB funded projects.

xxv. Based on the above findings, all the procurement in RSGMP will be managed by a procurement committee at the MPWT/ DOR level, appointed by the minister.

xxvi. Procurement under the Project will follow ADB's Procurement Guidelines. Major civil works will be procured using national and international competitive bidding procedures.

Private Sector Involvement

xxvii. Due to insufficient technical and financial capacity the MPWT has difficulties in maintaining its roads effectively. Therefor the Lao government needs to look for other sources for funding and ingenuity in road maintenance. The private sector would be a suitable partner in this regard. A possible model for MPWT involving the private sector is the PBC approach, which has already been tested and currently PBC contracts are also implemented in Laos.

xxviii. PBC modifies the public sector's role and responsibility for ownership of road assets and when correctly executed, the performance-based contracts offer greater benefits than more traditional maintenance methods (BoQ-based). PBC is based on a very simple but logical principle, which refocuses maintenance arrangements directly on final results/outputs expected by the MPWT.

xxix. In order to fully utilize the additional resources the private sector can contribute, the private contractors need capacity building in all aspects of contract management from bidding to implementation of the contracts. This training will be provided to the contractors implementing the PBC in the proposed project, as well for other interested contractors.

xxx. Although PBC has several benefits over traditional maintenance contracts, it can be challenging for the Government to implement and therefor care has to be taken at all stages when planning and implementing PBC contracts.

xxxi. Another component of the PBC maintenance works can be done by the communities living along the project roads, who will be responsible for the road side maintenance.

Governance Strengthening and Institutional & Capacity Building

xxxii. The systems/procedures presently in use and capacity building needs within the MPWT relating to road maintenance operations was reviewed in detail. Also other development partners' past and present support was reviewed and based on the findings following Governance Strengthening and Institutional/Capacity Building are proposed for the ensuing project:

- Improving the governance and practice for road asset management:
    - Revision of axle load monitoring regulation(s) and put these forward for government approval;
    - Revision of Road Maintenance Fund (RMF) regulation(s) and put these forward for government approval;
    - Development of web-based road asset management registry, which will be used for public disclosure of relevant road maintenance reports;
    - Upgrading of road asset management manuals and technical specifications, which will be put forward for government approval.
- Strengthening the Institutional capacity for road asset management:
    - Strengthening of MPWT and DPWTs road asset management;
    - Improving the private contractors' tendering and management capacity;
    - Improving the community-based road asset management capacity.

Benefit Monitoring and Evaluation

xxxiii. It is recommended that benefit monitoring and evaluation (not the same as DMF) of the project will be conducted at regular intervals, in order to measure the success of the project interventions, i.e. measuring the overall benefit of the project to the Lao economy and society, and the beneficiaries. The benefit monitoring and evaluation is concerned with how well the project has achieved its intended purpose.

The Project

xxxiv. As an outcome of what has been discussed above, the proposed project is summarized as follows: The Project will be implemented by the MPWT-DoR over a period of five years, with expected commencement April 2016 and ending in March 2021. The proposed implementation schedule is envisaged as follows:

- Development of systems and procedures for improving the governance and practice for road asset management during Q2 2016 to Q2 2018;
- Strengthening the Institutional capacity for road asset management by providing training to MPWT/DPWTs, contractors and communities during Q1 2017 to Q4 2020;
- Detailed design, preparation of bidding documents, and tendering will be done during Q2 2016 to Q4 2017;
- Award of the first 3-years maintenance contracts will start Q3 2017 and all the contractual maintenance works are expected to be completed in Q1 2021. The works will be supervised by the Project Management Consultant together with MPWT/DPWTs.

xxxv. ADB loan closing will be by 30 September 2021.

CHAPTER 1 INTRODUCTION

1.1 Project Purpose

1. The purpose of this PPTA was to prepare the project design for a future 'Project' [i.e. the Lao PDR: Road Sector Governance and Maintenance Project]. The overall objective of the ensuing project is to cultivate sustainable and efficient road asset management practices through the strengthening of governance and institutional capacity in the areas of planning, financing and implementing road maintenance activities. This is to be done by identifying any deficiencies in the present approach to both routine and periodic road maintenance interventions at the central level and specifically, within the 3 southern provinces of Salavan, Xekong and Attapeu. As a means of demonstrating and instilling modern practice in these areas, candidate roads within each of the three subject provinces were selected for ADB-funded interventions over a 3-year period.

2. In close alignment with the Government of Lao PDR's decentralization policy, the Project will therefore include components for:

(i) strengthening the governance and institutional capacity of the Ministry of Public Works and Transport (MPWT) and its Provincial Departments of Public Works and Transport (DPWTs) in undertaking road maintenance activities; and

(ii) demonstrating the required processes through the financing and implementation of routine and periodic maintenance on selected national and local roads in those target provinces.

1.2 Project Outputs and Timescale

3. The end result of the PPTA [the Study] is the identification of the different components of a future Project in the form of a program of activities deemed to be needed to foster sustainable road asset management practices in the Provinces of Salavan, Xekong and Attapeu and at the central level, which together will lead to a sustainable approach to road asset management.

4. The PPTA therefore had a strong emphasis on the institutional, governance and capacity building aspects in relation to road maintenance management efforts for sustainable accessibility for road transport in the Lao PDR.

5. One of the main underlying needs of the PPTA therefore was to identify potential candidate roads and to carry out condition assessments in preparation for a Project in line with stated objectives of Lao PDR Government and ADB.

6. The major reporting outputs of the PPTA have been an Inception Report, a Mid-term Progress Report and a Draft/Final Project report – the latter containing the proposed 'project design' complete with suggested institutional reforms, itemized maintenance works, associated reviews of environmental and social impacts [and means of mitigation] as well as

cost estimates.

7. This PPTA commenced on 1 June 2014 and is scheduled to be fully completed by 31 October 2015[1].

1.3 Intent of Final Report

8. The purpose of this report is to describe the Consultant's achievements at the end of the PPTA and to present findings and detailed recommendations in each of the main areas of work.

9. The actual implementation of the 'Project' is expected to follow this Study stage, beginning with the recommended capacity building programme and detailed design of the maintenance works managed by a project management consultant expected to be recruited in the beginning of 2016. After completion of the detailed design the procurement of the maintenance works contracts[2] will be done and the works are expected to be implemented during an approximately 3-years period from 2018 to 2021.

10. This report contains several sections addressing each of the different components of the work for which teams of international and counterpart, national experts were mobilized. The results of their efforts are contained in subsequent sections of this Final Report.

[1] The completion date postponed with 2 months by a Variation Order.

[2] There will be 6 maintenance contracts, each one with a 3-years duration, but not necessarily starting exactly at the same time.

CHAPTER 2 COUNTRY BACKGROUND

2.1 National Economic Context

11. Being a land-locked country with growing economic development in the region in the past recent years, the Lao PDR is facing an increasing demand for transport - not only for the all-important road sub-sector but also for other modes of transport.

12. The Lao PDR has land borders with five other countries - Thailand, Viet Nam, China, Cambodia, and Myanmar each of which have expanding economies and increasing logistical requirements. In parallel with its neighbors, the economy of Lao PDR has been growing strongly over the last decade or so, with the leading sectors being in power generation (hydro-power for export, mainly to Thailand), mining, foreign assistance inflows, and tourism[3]. Forestry products exports are also significant but this sector has continuing challenges including those relating to the establishment and maintenance of sustainable practices – particularly the elimination of illegally exported forestry products. The garment industries have continued to produce goods for export albeit under increasingly competitive conditions from lower cost producers such as Bangladesh.

13. Domestically, the agriculture sector is the largest employer – though the number of people working in the sector has been slowly declining with the migration of rural people to the towns and cities of the country while the services sector is growing strongly. Some agricultural products are exported however, to neighboring countries, particularly Thailand. The construction sector is also very active, funded by both public (national and international), and private (national and international) funding sources. Nevertheless, Lao PDR has the smallest population (some 6.3 million people) of all the countries in its immediate region, though its land area (at around 236,800 sq km) is comparatively large (about 2/3 the size of Viet Nam, with its 90 million people, and larger than Cambodia).

2.2 Road Transport Sector Status and Issues

2.2.1 Overloading

14. Currently Lao PDR has 3 different legal axle load limits on its national roads:

- On majority of the roads the legal limit is 8.16 tonne;
- On 5 national roads the legal limit is 9.1 tonne;
- On the national roads 3, 4 and 9 the legal limit is 11.0 tonne.

15. Statistics received from the DoT shows that overloading incidence on 9 major national roads in Laos during 2008 – 2014 was still frequent and there is no trend-line pointing to the direction that overloading is currently reducing. The statistics also shows that the mobile

[3] On 9 May 2013, Lao PDR was officially awarded the prestigious honor of being the "2013 World's Best Tourism Destination" by the European Council for Trade and Tourism.

inspections have revealed more overloading incidences than the fixed weigh stations, which indicates that the 'surprise element' of mobile inspections is catching some overloaded vehicles, which otherwise would not have been caught. See **Annex B - Overloading Statistics** for details.

16. Major impacts of truck over-loading include (i) Economic loss due to shortening of pavement service life and/or increasing rehabilitation and maintenance costs, (2) Environmental impact due to increase in emission, air pollution etc. and (3) decreases road safety due to damaged road surface, which leads to vehicle breakdowns and accidents.

17. If the current Government limits are not rigorously enforced or the legislation relating to legal axle loads are changed - perhaps as a result of agreements between the Government and neighboring ASEAN member countries - the ESAL forecasts would change significantly and the extent of inflicted damage to pavements would rise accordingly.

18. It is reported[4] that the legislation concerning load limits was modified to allow 9.1 tonne axle loads in the mid-2000s and again in 2009, to permit 11.0 t loads on certain trunk roads. This has led to frequent incidences of heavily loaded trucks on those trunk roads where the increased limits apply and to increased pavement strength provisions in the NR-9 design process to accommodate them. This allowance for higher loads (11.0 tonne) on some roads creates the risk that some heavy trucks being within the limit on these roads, deviate to other roads with lower limits.

19. It is also to be noted that permanent weigh stations installed along several of the nation's major routes to monitor and enforce loading legislation are presently non-operational by Government decree in June 2011 for closing down the weigh stations.

20. However there are still some weigh stations in operation at or nearby the border crossings, but they are regularly experiencing a number operational lapses as: (i) lack of operational staff at weigh stations; (ii) insufficient procedures to guide all heavy vehicles for a compulsory load check; (iii) absence of 24-hour operations in weigh stations; (iv) absence of prompt technical support for equipment defects from MPWT head office; (v) lack of training and information provided to weigh station staff on the importance/rationale for axle load control without any loopholes; (vi) power failures and non-functional backup generators, which hamper operations; (vii) lack of procedures to capture repetitive violators; (viii) insufficient space for unloading; and (ix) seemingly frequent political influence on operations, that forces the weigh station staff to ignore specific influential violators.

21. In order to confirm the structural requirements for subject pavements, it is recommended that during the detailed design (during the implementation project) further review to be undertaken of loads likely to be carried and review the legislation and regulations. The review should take into account the intervening years from now to the start of the physical works [planned to begin in early 2018] and the changes in legislation/regulations to be proposed by the PMC.

22. One of the major problems about law enforcement on overloading in Laos is the lack of enforcement capability and equipment for axle load control. There is also the institutional problem as to who should be the appropriate enforcement agency. Recently a proposal has been circulated in MPWT for establishing a new authority, Public Works and Transport

[4] Concept Design Report for National Road No. 9, JICA 2013

Authority, for enforcing the transport sector regulations, including overloading control as it has become evident that the Lao traffic police do not have the required expertise nor have been able to enforce their authority inter alia in overload control. This new authority, which has already been proposed and is waiting for the Prime Minister's decision, would be better positioned for enforcing the legal weight limits on the roads, as well other responsibilities falling under its jurisdiction.

23. A study carried out in the US in 2002 has established that the enforcement strategy on overloaded vehicles is highly correlated to methods of enforcement and penalties. As expected, higher enforcement intensity combined with heavy penalty results in lower rate of violating the allowable load limits.

24. As a result of several meetings between MPWT/DOR, ADB and the PPTA team members it has been agreed as described below.

(i) Within 36 months after loan effectiveness, the government will ensure or cause the MPWT to ensure that the measures for monitoring axle overloading, including addressing vehicle modifications, and institutional set-up or arrangements for proper enforcement of axle load control, are designed;

(ii) Within 36 months after loan effectiveness, the government will ensure or cause MPWT to ensure that a revised regulation(s) for monitoring axle overloading including addressing vehicle modifications is drafted;

(iii) Within 48 months after loan effectiveness, the government will ensure or cause the MPWT to ensure that a revised regulation(s) for monitoring axle overloading will be put forward for relevant government approval(s).

25. The government and MPWT have agreed to discuss with ADB any issues and constraints encountered during implementation of above policy actions, and appropriate measures to overcome or mitigate such problems and constraints.

26. In April this year, DOT (MPWT) requested the Central Government for the re-opening of 3 pilot weigh stations in following locations.

(i) The border of China (end of NR-13 North) in Luang Namtha Province;

(ii) Km 30 of NR-30 on NR-13 North in Vientiane capital; and

(iii) Donghen on RN-9.

27. The operation of above weigh stations will be financed with local budget from MPWT and if additional funds are needed, by the RMF.

2.2.2 Road Safety

28. The Terms of Reference for the PPTA required the Consultant to carry out a conventional multi-stage review of road safety issues including a "road safety assessment" of existing conditions in each corridor and later a "road safety audit" of the proposed design features. The former exercise has been completed and the report is included as **Annex C - Road Safety Assessment**, while the latter can only be undertaken during the future detailed design stage for the project.

29. Further, the wording of the ToR specifically states that the Consultant must also….."*assess the level of road accidents, the degree of road safety awareness of local*

communities, and road safety measures applied to roads in the project area. Carry out a road safety audit on the Project road sections using International Road Assessment Programme road safety audits and identify road engineering, traffic management, motor cycle path, pedestrian facilities, and other measures that need to be incorporated into the detailed designs to eliminate hazards".

30. Presently no details of accident location, frequency and severity appear to be formally recorded and reports are therefore largely anecdotal, based on verbal comments received from DPWT and community sources. This situation should be addressed by introducing an appropriate and coordinated system within the MPWT and DPWT on a Provincial / District level. Collaboration with the Police and insurance companies should be mandated.
This aspect is also addressed in **Annex C - Road Safety Assessment**.

31. Typically road safety audit procedures as defined in the ADB's 2003 "Operational Toolkit" publication, involve a multi-stage approach featuring:

- Stage 1: Planning Phase;
- Stage 2: Preliminary Design Phase;
- Stage 3: Detailed Design Phase;
- Stage 4: Construction Phase;
- Stage 5: Monitoring Existing Roads.

Methodology

32. In the case of the subject PPTA, the roads already exist and for the National roads particularly, only maintenance interventions will apply with no changes made to the horizontal or vertical geometry. The Consultant therefore initially conducted a 'Stage 5' type of assessment study for all roads on the basis that they already existed and that no planning phase therefore was involved. A Stage 2 level of appraisal was carried out later on for the subject roads when the nature of the maintenance works on the National roads and the rehabilitation works required on the Local roads had been confirmed during the PPTA study stage.

33. Stage 3 and Stage 4 level assessments will be applicable during the future implementation phase and should be written into the ToR for that work at the appropriate time. A subsequent, Stage 5 type of review of safety issues under future operational conditions may also be undertaken when the rehabilitation works have been completed in 2018.

Findings

34. The investigative approach followed, the information was compiled and the results of the assessment processes are described in the **Annex C - Road Safety Assessment**. The general findings are summarized below.

Existing Conditions

35. Assessments of road safety issues were made for all six project roads during 15 - 19 January 2015. This was done by means of visual inspections carried out in together with DPWT engineers who in most cases were able to describe local experiences in terms of accident frequency and severity along the routes falling under their jurisdiction. Each road had items of concern in a road user safety context, some of which can be directly addressed under

the Project while others are dependent upon the acceptance of changes in MPWT 'policy'. The main items identified fall into the following categories:

i) Road maintenance deficiencies;
ii) Signs and markings deficiencies;
iii) Inappropriate design standards;
iv) Education of road users.

36. Issues in Categories i) and ii) will be largely eliminated by the inclusion of the appropriate work items in the maintenance contracts that are to be assembled during the implementation stages of the Project.

37. Category iii) contains safety issues that are inherent in some of the standard design details currently used by MPWT. They are reported herein for reference but the suggested modifications are unlikely to be ready for inclusion in the Project due to the timeframe needed for MPWT to approve the required 'policy' changes - and to make necessary revisions to the design standards.

38. Category iv) contains items of broader concern that relate to community awareness of road user safety issues. Means to improve this aspect [at least at the local community level along the subject roads] were identified for inclusion in the Project - these are discussed in a later section of this report.

Table 2-1 Summary of Major Road Safety Concerns

Category	Attapeu		Xekong		Salavan	
	NR 18B	LR 9001	NR 16	LR 7615	NR 20	LR 6901
i) Maintenance Deficiencies	X	X	X	X	X	X
ii) Signs / Markings Deficiencies	X	X	X	X	X	X
iii) Modified Design Standards	X		X		X	
iv) Road User Safety Awareness	X	X	X	X	X	X

39. The road safety assessments completed for each of the subject roads are contained in **Annex C - Road Safety Assessment**.

Community Awareness

40. During the PPTA a number of interviews were convened at the community level on subjects relating to environmental and social conditions and possible impacts/benefits of the planned interventions. At the same time, opportunities were taken to discuss road safety issues and to record observations made on this subject by the local people. These can be summarized as follows:

- In the target provinces most accidents occur in built-up areas while only a relatively small number of accidents occur on the roads between the villages;

- Most commonly, accidents involve motorcycles driven by young people and/or riders under the influence of alcohol and usually in the evening or night time. The second most common group of incidents involves hand tractors being operated at night time without lights;
- Other observations made by the Provinces included details of earlier efforts in road safety education, the need to target school pupils and village residents in general and the need to provide more funding for staff working in this field.

41. The ADB-funded program presents an opportunity to support the further development of road safety improvements in both the physical and the community awareness areas.

42. As confirmed during the PPTA the planned road rehabilitation works will address several physical safety concerns identified during the field assessment and suitable cost estimates for this have been included accordingly. On the awareness side, a similar opportunity arises for which the following process could be adopted:

43. After discussion with the NRSC Secretariat, the various concerned Ministries and the Traffic Police and in close coordination LWU and other involved actors to avoid duplication of efforts, a number of issues could be addressed by specialists in the area of road safety embedded in the Project Management Consultant's workforce during the design and construction phases.

44. Topics to consider in the development of future community level awareness campaigns would include:

- General Road User Education;
- Enforcement of Traffic Regulations;
- Coordination with Other Road Safety Improvement Proponents.

2.2.3 Private Market Contracting Industry

45. In the road sector of Lao PDR, direct responsibilities for implementation of road works including upgrading, re-construction, etc. are primarily taken by DPWTs in each province. DPWTs also take responsibilities for procuring and supervising the contracts on local and provincial roads. At the central level MPWT is responsible for the overall planning of the road network and oversees the DPWTs. Year 2014 four regional maintenance offices (RO) were established, dividing the country in four regions. Staff have been deployed from MPWT to the regional offices for the operation and management of the maintenance works in the respective regions. DPWTs oversee works on national roads in their jurisdictions for the MPWT via the RO. The direct implementation and supervision of contracts by the MPWT has become an exception that is applied only on large road projects on national roads covering several provinces.

46. The procurement of contract for road projects in Lao PDR depends on the financial sources and the level of government involvement in the financing. The MPWT normally applies international competitive bidding (ICB) procurement for major national road projects financed by multilateral donors such as ADB and World Bank, etc. The competition of ICB contract is mostly between contractors from neighboring countries such as Vietnam, Thailand and China. Small scale road projects financed by multilateral or bilateral donor, which are managed by the DPWT, are procured under national competitive bidding (NCB) procedures. Government-

financed road projects are normally awarded to local firms through direct contracting. The contracts procured by provincial governments are often very low price, which may not be competitive.

47. Often provincial governments directly employs private contractors for road projects at reimbursable based contract. Under these projects, the contractor must secure the initial financing for the construction phase, either from private banks, state-owned enterprises, or the central bank and is reimbursed by the government after completion of the project, with the reimbursement terms being from 8 to 10 years. There is another unique financing mechanism for road construction works, i.e. land concession contracts. In land concession contract deals the provincial government purchases land adjacent to the planned road at below market prices and sells it once the road project is complete, using the subsequent increase in land value to repay the contractor. These arrangements allow the provincial governments to circumvent the budget priorities defined by the central government, which can create future liabilities for the government by promising to pay for services at a later date. Currently both procurement methods, i.e. reimbursable based and land concession have been abolished under the government degree in 2014 due to excess reimbursable liabilities for the government.

48. In 2012, the MPWT issued an instruction to DPWT to facilitate road maintenance by applying both labour based application (LB) and performance based contracts (PBC). Those contract features are summarized as follow:

- Road maintenance with labor based application
    - DPWT coordinates with OPWT to inspect data such as: road length, quantity of work, unit price of each activity in the bill of quantity that is specified in the contract, budget requirement including the supervision cost (5% of contract value for OPWT);
    - Road sections of 5 to 10 km per contract to be implemented as out-put based contracts with contract amounts calculated by applying 1.3 million kip/km/year. The works are to be supervised by the OPWT and periodical follow up and inspection is done by DPWT and DOR;
    - Work progress is monitored and controlled by DPWT. Payments are done quarterly, however an advance payment to the villagers is made after the signing of contract to facilitate the maintenance works. RMF is financing the maintenance works and the payment amount approved by MPWT is transferred to the DPWT's account, where after OPWT pays to the villagers based on the amount specified in the contract.

- Performance Based Contract
    - The main activities of performance based contract are: patching of potholes, crack sealing and rehabilitation of area < 160m^2/km, emergency work as specified in the contract. DOR coordinates with DPWT to inspect, plan and allocate budget for rehabilitation of serious defects and other activities that are not specified in the contract;
    - DPWT coordinates with OPWT to inspect data such as: road length, quantity of work, unit price of each activity in the bill of quantity that is specified in the contract, budget requirement including the project management cost (2% of contract value for OPWT). Road sections maintained will be inspected and must satisfy the performance index specified in the contract;

- The maintenance works are performed as out-put based, i.e. required to meet specified performance indexes. The road lengths per contract are to be 50 to 100 km. Contracts are procured by National Competitive Bidding (NCB) in accordance with the procurement procedures of the government decree 03/PO. DPWT is the authorized signatory of the contract. The contract amount fluctuate depending the initial road condition, the actual needs of maintenance activities, road classification and location of road. The works are to be supervised by the OPWT and periodically follow up and inspection is conducted by DPWT and DOR;
- Work progress is monitored by OPWT and controlled by DPWT. Payments are done quarterly, however an advance payment to the contractor is made after the signing of contract to facilitate the initial rehabilitation works. RMF is financing the works and the payment amount approved by MPWT is transferred directly to the contractor's account.

51. The by MPWT operated Road Maintenance Fund (RMF) is primarily sourced from fuel tax. In 2013 the RMF managed to source approximately LAK 370 billion / US$46.25 million. RMF is supposed to be used for road maintenance but in reality the RMF funds are often used to finance urgent works as well as paying contractor debts from earlier IOU-contracts and land concession contracts. The MPWT is currently developing guidelines and oversight mechanisms addressing issues with using RMF funds for road rehabilitation and reconstruction.

52. Since the provincial governments are involved in IOU-contracts and land concession procurement methods, the budget allocation for the local roads is limited. Through decentralization the central government is trying to shift a large portion of the implementation and oversight responsibilities to the DPWTs. However it is not easy for provincial governments to shoulder this responsibility, as the allocation of funds from RMF is not sufficient to meet their responsibilities, which often forces DPWTs to choose between several priority projects. It is more of the rule than the exception that the provinces do not receive their full budget allocation, which regularly leads to cancelled or scaled down works.

2.2.4 Road Maintenance Issues and Constraints

53. The devolution of road maintenance responsibilities has continued to be constrained by unclear institutional arrangements and weak coordination between central and local authorities. In addition to the inefficient decentralization of road maintenance responsibilities, the key challenges faced by MPWT and provincial DPWTs for undertaking road maintenance activities are in-adequate use of proper maintenance procedures for road maintenance planning, financial management, procurement, and contract supervision that has already been developed[5]. Other constraints are lack of staff's technical capacity and experience in road maintenance management, and financial constraints for undertaking road maintenance responsibilities. Weak institutional capacity, poor governance and inadequate financial resources contribute to MPWT and DPWT's inability to carry out necessary road maintenance works, resulting in poor road conditions.

54. Road maintenance in the Lao PDR has in the past two decades been heavily

[5] During RMP1/ RMP2 WB and SIDA were supporting in this area, and further assistance has been given by subsequent support from JICA and KfW.

dependent on assistance provided by various development partners, as the funding level of both RMF and allocation from the provincial government budget has never been sufficient to meet the road maintenance needs and is currently not even covering half of the needs. This model is not sustainable, once external support on road maintenance ceases. Currently MPWT is lacking a long term strategy for self-reliable and sustainable road maintenance, which needs to be developed. A considerably increased road maintenance funding would be an important step forward achieving a sustainable road maintenance management.

55. The lack of axle load control on Lao roads has led to an increased number of overloaded trucks on the roads, which has resulted in the roads deteriorating much quicker than they should. This is a major road maintenance governance issue that needs to be addressed. MPWT has clearly noted the adverse impact on the roads due to insufficient axle load control and this issue has recently been discussed in several recent meetings, in order to find a way forward for addressing the overloading issue.

Institutional Setup

56. The road sector is under the overall jurisdiction of the MPWT. Following the decentralization policy initiated in 2000, MPWT has delegated road maintenance responsibilities to the DPWT of each province. MPWT is now in the course of re-organization, particularly that for the road maintenance. There are new departments set up, such as the Department of Finance, ICT Division under the Cabinet Office, and four Regional Maintenance Offices under the DOR.

57. The specific roles and responsibilities of the Regional Maintenance Offices have not yet been published in any decrees, and the discussions about the roles of the Regional Maintenance Offices are still on-going. However, responsibility of national roads maintenance, including planning, budgeting and implementation, most likely will come under the Regional Maintenance Offices.

58. The on-going reorganization in the DOR, already applied to similar institutional setups for road maintenance in many other countries, seems relevant. However, one could point out that it is very ad-hoc approach, establishing a new organization without having a basis such as vision and policy on place.

59. The MPWT has adopted the ‘Strategy for Transport Sector Development for the period 2010-2020 and Direction for 2011-2015’ and is currently developing the new long-term development policy through the technical assistance by the WB. The new development policy of the MPWT should provide guidance for the DOR to determine long-term institutional and organizational directions to develop a sustainable maintenance mechanism in Laos.

60. It can be concluded that there is a strong need to establish a sustainable institutional setup, for the road maintenance in Lao PDR. In this context capacity building at all levels is crucial.

61. During the past 10 years and more WB and other development partners have been and are still supporting the Lao government in the road and transport sector area regarding the overall sector reform/ policy reform. This has resulted in that relevant policies for Lao PDR already exist and thus an overall sector reform/ policy reform is not needed. Nevertheless there are some policy gaps on which the LRSGMP can provide assistance in filling, but LRSGMP should primarily work with improving the governance and strengthening the

institutional capacity of the MPWT.

Poor Implementation and Supervision of Maintenance Works

62. Traditionally the Lao contractors have been geared towards road constructions rather than road maintenance, but during the last decade and more the Lao government together with the donor community has stressed the importance of road maintenance and increased the maintenance funding, which was also the contributing factor for creating the RMF. Changing from constructions approach to maintenance approach has not been easy, neither for the client nor for the contractors, because road maintenance is fundamentally different from road construction and requires a different approach and outlook and is not perceived as glamorous as road construction.

63. Generally the contractors in Laos are not experienced and skilled, often having problems with the most basic tasks, both on the field and preparing necessary documents. The same applies on the supervision of the road works, from the contractor's side and from hired local consultants as well as from the government staff (staff from MPWT/DPWT/OPWT). Thus, this has often resulted in poorly maintained- and constructed roads.

2.3 Relevant Other Projects

WB and SIDA initiatives

64. In 2000 the MPWT, with assistance from the World Bank and Swedish International Development Cooperation Agency (Sida), embarked on a long-term program to improve road maintenance in the country, primarily by strengthening road maintenance capacity and capability at the provincial DPWTs. One of the key outputs of the program was the establishment of a road maintenance fund (RMF) and the development of appropriate road maintenance management systems, -RMS and PRoMMS-, which helps allocating funds and prioritize the maintenance needs of Lao PDR road assets. Between 2004 and 2010, the World Bank and Sida financed Road Maintenance Program Phase 1 and Phase 2 (RMP1 & RMP2) to further support road maintenance in the country. The primary objectives of the RMP1 & RMP2 were to;

(i) scale up the RMF financing mechanism to a sustainable level;

(ii) operate efficient systems to manage road assets in all provinces; and

(iii) expand institutional capacity at both central and local levels.

65. Another of the activities supported by both the WB and SIDA was the development of the "Maintenance Procedures", a comprehensive manual/ guidelines for road maintenance management. In order to sustain the legacy of its earlier support, WB together with MPWT has now engaged 3 experienced local consultants for follow up and promotion of using RMS, PRoMMS and the "Maintenance Procedures". In addition, the on-going World Bank-financed Lao Road Sector Project (2010-2017) supports road maintenance works on provincial road networks in Phongsaly and Houaphanh provinces.

66. In general, RMP1 & RMP2 were able to realize much of their primary objectives and has provided a good foundation towards the future goal of achieving sustainable road maintenance in Lao PDR, but much is left to be accomplished in terms of capacity development and financial sustainability.

Capacity Development for Road Maintenance in Laos (CaRoL), JICA

67. To support the government in addressing the continued lack of institutional capacity and financial resources for undertaking proper road maintenance at the provincial level, Japan International Cooperation Agency (JICA) currently finances a project titled *Improvement of Road Management Capability Project* (2011-2016) to improve governance, planning and management of road maintenance in Vientiane and Savannakhet provinces to ensure a sustainable road asset management.

Rural Infrastructure Programme (RIP)

68. Since 2003 German Development Cooperation, in close cooperation with the Lao Ministry of Public Works and Transport, is financing the rehabilitation and construction of 830 km of rural roads in six provinces (Bokeo, Luang Namtha, Oudomxay, Sayabury, Attapeu and Xekong), which will be open to traffic all year round. The numbers of beneficiaries of the roads are approximately 170,000 people.

69. Rural people are actively involved in the road planning process and receive training on how to maintain the new roads. The new Public Works and Transport Training Center currently under construction in Vientiane offers courses on road construction and maintenance to ministry staff.

70. The purpose of the programme is the sustainable utilization of roads throughout the year and adequate maintenance of local roads. In addition to rural roads, the programme also invests in bridges, boat landing ramps, markets and bus stands. This contributes to the improvement of socio-economic living conditions of the rural population in the project regions. A PPTA consultant has recently prepared a project design for the RIP phase 6, covering roads in Saravan and Xekong provinces.

71. Though other development agencies have made great efforts to support road maintenance in Lao PDR, further development assistance particularly in the areas of governance, capacity and financial support at the provincial level are required to realize sustainable and efficient road asset management.

2.4 Existing Road Network

72. The Lao PDR road system extends around 46,000 km, representing a road density of about 5.7 km per 1000 persons, which is one of the highest in the region. Although the high road density suggests that the country has an adequate road network, much of the road network in the provinces is in poor condition due to lack of proper maintenance. The poor road condition effectively isolates those areas and constrains the movements of people and goods, impeding economic development at the provincial level. The lack of well managed and maintained roads constrains people's access to markets and basic services, and significantly contributes to the high rural poverty rate.

Table 2-2 Length of Lao Road Network, 2014

Road Class	Length (Km)
National Roads	7,338
Local Roads	
Provincial Roads	8,209
District Roads	5,643
Rural Roads	20,258
Special Roads	2,123
Urban Roads	2,216
TOTAL	**45,825**

Source: DoR Statistics

CHAPTER 3 PROJECT ROADS

3.1 Long List of Candidate Roads

73. Initially the MPWT proposed about 1,521 km of roads in Salavan, Xekong and Attapeu to be considered for the *Road Sector Governance and Maintenance Project*, as shown in below table.

Table 3-1 Long List of Candidate Roads

No.	From	To	Length (km)
SALAVAN PROVINCE			
National Roads:			**433.35**
13	Savannakhet border.	Champasak border.	85.75
20	Champasak border	Urban Salavan	56.00
15B	Junc.13S/ B.Napong	Urban Salavan	73.00
15A	Junc. Phondou	Vietnam border. R16	147.16
1 G	Junc.15 Nadonekhouang	Salavan Dist./ Toumlan Dist. border	61.44
1 H	Junc.20 B.	Beng Xekong border, Thateng Dist.	10.00
Provincial Roads:			**42.90**
6904	Junction Road 13S, B. Hinsiew	B. Khanthoungxay	19.40
6901	Junction Road 13S, B. Phuangsavan	B. Paktaphan	23.50
District Roads:			**80.19**
6913	Junction Road No.20, B. Temebeng	Paksong district Boundary	16.80
6907	Junction Road 13S, B. Bengdan	B. Nongpherng	15.70
6907	B. Nongpherng	Junction Road 15A, B. Vapi	11.69
6909	Junction Road 20, B. Temesangthong	Road 20, km 24	24.00
6909	Road 20, km 24	B. Namy Tai	12.00
Rural Roads:			**76.80**
6906	Junction Road 15A, B. Nonsavan	B. Natandong	26.30
6935	Junction Road 15B, B. Paksong	B. Kengsim	18.50
6914	Junction Road 13S, B.B Houaysao	B. Khamteu	32.00

XEKONG PROVINCE			
National Roads:			**210.70**
16	Xekong / Champasak Boundary.	Urban M. Lamarm	54.00
16	Urban M. Lamarm	Vietnam Boundary.	117.70
1H	M. Thateng	Salavan Boundary.	10.00
1I	Junction national road No: 16 (Phia May)	Xe Nam Noi (Attapeu Boundary.)	20.00
District Roads:			**53.20**
7518	Junction Road 16B, B. Dackcheung	B. Ayoun	30.00
7615	Junction Road 16E, B. Kongtayoune	Junction Road 16E, B. Khamkok	23.20

Rural Roads:			**40.00**
7636	B. Taneung	B. Khandone	20.00
7638	B. Taneum	B. Long Noy-Long Gnay	20.00
ATTAPEU PROVINCE			
National Roads:			**356.90**
1I	Attapeu port	Xenoi bridge, Xekong border	56.00
1J	Ban Xekamarn	Cambodia border	91.00
16A	Km 48 junction	Ban Beng, Phoukham Xenoi bridge, Champasak border	14.00
18A	Km 3 junction	Xe Khamphor, Meung Sanarmxay (Champasak border)	84.00
18B	Attapeu port, Ban Samakhixay	Phougnang checkpoint (Vietnam border)	111.90
Provincial Roads:			**179.30**
9001	Junction Road 18B, Km: 14	Xekong Boundary	76.00
9045	Junction Road 18B, B. Km: 100	Lao/ Vietnam Boundary	77.70
9047	M. Phouvong	B. Viengxay	25.60
District Roads:			**57.00**
9037	Junction Road 18B, M. Xaysetha	B. Phonngam/ Sakhea	18.00
9002	Junction Road 18B, B. Km: 1.5	B. Thalane	20.00
9232	Junction Road 18B, B. Km: 102	B. Nam Xuan	19.00

3.1.1 Short Listing Criteria

Multi-criteria Analysis

74. A multi-criteria analysis process was adopted and used to decide the candidates from among those included in the original long list. This involved an appraisal in which the respective roads were evaluated on the current status of 3 main areas as shown below in italics:

(i) *Existing Road Conditions* - Road Class, Surface Condition, Roughness and Traffic Volume;

(ii) *Regional Development* - Agricultural Development Potential, Non-Agricultural Development Potential and Proximity to other Development Projects

(iii) *Social- and Environmental Safeg*uard - Accessibility to Health Services, Accessibility to Schools, Potential Involuntary Resettlement/Land Acquisition and Impact on Environmental Reserve, Fauna and Flora.

75. Within each of the main areas a number of indicators (as listed above, e.g. Road Class, Surface, etc.) were rated with points from 1 to 5 – see **Annex D - Evaluation of Long Listed Roads**. Together with this, a sensitivity analysis was done by varying the emphasis / weights in each of the 3 main areas of interest, i.e. (i) *Existing Road Conditions, (ii) Regional Development and (iii) Social- and Environmental Safeguards.*

76. The sensitivity analysis together with the applied ratings on the indicators and the fact that the project is targeting sustainable asset management on both central and provincial levels[6], -meaning that at least one National- and one Local Road in each Province needed to be included in the program-, resulted in that following roads emerged for the 'short listing':

- Salavan National Road 20 and Local Road 6901;
- Xekong National Road 16 and Local Road 7615;
- Attapeu National Road 18B and Local Road 9001.

77. The field investigations validated what was stated in the multi-criteria analyses (Existing Road Conditions – i.e. Surface Condition, Roughness) that the national roads were already in 'maintainable condition' while the selected local roads needed some rehabilitation work (which can be seen as 'backlog maintenance, i.e. maintenance that has been neglected for some time) to reach the 'maintainable condition'. Most of the local roads in Laos need some rehabilitation works before the activities can fully focus on only maintenance activities, and this is very much true in the poorer provinces as Saravan, Xekong and Attapeu. It is a common practice in road maintenance and especially in Laos that you have to include some rehabilitation works in maintenance contracts in order to achieve the full potential and functionality of the road, e.g. elimination of bottle necks as a partially collapsed embankments, rough road surface with many potholes or other major defects.

78. In the ADB financed *Yunnan Sustainable Road Maintenance (Sector) Project* [7] terminology as 'Intermediate Maintenance' and 'Heavy Maintenance' are used for activities related to rehabilitation and improvement of roads, since in Yunnan they are also often facing initial poor road conditions before the 'pure maintenance' activities can commence. In the ADB supported *Transport Sector Development Project*[9] on Solomon Islands terminology as 'Specific Maintenance' is used for the same purposes, i.e. for rehabilitating roads into a condition where subsequent regular maintenance becomes feasible. These two cases demonstrate clearly that necessary initial rehabilitation works are often included as part of maintenance works. Both of these projects are currently on-going.

3.2 Derived Short List of Candidate Roads

79. Below table summarizes the short-listed roads identified for maintenance, together with their respective sub-sections, which have been used in the engineering studies and economic analysis of the roads:

[6] The central level Department of Road, DoR, is responsible for National roads and the provincial Department of Public Works and Transport, DPWTs, are responsible for the local roads.
[7] RRP PRC 45030
[9] ADB TA 7335-SOL

Table 3-2 Short-Listed Roads

Classification	National Roads			Local Roads		
Province / Road No.	Salavan: NR-20	Xekong: NR-16	Attapeu: NR-18B	Salavan: LR-6901	Xekong: LR-7615	Attapeu: LR-9001
Sub-sections	A & B	A	A & B	A, B & C	A, B & C	A & B
Total Length [km]	56.0	54.0	111.9	27.5	22.7	54.0

Source: ADB Consultant

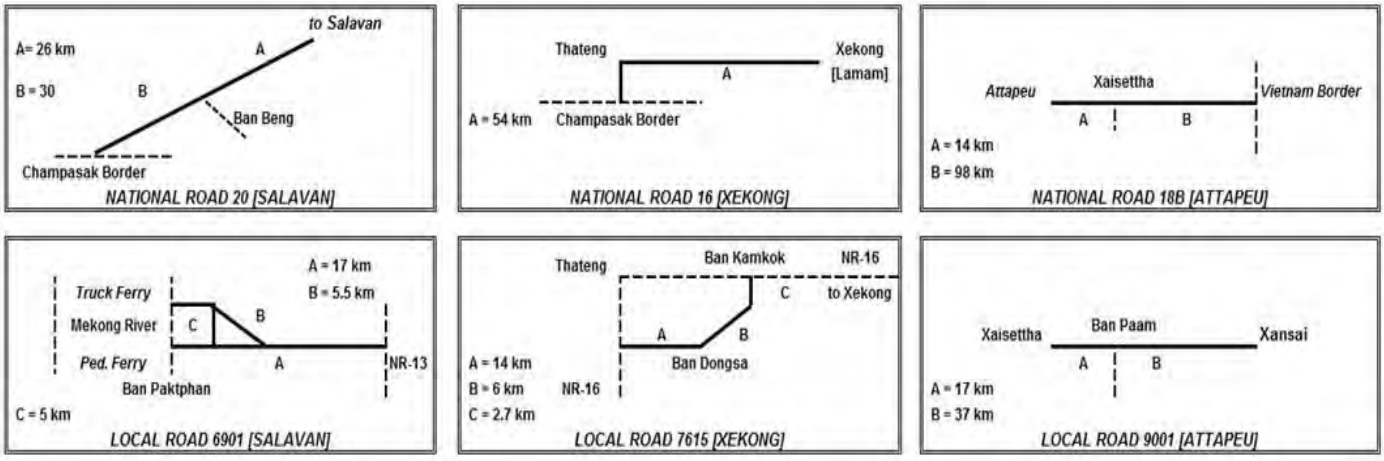


Figure 3-1 Section Definitions – Shortlisted Roads

CHAPTER 4 ENGINEERING DETAILS

4.1 Data Collection

80. In order to determine the nature and extent of the road maintenance interventions to be undertaken, it was necessary to conduct a series of investigations into existing field conditions. From this work alternative interventions were identified from which cost estimates and subsequent economic viability assessments were made. The field work phase included route inventories, topographical and geotechnical surveys as well as visual assessments of the present conditions of road surfaces, bridges and main drainage features.

Route Confirmation

81. In order to re-confirm route locations ahead of the deployment of the data collection teams, a series of joint site visits was undertaken with representatives of the three DPWT's. This was done in conjunctions with representatives of the specialist sub-Consultant firms commissioned to carry out the field work. At that time the start and end locations of each of the subject routes [3 National roads and 3 Local roads] were marked in the field, relevant photographs taken at strategic locations and corresponding GPS coordinates recorded.

Reference Stationing

82. To ensure that all team specialists making subsequent field visits would use a common referencing system it was decided to install station reference markings along each of the subject roads.

83. For each of the 3 National road links included in the PPTA Study, the marks were placed along the road centrelines at 100 m intervals with the forward stationing painted on the road surfaces at 500 m intervals. Each road was assigned a project-specific stationing beginning at "0+000" - the start location defined by the respective DPWTs.

84. Similarly, stationing was established for the 3 Local roads to be covered by the PPTA. But as they were all un-surfaced [with some sections covered with mud and water] other forms of roadside markers were used. These included flagging and/or paint markings placed on nearby rocks or trees so that a semi-permanent and visible reference system was established for each road.

GPS Tracking

85. Subsequently, each road was driven and 'tracking coordinates' captured at regular intervals. This enabled the routes to be superimposed onto Google Earth image bases and these are included in **Annex E - Route Locations [GPS Tracks]** of this report.

4.2 Inventories

86. Crews were also mobilized to make notes of general corridor conditions and roadside features including the locations of bridges, box culvert and pipe culvert crossings.

Drainage Structures

87. At the same stage, available information was collected on existing bridges, box and pipe culverts in each corridor. Location details together with observations on condition, type of crossing and general dimensions[10] were also collected – the recorded data is included in **Annex F - Drainage Structure Inventories**.

4.3 Topographical Surveys

Extent of Coverage

88. Given the limited budget amount made available for the entire field data collection exercise, the extent of the topographical survey work had to be limited. Accordingly, it was concluded that such work would extend only to the most critical aspects for which accurate data was needed in order to help define work items with potentially high cost implications. These included the required road rehabilitation work in the local road corridors, the replacement of bridges being sub-standard in dimension and/or load carrying capacity as well as treatments of two of the unstable side slopes.

4.3.1 Local Road Profiles

89. Early in the data collection process it became apparent that conditions along the local roads in particular, were likely to involve more than just basic 'maintenance' interventions. Work envisaged included:

- the placement of imported fill materials [together with overlying base and sub-base layers] needed to elevate some road sections above regular flood levels;
- the addition of base course materials in sections previously only having been built to sub-base level [i.e. LR-9001, Section B];
- the provision of concrete pavement surfaces in sections with excessively steep gradient [MPWT standard suggests sections with gradients > 12%].

90. Accordingly it was decided that the centreline profiles of the existing local roads[11] should be surveyed from which preliminary design details and materials quantity estimates could be estimated for costing purposes. Using the previously established stationing reference systems, the field work included the collection of road centreline coordinates - using hand held GPS equipment – and corresponding surface elevations - using conventional leveling equipment – based on an assigned 'local' datum. This work was duly completed for all 3 local road corridors and the resulting plan / profile information is presented in **Annex G - Local**

[10] Bridge and culvert data collected was later correlated with information available by PTI from their 2014 RMS database to check for consistency.

[11] After consultation with the DPWT in Attapeu, it was established that 'as-constructed' information for project Road No. 9001 was available from the earlier ADB-sponsored intervention in 2010. From this it was concluded that adequate geometric information was already available for PPTA Study purposes and therefore a new centreline profile survey for that particular road was unnecessary. The 'as-constructed' detail is reproduced in this report.

Road Plans/ Profiles.

4.3.2 Bridge Site Surveys

91. Subject to confirmation that the many existing bridges along the other subject roads would be found to be adequate [at least after preliminary inspection] in terms of both dimension and load carrying capacity, it was concluded that only the clearly 'sub-standard' bridges along National Road NR-20 in Salavan Province would need to be replaced. The limited funding available for topographical surveys led to the conclusion that bridge site surveys should be concentrated along the NR-20 alone.

Bridge Replacements [NR-20 only]

92. The existing inventory contains a total of 10 bridges within the two designated sections of NR-20 included in this PPTA study. Of these, two have been recently constructed [modern standard concrete bridges] while the remaining 8 are steel bridges of the 'Bailey' type. All of the steel bridges are subject to weight limits and many have wooden decks to being in poor condition.

93. The steel bridges are of different span lengths but all are narrow with only about 5.0 m clear deck width and operate under single-lane conditions giving rise to road safety concerns for users. Most of the crossings are subject to a posted weight restriction of 20 tonne GVW[12], which leads to added journey times for heavy goods vehicle traffic that would otherwise use this part of NR-20 if no such restriction existed. Clearly, for an important national road these represent a sub-standard configuration and it was therefore concluded that the option of replacing at least some of the steel bridges should be addressed in the present study. After some consideration it was concluded that the 4 steel bridges in Section A should be replaced as soon as possible in order to open the link from Saravan to Ban Beng to heavier vehicles – the economic assessment was completed on this basis.

94. However, for the 4 similar bridges [two of them of having very long spans] in Section B it was considered that replacement would be unjustified at this time due to the fact that similar loading constraints would remain further south in Champasak Province - with the result that heavy vehicles would continue to avoid using that part of NR 20. Instead, it was decided that the 4 bridges should remain in service with only deck repairs and other minor maintenance works undertaken pending the possible sourcing of funding with which to remove all such restrictions – in both Salavan and Champasak Provinces.

95. As part of the Study however, topographical survey work was carried out at all 8 potential bridge replacement sites along NR-20 for future reference. This resulted in the creation of site-specific contour plans from which road and waterway channel cross-sections were extracted. Each survey was based on a group of 3 "temporary bench marks" established at each crossing to which project-specific 'x' and 'y' [i.e. northing and easting] coordinates were assigned along with a designated project datum ['z' coordinate]. The topographical survey plans produced for each crossing are included in **Annex H - Bridge Site Surveys**.

[12] One in Section B to the south of Ban Beng has a 15 tonne limit.

4.3.3 Unstable Side Slope

96. Although a number of potentially unstable zones were observed on some of the other subject roads, the most extensive and highest risk areas where noted to occur in Attapeu Province. Slopes located at around km 49 and km 40 of roads NR-18B and LR-9001 respectively were noted to be the most extensive and investigative efforts were therefore focused on those two links. This was done with a view developing 'standard' treatments that could be introduced in this Project and in other locations on the road network in future years.

97. Topographical surveys and related geotechnical sub-surface investigations were carried out over lengths of approximately 500 m and 1,000 m. The information generated at both locations is included in **Annex I - Unstable Side Slope Surveys** and **Annex J - Geotechnical Investigations [Side Slopes]** respectively. With the help of a specialist sub-consultant, some alternative treatment methods were then identified and corresponding cost estimates prepared.

98. For the purposes of economic assessment, the same treatment method was chosen for potential use over the respective lengths at both locations and the estimated costs included in the overall investment required for each road. It is recommended that additional field investigations and design to be carried out during the Project's implementation stages in order to confirm the precise requirements – because the present conditions are likely to change due to rainfalls [and possible emergency interventions needed in response] during the intervening years from 2014 until the works are scheduled to begin in 2016.

4.4 Existing Road and Structure Condition Assessments

4.4.1 Roadways

99. One of the most critical aspects of the engineering data collection process was the assessment of existing pavement conditions from which the cost of the required maintenance interventions could be defined and the estimated costs for subsequent assessment of the economic viability. For this purpose the Consultant deployed a local specialist engineering company to inspect and record pavement surface conditions along the subject roads[13] and to undertake at selected locations, a series of sub-surface investigations with laboratory tests of recovered samples.

National Road Pavements

100. The Provisional Sum budget allocation under the PPTA for the field investigations allowed only a restricted program of pavement testing along the National roads. The Consultant therefore made reference to supplementary data that was available from the RMS and PRoMMS databases – e.g. details of road surface roughness [IRI] and deflection measurements. This was deemed to be sufficient for study purposes but should be the subject of further consideration and for the implementation of additional testing during the design work performed during the implementation phases of the project.

[13] Due to limited funding, similar efforts for the three local road corridors could not be undertaken, and instead a simple visual assessment methodology was introduced accordingly as described later in this Chapter.

101. At the end of each National road survey, an existing surface conditions report was prepared in a tabular format as shown in **Annex K - Pavement Conditions [National Roads].** This Annex contain visually observed factual details of the following:

- Surface widths;
- Surface distress observations by type and extent;
- Locations of significant drainage structures.

Local Road Surfaces

102. For the 3 Local roads where mainly unpaved surfaces of laterite or native earth only exist [some sections already have sub-base materials in place] the intervention requirements were identified by using a visual assessment approach. This included examination of the suitability and condition of existing roadbed materials as well as assessment of the impacts of regular flood events reported by DPWT staff and local residents. From this, an indication of the optimal maintenance and rehabilitation work required for each section of local road was developed.

103. The most cost-effective treatment that could be introduced would be a simple re-grading of the existing surfaces with the addition of sub-base and base layers where appropriate, for low traffic loading applications. However with more investment, other treatment options could be considered by which year-round accessibility and travel times could be improved. The options identified included:

104. *Treatment 1* - It was observed that increases in road formation levels would be highly beneficial in some areas in order to reduce the impacts of the more frequent storm events, which often causes flooding. By these means considerable benefit would accrue to the communities served by the roads. The imported earth materials required after suitable grading and compaction work would need to be covered by new base and sub-base layers as needed to support the predicted traffic flows and the cost implications of these were included in the cost estimates accordingly.

105. *Treatment 2* - It was also noted that in some areas steep gradient occur along the two subject local roads in both Xekong and Attapeu Provinces. The generated local road profiles were therefore reviewed and sections identified where slopes of >12% exist and where sections of concrete pavement[14] should be installed to improve traction and thereby increase safety.

106. The estimated construction costs for both of the above treatment types were calculated and included in the economic viability assessment.

4.4.2 Bridges and Box Culverts

107. As indicated in **Annex D**, the existing drainage structure inventory collected under this PPTA revealed that a total of 35 bridges and 108 box culverts and over 275 pipe culverts are located within the 6 subject road corridors. These installations needed to be checked for hydrological and structural sufficiency. For PPTA study purposes, the first of a typical 2-stage

[14] During the field reconnaissance work, it was noted that sections of concrete pavement are already being placed in some parts of LR-9001 [Section B] - work is still ongoing at this time [Q1 of 2015].

approach to inspection [a common international practice] was followed. This involved a 'preliminary' stage investigation when basic dimensions were collected and initial condition information recorded and from which a 'replace', 'strengthen' or 'retain as-is' categorization was assigned, for preliminary cost estimation purposes. This should be followed in a future detailed design stage by a more detailed, 'secondary' inspection carried out by a qualified structural engineer with a view of defining specific details of any necessary interventions.

108. In view of the limited budget available for field work at the PPTA stage, it was not possible to carry out any load testing or other non-destructive investigative work and a visual assessment approach was adopted. Investigations were initially carried out to confirm that the 8 narrow 'Bailey bridge' structures located along NR-20 in Salavan Province were indeed in need of replacement [by new bridge or box culvert structures] due to their sub-standard deck widths and limited load carrying capacity.

109. For the several bridges located along the other subject roads – some of which were quite recently constructed and therefore in good condition – it was concluded that only a basic 'preliminary' stage level of inspection was required from which maintenance interventions could be defined and costs estimated.

110. The findings of all inspections carried out were recorded on a pro-forma, which are included in **Annex L - Bridge Inspection Reports.**

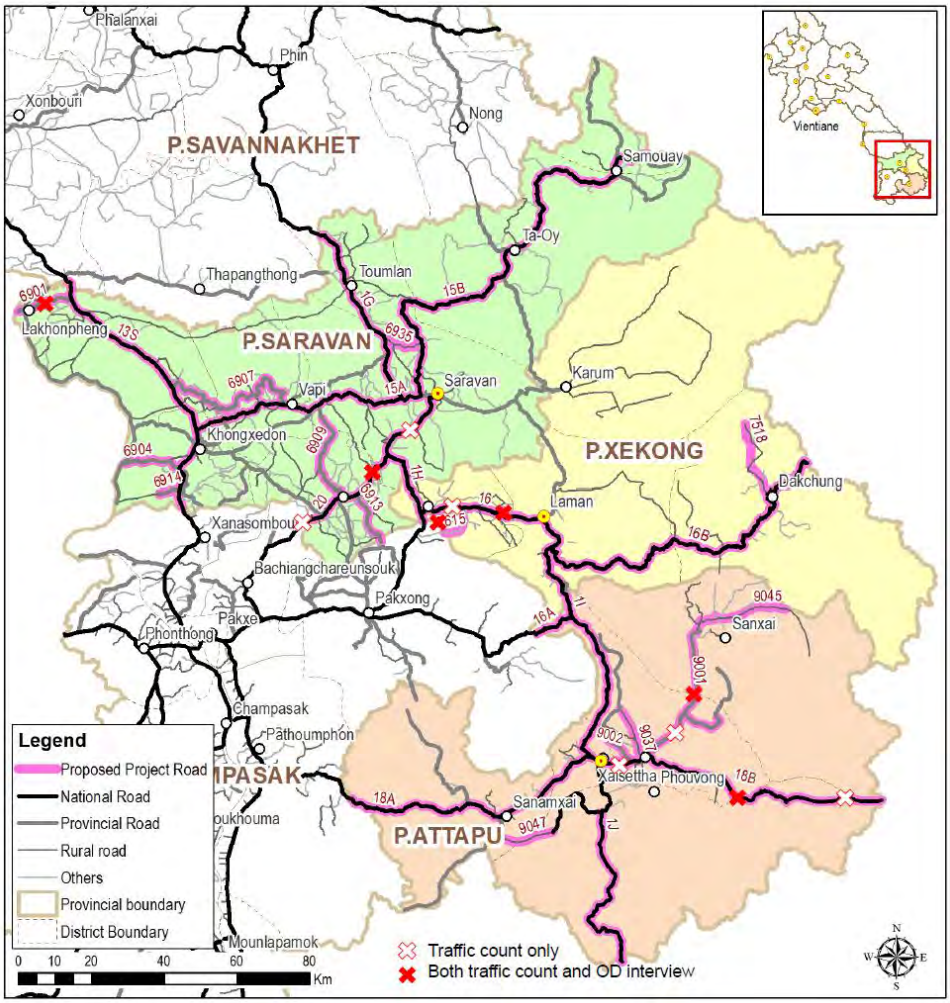
4.5 Traffic and O-D Surveys

111. In order to determine existing traffic volumes on each of the subject roads, teams of trained enumerators were mobilized to conduct the following surveys:

I. Classified Traffic Volumes;

II. Origin-Destination Data.

112. These surveys were conducted at 10 locations - 6 sites for the traffic counts only and another 4 sites where combined traffic and O-D surveys were conducted. The locations where all traffic surveys were conducted are indicated in the following figure.



Source: ADB Consultant

Figure 4-1 Traffic survey Site Location Map

Vehicle Fleet Classifications

113. Volumes were recorded for each of the following standard MPWT vehicle categories:

1. Bicycle
2. Ox-drawn / Hand Cart
3. Tok-tok, Tractor-trailer
4. Motorcycle
5. Tuk-tuk, Jumbo
6. Passenger car
7. Pickup, Jeep, 4WD
8. Sonteo, Minibus
9. Medium Bus [16-39 passengers]
10. Large Bus [40+ passengers]
11. Light Truck [2 axle, single rear wheels]
12. Medium Truck [2 axle, twin rear wheels]
13. Heavy truck [3 or 4 axles]
14. Truck & Trailer

4.5.1 Classified Traffic Counts

114. Classified counts were conducted at each of the 10 sites between 6 AM and 6 PM on two consecutive weekdays from late September to mid-October of 2014. Care was taken to avoid weekends and days on which special local events were staged in order to avoid unrepresentative flow patterns.

115. An indication of the volumes obtained for each vehicle category is shown in below Table 4.1 - more detailed information is included in **Annex M - Traffic Surveys**.

Table 4-1 Classified Traffic Count Summaries [2-way], 2014

No.	Classification	Salavan				Xekong			Attapeu			
		NR-20 [B]	NR-20 [C]	NR-20 [D]	LR-6901 [A]	NR—16 [E]	NR-16 [G]	LR-7615 [F]	NR-18B [H]	NR-18B [J]	LR-9001[K]	LR-9001 [L]
1	Bicycle	8	7	21	7	234	0	0	0	0	29	6
2	Ox-drawn / Hand Cart	0	0	0	0	0	0	5	0	0	3	0
3	Tok-tok, Tractor- Trailer	226	179	233	61	63	69	161	1	0	29	3
4	Motorcycle	1,993	2,375	2,910	625	3,367	2,029	1,077	551	424	1,906	475
5	Tuk-tuk, Jumbo	3	3	0	1	4	5	5	1	5	5	0
6	Passenger Car	118	108	160	6	66	323	7	85	16	37	0
7	Pick-up, Jeep, 4WD	373	571	809	102	746	726	99	290	238	290	35
8	Sonteo, Minibus	72	33	16	44	37	41	1	14	19	1	0
9	Medium Bus [16-39 pax]	9	8	14	0	18	24	1	46	39	0	0
10	Large Bus [40+ pax]	41	35	45	4	63	53	0	9	12	0	0
11	Light Truck [2-axle, single rear wheels]	325	334	457	135	308	226	36	24	24	114	2
12	Medium Truck [2-axle, twin rear wheels]	119	141	85	14	104	57	46	6	8	99	2
13	Heavy Truck [3 or 4 axles]	33	41	28	16	39	34	4	55	7	19	6
14	Truck & Trailer	18	5	24	13	42	36	3	76	126	6	1
	TOTALS	**3,338**	**3,840**	**4,802**	**1,028**	**5,101**	**3,623**	**1.445**	**1,148**	**918**	**2,538**	**530**

Source: ADB Consultant

4.5.2 Origin-Destination Surveys

116. Origin-Destination surveys were completed at a total of 4 locations and generally between the hours of 6 AM and 6 PM on selected days from late September to mid-October, 2014. All sites were coincident with one of the above shown traffic count locations. With the assistance of the Police, interviews were held with drivers to identify the route taken from the point of origin, the route to be taken to reach the destination, the purpose of the journey and to ask if there is a possibility that route changes may occur if the local road network is improved. At the same time, details of vehicle types, numbers of crew / passengers on board, commodities carried etc. were recorded. Again, care was taken to avoid weekends and special event days in order to avoid unrepresentative flow conditions. A summary of the results of the O-D surveys is included in **Annex N - O/D Surveys.**

4.5.3 Flow Forecasts for Subject Roads

117. As part of this Study, forecasts of 2-way traffic flows were produced for the major vehicle categories expected to use the project roads; as presented in **Annex O - Traffic Data Collection and Forecasts**.

118. For preliminary design purposes under the PPTA, a 10-year study period was adopted which would commence at the end of the maintenance period – taken to be 2020 and end in 2030.

4.5.4 Axle Load Surveys

119. As a result of the discontinuation by legal Decree of mandatory axle load measurements at most of the official permanent weigh stations, only limited amount of recent records were received from the Department of Transport (see **Annex B - Overloading Statistics)**. For preliminary design purposes, 'assumed gross vehicle weights' and 'axle configurations' were adopted based on typical values taken from other studies for different parts of the ASEAN region and on local anecdotal reports.

120. A prime example of vehicles using the project roads would be the logging trucks that were present in late 2014 in large numbers on NR-18B in Attapeu Province. Local officials [staff of the presently non-operational weigh-station] reported the typical vehicle as being of 61 tonne GVW with a semi-trailer configuration of 6 axles.

4.5.5 Standard Axle Configurations and vdf Values

121. Based MPWT records from earlier years and on recent study reports for other national road links [notable NR-9], vehicle damage factors were assigned to each of the heavy vehicle categories - the lighter vehicle categories were neglected on the basis that they inflict little or no damage to pavement surfaces. Table 4.2 indicates typical vdf values for the different heavy vehicle categories based on a standard 8.2 equivalent single axle load. The corresponding figures for 1 tonne incremental increases in load [i.e. 9.2, 10.2 and 11.2 t] show that the vdf values increase significantly. Using a conventional exponential value of 4.5 the increases are about 70%, 170% and 300% respectively for all vehicle classes. The use of higher exponent values as used by some jurisdictions, would of course result in even greater vdf values.

Table 4-2 Assumed Vehicle Damage Factors

Heavy Vehicle Classification	No. of Axles	Damage Factor [vdf] for 8.2t axle load	Damage Factor vdf for 9.2t axle load*	Damage Factor vdf for 10.2t axle load*	Damage Factor vdf for 11.2t axle load*
Large Bus	2	1.005	1.687	2.684	4.088
Truck	2	0.113	0.190	0.302	0.460
Large Truck	2	0.899	1.509	2.400	3.657
Large Truck	3+	2.225	3.734	5.941	9.050
Trailer	5 or 6	3.887	6.524	10.379	15.810
Double Trailer	6	5.959	10.001	14.267	20.739

** Using a ''power of 4.5"' exponential value*

Source: Concept Design Report, National Road No. 9 - JICA, Oct. 2013

4.5.6 Projected Load Applications

122. For the selected design horizon of 10 years after completion of the physical maintenance works, i.e. from the end of the 3-years PBC contracts in 2019-2020, standard axle load applications were estimated for each of the 6 subject roadways. These estimates were based upon assumed annual growth rates for the different categories of vehicle and for an *assumed to be enforced*, individual axle load limit of 8.2 tonne.

123. Using the above load application data and the indicative current roadway layer properties [as discussed below] the residual and the required pavement support strengths were estimated for each road link and appropriate treatment options – including major AC overlay intervention options that could be considered in the future and financed from other sources (this cost not included in the total cost of this project) – were identified for costing purposes.

124. 117. For 10-year horizon the estimated overlay thickness requirement for NR-16, Section A was 60 mm, for NR-18B, Sections A and B were 60 mm and 40 mm respectively and for NR-20, Sections A and B were 30 mm and 70 mm respectively. In the event that axle loads up to a 9.2 t, 10.2 t or even 11.2 t limits are permitted on the national roads, the overlay requirement for a 10-year design horizon would increase significantly.

4.6 Geotechnical and Slope Stability Surveys

4.6.1 Pavement Sub-surfaces

National Roads

125. The budget allocation under the PPTA for the geotechnical investigations was also constrained and only a restricted program of sub-surface testing [15] was possible. The Consultant therefore undertook some testing to supplement data available from the RMS and PRoMMS databases. This again was thought to be adequate for the PPTA study purposes, but should again be re-visited during detail design in the future implementation phase of the project. This particularly in view of the fact that the physical maintenance works are not expected to begin until early 2018 by which time surface conditions may be expected to have further deteriorated due to the traffic loads imposed and possible flood events experienced.

126. The Study work included the following items during which in-situ densities and layer support strength contributions were measured using standard DCP and sand replacement equipment. Also, selected samples of materials were recovered for subsequent laboratory analysis of materials properties including:

- Sub-surface investigations [from DCP and Test Pits];
- In-situ densities;
- Sample recovery [for CBR and soil classification testing in the laboratory].

127. At the end of each test program, a report on the geotechnical properties found at each of the test locations was prepared. The results are included **Annex P - Geotechnical Investigations [Pavement Sub-surfaces]**.

[15] *Investigations were undertaken only for the National roads where DBST/AC surfaces exist.*

Local Road Surfaces

128. Extensive geotechnical testing was not possible for the local roads due to the funding limitations and to the inaccessibility of some lengths of the three subject local roads due to recent inundation. The latter led to the conclusion that some areas should be subject to 'rehabilitation' rather than 'maintenance' works as the required work would involve the raising of the road formation above at least the level of the more frequent flood events. The proposed approach involving the covering of any existing road base layers with imported fill materials with the subsequent addition of road bed layers over top. In such cases it was concluded that the contributing support strength of those layers need not be determined by geotechnical testing methods at this time.

4.6.2 Unstable Side Slope Investigations

129. It was reported by DPWT staff that the movement of side slopes often occurs along roads in Attapeu Province particularly and that these events result in temporary blockage, disruption of traffic flows and the expenditure of scarce 'emergency' funding on urgent clearance operations. During the initial reconnaissance process, the locations of previous and potential future landslides were noted. The terrain surrounding the subject roads in the other Provinces was found to be flat or gently rolling and no locations where significant landslides might occur were identified.

130. For the subject PPTA roads in Attapeu Province however, evidence of several significant and recent slope failures were recorded along the eastern-most lengths of both the NR-18B and LR- 9001 corridors [i.e. Section "B" in both cases] - some of these having already been successfully removed from the road and protective vegetation established on the exposed faces. At around km 49-50 of NR-18B however, restorative work was noted to be still ongoing in late 2014 [on both the uphill and downhill side slopes] involving side slope re-profiling, installation of lined catchment ditches and benching of the cut faces. In one area, added support was being provided by means of extensive rock-filled gabion boxes and wire mattress units installed on the downhill side.

131. In view of the potential for more slope failures and the associated cost of future emergency maintenance work, the Consultant undertook a sub-study of alternative slope stabilization methods using proprietary materials - with the aid of a specialist materials supplier. Possible application sites were selected in both the NR-18B [500 m length] and LR-9001 [1,000 m length] in Attapeu Province and some alternative face treatments were suggested.

132. For this Study stage, the process involved visual inspections, topographical surveys of the affected areas from which road profiles and associated cross sections were generated. A number of DCP tests were also conducted to investigate sub-surface conditions. Subsequently, three possible slope stability treatments were developed by the specialist sub-consultant who visited each of the sites in September, 2014 and subsequently produced some alternative design concepts with associated cost estimates. The design concepts are reported in **Annex Q - Side Slope Treatment Options**, the options being (1) Concrete Mattress, (2) Geo-cell and (3) Earth Reinforcement. The Annex also contains construction installation details and indicative unit costs – the latter were later carried forward to the individual BoQ sheets prepared for the respective two sections of road.

133. The cost of a typical treatment for a length of 300 m on each road has been incorporated into the economic viability assessment for the two roads. Final selection and layout details must be further developed and addressed in the final design stages of the Project.

134. The concept was for the installations to be used to demonstrate a suitable slope stability restoration procedure from which the relative effectiveness of the solution can be judged during the post-construction stages. If found to be both successful and cost-effective the same procedures could then be adopted by the DPWT in other high-risk locations for the road network in Attapeu or indeed for other Provinces. The design, installation and later monitoring process could also become part of an overall capacity building process for the DPWT staff concerned.

4.7 Hydrology & Drainage

135. The Terms of Reference for the PPTA required the Consultant to:

*"Study the existing hydrological regime, based on an analysis of rainfall and flood records including subsurface water characteristics, supplemented by detailed field investigations to establish adequacy of road embankment levels, culverts, and side ditches"….*also to*…….."Assess cross drainage requirements and propose new structures, culverts, and causeways as appropriate, or improvements to existing structures where these are otherwise structurally sound".*

4.7.1 Background Data

136. This part of the work was completed by means of visual inspection, review of both RMS/PRoMMS records and subsequent assessment of existing capacity / identification of requirements for system expansions. This was based on the inventories compiled from the Consultant's field notes and is contained in **Annex D – Drainage Structure Inventories**.

137. Other information collected under the hydrology / drainage part of the Study included:

- Regional rainfall records [for the maximum number of years available];
- Contour mapping; [1:50,000 scale];
- Anecdotal evidence collected from the local communities.

4.7.2 General Approach

138. Given that there was no time allocated in the PPTA for a Hydrologist, the assessment was limited to a review of available records followed by a series of field trips in which a number of 'engineering judgments' being based on the existing drainage patterns. These related essentially to observations of the extent of previous flood events [based on DPWT staff experiences and in some cases, local residents] and observations made on the apparent scope of interventions needed.

139. The findings of the reconnaissance trips and the various recommendations made in respect of both the 'major' and minor' drainage systems are described below:

4.7.3 Drainage Systems

140. These are often regarded as being:

- The 'major system' - defined as the features along the route followed by the run off, in form major events [i.e. storms with 10+ return periods] when the capacity of the 'minor' system is exceeded. The 'major' drainage system consists of the local river / stream network including any storage areas, the major cross drainage structures, roadway surfaces and related watercourse / channels conveying the larger run-off volumes;
- The 'minor system' - represented by the features that are present to accommodate the more frequent, minor run-off volumes (often 1-5 year storm return periods) and comprising the side drainage ditches in rural areas and gutters / catch basins / enclosed pipe systems in any urban locations.

141. For the purposes of preparing cost estimates by which to confirm the viability of the Project, the Consultant's team focused on compiling inventory data and establishing the likely scope of any maintenance needs and additional provisions for existing drainage features - generally in both of the above categories. Time and budget allocations prevented detailed calculation of channel flow characteristics and development of related hydraulic efficiencies of the associated major drainage structures – this should be revisited during the subsequent detail design stage. For Study purposes, the team has relied on the field assessments and concluded that aside from necessary maintenance efforts, no major system upgrades are required.

4.7.4 Field Observations

142. The following summarizes the observations made during the reconnaissance missions to each of the subject roads as recorded in **Annex D – Drainage Structure Inventories**.

143. **Table 4.3** below summarizes the main drainage crossings located in each of the six subject road corridors, respectively - a total of 420 items was recorded.

Table 4-3 Major Drainage System Features

Road No.	Province	No. of Bridges	No. of Box Culverts	No. of Pipe Culverts	Remarks
NR-16	Xekong	1	8	27	From Sub-Consultant's field inventory. * Two already concrete – four steel to be replaced in Section A. Four steel in Section B, deferred
NR-18B	Attapeu	17	54	164	
NR-20	Salavan	10*	29	3	
LR-6901	Salavan	0	3	12	From Sub-Consultant's field inventory
LR-7615	Xekong	2	3	15	
LR-9001	Attapeu	5	11	56	From 'as-built' records.
TOTALS =		**35**	**108**	**277**	**Grand total of 420 crossings**

4.7.5 Potential Flood Impacts

144. Based on anecdotal evidence gathered from provincial and local sources, it was

concluded that the following provisions should be made in the PPTA study for cost estimation purposes. The provisions proposed should however, be the subject of more detailed hydrological review and analysis during the next stage of the implementation process.

National Road Corridors

145. Overtopping of the road surfaces is reportedly not a frequent occurrence and no change in embankment elevations appears to be warranted. Similarly, no increases in waterway opening sizes at major crossings [i.e. bridges and box culverts] are required – see text below.

Local Road Corridors

146. Inundation of sections of the existing road surfaces is reported to be a fairly regular occurrence and indeed, the Consultant's teams experienced difficulties in accessing parts of the routes during the field investigation stages. Journeys by motorcycle, bicycle and pedestrian transport modes only were observed in some sections and then accomplished, only with some difficulty.

147. As described above, the solution to most of the local road access problems would be to introduce localized raises in road formation levels with associated side ditch excavation and subsequent construction of new road surfaces. Below table shows the preliminary locations where raising of the embankment is required.

Table 4-4 Identified Annual Flood Risk Areas

Road No.	Province	Potential Flood Areas	Affected Length [m]	Approx. Raise in Elevation* Raise [m]	Remarks
NR-16	Xekong	none	-	-	
NR-18B	Attapeu	none	-	-	
NR-20	Salavan	none	-	-	DPWT identified 1 riverside location prone to flooding. But a hydrological study would be required to identify corrective actions needed.
LR-6901	Salavan	3	1,000	Up to 1.0 m at road centreline	* To be confirmed in future detail design stage
LR-7615	Xekong	3	900	Up to 1.0 m at road centerline, and up to 1.5 m in one location	
LR-9001	Attapeu	2	700	Up to 1.0 m at road centreline	

4.7.6 Waterway Opening Sizes

148. From field observations of historical high water levels and commentary on past flood events collected from local sources on high water levels etc. waterway opening sizes at all bridges and box culvert structures appear to be adequate. It was concluded therefore that no replacements for hydrological reasons alone were necessary.

149. In the case of the 4 existing Bailey bridge structures located in the northern section [Section A] of National Road NR-20 in Salavan Province, replacements were included in the cost estimate due to their presently sub-standard dimensions - and to load carrying concerns. In each of these cases the Study team has concluded that the existing waterway opening areas need to be at least retained in order to avoid changes to the present flow patterns and thereby affect upstream and/or downstream riparian land use. The steel bridges are proposed to be replaced by new twin-cell box culverts for cost savings and convenience of construction reasons.

150. In the case of the 4 existing Bailey Bridges located in the southern section [Section B] of National Road NR-20, replacements were also judged to be warranted for similar reasons. However in this case, the Study team concluded that replacement of these bridges under the future Project is unjustified. This is due to the fact that other similar restrictions will remain to the south of the Project road in Champasak Province resulting in Section B continuing to be 'unusable' by heavy vehicles. Under this circumstance and although cost estimates for the reconstruction have been developed [using two box culverts and two long-span concrete bridges], the high cost of their replacement was excluded from the economic analyses carried out.

151. Accordingly, and subject to confirmation following more detailed reviews and analysis during the next stages of the project implementation process, the costs of such provisions in Section A only were included in the cost estimate preparation work.

4.7.7 Erosion Control

152. Field observations made at each existing bridge and box culvert site indicate that some damage due to erosion has been experienced from past flood flow events. Although difficult to define and quantify without a full hydrological study, it was considered prudent to include some provision for the cost of renewing / restoring parts of the existing protection measures. Following measures were included, for which appropriate cost allowances were made:

- Addition of new and/or replacement of existing retaining wall structures on river banks;
- Provision of anti-scour measures at bridge abutments and mid-stream piers;
- Addition of energy dissipating measures at outlet ends of box culverts.

4.7.8 Climate Change Effects

153. The ToR for the PPTA contains a requirement for the Consultant to…*'prepare feasibility engineering designs to include road safety and climate resilience features"… that need to be incorporated into the detailed designs'.* This in turn was drawn from the ADB's Concept Paper for the project which among other aims, identified necessary strengthening of MPWT / DPWT capacity for the technical management of road maintenance works in the area of climate resilience.

154. In recognition of its importance, many funding agencies have financed research efforts through the provision of grants and subsequently published reports on the probable effects of climate change. These include the ADB's own initiatives under the CCF, CEFPF, APCF, FCF, WFPF and PEF headings which include a range of models by which impacts can be estimated

in the short, medium and long terms. While the extent of impacts at any particular time are difficult to predict with any precision [due to the large number of variables involved and subjective interpretations of their effects on a regional basis] it has been concluded that changes will occur and that steps in the areas of 'adaptation' and 'mitigation' must be taken. These are also raised as areas to be addressed, in the ADB's Project Concept Paper.

155. For the subject road maintenance project, the provisions to be made are clearly in the area of 'adaptation' and these were interpreted as being in the following 5 main categories:

- Roadway Design
  - Raising of road surface elevations above frequent flood levels *;
  - Adjustment of embankment side slope ratios;
  - Paving of road surfaces*.

- Drainage Design
  - Lining of ditches*;
  - Provision of additional cross drainage *;
  - Replacing small diameter pipe culverts with larger ones [min. 800 mm proposed]
  - Improving flow condition at bridges and major culverts*.

- Erosion control
  - Gabions and other slope protection measures*;
  - Benching of side slopes*;
  - Grassed roadside slope treatments;
  - Anti-scour measures, energy dissipaters and debris controls.

- Maintenance
  - Dust control;
  - Ditch and culvert cleaning*;
  - Repair of erosion protections*;
  - Repair of roadway shoulders*.

- Institutional Issues
  - Promotion of Road Management Systems [RMS], Pavement Management Systems [PMS] & Bridge Management Systems [BMS];
  - Review / updating of Design Standards;
  - Review / updating of Standard Technical Specifications.

** For the subject PPTA Study the aspects marked above with * have been identified as being measures for inclusion in the cost estimation process. The other measures might be considered for addition as the detailed design progresses.*

4.8 Construction Materials Sources

156. The Terms of Reference for the PPTA required the Consultant to:
"Investigate the suitability of locally available construction materials and where necessary locate new quarries and borrow pits and assess the quality and quantity of materials and the hauling distance".

4.8.1 Earth Fill Material

157. Given the nature of the project as a program of maintenance interventions for the three already surfaced, national roads no horizontal or vertical re-alignment was envisaged. As a result, the need to procure significant volumes of earth fill [i.e. borrow] material was deemed unnecessary for NR-16, NR-18B and NR-20 and no sources of borrow material were therefore researched at this time.

158. For the three local roads however, it was noted that some of the existing road surfaces [all presently unpaved] are subject to regular inundation making them impassable at least with an annual frequency. The best solution was deemed to be elevation of the sub-grade elevations in the affected areas using fill materials imported from local sources. These were reported by DPWT staff as being available in sites adjacent to the rights of way.

159. The use of imported fills in localized sections results more in 'rehabilitation' works rather than simple 'maintenance' interventions. However, a simple maintenance intervention [involving re-grading and the clearing of debris and roadside vegetation etc.] were considered not to be cost effective. For use in the affected sections of the local roads therefore the Consultant with DPWT assistance, has attempted to identify potential sources of borrow materials. Confirmation of the actual quantities available and the quality of the materials at each site [possibly requiring mechanical and/or chemical stabilization] need to be a topic for closer field investigation and related laboratory testing during the future detail design stage.

4.8.2 Aggregates for Base, Sub-base and Concrete Production

160. For the other construction materials likely to be needed, the team undertook the following:

- Discussions with MPWT and DPWT staff regarding records of authorized sources of aggregates in or close to each Province;
- Assembly of any quantity / quality details available for any licensed aggregate sources;
- Review of available geological information to identify possible alternative sources;
- Review of potential locations and resulting haul distances involved;
- Determination of any potential environmental risks.

161. Due to a limited budget for ''field surveys'' no detailed prospecting for potential sources of construction materials[17] could be undertaken. Instead consultations were held with DPWT staff during the field trips to identify locations for major construction materials likely to be required. Potential sources of different major construction materials are shown in Figure 4.2 below.

162. It will be necessary to include an item in the detailed design phase to cover confirmation of these sources [including quality and potential quantities]. It should be noted however, that if data of this nature is to be provided to the eventual tenderers, appropriate wording in the bidding/contract documents must be used to place the risk that any sources

[17] The level of funding available for field investigation work [under the designated PPTA PS] was insufficient to cover work other than condition assessment of the shortlisted roads, limited geotechnical and topo surveys and traffic and social impact surveys

prove to be unsuitable [in terms of quality and quantity] on the Contractor.

4.8.3 Sand

163. Sources of sand for construction purposes are reported to exist mainly in sections of the Mekong River to the north and south of Pakse city. Haulage distances for Salavan and Xekong Provinces are understood to be manageable and no major surcharges for long-haul operations are anticipated. In the case of Attapeu, distances from the river [to the centre of the subject sections of roadway] are of the order of 80-100 km and although access routes are presently of good standard, higher base costs for this material may be anticipated. An allowance to cover this incremental cost was included in the relevant unit prices.

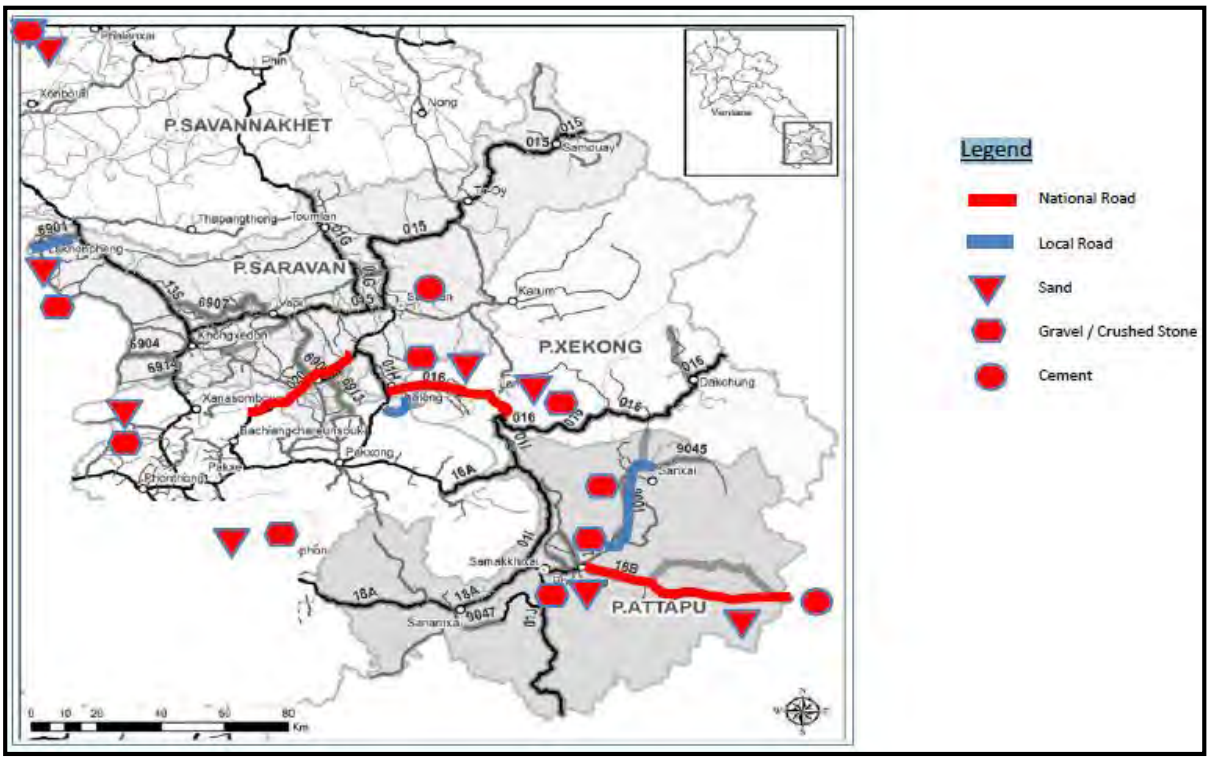


Figure 4-2 Potential Sources of Construction Materials

4.8.4 Cement

164. Typically in the southern provinces, cement is imported from Thailand or Vietnam and stockpiled in regional suppliers' stockpiles. The unit cost of this material is reported to be similar in all three provinces and the unit cost reflects also the costs of importation and haulage.

4.8.5 Water

165. Each of the subject Provinces is understood to have widely available supplies of water – either from surface or sub-surface sources. Subject to confirmatory testing of samples and a review of any environmental implications at the future detailed design stage, the sources are expected to be available within close proximity to each of the work areas. The extraction and haulage costs of water are reflected in the unit cost of construction work items in which water is required.

4.8.6 Bituminous Materials

166. The sources of these materials will again involve the importation of base materials from neighboring countries. While the decisions to import portable batching plants and where to site them will be left to the individual Contractors, the compiled cost estimates include average costs for the procurement, haulage and application of these materials.

4.9 Maintenance Options

167. The maintenance activities to be undertaken under the Project will involve several types of interventions that fall into the different groups of maintenance activities defined in the current MPWT Maintenance Activity Codes [MAC] manual dated August, 1999. MAC contains the following categories:

- Routine Maintenance;
- Periodic Maintenance;
- Rehabilitation and Improvement;
- Emergency Maintenance.

168. Within the above groups the following main categories of physical works were identified for which the associated quantities and unit costs were estimated:

- Patching and pothole repairs – DBST and AC surfaces;
- Patching and repairs - gravel surfaces;
- Earthworks in areas where embankment raises are needed;
- Ditching;
- Re-grading of gravel surfaces;
- Shoulder restoration work;
- Bridge maintenance;
- Drainage system work;
- Restoration of existing / installation of new erosion protection;
- Traffic safety provisions including signs, markings, safety barriers etc.;
- Roadside maintenance, e.g. clearing of ditches, culverts etc.

169. In the cost estimate the works have been grouped as follows:

(i) initial rehabilitation/ maintenance;
(ii) performance based carriage way maintenance;
(iii) performance based road side maintenance; and
(iv) provisional sums for emergency maintenance.

170. The other described options in this report, -full AC overlays and full DBST overlays-, are only presented for possible future considerations (if funds become available), and are not part of the current project cost estimate.

4.9.1 Intervention Sub-categories, National Roads

171. For the three National road sections the major work items were defined and included

in the cost estimate, as shown in Table 4-5 below. The work items were categorized as:

1. Routine Maintenance Backlog, including Road Safety Items;
2. Periodic Maintenance Backlog;
3. Rehabilitation and Improvement Works.

Table 4-5 Summary of Interventions for National Roads

Work Category	NR-16	NR-18B	NR-20
1. Routine Maintenance			
Pothole repair - full and partial depth [DBST surfaces]	√	√	√
Pothole repair - full and partial depth [AC surfaces]		√	
Ditch re-grading / new excavation	√	√	√
Box and pipe culvert clearing	√	√	√
Grass cutting, clearance of encroaching vegetation	√	√	√
Repaint / replace vertical signage	√	√	√
Bridge superstructure - deck cleaning, repaint rails, deck drain cleaning	√	√	√
2. Periodic Maintenance			
DBST surface re-sealing	√	√	√
Re-graveling / re-grading of shoulders	√	√	√
Install horizontal & vertical signage, including reflectors, delineators	√	√	√
Guardrail new installation / repair	√	√	√
Bridge superstructure - repair / replace joints, rails	√	√	√
Bridge sub-structure - replace bearings	√	√	√
Additional Pipe Culverts	√	√	√
Anti-scour provisions at bridge abutments, piers, river banks	√	√	√
Anti-erosion provisions - ditch linings, energy dissipaters, ditch checks	√	√	√
3. Rehabilitation & Improvement			
Bridge replacement with Box Culverts [NR-20 Section A only]			√
Unstable slope treatment [NR-18B only]		√	
3a. Road Safety Items			
Install horizontal & vertical signage, including reflectors, delineators	√	√	√
Guardrail new installation / repair	√	√	√

4.9.2 Intervention Sub-categories, Local Roads

172. For the three Local road sections the major work items were defined and included in the cost estimate, as shown in Table 4-6 below. The work items were categorized as:

1. Routine Maintenance Backlog, including Road Safety Items;
2. Periodic Maintenance Backlog;
3. Rehabilitation and Improvement Works

Table 4-6 Summary of Interventions for Local Roads

Work Category	LR-6901	LR-7615	LR-9001
1. Routine Maintenance			
Ditch re-grading / new excavation	√	√	√
Box and pipe culvert clearing	√	√	√
Grass cutting, clearance of encroaching vegetation etc.	√	√	√
Bridge superstructure - deck cleaning, repaint rails, deck drain cleaning	√	√	√
Re-paint vertical signage	√	√	√
2. Periodic Maintenance			
Re-grade road surfaces	√	√	√
Reseal existing DBST sections	√		
Tree removal	√	√	√
3. Rehabilitation & Improvement			
Grade raising [imported earth fill] in flood prone areas	√	√	√
Add new sub-base, base layers	√	√	√
Extend existing DBST sections/ add new DBST sections	√	√	√
Install short sections of concrete pavement		√	√
Bridge superstructure - repair / replace joints, rails	√	√	√
Bridge sub-structure - replace bearings	√	√	√
Prepare foundations and install relocated steel bridge		√	
Install new / replace existing Box Culvert		√	√
Anti-scour provisions - at bridge abutments, piers, on river banks	√	√	√
Anti-erosion provisions - ditch linings, energy dissipaters, ditch checks	√	√	√
Unstable slope treatment [LR-9001 only]			√
3a. Road Safety Items			
Install horizontal & vertical signage	√	√	√
Install Guardrails		√	√

4.10 Design Approach

4.10.1 Pavements - National Roads

173. A limited series of investigative tests using DCP equipment and test pit excavations were carried out for all three National road sections. From these and using also the results of the laboratory tests conducted on recovered samples of the in-situ materials, existing layer thicknesses and corresponding support strength contributions were derived for each of the test locations. These were then assumed to be representative of each section of the route and the values obtained were extrapolated over the full length of each corridor.

Patching & Pothole Repairs

174. Using the above data and the field records of the extent and nature of each area of distress, the required remedial actions were estimated in terms of surface area and material types / depths. These were based on an assumed 'like for like' maintenance intervention approach.

Long-term Upgrades

175. The three subject national roads are part of an important regional network that will increasingly contain cross-border traffic flows going to/from neighboring Thailand, Cambodia and Vietnam. With a view to stimulate the local economy by encouraging international trips as well as facilitating local traffic movements, a high class trunk road is desirable. This suggests that beyond this maintenance project, a longer term strategy should be considered in which overall road standards are improved. This could be achieved by the following means if and when additional funding is made available:

a. DBST Re-sealing Option

176. After the maintenance backlog has been addressed under the proposed Project, an option would be to apply a full length DBST re-seal to the subject sections of national road. While this action would contribute little to the structural strength of the pavements, it would provide a new surface of uniform appearance and skid resistance as well as an opportunity to install road markings of a consistent international standard. On the assumption that a full re-sealing operation on existing DBST surfaces is an option to be considered, the extent of the work required was estimated on a simple 'surface area of roadway' basis. Deductions were made for any significant areas where recent re-sealing work has already been completed by the DPWTs. The approximate cost of the required work is presented in the appropriate section of this report – but as this is only an option, it has been excluded from the total project cost estimate and the economic viability assessments.

b. AC Overlay Option

177. Although the study's traffic loading forecasts suggest that the existing layer configurations and/or support strengths provided by them will be adequate for several years into the future, the option of increasing support strength by the application of overlays could be considered. Sometime in the future time when the maintenance backlog has been eliminated and appropriate asset management processes installed, AC overlays could be introduced. As for the DBST alternative, it would provide a new surface of uniform appearance and skid resistance as well as the opportunity to install consistent road markings

178. In order to estimate the material requirement and the cost implications for this long-term intervention on the subject National roads, a design for the thickness of the Asphalt Concrete overlay was prepared for each section - this was however based on somewhat limited amount of pavement data available and as such would need to be further investigated at a later date. The cost of the work was calculated and is presented in the appropriate section of this report – but again as this is only an option, it was excluded from total project cost estimate and the economic viability assessments.

179. Using the predicted axle load applications [for the different classes of vehicles produced from the traffic surveys and future growth rate scenarios see above] the 1993

AASHTO design methodology was applied using the same design parameters as contained in the 2013 JICA study for National Road No. 9. A check of the results should be made during the detailed design stage when more data becomes available and a check could be made using methods in use by other jurisdictions [including the TRL from the U.K and the AustRoads Guidelines from Australia].

4.10.2 Pavements - Local Roads

180. To derive preliminary material requirements and the related cost implications for the local roads, a standard MPWT layer configuration for 'low volume roads' was adopted. These were used to define thicknesses of layers to be placed over imported earth fill material used in areas where frequent high flood levels and suggested raises in road embankment elevations were suggested.

181. In the case of LR-9001 [Section B] in Attapeu Province however, placement of sub-base materials over a prepared sub-grade was completed in an earlier ADB intervention over the full length of 37 km. With some provision for re-grading and the use of additional materials in presently distressed areas, the sub-base was assumed to be adequate with only base layers needing to be added.

Concrete Pavement Option

182. As indicated in the corridor inventory and the plan/profile information gathered from the DPWT, some areas of steep gradient exist in parts of LR-7615 and LR-9001 [Section B]. In order to improve traction and the safety of users, the installation of sections of concrete pavement[19] has been included in the preliminary design. Using the MPWT standard design for unpaved surfaces [i.e. for gradients > 12%] in mountainous areas, the associated construction cost has been determined.

4.10.3 Pipe Culverts

183. Work on the pipe culverts [located during the corridor inventory work] was assumed to involve the cleaning of all existing installations and the provision of additional capacity in a few areas as noted by the field crews. Some sections of the two local roads LR-6901 and LR-7615 are subject to frequent inundation and therefore additional pipe culvert for cross drainage are needed. A minimum concrete pipe diameter of 800 mm was adopted for any new provisions or for the replacement of existing smaller pipe culverts.

4.10.4 Drainage Ditches

184. Field crews also noted that along much of the length of all of the subject roads, side ditches were in need of clearing and re-grading – in some areas they are non-existent. From the inventories, quantity estimates were made for these items of work and due allowance made for the provision of ditch linings in areas where steep slopes were recorded. An allowance was also made for installation of anti-erosion measures in some locations.

[19] The conventional slab thickness reportedly used in Attapeu Province is 230 mm with a single layer of steel reinforcement. This has been used for cost estimation purposes.

4.10.5 Utility Relocations

185. Given the predominantly rural character of the subject roads and the requirement to retain the existing alignments, no shifting of any existing utilities was anticipated. The provision of duct crossings for any future utility systems should be checked with the respective owner-agencies during the detailed design stage.

4.10.6 UXO Clearance

186. As the National roads interventions proposed are essentially surface maintenance works with no horizontal or vertical re-alignment required, it is assumed that unexploded ordnance is unlikely to be a concern.
For those sections of the Local roads where raising of embankment levels - resulting in wider earthworks and drainage ditch 'footprints' - and where roadside sources of fill materials may be needed, necessary precautions need to be taken. Reviews of available UXO clearance records for these roads and some subsequent field survey checks need to be carried out during the detailed design and/or the maintenance stages. Depending upon the findings, appropriate provisions need then to be made in the tender documents for the required UXO clearance work.

4.10.7 Bridge Load Carrying Capacities

187. Original design details and as-constructed records for bridges were not made available for checking load carrying capacity, but from the visual assessments and the general findings of the inspection teams, no major problem areas were reported and all bridges were judged to be suitable for retention from the Load Carrying Capacity point of view. It was concluded that detailed estimates of current load carrying capacity were not prepared based upon the findings of the inspection teams. Accordingly, the cost estimates prepared included basic maintenance interventions only.

4.11 Quantity Estimates

4.11.1 Major Cost Work Items

188. Interventions that will require the most significant investment costs include the following items for which condition surveys have been completed and itemized quantity estimate work was carried out. The method adopted to produce preliminary quantity estimates for Study purposes is indicated in several cases:

Table 4-7 Derivation of Quantity Estimates, Major Items

National Roads	Quantity Estimate Methodology
Patching	Surface areas from distress surveys, depths from field test results
Pothole repairs	Surface areas from distress surveys, depths from field test results
DBST surface re-sealing	Surface areas from distress surveys, visual assessment
Re-graveling / re-grading of shoulders	Visual assessment
Ditching	Visual assessment, field inventories
Local Roads	**Quantity Estimate Methodology**
Grade raising [earth fill]	Surveyed profiles, field identification of potential flood areas
New sub-base, base layers	Widths from standards, pavement layer depths from design
Extend existing DBST sections	Visual assessment, field inventories
Ditching	Visual assessment, field inventories

4.11.2 Minor Cost Work Items

189. The other interventions listed in Tables 4.5 and 4.6 above involve only relatively small implementation expenses for which some itemized quantity estimates could not be prepared and in such cases simple 'allowances' were introduced. It is anticipated that these will be the subject to re-examination during the future detailed design in order to arrive at more accurate quantities and cost estimates.

4.11.3 Optional Interventions

190. As indicated earlier some optional interventions, -that can be considered in the future, beyond this project-, have been identified during the Study for which the costs were estimated. However these options have not been considered when assessing the economic viability of this project. Only the 'base maintenance' works have been included in the economic viability assessment of the LRSGMP. As reported in Chapter 4.9 'Maintenance Options' following optional maintenance interventions were identified and costed.

Table 4-8 Derivation of Quantity Estimates, Optional Interventions

National Roads	Location/Source of Dimensions
Replacement of other steel bridges	NR-20, Section B [4 structures], dimensions from field surveys
DBST Re-seal	All National roads, widths from field surveys
AC Overlay	All National roads, widths from field surveys, overlay depths from design calculations

4.11.4 Contract Packaging

191. Based upon the derived maintenance cost estimates and ADB's thresholds for ICB / NCB procurement, a proposed list of Works Contracts was prepared. The list contains a number of both ICB and NCB packages as described in Chapter 12.

CHAPTER 5 ENVIRONMENTAL ASSESSMENT

5.1 Introduction

192. This introduction presents the results of the activities in the field covering the three provinces of Salavan, Xekong and Attapeu where the project roads for maintenance are located. Activities in the field included the following:

- Conduct site inspections of the roads for maintenance, the existing conditions of physical, natural environment to determine and confirm the environmental classification of the shortlisted roads for maintenance with the ADB's "Rapid Environmental Assessment Checklist" for roads and highways, See **Annex R – Rapid Environmental Assessment Checklist [6 Roads].**;
- Meetings with the Provincial and District offices of the Department of Works and Transport were held to gather additional information about the proposed priority and alternative roads, organizational set up and management from the provincial to their district offices;
- Meetings with the Provincial Department of Natural Resources and Environment to confirm the procedural requirements, time frame for the review and approval of the Project Document prior to the issuance of the Environmental Compliance Certificate (ECC); maps pertaining to protected areas and forest cover and meteorological data information were also solicited for the general environmental settings of the project area as baseline data;
- Identify potential impacts of the maintenance activities, determine the magnitude, distribution, and the affected group, and the duration impacts;
- Provide information on possible mitigation measures to minimize the impact including mitigation costs; and
- Provide recommendation for formulating the Environmental Management and Monitoring plan; and Institutional Arrangements for implementation.

5.2 ADB Environmental Safeguards and Lao PDR Environmental Legislations

5.2.1 ADB Safeguard Policy 2009

193. The general requirements of the Safeguard Policy of ADB for the project include assessment of the project's environmental and social impacts, prepare an Environmental Management Plan (EMP) and monitoring plan, and conduct public consultations with affected communities. Also, the project must comply with the Lao PDR environmental laws, regulations, and standards.

5.2.2 Lao PDR Environmental Legislations

Environmental Protection Law (National Law 02/1999)

194. The Environmental Protection Law (EPL) was approved by the President on April 3, 1999. This law provides a legal framework for environmental management of development projects. It establishes the framework for unified environmental management with the aim of preserving the environment and making rational and sustainable use of natural resources. The EPL specifies necessary principles, rules and measures for managing, monitoring, restoring and protecting the environment in order to protect the public, natural resources and biodiversity, and to ensure the sustainable socioeconomic development, health and improved quality of life of the nation. The Ministry of Natural Resources and the Environment (MONRE) is responsible for the implementation of EPL.

Decree on Environmental Impact Assessment (Decree No. 112/PM02/2010

195. Under the EIA Decree no. 112/PM the time frame for the review and approval of the Project IEE Document prior to the issuance of the Environmental Compliance Certificate (ECC) is 30 days after submission of the project IEE document.

196. While other ministries issue guidelines for implementing provisions of the IEE and EIA and environmental protection, it is MONRE that is responsible for review of the IEE and EIA and that will issue the environmental compliance certificate. In the case of the Road Sector Governance and Maintenance Project the Provincial Department of Natural Resources and Environment (DONRE) shall review and issue the ECC where the said Road Maintenance works are located.

197. Other laws, regulations or enactments that provide for the protection of the environmental resources in Lao PDR include:

198. Governmental Decrees, Regulations, and Standards relevant to the EPL are:

- The Implementing Decree of 2002, which provides the legal tool for implementation of the law; and
- The Environmental Management Standard of 2001 stipulates the minimum environmental standards when developing a Project. The Lao environmental standards have not yet been fully established but some provisional standards are in place and environmental standards used by international organization and advanced countries have been adopted as reference compliance standards.

5.3 Description of the Environment

199. The geographical location of the shortlisted roads in the maintenance project spans the provinces of Salavan, Xekong and Attapeu. Each province has 1 national road and 1 local road under the Lao Road Sector Governance and Maintenance Project.

5.3.1 Biodiversity and National Protected Areas

200. The first biodiversity management study in the Lao PDR was undertaken in 1986; followed by the first attempt to develop a biodiversity management system at the national level,

instituted by the Forest Resources Conservation Project (1988-91), part of the Lao-Swedish Forestry Cooperation program.

201. Lao PDR's biodiversity significance has become increasingly important since systematic field investigation began in the early 1990's, with the discovery of several new mammal species of major international interest, but also with the detailed compilation of faunal lists and a comprehensive status document (Duckworth et al. 1999). However, much still needs to be learned about the biodiversity; especially the flora, invertebrates and small mammals.

202. This project focused on developing and establishing a Protected Areas System, i.e., areas set aside specifically for the management and protection of biodiversity, based on two foundations:

1. Policy arising from GoL's commitment to forest conservation, especially as expressed in the Tropical Forestry Action Plan of 1990. GoL's goal was to achieve 25,000 km2 of forest under conservation protection (10.5% of country);
2. Design philosophy and criteria for site selection were based on the bio-geographic analyses of MacKinnon and MacKinnon (1986).

203. The principles that guided the assessment of suitable sites (Salter and Phanthavong 1989) were:

- Protection needs to be provided to the full range of ecosystems and species communities occurring within the country";
- "The total area under protective management needs to be adequate to prevent or minimize species extinctions";
- "Effective protection for 5-20% of the original area of each habitat type within each bio-geographic subunit" needs to be provided in the Lao PDR;
- The approach assumed that protection of adequate, representative areas of habitat would also protect the majority of plant and animal species, therefore individual species requirements were not considered.

204. The search for appropriate protected areas started by assessing 68 sites that had been proposed (by various sources) for protection. Analyses of the sites, individually and as a system, were based on:

- Extent of remaining natural vegetation: 50,000 ha. was the minimum for selection;
- Completeness of original cover: priority given to more intact areas;
- Extent of representation in bio-geographic subunit, based on contributions of altitude classes and habitat types;
- Regional priority: according to MacKinnon and MacKinnon (1996) by bio-geographic sub-unit, size, regional importance of habitat, and so forth;
- Degree of threat: priority given to high threat areas identified by MAF.

205. The process identified 29 of the 68 sites as potentially suitable for protected areas (and rejected the others). Ground assessments of most of the 29 were completed by 1991 and 17 suitable sites identified.

206. The process culminated in 1993 by PM's Decree 164 establishing the 17 recommended protected areas, plus Phou Phanang near Vientiane, which was added for its historical value. Two more areas were added by Ministerial Decrees in 1995 and 1996, making a system of 20 protected areas, or NPAs.

207. The system of National Protected Areas (NPAs) is new, having been decreed only in 1993, with two other areas added later for a total of 20 (see map below).

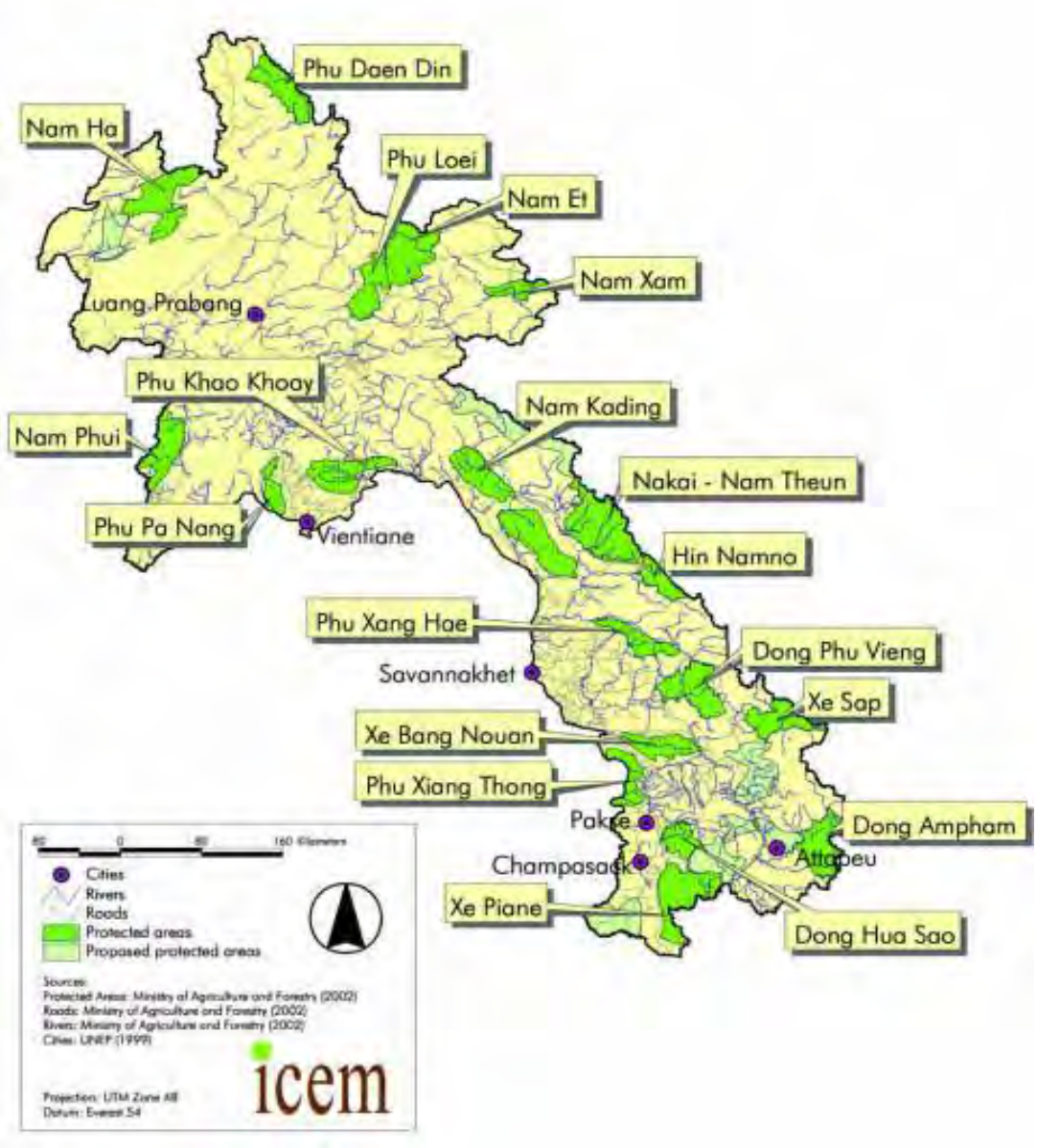


Figure 5-1 National Protected Areas [NPAs]

208. The NPA system covers around 14 percent of land area in Lao PDR, which together with protected areas established at provincial and local level, covers more than 20 percent of the country. The NPA system was created on two foundations:

1. The government's commitment to forest conservation, especially as expressed in the Tropical Forestry Action Plan of 1990; and,

2. Sound bio-geographical analysis as the scientific basis for the overall system design and site selection criteria.

209. Specifically, the system's design goal was to "provide effective protection to 5-20 percent of the original area of each habitat type within each bio-geographical sub-unit" in the country. While the area under nominal protection is large, in reality all NPAs are multiple use areas (IUCN Category VI).

5.3.2 Climate and Rainfall

210. The climate is dominated by monsoons, with pronounced wet and dry seasons. Most rain falls during May to September, when the prevailing winds blow from the southwest. Annual rainfall ranges from 1,000 mm in the extreme south to 3,000 mm in the north. The dry season, from October to April, is characterised by winds that blow from the north-east.

211. Mean temperatures range from about 10 0C in January to 38 0C in July, cooler in the north, warmer in the south. Lowland areas are tropical, while the highest elevations and the mountains of the extreme north are sub-tropical. **Annex S - Initial Environmental Examinations [6 Roads]** presents the meteorological data of Salavan, Xekong and Attapeu provinces respectively.

5.3.3 River System

212. The Mekong River is the dominant drainage system. It reaches Lao PDR from China in the northwest, where it demarcates the international borders with Myanmar and Thailand. It enters Lao, swings eastwards to Luang Prabang; then south to rejoin the border with Thailand, past Vientiane, and re-enters Lao again near Pakse from where it flows south into Cambodia. Several major tributaries enter the Mekong from the east during its 1,600-km journey between China and Cambodia. There are no natural lakes in Lao PDR. The largest body of surface water, Nam Ngum to the north of Vientiane, is man-made.

5.3.4 Water Quality

213. The urban area of Salavan straddles the confluence of the Xedon River. Several streams and a number of drainage channels flow into the Xedon within the study area. Grey water from households, markets, restaurants and other establishments in the urban area is mostly discharged directly to these water courses. Sewage is also finding its way into the drainage system and thereby discharged untreated into the Xedon. All outfalls are upstream of the intake for the Salavan water supply, giving rise to much local concern over the quality of raw water being delivered. It is understood that the intake, which is currently close to the riverbank, will be moved to the centre of the river utilizing a provision incorporated into the design of the Xedon River bridge. In Attapeu it was observed that several households using water supply, also discharged directly into the Xekhaman River.

5.3.5 Air Quality

214. Due to a lack of equipment and technical expertise there has been no historic collection of data on air and water quality in Salavan, Xekong and Attapeu. In the meantime reports on pollution remain anecdotal. At the present time air quality is good in the three provinces of Salavan, Xekong and Attapeu.

215. Air quality monitoring is still not a routine practice in Lao PDR and no information on the concentrations of air pollutants in three provinces (project sites). Generally the air quality appears to be good. There are almost no industries and traffic volumes are currently low by international standards.

216. Nevertheless localised pollution does occur and the incidences are likely to increase with increased urbanization unless action is taken to prevent or mitigate them. In some areas pollutions include:

- Uncontrolled incineration of garbage
- Decaying deposits of uncollected garbage
- Wind-blown dust and debris resulting from solid waste transportation
- Dust caused by traffic along unsealed roads
- Exhaust from vehicles and motorcycles – exacerbated by poor traffic management

5.3.6 Topography and Soils

217. The topography of the provinces of Salavan, Xekong and Attapeu is about 60% flat land area. The topography is characterized by geologically young landscape being created by active and ongoing processes. The slopes of the lower hill zones tend to be steep where tributaries have down-cut in V-shaped valley bottom. The slopes of the Attapeu upper hill zones tend to be less steep and are more rounded. There are significant areas of flat land being cultivated to rice in Salavan, Xekong and Attapeu provinces. The present project road alignment in Xekong passes through a generally flat terrain. The project roads in Attapeu pass through rolling and steep slopes.

218. The soils in the southern part of Lao are generally good soils and are acid hydromorphic and contain low organic matter and nutrients, which are moderately suited to rice production. More fertile soils with high organic matter and good physical properties are found in the southern portion of the Laos. Mostly crops like corn, ground nuts are grown in these soils in addition to the rice.

5.3.7 Flora and Fauna

219. Lao PDR has moderate levels of biological richness and a few endemic species. Endemic Bird Area (EBA) of Lao PDR is in the region of Nakai Nam Theun National Biodiversity Conservation Area (NBCA). Of the nine restricted range species of the GMS, four are known (or are likely) to occur in Lao PDR. They are listed below with global status and habitat.

- White-cheeked laughing thrush (Garrilax vassali) **Least concern**.

Evergreen forest edge, secondary growth, scrub, grassland, edges of cultivation from 600 to 900 metres;

- Short-tailed scimitar-babbler (Jabouilleia danjoui): **Vulnerable**.

Undergrowth in lowland evergreen forest and bamboo between 50 and 900 metres;

- Sooty babbler (Stachyris herberti): **Vulnerable**.

Forest on limestone outcrops at about 200 metres;

- Grey-faced tit-babbler (Macronous kelleyi): **Near threatened**.

Lowland evergreen forest and bamboo from 50 to 700 metres.

220. The numbers of known species of higher plants (MacKinnon, 1997) is presently 8,286. Known vertebrates number about 1,300 but the following approximations must be subject to considerable revisions as further surveys and studies progress.

221. Three large mammals recently discovered to science are small dark muntjac (*Muntiacus truongsonensis*), giant muntjac (*Megamuntiacus (Muntiacus) vuquangensis*) and saola (*Pseudoryx nghetinhensi*). They are endemic along the border between Lao PDR and Viet Nam. Threatened species recorded in Lao PDR, based upon November 1998 data from the WCMC, comprised 220 plants (211 excluding synonyms) and 150 animals. Numbers of threatened animals are listed below. Categories of threat follow those of IUCN.

- Mammals 200
- Birds 750
- Reptiles 70
- Amphibians 40
- Fishes 250

5.3.8 National Protection Forest and Production Forest Cover

222. Most of Lao PDR was once forested. MacKinnon & MacKinnon (1986) estimated 68% comprised evergreen forest, 23% mixed deciduous and 7% dry dipterocarp. Berkmuller et al (1995) observed that, by 1992, coverage of these forest types were 5%, 35% and 5% respectively, revealing a dramatic decline in evergreen forest. The main forest types today are:

- Dry evergreen forest: Extensive areas in the north
- Tropical montane evergreen forest: Along highland areas of the Annamite Mountains and Bolovens Plateau
- Lowland semi-evergreen dipterocarp forest: The Mekong Plain
- Tropical montane deciduous forest: Scattered areas in the north
- Dry dipterocarp forest: Southern areas
- Mixed deciduous forest: Southern areas
- Forest on limestone: Small areas in the Annamite Mountains
- Pine forest: Small areas in the Annamite Mountains
- Sub-tropical montane forest: Small area in the extreme north.

223. Lao PDR has a number of Protection forest, which are forests and forestry lands which

are located in the areas of water resources, watershed areas, wetland forest and river bank's forests, road side forests, municipality or outskirts of city, sacred forests of villages. These have been determined for the purpose of protection of watershed areas and to reduce soil erosion and natural disasters and for the national and public security.

5.4 Rapid Environmental Assessment and Classification of the Project

224. All loans and investments to be funded by the ADB are subject to categorization to determine environmental assessment requirements. For the selected roads for maintenance, the environmental Categorization for each road were conducted utilizing the Rapid Environmental Assessment (REA) Checklist developed by ADB for the road sector. See **Annex R – Rapid Environmental Assessment Checklist [6 Roads].** According to the assessment the project roads are classified as Category "B"**.**

5.5 Screening of Potential Environmental Impacts

225. The generally perceived impacts associated with road maintenance include the following:

- Noise and vibrations from operation of heavy equipment (e.g., unloading of materials for maintenance works, use of tools such as jack hammers, etc.);
- Dust and air pollution during transport, loading and unloading of materials for road maintenance works;
- Smoke and foul odors from burning fuel wood for heating bitumen;
- Workers health and sanitation at workers' camp; and
- Solid waste disposal.

226. The potential environmental impacts on each individual road are discussed separately and in detail in **Annex S - Initial Environmental Examinations [6 Roads],** which also includes detailed discussions on:

- Mitigation Measures;
- Environmental Management Plan;
- Environmental Monitoring Plan;
- Public Consultation; and
- Conclusion and Recommendations.

5.6 Mitigation Measures

227. Perceived potential impacts, mitigation measures and responsibilities for implementation during maintenance works are discussed in **Annex S - Initial Environmental Examinations [6 Roads].**

5.7 Environmental Monitoring Plan

228. Environmental Monitoring Plans are included in **Annex S - Initial Environmental Examinations [6 Roads].**

5.8 Grievance Redress Mechanism

229. Prior to commencement of site maintenance works or other project activities, the Project Manager and the Contractor will institute a system that will allow for receiving/recording and immediately responding to any project-related complaints. The field office of the Contractor shall serve as the office to receive the complaints of the project-affected person or group of persons and the members of the communities along the project road maintenance. At road maintenance work zones, the Contractor will install notice boards to publicize the name and telephone numbers of the Contractor's relevant contact persons.

230. The Contractor, in coordination with the environmental officer, will record and document all the complaints received by the Contractor's field office. The Contractor and the environmental officer shall immediately process and resolve the complaints, disputes or questions received about the road maintenance. Any individual, household or organization can lodge a complaint against the Contractor if her/his or their properties/life/ business/health are compromised or damaged by the maintenance activities.

231. The existence of the Contractor's field office shall not impede the complainant's access to the Government's judicial or administrative remedies. Resolution of issues under the Grievance Redress Mechanism (GRM) shall consist of the following steps:

Table 5-1 Steps for Resolution of Issues under GRM

Grievance Resolution Step	Process
Receiving a Complaint	A complaint may be made verbally or in written form and shall be filed in the field office of the Contractor. A grievance letter can also be sent to the DPWT office with a copy to the local government units. If the complainant does not know how to send a grievance letter, the assistance of third-parties, such as media or local government officials, can be tapped to send this letter to the contractor and/or to the DPWT.
Receive and Register a Complaint	Once a complaint has been received, it is registered by the DPWT with local officials and all concerned parties notified properly. Within a maximum 5 calendar days a reply in written form from the DPWT or contractor will be sent back to the complainant with a copy to the local officials.
Screen for Eligibility and Assess the Complaint	DPWT officer, in close coordination with Contractor, should determine if the complaint is attributable to the Project and if it is within the scope of the Grievance Redress Mechanism. It then identifies who will conduct the assessment of the problem. This may include technical officers from the Project team or its consultants and contractors.
Assess the Problem Caused by the Project maintenance activities	In case the complaint is related to the Project activities, representatives of the DPWT and the chosen assessment unit will visit the complainant and the site where a problem is reported. The assessment should be implemented with participation of the complainant and witnesses, such as local officials and the results of the assessment should be agreed upon and signed by the complainant, representatives of project owner/contractor, DPWT, assessment unit and local officials. If one side is not satisfied with the assessment results, they can propose another method or another assessment unit to re-assess the impacts until the assessment satisfies both sides.
Select Grievance Resolution Approaches	Resolution of the grievance may be approached several ways. Some common approaches are as follows: a. The complainant proposes a solution, based on their self-evaluation of their impact or damages; b. The project owner/contractor proposes a solution, based on the legal regulation and their assessment of the damages; c. The complainant and project owner/contractor negotiate; or d. The two sides defer to a third party (local mediating committee), government agencies with the participation of environmental management units. In case resolution is not achieved by these bodies, both sides may request a court to decide.
Compensate Damages Caused by the Project Activities and Communicate Back to All Parties Involved	After arriving at an agreement, the contractor will immediately compensate the complainant, if appropriate. The compensation may be in money and/or in kind (for example land, construction materials, house, etc.) depending on the agreement between the two sides or by decision of courts. Compensation also includes restoration of the damaged environment caused by the project activities, if the complainant requires.
Closure	A documentation of the process is prepared and signed by the complainant, representatives of the project owner/contractor and local PC and distributed. The process may be monitored by Community officials/organizations

5.9 Institutional Arrangements

232. The project's executing agency will be the MPWT and DoR will be the implementing agency, while the three DPWTs in Salavan, Xekong and Attapeu will be the implementing units. For the overall management of the project, a National Steering Committee and a Regional Advisory Committee will be set up.

233. Staff from the MPWT's Division of Environmental Management under the Public Works Transport Institute (PWTI) will be involved in the Environmental Monitoring and Evaluation, together with the Provincial and District offices of DPWT.

234. The Contractor of the road maintenance shall have the responsibility to implement the mitigation measures identified in the EMP. The DPWT staff shall have the duty and responsibility to coordinate with the Environmental Inspecting Agencies to conduct environmental inspections, and with the Provincial DoNRE for compliance monitoring of the Project.

5.10 Public Consultation

235. The Public Consultation is a process that:

(i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;

(ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people;

(iii) is undertaken in an atmosphere free of intimidation or coercion;

(iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and

(v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

5.11 Conclusions and Recommendations

236. The environmental screenings and assessments conducted for the six subject roads were performed to determine the environmental classification of the proposed projects. The ADB environmental safeguards policy (SPS, 2009) and the Decree on EIA and the Environmental Protection Law of the Government of Lao PDR were followed in the conduct of the environmental analysis and classification of the road maintenance projects.

237. The Rapid Environmental Assessment (REA) Checklist developed by ADB for roads and highways sector was used to categorize the priority road maintenance projects under the Lao Road Sector Governance and Maintenance Project. The results of the assessments indicate that the projects are classified as Category "B" projects.

238. Similarly, under the Lao PDR EIA system the projects are classified under Category '1' projects as they are small and create few impacts on the environment and society. Therefore the requirements are only IEE Reports with associated management of impacts and monitoring plans. The road projects are classified as Category "B" projects and will not be subjected to a full EIA studies.

239. The following Institutional arrangements are proposed for the implementation of the EMP and monitoring plan:

240. The project's executing agency will be the MPWT and DoR will be the implementing agency, while the three DPWTs in Salavan, Xekong and Attapeu will be the implementing units. For the overall management of the project, a National Steering Committee and a Regional Advisory Committee will be set up.

241. Staff from the MPWT's Division of Environmental Management under the Public Works Transport Institute (PTI) will be involved in the Environmental Monitoring and Evaluation, together with the Provincial and District offices of DPWT.

242. The Contractors of the road maintenance work shall have the responsibility to implement the mitigation measures identified in the EMPs. The DPWT staff shall have the duty and responsibility to coordinate with the Environmental Inspecting Agencies to conduct environmental inspections and with the Provincial DoNRE for compliance monitoring of the Projects.

243. It is concluded that the future Project generates opportunities for creating both direct and indirect benefits for many people and alleviates poverty, which is an important goal of both the Government of the Lao PDR and of the ADB.

CHAPTER 6 POVERTY AND SOCIAL ANALYSIS

6.1 Methodology

244. The approach and methodology of the data collection for the Poverty and Social Analysis included a household survey with a sample of approximately 410 households along the six (6 subject roads), Focus Group Discussions (FGD) in 37 villages along the same roads, with one male and one female group in each villages, with the inclusion of approximately 40% Ethnic FGD representation. For all details see **Annex T – Poverty and Social Assessment, PSA**.

245. The Household survey was designed to collect information from potential beneficiaries/ affected households with a sampled approach designed to be representative of the overall situation along the subject roads. The survey questionnaire comprised five themes covering general information about the head of household; household demographics and housing; income and expenditure; access to and use of rural infrastructure, services and facilities, willingness to pay for new and improved services; and participation in community decision making and development.

246. The FGDs issues were covering the same themes as the household survey, however with the objective of providing additional, and in depth information. The FGD questions were also more focused towards the scope of the project. In addition to these, interviews with relevant stakeholders have also been carried out with GoL/ PWT staff, village leaders and villagers.

6.2 Activities Carried out

247. The field survey as described above was carried out between 6 October and 17 October 2014, through an externally procured service contractor. The contractor carried out both the household survey and the FGDs, and delivered the entered data and FGD feedback to the PPTA consultants.

248. Following initial analysis of the household data, and responses from the FGD, the PPTA team carried out verification visits to the subject roads, and the provincial PWTs, to ensure that findings from the field work represented the general impression of the GoL staff.

6.3 Poverty Issues

249. Based on the field survey the general assessment is that there will be short-term job creation as a result of the project, and while this does not address longer-term job security it will provide immediate incomes to households who are in need. The measures incorporated in the project are designed to address issues raised during the survey, i.e. lack of skills and the poorly skilled who dominate the people living in these areas.

250. Only a minority (4.4%) of the people living along the subject roads falls within the GoL defined limit for rural poverty. There are however differences within the population and the most relevant is the gap between Lao and Ethnic Groups. Ethnic people are generally poorer and more vulnerable. The noticed differences between Lao and Ethnic Groups are not noticed between male and female-headed households.

251. The maintenance phase of the project will represent opportunities for income generation through (i) employment (wages) for locally available labor; (ii) provision of food, clothing, and other items to the workers, and (iii) the effect locally spent income has on the local economy.

252. Project maintenance interventions will result in better access to schools, markets, health facilities and job opportunities which will target women and ethnic groups, to assure that they are not falling out of the potential project benefits. To ensure that potential benefits reach these target people, the project is including a component on community-based routine maintenance targeting indigenous people and the poor, to provide rural non-farm income, and improve status of ethnic groups in the communities.

253. It is expected that the socio-economic status of Ethnic groups will improve, as a result of increased trade, deriving from improved road condition. This improvement will however not be limited to Ethnic people, but to the population along the subject roads in general. To ensure that these benefits reach the Ethnic Groups as intended, they will be prioritized for participation in the community based maintenance components under the proposed project.

254. Improving and expanding coverage of infrastructure and services will provide a range of benefits. The conclusions of the assessments and consultations are that while there will be benefits at both village and household level, where both Lao and Ethnic women will gain more benefit than men in a range of ways. However some of the negative impacts could disproportionately affect women and therefore these are to be addressed through measures included in the project. The potential impacts on IPs are categorized as ‘B’, with special provision provided in the inclusion of a community based maintenance component to the project.

6.4 Gender Issues

255. As mentioned above there are only minor differences between male and female-headed households. Generally the female-headed households seem to be better off, mainly due to the fact that women to a larger extent are involved in trade and commerce. There are also only minor differences in the level of participation and representation in local decision-making.

256. ADB’s country gender strategy for Lao People’s Democratic Republic is built on Goal 3 of the MDGs. Under this framework, ADB will promote: (i) equal capabilities in women and men and girls and boys; (ii) equal access to resources and opportunities; and, (iii) equality in decision making and rights. This gender strategy framework is consistent not only with the MDGs but also with the guarantees of equal treatment in the Lao Constitution and laws and with the gender strategies included in both the NGPES and the NRDS. It can also be linked to ADB’s three core operational areas of inclusive social development, pro-poor and sustainable

economic growth, and good governance.

257. Improving and expanding coverage of infrastructure and services will provide a range of benefits. The conclusions of the assessments are that while there will be benefits at both village and household level, women will gain more benefit than men in a range of ways and also that some of the negative impacts could disproportionately affect women. Women are to a greater extent invested in trade and commerce along the subject roads

258. The main issues raised by women in the assessment include; (i) inadequate rural infrastructure and services which hampers both trading opportunities and ability to improve wellbeing of the household; (ii) low awareness about important issues such HIV and STIs, trafficking and public and environmental health; (iii) lack of access to key decision-making channels in respect of identifying infrastructure needs and planning; (iv) unemployment and lack of training; and, (v) specific issues for women from poor households including lack of skills and inability to provide for basic needs on a regular basis.

259. Based on this assessment Gender as per the ADB categorization the project interventions set out as in the project design it is unlikely that the project will lead to deterioration is women's access to social economic and financial resources and opportunities. Rather the opposite is expected to occur, since travel time and transportation costs are likely to decrease, and women in general involved in and are those benefitting most from trade. The Categorization is therefore defined as "Some Gender Elements", and will not require a Detailed Gender Action Plan.

6.5 Participation and Community Based Maintenance

260. Roads deteriorate over time, mainly through the forces of water and traffic. Of these two, water is by far the most important, especially for unpaved roads. Water can cause damage through erosion, where the flow of water removes material, resulting in rills in the road surface, cuts in the road shoulder, and gullies in the drainage system, as well as undermining the road structures.

261. Minor repairs not only aim to bring the road back to a better condition, but will specifically try to avoid more serious damages by ensuring that the different road elements work properly, resulting in reduced overall maintenance costs and better average road condition.

262. Some routine maintenance activities are already carried out by the GoL established Village Maintenance Committees, where under the leadership of the village head, and under the supervision of the District OPWT the groups carry out basic routine maintenance, such as cutting grass and bushes alongside the roads, clearing side drains, removing minor landslides, and filling of emerging potholes. VMCs are already established along all roads in the three provinces; however, this is currently done with very limited budgets, or on voluntary basis.

263. It is suggested to formalize the implementation of routine road maintenance through contracted and remunerated maintenance workers through the VMCs for a more timely response to maintenance needs under the NCB contracts. As with the ICB/ NCB contracts, also the Community Based Maintenance would be performance based. The application will be a performance-based approach, where payments are based on the performance of the

maintenance group (i.e., the quality of its output) rather than on the length of time the workers spend on the job (the input). This means that only results count, making the inspection process a lot easier, and thereby make it easier for the already understaffed, and budgeted O/DPWTs. The planning and budgeting process is also made easier because the budget is based on the planned output, rather than on input, which may vary from initial estimations.

264. These VMCs would receive basic training and tools to ensure the quality of their work, and are selected from interested candidates according to selection criteria to ensure fairness. Apart from ensuring better maintenance, this approach also leads to income and employment generation, which contributes to poverty alleviation and general development of the rural areas, with the maintenance workers easily spending 70% of their incomes locally, creating indirect employment opportunities.

265. VMC workers should be selected from interested candidates from villages along the subject roads. The selection criteria would include technical requirements (those with the most experience and best skills), as well as social objectives (to provide income and employment to certain underprivileged groups). Under the proposed project, following the findings from the Indigenous People and the Gender assessments the focus should on ethnic groups, with poverty and women as the second criterion.

266. Before the maintenance group starts work, they need to undergo basic training. This training looks at both the (i) technical aspects on how to properly implement the maintenance activities, and (ii) the managerial aspects on how to manage a maintenance group and the work itself. The initial training needs to be followed up by a regular on-the-job training to further improve the workers' skills.

267. The technical training would consist of a theoretical part and a practical part. The theoretical part should explains the causes of road deterioration and the need for road maintenance, while introducing the different maintenance activities and explaining the role they play in slowing down or even halting the different types of deterioration. A better understanding of the deterioration process and the purpose of the road maintenance activities would enable the maintenance group members to better respond to the different needs in a timely manner.

268. Although the initial training provided at the beginning of the contract will provide the maintenance group with the basic skills required to undertake the maintenance activities and to manage the work and the maintenance group, additional on-the-job training is highly recommended to provide continuous improvement in their skills and to correct beginners' errors. This can be done during the monthly visits when the work plan is prepared and the inspection is carried out, although initially it would be beneficial to arrange for more frequent visits.

6.6 Addressing Other Social Risks

269. In the three provinces the subject projects are expected to require a total workforce of 3450 person month over the project period of which all will be sourced from the pool of unemployed people in the local areas. The estimated maintenance period is 36 months for each subject roads.

270. The inclusion of local community based maintenance sub-contracts with the general ICB/ NCB performance based maintenance contracts suggest that there will be an interaction between workers coming from "outside" and local people. This will entail additional risks of the spread of HIV/Aids/STIs, as well as increased risks of human trafficking and exploitation.

271. The risk of spread of STIs and HIV associated with the project is a factor of three things; (i) the existing prevalence and transmission rates; (ii) the knowledge of the community about pathways of transmission and methods of prevention; and, (iii) the aspects of the project that could worsen the existing situation (i.e. presence of a workforce mainly comprised of outsiders or foreigners in an area where people have low existing knowledge and awareness of the risk or ways to prevent its transmission).

272. The risks are associated with a) the location of the provinces and b) to the specific subject roads. The corridor development strategy which encourages improved accessibility and mobility along the corridor and trade promotion are inevitably triggers for commercial activities that cater to a highly mobile population such as truck drivers, etc. and include construction workers (people from outside the local areas), traders, people from households who travel for marketing or selling, seasonal migrants moving between Thailand, Cambodia and Viet Nam, and commercial sex worker (CSWs). There is no data available on the number of CSWs operating in the project areas.

273. Mitigating the risk of spread of STIs and HIV during the maintenance phase of the works will include implementation of a small and targeted STIs and HIV awareness and prevention program for the communities along the subject roads, and the maintenance workforce. The project's awareness and prevention measures should link in with existing initiatives wherever possible. Additional measures would cover:

- Inclusion of standard FIDIC HIV and STI prevention clauses in the contract documents;
- Provision in maintenance contracts requiring the contractor to ensure the workforce attend STI and HIV and AIDS prevention workshops provided through an approved service provider. The workshops will be delivered to the workforce prior to commencement of works, the workshops will be run two times per year to ensure that new recruits have the benefit of the training;
- Provision of condoms at the construction camp;
- The Contractor providing adequate health care facilities including an HIV, AIDS, and STIs education post and first aid facilities within each construction camp; and
- Village-based community awareness raising about transmission of STIs and HIV, reproductive health, safe sex, and anti-trafficking for the community based maintenance groups. The program will be implemented in the subject road villages in each province. The community based program will be based on training-of-trainers (TOT) provided by a suitable NGO or PCCA to the village health volunteers or facilitators who will then pass on the information through workshops undertaken in small groups in the villages.

274. Approximately one-third of global trafficking in women and children occurs in or from GMS. A significant proportion of this trafficking affects the GMS countries of Thailand, Cambodia, Viet Nam, Myanmar and Lao People's Democratic Republic. The Lao People's Democratic Republic is predominantly a source country for trafficking to Thailand but it also

acts as a transit point for trafficking from the People's Republic of China and Viet Nam to Thailand and onwards.

275. A disproportionate number of trafficking victims are generally from ethnic groups other than Lao. In order of frequency after Lao-Tai groups (62%), the Mon-Khmer show up most in trafficking reports. The provinces most affected by cross-border trafficking, in addition to Phongsali, are Luang Prabang, Luang Namtha, Oudomxay (for trafficking to the People's Republic of China), and Vientiane, Xayaboury, Khammuane, Pakse (for trafficking to Thailand).

276. The maintenance work will bring people into the surrounding area as laborers at the sites and others wishing to respond to the presence of a larger workforce in small entrepreneurial ways. This can create impacts on the communities through increased demand for service/ sex workers, increased demands on existing health services, disintegration of social networks, disruptions and involuntary relocation for some community members, all of which can contribute to, or increase vulnerability to being trafficked.

277. During the maintenance period there will be opportunities to target those most vulnerable to trafficking with paid and regulated employment for up to three years. A preferential employment policy, targeting the Ethnic groups, poor and women, will enhance the anti-trafficking elements to be incorporated into the project.

278. The impacts that can be implemented to reduce the vulnerability of these groups to trafficking include:

- Ensuring no trafficked labor is engaged as part of the maintenance workforce or any ancillary employment (guards, cooks, cleaners etc.);
- Ensuring legal wages are paid to maintenance and ancillary workers in line with Lao Labor Law and minimum wages set in accordance with the province;
- Implementation of a preferential hiring policy by the developer that gives priority to the vulnerable, project-affected households, and local labor within the local areas and wider catchment;
- Conduct village education campaigns in collaboration with the Department of Labor and Social Affairs and NGOs working in the sector which include a trafficking awareness and prevention workshops for communities (aimed at women and children);
- The members of the maintenance workforce who do not live locally will be required to reside at camps which should be located away from existing villages and at sufficient distance to discourage interaction with local people;
- The incorporation of awareness messages into the project components already addressing community impact issues, and codes of conduct for maintenance workers that raise concerns about service/ sex workers and child prostitution can also be a means to address some trafficking issues; and

- Awareness messages for service/sex workers and maintenance workers can be combined with anti-trafficking and safe migration messages (as migrant workers are a high-risk group for HIV and STIs).

6.7 M&E / Benefit Monitoring

279. In the proposed Project there will be a poverty reduction aim linked to Component 3, relating to improved livelihoods of the people along the subject roads in particular in the three Provinces and in Lao PDR in general. The framework developed as part of the Project Administration Manual, forms the basis of the benefit monitoring. Monitoring is the continuous process of assessment of subject road implementation work in relation to agreed schedules and other requirements. For social impact and indigenous people components, the monitoring has two purposes:

a) to verify that activities have been effectively completed including quantity, quality and timeliness considerations and complies with the plan;
b) to assess whether affected persons have been able to benefit or have their livelihoods improved over their pre-project status.

280. Monitoring and evaluation is an integral part of good project management practice. It assists the project engineer and the project director to assess the performance of the project against defined targets and make corrective measures where necessary. For the Road Sector Governance and Maintenance Project, this would include the following:

- Reviewing current monitoring, evaluation and reporting practices in MPWT, comparing them with 'best practices' and identifying any gaps.
- Developing an implementation plan;
- Developing within MPWT the capacity to undertake monitoring and evaluation (M&E) processes to gauge project outcomes;
- Designing of a monitoring program and the organizational arrangements required to undertake the 'baseline' and initial project monitoring data collection and analysis process for quality management in later years; and
- Developing and implementing progressive quarterly and annual reporting protocols.

281. The Benefit, Monitoring & Evaluation System will be developed whereby data is regularly collected to measure progress against defined targets. The benefit aspect will mainly target the people living along the roads who are involved in the community-based maintenance activities in order to assess the direct benefits of the program. As a starting point, the survey will need to be carried out to set the baseline conditions. The households survey carried out under the PPTA would make a sufficient baseline if not too much time expires between the initial data collection and the start of the Project.

282. The Project will have two separate but related monitoring and evaluation aspects which will be implemented, namely:

a) monitoring of the social safeguards; and
b) monitoring of the environmental management plans.

283. The regular monitoring of defined indicators of social and environmental safeguards will be part of the Project reporting cycle. There will be no resettlement issues, since the

proposed Project will retain the existing road alignments. However the proper inclusion of indigenous peoples in the community-based maintenance program needs to be monitored and managed. Quarterly reports will be used to update the progress of each target indicator.

284. For monitoring of the social and environmental safeguards [in addition to the establishment of a practical system for collecting and analyzing the collected data], assessments made during the PPTA suggest that there is a considerable need to strengthen the human resource capacity within the DPWT line organization in order to carry out these tasks adequately.

285. It is expected that during the course of the Project, relevant D/OPWT staff will acquired the skills and gain sufficient practical experience, to organize and manage socio-economic data collection and analysis. They should furthermore, become familiar with survey techniques, be able to carry out basic household surveys, compile input data input and perform analyses. This should enable them to ensure that social and environmental safeguards are implemented - and monitored. It is further expected that the D/OPWT will appoint both female and male staff to be trained on these aspects.

286. The monitoring plan focuses on all three phases of the Project (i.e. before, during and after the implementation of the required maintenance activities) on the subject roads. The plan consists of establishing suitable environmental indicators, identifying sampling locations and frequency, producing a method[s] to collect the necessary data and to identify the responsible parties. The main purpose of the monitoring plan should be to determine the effectiveness of the impact mitigations introduced and to document any unexpected positive or negative social and environmental impacts on the subject roads.

287. For the Social and Environmental Safeguards, the EA will be in charge of implementing the monitoring program, while the international and national social and environmental consultants will provide advice, assist to build capacity and offer general support – the OPWTs will implement the monitoring plans. Once the maintenance works are completed and the upgraded roads are in service any effects on traffic patterns, standards of water and air quality should be monitored by the EA. In addition to this, the environmental monitoring process should also include reviews of indicators on work-site environment and safety - both during the maintenance works and once the subject roads have been handed over.

288. Reports will include updates on the implementation of mitigation measures and on monitoring activities carried out during the maintenance phase of the subject roads on an ‘as and when required’ basis. Reporting is the responsibility of the EA and should be conducted in conjunction with meetings to be convened with stakeholders as part of the stakeholder communication strategy. Environmental monitoring reports will be prepared quarterly and included in the regular project reporting process - but with the Environmental monitoring section issued separately to MoNRE. These reports will contain details of all indicators defined in the Environmental Management Plan - including those relating to performance monitoring.

6.8 Findings, Recommendations and Next Steps

289. Increased cross-border trade in the three provinces between Lao PDR, Cambodia and Viet Nam will contribute to poverty reduction by raising incomes for the poor and creating employment for men, women, youth and ethnic groups. According to recent government

statistics national poverty rate is 27.6% in Lao PDR.

290. Poverty rates in the proposed project provinces are as high as 36.3% in Saravane, 20% in Xekong and 39% in Attapeu. Improved National and Local roads will remove constraints inhibiting development of both secondary towns and rural areas in the project area of influence, and facilitate the poor's access to markets and services, and contribute to improved health and living standards. Improving infrastructure to boost inclusive growth is a priority of the GMS Strategic Framework 2012 and ADB's country partnership strategies for the participating countries. Lao PDR identify improved transport infrastructure as a key economic activity in its poverty reduction strategies due to its ability to create jobs and markets for locally produced goods and services.

291. The project will expand social and economic opportunities linking rural and urban areas in the project provinces, in addition to facilitating and improving cross-border trade. Environmental improvements will improve the health and living standards of people living in along the project roads. This will contribute to poverty reduction and generate positive spillover effects in a range of sectors.

292. Potential primary beneficiaries of the project are: (i) rural, urban and peri-urban residents that will benefit from improved and expanded access to services (health, education, markets); (ii) owners and operators of micro- small and medium sized enterprises, which are primarily women and ethnic groups, and; (iii) farmers that will benefit from improved access to markets and services. It is expected that both rural and urban residents, including the poor, will benefit from project interventions through improved access; increased land values; job creation; increased local involvement in decision making; and improved self-reliance. Awareness programs (Road safety, HIV/Aids/ anti-trafficking) will reduce social and health risks related to the infrastructure investment for the entire population living in project areas.

293. Potential constraints in accessing the proposed benefits and services are insufficient investment in public transport and environmental infrastructure, limited capacity of government agencies to facilitate pro-poor participation and income generation from the interventions, and inadequate operations and maintenance capacity. The proposed project will address these constraints by investing in appropriate public infrastructure, strengthening public sector management capacity and establish public-private partnerships with public goods aspects. It will develop mechanisms to strengthen long-term sustainability and lower the financial burden on local people to finance operations and maintenance of the infrastructure. Infrastructure design will incorporate environmentally and enterprise-friendly design to maximize employment opportunities and the quality of life of local residents.

CHAPTER 7 ASSESSMENT OF SOCIAL IMPACTS & SOCIAL SAFEGUARDS

7.1 Methodology

295. As discussed above in Chapter 6.1, a household survey, which included a quantitative household survey and focus groups discussions, was carried out to analyze the poverty and social aspects in the project area. Based on the collected data, in addition to providing a picture of the social and poverty dimensions, potential positive and negative impacts have been assessed with special focus on indigenous people and gender.

296. The Poverty and Social Assessment covered beneficiaries of the along the proposed subject roads in the three provinces. The survey was conducted in selected villages with the assistance of the village leaders to ensure the inclusion of poor areas/households in the sample. In addition, focus group discussions were conducted in a sample of villages.

7.2 Activities Carried Out

297. The field survey as described above was carried out between 6 October and 17 October 2014, though an externally procured service contractor. The contractor carried out both the household survey and the FGDs, and delivered the entered data and FGD feedback to the PPTA consultants. The PPTA consultants have thereafter processed and analyzed the collected data.

298. Following initial analysis of the household data, and responses from the FGD, the PPTA team carried out verification visits to the subject roads, and the provincial PWTs, to ensure that findings from the field work represented the general impression of the GoL staff.

7.3 Assessment of Social Impacts for Indigenous Peoples

299. ADB's safeguard defines indigenous people (IP) as a distinct, vulnerable, social and cultural group who: (i) self-identify as members of a distinct indigenous cultural group and the recognition of this identity by others; (ii) have collective attachment to geographically distinct habitats or ancestral territories; (iii) have customary, cultural, social or political institutions that are different from those of the dominant society and culture; and, (iv) have a distinct language, often different from the official language of the country or region.

300. The household survey confirms that the majority of the beneficiaries are Lao with numbers of 40.1% and other ethnic groups. During the PSA, FGDs with the Ethnic groups was undertaken in villages along the subject roads. The assessment concluded the following:

- The people see themselves first and foremost as Lao, they hold Lao citizenship and communicate through Lao language in different facets of society such as marketing, business activities, political activities, and participation in village/district administration;

- They have inter-married with other ethnic groups including Vietnamese;
- The different ethnic groups live together in mixed communities, there is a high level of social/cultural homogeneity in the villages, and if villages are purely ethnic, they get along well with other villages of other ethnic belonging.
- There are no special agencies or government offices established in the provinces to work with non-Lao people because the non-Lao do not exhibit differences which make them any more vulnerable or in need of special assistance than the Lao;
- Amongst the different ethnic groups there is high support for the subject roads that seek to improve, upgrade and rehabilitate rural infrastructure as key and important facilities for community access to services and employment opportunities. Assessment have ascertained broad community support for the subject roads;
- There are expectations of potential benefits following the improvement of the roads, both in terms of improved access to services and for the potential financial benefits from direct employment and/or increased income through trade; and
- There is also both the willingness and capacity to participate in design, implementation, and monitoring of the interventions. People commented on the benefits and positive impacts anticipated to result from the subject roads, and have stated there are no constraints on the ability of people to participate in project benefits as a result of ethnicity or culture.

301. Ethnic groups are in higher risk to being negatively affected by the project activities, both in terms of benefitting from the improved roads, and from taking advantage from improved governance and sustainability of the road network. For this reason, and to assure that ethnic groups along the project roads are ensures the potential benefits of the project focused is placed on these groups for the participation in community based maintenance works. Targets are not established, however conditions are included that local labor through Village Maintenance Committees are sub-contracted for community based maintenance works under the NCB maintenance contracts.

302. The social and economic profile of ethnic groups compared to the Lao is not balanced. Ethnic households are generally poorer, have fewer assets and of less value, and live in less “advanced” housed – all indicators of a higher level of vulnerability. The social safeguard for Indigenous People is therefore categorized as “B”.

303. The objective of ADB’s IP safeguard is “…to design and implement projects in a way that fosters full respect for IPs’ identity, dignity, human rights, livelihood systems, and cultural uniqueness as defined by IPs themselves so that they (i) receive culturally appropriate social and economic benefits, (ii) do not suffer adverse effects as a result of projects, and (iii) can participate actively in projects that affect them.” The project will not involve any activities or interventions that will:

- Provide for or allow commercial development of cultural resources or indigenous knowledge under the project;
- Provide for or allow commercial development of natural resources that would impact the livelihoods or cultural, ceremonial or spiritual use of land that would impact the identity or community;
- Provide for or allow restrictions in use of, or access to, protected areas and natural resources; or

- Require displacement from traditional or customary lands.

7.4 Assessment of Social Impacts for Involuntary Resettlement

304. Early on in the project preparation process, the design principles for the maintenance works defined that maintenance works would only be carried out within the existing alignment, and that therefore would be no required land acquisition or resettlement.

305. Involuntary resettlement (IR) impacts, in addition to physical displacement, include economic displacement which is defined as the loss of, or restrictions on access placed upon, any land or income generating assets (including communal resources or property). IR impacts are therefore not expected under the project.

7.5 Findings, Recommendations, and Next Steps

306. The assessment confirms that the categorization of the project is 'B'. The project interventions will not affect the dignity, human rights, livelihood systems, or culture of indigenous people. The project will not adversely impact on, and is designed in such a way that will respect, the identity, dignity, human rights, livelihood systems or culture of the non-Lao ethnic groups in the provinces. Any negative impacts on non-Lao will be the same as for Lao. An indigenous Peoples Plan has however been prepared to account for the higher level of vulnerability among people from Ethnic Groups; see **Annex U – Indigenous Peoples Plan**. The plan includes mitigation measures to assure that ethnic groups are not disadvantaged when it comes to potential project benefits. The beneficiary communities, including the ethnic groups are supportive of the expected interventions for the subject roads, and can see clear and direct benefits for them.

307. Resettlement and land acquisition is not anticipated following project interventions as described above. Land related issues are however included in the Environmental Monitoring Plan (EMP), and should a change of project scope for any of the subject roads occur during project implementation the monitoring of the EMP will highlight these aspects and a thorough assessment will be required. This may be related to requests for widening of road section or the use of land as borrow pits, none of which envisioned during the PPTA. For the potential need for resettlement compensation, funds have not been allocated in the project budget, hence in the event of the need for compensation will come through GoL sources.

CHAPTER 8 COST ESTIMATES AND FINANCING

8.1 Introduction

308. In order to examine the viability of the required investment, it was necessary to prepare estimates of the cost of the required maintenance intervention for each of the subject roadways. Based upon the existing condition assessments, traffic surveys and forward projections carried out - as described in Chapter 4 - quantities for each major item of work required were estimated using the MPWT's standard "Maintenance Activities Codes [MAC]", dated August, 1999. This document defines the physical work to be carried out under each Pay Item and also specifies the methods of measurement to be used in each case. Allowances were also made for other physical works for which accurate quantities could not be produced at this Study stage when necessary topographical, hydrological and geotechnical field information was not available. These will need further review during the subsequent detailed design phase.

309. After deriving the appropriate 'unit rate' for each Item - using prices from recent tenders received by MPWT / DPWT for similar work in the region - these unit prices were applied to the estimated quantities to arrive at the cost estimates. These were done for each different section of the 6 subject roadways and later combined to arrive at a maintenance intervention cost that could be quantified at this stage. These works that are listed in the BoQ are the initial rehabilitation and maintenance works, which will be implemented during the first year of the contracts.

310. In addition to above, costs for performance based works were added, both the performance based maintenance with equipment (registered contractors doing this work) and the performance based road-side maintenance by communities. Bill of Quantities cannot be prepared for these activities at this stage, as the required maintenance works are based on weekly inspections to be conducted when the maintenance contracts are implemented. For this project adjusted historical costs for these components were used for preparing the estimates. Provisional sums for emergency maintenance are included in the performance based contracts. The performance based maintenance costs are included in the over-all maintenance costs, which are reflected in the project investment plan. The implementation of performance based works will follow on the initial rehabilitation/ maintenance works, and will continue up to the end of the 3-years maintenance contracts.

311. In some cases some optional interventions were identified [e.g. DBST and AC overlays for the national roads, replacement of steel bridges on NR-20 Section B etc.] for consideration under future work programs and NOT to be part of this project. Consequently in the economic assessment of the basic maintenance interventions identified for this Project, these options were not included. The results of the cost estimate process are described below while the economic assessments carried out are contained in Chapter 9.

312. In addition to the cost of the physical works it was also necessary to prepare estimates of the overall cost associated with the implementation of the future Project. This was done following the identification of the 'soft' components including the cost of the engineering and auditing services (international and local consultants) required to deliver the Project as well as those for various goods to be procured.

313. A proposed financing plan giving details of the funding requirements was also developed to show a funding disbursement schedule on a year-by-year basis.

8.1 Base Cost Estimates - Civil Works

314. After the data collection program was completed, efforts focused on the analysis of the field results and intervention definition stages. This was done using the above referenced MAC codes to classify each of the rehabilitation / maintenance work Items found to be needed in each of the following categories[20]:

- Routine Maintenance;
- Periodic Maintenance;
- Rehabilitation.

Bills of Quantity

315. For each section of the 6 subject roads, the Consultant's engineering team produced an itemized Bill of Quantities resulting in a total of 13 individual BoQs to cover all of the work envisaged at this stage. These BoQs are contained in **Annex V - Bills of Quantity [6 Roads]** to this report.

316. In several sections rehabilitation work technically beyond the scope of a normal maintenance intervention program was identified. These were proposed for inclusion in the Project on the basis that they offer considerable benefit in terms of a significant reduction in annual maintenance efforts as well as improved living conditions for local communities. The quantities were estimated and the costs included in the economic assessments of Project components.

317. The items of work that were included in the anticipated scope of the Project were:

- Application of DBST surfacing as extensions to existing treatments and/or the provision of localized new ones – i.e. for LR-6901 in all Sections, LR-7615 in Sections A and C and LR-9001 in both Sections;
- Localized raising of road sub-grade elevations [above regular flood event levels] on affected parts of Local roads - i.e. for LR-6901 in all Sections and LR-7615 in Sections A and C and LR-9001 in both Sections;
- Placement of sections of concrete pavement to improve traction on steep parts of LR-7615 in Section B and LR-9001 in Section B;
- Installation of side slope stability improvements in selected parts of NR-18B, Section B and LR-9001, Section B as a 'pilot' treatment approach;

[20] A *fourth MAC-defined category covering 'Emergency Maintenance' activities is included as a provisional sum in the estimated contract costs.*

- Replacement of existing 4 sub-standard steel bridge structures in NR-20, Sect. A.

318. In some cases other items of work were identified as being desirable but that were judged to be beyond the scope of the maintenance program envisaged – due to their high cost. These were classified as 'optional interventions' for which appropriate quantity and cost estimates were also compiled and can be considered by MPWT for possible inclusion in a future rehabilitation program. As such they are not part of the proposed LRSGMP and subsequently not included in the economic assessment for this LRSGMP – This 'optional' work includes:

a) Asphalt Concrete overlay applications on the three National road surfaces in order to improve pavement strength and thereby to extend life cycles;
b) DBST resealing of the three subject National road surfaces and parts of the three Local roads where such treatments already exist in order to improve both skid resistance and general appearance;
c) Replacement of the 4 existing but sub-standard steel bridge structures located in Section B of NR-20 in Salavan province.

Unit Prices

319. For each of the identified 'pay items' an appropriate unit cost was assigned based on an analysis of past bid prices received by MPWT / DPWT, including bids for similar work tendered for 2014 PBC Maintenance Contracts [and recently executed by MPWT] and for other work just completed under the ongoing CaRoL project supported by JICA.

320. In some cases an increase in the rates was introduced to cover regional variations i.e. to account for terrain type and haulage distance variations as well as possible price escalation in the intervening years before the Project work is expected to be tendered.

321. The final list of individual unit prices provided from different sources and the 'arithmetic averages' adopted for use in the engineering cost estimates are contained in **Annex W - Unit Prices Adopted**.

Allowances

322. A number of work-items were identified for which no accurate estimate of quantity could be prepared due to the absence of detailed field information as a result of the limited PPTA budget for the field work. In such cases, engineering judgment was applied from which an estimated intervention quantity and cost was developed. Items in this group included the provision or erosion protection in ditches with steep gradients, protection of culvert inlets and outlets, additional guardrail installations in critical areas etc. These relatively minor allowances must be revisited during the detailed design stages when more extensive field surveys are expected to be undertaken.

323. For the engineering cost estimate no 'contingency allowances' were included and the possible effects of price escalation between the time of the PPTA estimate preparation and the scheduled date of the tender calls was omitted. These factors were taken into consideration under the financial management part of the Study and are reported elsewhere.

Final Base Cost Estimates

324. From the above, the amount of investment needed for the anticipated work on each of the subject road corridors was calculated and a summary of the overall cost was prepared. The figures that emerged were expressed in both kip and USD [at a current exchange rate of 8,116 kip to the USD] and are summarized on the following pages with the detailed breakdowns shown in **Annex V - Bills of Quantity [6 Roads].**

Table 8-1 Cost Estimates for National Roads [kip]

NATIONAL ROADS

	NR-16	NR-18B		NR-20		COMBINED COST [kip]
	Section 'A'	Section 'A'	Section 'B'	Section 'A'	Section 'B'	
						0
1. Routine Maintenance Backlog	1,873,365,937	1,894,636,397	8,276,650,321	2,127,307,101	2,988,494,104	17,160,453,862
2. Periodic Maintenance Backlog	3,446,125,748	930,489,560	5,817,669,296	8,003,428,227	1,099,923,858	19,297,636,688
3. Rehabilitation & Improvement	0	0	2,337,408,000	0	0	2,337,408,000
Sub-total =	5,319,491,685	2,825,125,957	16,431,727,618	10,130,735,328	4,088,417,962	**38,795,498,550**
TOTAL COST [kip] =	**5,319,500,000**	**19,256,860,000**		**14,219,160,000**		
4a. Long Term Upgrade Option [AC Overlay]	113,654,602,286	29,466,008,000	142,632,616,000	37,841,306,286	72,880,645,714	396,475,178,286
4b. Long Term Upgrade Option [DBST re-seal]	36,646,529,143	9,500,952,000	66,506,664,000	17,644,625,143	20,359,182,857	150,657,953,143
4c. Long Term Upgrade Option [Replace Bridges]	n/a	n/a	n/a	n/a	27,132,580,000	27,132,580,000
Sub-total =	150,301,131,429	38,966,960,000	209,139,280,000	55,485,931,429	120,372,408,571	**574,265,711,429**
TOTAL COST [kip] =	**150,301,140,000**	**248,106,240,000**		**175,858,340,000**		

Table 8-2 Cost Estimates for Local Roads [kip]

LOCAL ROADS

	LR-6901			LR-7615			LR-9001		COMBINED COST [kip]
	Section 'A'	Section 'B'	Section 'C'	Section 'A'	Section 'B'	Section 'C'	Section 'A'	Section 'B'	
									0
1. Routine Maintenance Backlog	2,256,522,622	732,743,013	451,529,226	1,759,238,979	1,066,752,240	377,632,403	1,014,193,608	7,132,326,859	14,790,938,949
2. Periodic Maintenance Backlog	6,071,563,200	2,331,432,642	2,041,925,250	4,933,514,517	1,975,984,833	1,079,140,250	597,694,147	26,193,140,078	45,224,394,916
3. Rehabilitation & Improvement	751,104,745	1,141,963,883	394,810,812	713,274,688	2,733,360,590	251,218,366	584,452,477	10,864,533,764	17,434,719,326
Sub-total =	9,079,190,567	4,206,139,538	2,888,265,288	7,406,028,184	5,776,097,663	1,707,991,019	2,196,340,232	44,190,000,701	**77,450,070,000**
TOTAL COST [kip] =	**16,173,600,000**			**14,890,120,000**			**46,386,350,000**		
4a. Long Term Upgrade Option [AC Overlay]	n/a	n/a	n/a	n/a	n/a	n/a	24,742,392,571	n/a	24,742,392,571
4b. Long Term Upgrade Option [DBST re-seal]	n/a	n/a	n/a	n/a	n/a	n/a	11,536,870,286	n/a	11,536,870,286
4c. Long Term Upgrade Option [Replace Bridges]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
Sub-total =	34,331,981,134	8,412,279,076	5,776,530,576	29,702,176,367	11,552,195,326	3,415,982,038	75,521,423,035	88,380,001,402	**257,092,590,000**
TOTAL COST [kip] =	**48,520,800,000**			**44,670,360,000**			**163,901,430,000**		

Table 8-3 Cost Estimates for National Roads [USD]

NATIONAL ROADS

	NR-16	NR-18B		NR-20		COMBINED COST [USD]
	Section 'A'	Section 'A'	Section 'B'	Section 'A'	Section 'B'	
						0
1. Routine Maintenance Backlog	230,824	233,445	1,019,794	262,113	368,223	2,114,398
2. Periodic Maintenance Backlog	424,609	114,649	716,815	986,130	135,525	2,377,728
3. Rehabilitation & Improvement	0	0	288,000	0	0	288,000
Sub-total =	0.66	0.35	2.02	1.25	0.50	**4.78**
TOTAL COST [USD] =	**0.66**	**2.37**		**1.75**		
4a. Long Term Upgrade Option [AC Overlay]	14,003,771	3,630,607	17,574,250	4,662,556	8,979,873	48,851,057
4b. Long Term Upgrade Option [DBST re-seal]	4,515,344	1,170,645	8,194,513	2,174,054	2,508,524	18,563,079
4c. Long Term Upgrade Option [Replace Bridges]	n/a	n/a	n/a	n/a	3,343,098	3,343,098
Sub-total =	18.52	4.80	25.77	6.84	14.83	**70.76**
TOTAL COST [USD] =	**18.52**	**30.57**		**21.67**		

Table 8-4 Cost Estimates for Local Roads [in USD]

LOCAL ROADS

	LR-6901			LR-7615			LR-9001		COMBINED COST [USD]
	Section 'A'	Section 'B'	Section 'C'	Section 'A'	Section 'B'	Section 'C'	Section 'A'	Section 'B'	
									0
1. Routine Maintenance Backlog	278,034	90,284	55,634	216,762	131,438	46,529	124,962	878,798	1,822,442
2. Periodic Maintenance Backlog	748,098	287,264	251,593	607,875	243,468	132,965	73,644	3,227,346	5,572,252
3. Rehabilitation & Improvement	92,546	140,705	48,646	87,885	336,787	30,953	72,012	1,338,656	2,148,191
Sub-total =	**1.12**	**0.52**	**0.36**	**0.91**	**0.71**	**0.21**	**0.27**	**5.44**	**9.54**
TOTAL COST [USD] =	**1.99**			**1.83**			**5.72**		
4a. Long Term Upgrade Option [AC Overlay]	n/a	n/a	n/a	n/a	n/a	n/a	3,048,594	n/a	3,048,594
4b. Long Term Upgrade Option [DBST re-seal]	n/a	n/a	n/a	n/a	n/a	n/a	1,421,497	n/a	1,421,497
4c. Long Term Upgrade Option [Replace Bridges]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Sub-total =	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.47**	**0.00**	**4.47**
TOTAL COST [USD] =	**0.00**			**0.00**			**4.47**		

8.2 Cost Estimates and Financing - Project Implementation

325. The Consultant produced costs estimates for the complete program, which includes the following main components:

i) Maintenance & Rehabilitation;
ii) Project Management and Detailed Design & Supervision;
iii) Recurrent Costs [In-kind & Administrative];
iv) Contingencies [Physical and Price];
v) Financial Charges during Implementation.

326. Each of the above areas contains a number of individual sub-estimates to cover engineering services provision and related administrative costs as well as interest charges and applicable duties and taxes to be levied. Tables on the following pages outline the individual amounts and the total project cost.

1. Investment Plan

327. The project is estimated to cost 29.9 million USD as detailed in below table.

Table 8-5 Project Investment Plan

Item		Amount $ mill
A	**Base Cost**	
	Output 1: Governance and Practice Improved	2.5
	Output 2: Institutional Capacity Strengthened	2.2
	Output 3: Rehabilitation and Maintenance of Roads Completed	18.9
	Subtotal (A)	**23.6**
B	**Contingencies[b]**	**5.7**
C	**Financial Charges During Implementation[c]**	**0.6**
	Total (A+B+C)	**29.9**

a. In 2015 prices – Exchange Rate is Kip 8,116. Incl. of taxes and duties of $2.5 million to be financed by Lao government

b. Physical contingencies computed at 10% on base cost for civil works, equipment, consulting services and capacity building and training. Price contingencies computed on the basis of foreign exchange costs annual escalation rate ranging from 0.3-1.5% and local currency costs annual escalation rate ranging from 4.0-5.5%: includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate

c. Interest during implementation on the ADB loan computed at 1% per annum

328. The required ADB loan amount for implementation of the project is $27.0 million. The expected loan will have a 32-year term, including a grace period of 8 years, an interest rate of 1.0% per annum during the grace period and 1.5% per annum thereafter, and such other terms and conditions that will be set forth in the draft Loan Agreement. There will not be any commitment charges.

2. Financing Plan

329. The financing plan is shown below in Table 8.6. The project will be financed by ADB through a $27.0 million loan. The government's counterpart financing is $2.9 million. ADB will finance: (i) 100% of consulting services, exclusive of taxes and duties (ii) 100% of finance charges during implementation; (iii) 100% of civil works, exclusive of taxes and duties; (iv) 100% of equipment, excluding taxes and duties; and (v) 100% of training and capacity building, excluding taxes. The Borrower will finance: (i) government counterpart staff salaries and office space (in-kind); and (ii) taxes and duties (through exemption). The Government of Lao PDR will make the loan proceeds available to the executing agency for carrying out the works and services.

Table 8-6 Financing Plan

Source	**Amount** ($ million)	**Share of Total** (%)
Asian Development Bank (loan)	27.0	90.2
Government	2.9	9.8
Total	**29.9**	**100.0**

3. Detailed Cost Estimates

330. Detailed cost estimate Tables have been prepared for various expenditure categories. These Tables are presented below.

Table 8-7 Detailed Cost Estimates by Expenditure Category

		$ million		
Item	**Foreign Currency**	**Local Currency**	**Total Cost**	**% of Base Cost**
A Base Cost				
1. Civil Works	6.23	10.09	16.32	69.0%
2. Consultants	4.29	2.02	6.31	26.7%
3. Equipment	0.34	0.21	0.55	2.3%
4. Administration	-	0.46	0.46	1.9%
Subtotal (A)	10.86	12.78	23.64	100.0%
B. Contingencies				
1. Physical Contingency	1.09	1.28	2.37	10.0%
2. Price Contingency	0.52	2.82	3.34	14.1%
Subtotal (B)	**1.61**	**4.10**	**5.71**	**24.2%**
C. Financial Charges During Implementation				
1. Interest During Construction	-	0.61	0.61	**2.6%**
Subtotal (C)	**-**	**0.61**	**0.61**	**2.6%**
Total Project Cost (A+B+C)	**12.47**	**17.49**	**29.96**	**126.7%**

Table 8-8 Allocation and Withdrawal of Loan Proceeds

No	Item	Amount Allocated (US$)	ADB Financing - Percentage and Basis for Withdrawal from Loan Account
1.	Civil Works	14,570,000	89.3% of total expenditure
2.	Consulting Services	5,630,000	89.3% of total expenditure
3.	Equipment	490,000	89.3% of total expenditure
4.	Interest During Construction	610,000	100% of amount due
5.	Unallocated	5,700,000	
Total		**27,000,000**	

Table 8-9 Detailed Cost Estimates by Financier

$ million

Item	ADB		Government		
	Amount	% of Cost	Amount	% of Cost	Total Cost
A Base Cost					
1. Civil Works	14.57	89.3%	1.75	10.7%	16.32
2. Consultants	5.63	89.3%	0.68	10.7%	6.31
3. Equipment	0.49	89.3%	0.06	10.7%	0.55
4. Administration	0.00	0.0%	0.46	100.0%	0..46
Subtotal (A)	**20.69**	**87.6%**	**2.94**	**12.4%**	**23.63**
B. Contingencies					
1. Physical Contingency	2.36	100.0%	0.00	0.0%	2.36
2. Price Contingency	3.33	100.0%	0.00	0.0%	3.33
Subtotal (B)	**5.70**	**100.0%**	**0.00**	**0.0%**	**5.70**
C. Financial Charges During Implementation					
1. Interest During Construction	0.61	100.0%	0.00	0.0%	**0.61**
Subtotal (C)	**0.61**	**100.0%**	**0.00**	**0.0%**	**0.61**
Total Project Cost (A+B+C)	**27.00**	**90.2%**	**2.94**	**9.8%**	**29.94**

a. In 2015 prices – Exchange Rate is Kip 8,116. Inclusive of taxes and duties of $2.5 million to be financed by Lao government.

b. Physical contingencies computed at 10% on base cost for civil works, equipment, consulting services and capacity building and training. Price contingencies computed on the basis of foreign exchange costs annual escalation rate ranging from 0.3-1.5% and local currency costs annual escalation rate ranging from 4.0-5.5%: includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate

c. Interest during implementation on the ADB loan computed at 1% per annum.

Note: Numbers may not sum precisely because of rounding

Table 8-10 Detailed Cost Estimates by Outputs

$ million

Item	Output 1 Amount	Output 1 % of Cost	Output 2 Amount	Output 2 % of Cost	Output 3 Amount	Output 3 % of Cost	Total Cost
A Base Cost							
1. Civil Works	-	0.0%	-	0.0%	16.32	100.0%	16.32
2. Consultants	1.97	31.3%	2.06	32.6%	2.28	36.1%	6.31
3. Equipment	0.45	81.8%	0.10	18.2%	-	0.0%	0.55
4. Administration	0.04	8.7%	0.04	9.1%	0.37	82.2%	0.46
Subtotal (A)	**2.46**	**10.4%**	**2.20**	**9.3%**	**18.97**	**80.3%**	**23.63**
B. Contingencies							
1. Physical Contingency	0.25	10.4%	0.22	9.3%	1.90	80.3%	2.36
2. Price Contingency	0.13	3.9%	0.21	6.2%	3.00	89.8%	3.33
Subtotal (B)	**0.38**	**6.6%**	**0.43**	**7.5%**	**4.89**	**85.9%**	**5.70**
C. Financial Charges During Implementation							
1. Interest During Construction	0.05	8.3%	0.05	8.8%	0.51	82.9%	0.61
Subtotal (C)	**0.05**	**8.3%**	**0.05**	**8.8%**	**0.51**	**82.9%**	**0.61**
Total Project Cost (A+B+C)	**2.89**	**9.7%**	**2.68**	**9.0%**	**24.37**	**81.4%**	**29.94**

Table 8-11 Detailed Cost Estimates by Year

$ million

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
A Base Cost						
1. Civil Works	-	1.44	6.01	6.60	2.27	16.32
2. Consultants	2.17	2.00	1.40	0.53	0.21	6.31
3. Equipment	-	0.28	0.28	-	-	0.56
4. Administration	0.09	0.09	0.09	0.09	0.09	0.45
Subtotal (A)	**2.26**	**3.81**	**7.78**	**7.22**	**2.57**	**23.64**
B. Contingencies						
1. Physical Contingency	0.23	0.38	0.78	0.72	0.26	2.37
2. Price Contingency	0.12	0.32	1.05	1.28	0.56	3.33
Subtotal (B)	**0.35**	**0.70**	**1.83**	**2.00**	**0.82**	**5.70**
C. Financial Charges During Implementation						
1. Interest During Construction	0.01	0.04	0.11	0.19	0.25	0.60
Subtotal (C)	**0.01**	**0.04**	**0.11**	**0.19**	**0.25**	**0.60**
Total Project Cost (A+B+C)	**2.62**	**4.55**	**9.72**	**9.41**	**3.64**	**29.94**

a. In 2015 prices – Exchange Rate is Kip 8,116. Inclusive of taxes and duties of $2.5 million to be financed by Lao government.

b. Physical contingencies computed at 10% on base cost for civil works, equipment, consulting services and capacity building and training. Price contingencies computed on the basis of foreign exchange costs annual escalation rate ranging from 0.3-1.5% and local currency costs annual escalation rate ranging from 4.0-5.5%: includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate

c. Interest during implementation on the ADB loan computed at 1% per annum.

Note: Numbers may not sum precisely because of rounding

CHAPTER 9 TRANSPORT ECONOMIC

9.1 Background

9.1.1 Objective of Chapter

331. While much of the project is institutional in scope, there are six road sections that have been selected as demonstration projects for maintenance and related interventions under the project. Forecasts of the future traffic on these sections and on which the economic assessments have been based, are included in Chapter 4 of this report.

332. This Chapter discusses the economic viability of the proposed works on each of the project roads and is based on the following key inputs:

(i) The traffic forecasts contained in Chapter 4 – Engineering Details;

(ii) Vehicle operating costs and savings, derived from earlier research in Laos;

(iii) The engineering interventions proposed also as described in Chapter 4;

(iv) The intervention cost estimates contained in Chapter 8.

333. The six selected road projects are shown in the following table, which also indicates the division of the roads into different sections for the purposes of the economic analysis.

Table 9-1 List of Project Roads

Ref.	*Road No. and Section*		*Overall Length (km)*	**Description**	*Province*	*District(s)*
1	LR 6901		27.5	National Road 13 South – Ban Paktaphan, including branches to ferry site	Salavan	Lakhonpheng
2	NR 1H*	**A**	26.0	Salavan – Ban Beng	Salavan	Salavan
	NR 20	**B**	30.0	Ban Beng – Champasak Province Border		Lao Ngam
3	LR 7615		22,7	National Road 16 (B. Lakkhao) – Ban Dongsa – National Road 16 (B. Khamkok)	Xekong	Thateng
4	NR 16		54.0	Champasak border – Xekong City	Xekong	Thateng, Lamam
5	NR 18B	A	14.0	Attapeu - Xaisetha	Attapeu	Samakhixai Xaisetha
		B	97.0	Xaisetha – Phoukua (Vietnam border)		Xaisetha, Phouvong
6	LR 9001	A	17.0	Xaisetha – Ban Paam	Attapeu	Xaisetha, Xanxai
		B	37.1	Ban Paam - Xanxai		Xanxai

* Known locally still as National Road 20

9.2 Economic Study

9.2.1 Background

334. The main purpose of the proposed Project is to support the Government's efforts to increase the MPWT / DPWT offices' capability, at both the local and central levels, to manage and maintain their road assets. The Project thus proposes three main types of intervention, spread over the five-year program life:

a. Institutional capacity building and technical support in managing and performing the needed tasks for road asset management and road maintenance;
b. Support to the maintenance of the selected Project roads in order to demonstrate best practice in road asset management and maintenance work. It has been decided that this support should be provided over a three year period within which restoration of the roads to their intended condition would be accomplished;
c. Initial investments to restore the project roads to maintainable condition. This 'backlog' maintenance work involving essential repairs and added safety measures are intended to restore the roads to their intended condition and will be carried out in the first year of the program. After this, the focus will shift to demonstrating and building up a sustainable approach to road maintenance through the implementation of road and roadside maintenance activities using performance-based and community-based contracting methods respectively.

335. The Terms of Reference (ToR) issued for this PPTA require a separate economic analysis for each project road. This approach only covers part of the cost and the activities to be undertaken within the overall project. An 'overview' giving the results of an assessment of the roads as a group was also undertaken during the final stages, however. Again, in accordance with the ToR, the economic evaluation was confined to two types of intervention, to ensure that the investment and maintenance activities on the selected project roads demonstrate economic viability.

9.2.2 Approach

336. The selected approach was to treat the initial restoration works as a 'capital' investment (capitalised maintenance) and then to add the subsequent annual maintenance demand expenditure as a 'recurrent' cost. These costs were then compared with the benefits, which were taken to be the lower vehicle operating costs and the time savings likely to occur as a result of the planned interventions under the future Project - plus any predicted accident cost savings.

337. The evaluation period for all of the required investments was taken to be 10 years. This was considered appropriate for a maintenance project in which the initial works are primarily for restoration purposes rather than major investments with a long life. Some of the works, however, especially those involving concrete structures, have a longer life - potentially up to 30 years. The extent of such works was assessed on a road-by-road basis, and a residual value at the end of the 10-year analysis period identified accordingly.

338. The Highway Development and Management program, Version 4 (HDM-4), was used in the evaluations. This takes account of the present condition of the roads, the proposed works and forecasts of the traffic volumes in order to predict future road conditions and hence savings in travel times and costs. HDM-4 can be difficult to apply to new road links or roads with very low traffic volumes but in fact the selected roads were found to carry enough traffic to make HDM-4 the most suitable tool.

9.2.3 **The HDM Analysis**

339. HDM has a number of modules, and it is necessary to enter details for each project road in each one.

340. The **first HDM module** contains details of the existing roads. The Transport Economist travelled on each road with a hand-held GPS unit and was able to record distances, travel times, average speeds, gradients, the average altitude (which affects vehicle operating costs), the rise and fall and the horizontal alignment of each road.

341. This information was used to supplement the engineering surveys and thereby to provide much of the input data required by HDM-4. The engineers were asked to provide additional information on the physical characteristics of each road from which to generate other parameters required by the program.

342. The roughness of the roads was taken from the RMS database which is maintained by PTI on behalf of MPWT. This is available for most of the national road sections for the year 2013. For the local roads, the assessment of roughness was made by visual inspection and by assessing the effect of the road roughness on travel speeds.

343. The amount of traffic estimated to use each road was derived from counts and projections as described in Chapter 4, 'Traffic Studies', prepared by the project in December 2014. **Table 9.2** on the next page summarises the results of the analysis of the traffic counts and indicates the forecast normal traffic on each road.

344. The **second HDM module** contains details of the vehicles that are likely to use the roads – i.e. their type, size and weight, cost, etc. and also the cost of using them including those for consumables including fuel, tyres, etc. The latest fuel prices in the southern provinces (October 2014) were used in the analysis. For other aspects of vehicle operating costs, the project time constraint led to the decision to take the latest available costs from previous research (2010) and then to update them to allow for inflation in the interim period. This is shown in **Annex X - Vehicle Operating Costs**. These base costs were used as the source from which the HDM program enabled assessments to be made of the operating costs per km according to the predicted quality (roughness) of the road surfaces.

Table 9-2 Traffic Forecast

(average vehicles per day)

	MC	PC	LDV	Bus	LGV	MGV	HGV	VHGV	Total	ACAGR
Road 6901										
2014	406	4	56	27	74	8	9	10	594	
2018	842	8	116	57	143	16	17	24	1,224	19.8%
2023	1403	23	254	120	245	30	34	66	2,177	12.2%
2028	1128	71	412	170	324	47	52	116	2,320	1.3%
Road 20										
2014	1034	56	182	43	136	53	15	8	1,527	
2018	1808	137	377	91	238	93	24	13	2,780	16.2%
2023	2769	369	827	195	385	172	39	21	4,778	11.4%
2028	2225	708	1339	304	511	265	60	32	5,443	2.6%
Road 1H										
2014	1892	104	446	39	252	47	15	18	2,813	
2018	3309	254	925	83	441	82	24	28	5,146	16.3%
2023	5066	686	2025	188	714	153	39	47	8,919	11.6%
2028	4072	1314	3281	332	946	235	60	72	10,313	2.9%
Road 7615										
2014	700	5	54	3	20	25	2	2	811	
2018	1224	12	112	7	35	44	3	3	1,440	15.4%
2023	1874	33	245	17	57	81	5	5	2,318	10.0%
2028	1506	63	397	38	75	125	8	8	2,221	-0.9%
Road 16										
2014	1754	126	405	62	147	44	20	33	2,591	
2018	3068	308	989	131	305	91	35	58	4,984	17.8%
2023	4697	831	2350	333	668	200	65	107	9,250	13.2%
2028	3775	1680	3807	675	1175	272	109	179	11,671	4.8%
Road 9001, Section A										
2014	1239	25	160	3	63	55	11	5	1,561	
2018	2167	61	332	7	110	96	17	8	2,798	15.7%
2023	3318	165	727	17	179	179	29	13	4,625	10.6%
2028	2666	316	1177	38	237	275	44	20	4,772	0.6%
Road 9001, Section B										
2014	309	1	19	3	1	1	3	1	338	
2018	540	2	46	7	2	2	5	2	607	15.8%
2023	827	7	125	17	5	5	10	3	998	10.5%
2028	912	14	274	38	8	8	16	5	1,277	5.0%
Road 18B										
2014	317	33	142	36	13	4	17	76	638	
2018	554	81	347	88	27	8	30	133	1,267	18.7%
2023	849	218	936	237	59	18	55	247	2,619	15.6%
2028	936	476	2050	520	110	34	92	412	4,630	12.1%

MC = motor cycle
PC = passenger car
LDV = light delivery vehicle (utility)
LGV = light goods vehicle
MGV = medium goods vehicle
HGV = heavy goods vehicle
VHGV = very heavy goods vehicle
ACGR = annual compound growth rate

346. Examples of the operating cost savings that is expected to be achieved under the Project is shown in **Table 9.3**. For each of the demonstration roads selected for the project, the savings per vehicle-kilometre, as a result of the project interventions, are shown for the main vehicle types. All three of the local roads show substantial savings. For the national roads which are all three currently in fairly good condition, the savings in vehicle operating costs are relatively small in the early years but are expected to grow over time instead of further deteriorating as they would if the planned maintenance intervention did not proceed.

347. The third HDM module looks at the proposed interventions in terms of restoration works (investments) and maintenance. Each project road was given a base case (i.e. the present conditions in 2014) and an investment option. This normally contained three elements of work identified by the engineers i.e. the backlog of routine maintenance required, the necessary subsequent periodic maintenance demands, and the related rehabilitation, miscellaneous and other works. For each project, these works were assumed to be carried out in between 2018 and 2021. Then, for the subsequent 10-year period from 2022 to 2031, the annual routine maintenance activities and associated costs were estimated and included in the model.

348. It was assumed that in the absence of the project the project roads would only receive routine maintenance during the evaluation period. For the 'with project' situation, it was assumed that in addition to the routine maintenance, periodic maintenance would be carried out as required on the unpaved roads. The assumptions on maintenance activities, for the analysis purposes. were as set out below, though in practice the main project will review and help to plan the annual programmes according to circumstances at the time:

a. Routine maintenance, local roads: annual grading and miscellaneous works (to allow for grass cutting, culvert clearance, etc.)
b. Routine maintenance, national roads: annual drainage clearance, patching and edge clearance (100%), miscellaneous
c. Periodic maintenance, local roads: grading twice a year, spot re-gravelling annually, re-gravelling when gravel thickness falls below 30 mm (as determined by HDM).

349. While the routine maintenance was assumed to be the same in the 'with' and 'without' project situations, the periodic maintenance was assumed to apply only to the gravel roads in the 'with project' situation. The gravel roads have very little gravel at the moment.

Table 9-3 Unit Vehicle Operating Costs With and Without Project, 2022

(US $ per vehicle-km)

Road	Vehicle Type	Without Project	With Project	Savings
LR 6901	Passenger car	0.49	0.40	0.09
	Bus	0.96	0.75	0.21
	Light truck	0.66	0.52	0.14
	Medium truck	1.13	0.87	0.26
	Heavy truck	1.67	1.31	0.36
NR 20/1H	Passenger car	0.23	0.22	0.01
	Bus	0.42	0.41	0.01
	Light truck	0.32	0.31	0.01
	Medium truck	0.49	0.48	0.01
	Heavy truck	0.75	0.73	0.02
LR 7615	Passenger car	0.51	0.34	0.17
	Bus	1.02	0.70	0.32
	Light truck	0.70	0.50	0.20
	Medium truck	1.37	1.06	0.31
	Heavy truck	1.86	1.35	0.51
NR 16	Passenger car	0.23	0.23	0.00
	Bus	0.44	0.42	0.01
	Light truck	0.33	0.32	0.00
	Medium truck	0.50	0.49	0.01
	Heavy truck	0.76	0.76	0.00
LR 9001 (A)	Passenger car	0.22	0.23	0.00
	Bus	0.41	0.42	0.00
	Light truck	0.31	0.32	0.00
	Medium truck	0.48	0.49	0.00
	Heavy truck	0.77	0.77	0.00
LR 9001 (B)	Passenger car	0.47	0.39	0.08
	Bus	0.93	0.76	0.17
	Light truck	0.64	0.53	0.11
	Medium truck	1.23	1.05	0.18
	Heavy truck	1.70	1.41	0.29
18B	Passenger car	0.22	0.22	0.00
	Bus	0.43	0.43	0.00
	Light truck	0.31	0.31	0.00
	Medium truck	0.58	0.58	0.00
	Heavy truck	0.81	0.81	0.00

350. Passenger time values for work trips were assessed based on average incomes, with the time of car and pickup users valued higher than that of motor cycle and bus users. The number of work and non-work trips was derived from the traffic surveys. The latter were valued at some one-third of the value of the work trips. For the value of cargo, the type of cargo and the degree of cargo perishability were assessed from the origin-destination surveys. Much of the agricultural production of the area is perishable and has to be brought to market quickly. In the absence of research, only nominal cargo time was used for passenger vehicles (to allow for goods being carried to market). **Table 9.4** shows the values for each vehicle type that were used in the analysis.

Table 9-4 Valuation of Passenger and Cargo Time

Vehicle Type	*Time Value/Hour (US $)*		
	Passenger Time (per person)		*Cargo Time (per vehicle)*
	Working Time	*Non-Working Time*	
MC	1.10	0.33	0.083
PC	1.50	0.50	0.083
LDV	1.50	0.50	0.083
MB	1.10	0.33	0.083
LB	1.10	0.33	0.083
LGV	1.10	0.33	0.20
MGV	1.10	0.33	0.54
HGV	1.10	0.33	1.00
VHGV	1.10	0.33	2.00

351. For the analysis purposes, all costs were entered in constant 2014 prices and were converted to economic costs, i.e. costs to the economy rather than 'market-place' costs (which include such items as import duties and taxes that would accrue to the Government and can be spent elsewhere). The generated traffic, as assessed individually for each road, is then added and HDM automatically calculates the benefit from this.21

352. HDM can then be run, and its analysis module takes the proposed works standards, traffic and vehicle details and prepares a cost-benefit analysis of the proposed interventions for each of the subject roads. This includes allowances for any likely accident costs savings and for any generated traffic that may arise as a result of the road improvement.

353. Details of the existing and future road conditions, average speeds and journey times are shown in **Tables 9.5 and 9.6** below. This shows a comparison of the existing conditions with those predicted by the HDM program, given the proposed interventions both 'with' and 'without' the Project.

[21] The benefit to generated traffic is calculated as half the benefit to normal traffic. This is because some of the new traffic would be generated by a small improvement, some only by the full extent of the improvement, so on average a benefit of 50% is assumed. This so-called 'rule of half' stems from consumer surplus theory.

Table 9-5 Existing and Future Conditions on Subject Roads [With & Without Project]

	LR 6901		*NR 20*		*NR 1H*		*LR 7615*		*NR 16*		*LR 9001-A*		*LR 9001-B*		*NR 18B-A*		*NR 18B-B*	
	Road 13 - Paktaphan		**Champasak border - B. Beng**		**B. Beng - Salavan**		**B. Lakkhao - B. Dongsa**		**Thateng - Xekong**		**Xaisettha - B. Paam**		**B. Paam - Xanxai**		**Attapu - Xaisettha**		**Xaisettha - Phoukeua**	
	IRI (m/km)	*Average vehicle speed (km/h)*	*IRI (m/km)*	*Average vehicle speed (km/h)*	*IRI (m/km)*	*Average vehicle speed (km/h)*	*IRI (m/km)*	*Average vehicle speed (km/h)*	*IRI (m/km)*	*Average vehicle speed (km/h)*	*IRI (m/km)*	*Average vehicle speed (km/h)*	*IRI (m/km)*	*Average vehicle speed (km/h)*	*IRI (m/km)*	*Average vehicle speed (km/h)*	*IRI (m/km)*	*Average vehicle speed (km/h)*
A. Without Project																		
2014	20	18	3.7	53	2.9	46	25	18	3.1	58	3.0	60	25	22	2.5	44	2.5	45
2022	29	22	4.6	86	3.9	88	30	23	6.0	81	3.8	89	25	24	3.4	83	3.9	75
2025	29	22	5.4	84	4.5	88	30	23	9.3	61	4.7	88	25	24	4.2	82	4.6	74
2030	29	22	6.5	79	5.5	85	30	23	16	34	6.0	84	25	24	6.6	77	6.2	71
B. With Project																		
2022	18	29	3.9	86	3.2	90	14	41	4.0	88	3.4	94	17	33	3.4	82	3.5	75
2025	20	26	4.3	86	3.6	90	12	46	5.1	86	3.8	94	17	34	3.4	81	4.2	74
2030	20	26	5.2	84	4.6	88	15	38	6.8	78	4.8	92	17	34	5.7	78	6.0	71

Table 9-6 Journey Times and Time Savings on Subject Roads [With & Without Project]

	LR 6901	***NR 20***	***NR 1H***	***LR 7615***	***NR 16***	***LR 9001-A***	***LR 9001-B***	***NR 18B-A***	***NR 18B-B***
	Road 13 - Paktaphan	Champasak border - B. Beng	B. Beng - Salavan	B. Lakkhao - B. Dongsa	Thateng - Xekong	Xaisettha - B. Paam	B. Paam - Xanxai	Attapu - Xaisettha	Xaisettha - Phoukeua
Km	*17.0*	*30.0*	*26.0*	*14.4*	*54.0*	*17.0*	*38.4*	*14.0*	*98.0*
A. Present Situation (2014)									
IRI, m/km	20	3.7	2.9	25	3.1	3.0	25	2.5	2.5
Average speed, km/h	18	53	46	18	58	60	22	44	45
Average journey time (mins.)	56	34	34	47	56	17	107	19	130
B. 2022-2031, without project									
IRI, m/km	28-29	4-7	4-6	30	6-16	4-6	25	3-7	4-7
Average speed, km/h	22	83	88	23	62	87	24	81	74
Average journey time (mins.)	46	22	18	38	52	12	96	10	79
Time saving (%)	10	12	16	9	4	5	11	9	51
Time saving (%)	18%	36%	48%	20%	7%	31%	10%	45%	39%
C. 2022-2031, with project									
IRI, m/km	18-20	4-5	3-5	12-15	4-7	3-5	17	3-6	3-6
Average speed, km/h	26	86	89	36	84	92	31	81	74
Average journey time (mins.)	39	21	18	24	39	11	74	10	79
Time saving (mins.)	7	1	0	14	14	1	22	0	0
Time saving cf. A (%)	***70%***	***62%***	***52%***	***51%***	***69%***	***65%***	***69%***	***55%***	***61%***
Time saving cf. B (%)	***15%***	***3%***	***1%***	***36%***	***26%***	***5%***	***23%***	***0%***	***0%***

354. The Project is expected to lead to substantial improvements in maintenance standards. While there may be some improvement in the early years without the Project, assuming at least some routine maintenance continues, the Project will make a big difference in the longer term and on average, journey times are expected to be reduced by more than 50% compared with today, as a result of the planned interventions.

355. In general, improvements of the local roads, which are all presently in poor condition, give rise to predictions of significant generated traffic as the roads are a deterrent to travel at the moment. This is less so of the national roads, which are already in generally good condition and the main purpose of the intervention is to help keep them that way.

356. **Table 9.7** summarises the amount of generated traffic predicted for each road.

Table 9-7 Generated Traffic on Studied Roads

(% of normal traffic)

Traffic Type	***6901***	***20***	***1H***	***7615***	***16***	***9001***		***18B***	
						Section		*Section*	
						A	*B*	*A*	*B*
Passenger vehicles (cars, utilities and buses)	20	0	0	30	0	0	120	0	0
Light and medium goods vehicles	5	0	0	10	0	0	60	0	0
Heavy goods vehicles	5	0	0	10	0	0	60	0	0

357. For each road it was also considered whether diverted traffic flows would arise, as might happen if the road was improved sufficiently to make it more attractive than an alternative route. In practice, as the investments are of limited nature and there are few practical alternative routes for most journeys, no potential diverted traffic was identified - this conclusion is explained for each individual road in the following sections of the report.

358. The next section of this Chapter describes each road to be included in the Project, the likely effect of the planned interventions on generated and diverted traffic and the results of the economic evaluation as performed by application of the HDM program. The results of the HDM runs for each road are contained in **Annex Y - Results of Economic Analysis** which also show the economic value of the works proposed under the future 'Project'. As explained above, this is only part of the economic value of the project as a whole.

359. **Annex X - Vehicle Operating Costs** shows the estimates of vehicle operating cost that were used as the basis for the analysis while **Annex Y - Results of Economic Analysis** contains the print-outs of the key results derived using the HDM-4 package. These include the indirect costs of the project, which have been allocated to each road on a pro-rata basis.

360. **Annex Z - Economic Value** of Proposed Works contains a table showing the combined benefit from all the road works (capital and maintenance) to be provided under the Project - if the indirect costs are not included.

361. **Annex AA - Estimation of Overall Project Viability** adds back in the 'overhead' (indirect) costs of the Project (i.e. the cost of the intended capacity development and associated activities). These were derived from the data contained in **Annex Y - Results of Economic Analysis** and provide an economic internal rate of return for the Project as a whole. In economic terms these overhead costs need not be apportioned to the individual roads in the economic analysis as that would introduce a risk of sub-optimal decision-making. Rather they could be considered to be 'common costs' and as such, are independent of any individual road intervention.

362. In this case, however, apportionment of all project costs to the road interventions has been undertaken in response to the ADB's requirements. Results show that the benefits of each planned road intervention are high enough to easily outweigh all of the costs even if these are allocated to the individual roads.

9.2.4 Summary of Results and Sensitivity Tests

363. Each individual road is considered in the following chapters. This section contains a summary of the findings and results of the analysis.

364. The tables in **Annex V - Results of Economic Analysis** show, for each project road, the net present value and internal rate of return after the allocation of the indirect project costs. The main results are summarised in **Table 9.8**, together with the results of the sensitivity analysis tests conducted subsequently. The latter were designed to show the effect of changes in the key assumptions on the net present values (NPV) and the economic internal rates of return (EIRR) derived for each road.

365. Taking the base case first (shown in blue font), the range of EIRRs is from 11% to 120%, which reflects the substantial benefits to be gained by providing good maintenance to roads restored to good condition. The low-cost interventions were shown to lead to very significant road user cost and time savings over the time horizon of the project

366. In general, projects with a positive NPV [using a 12% per annum discount rate] are accepted as representing worthwhile and justifiable investments. Similarly, the EIRR should exceed 12%. On both (related) measures, the interventions were found to be well worthwhile22. Sensitivity tests were carried out to show the effects on the economic indicators if the Project should cost more (or less) than anticipated, or if the traffic levels and benefits should prove to be more or less than those forecast. Both the costs and traffic levels have been varied upwards and downwards by 20%. This is related to the risk analysis. If this sensitivity test process was found to result in an economic indicator switching to a level below that deemed to be acceptable, the project could be 'risky' and further analysis – and/or remedial measures – would be required. In fact, as the base case results are so favourable, the EIRRs for the planned Project roads remain over 15% in almost all cases, showing that the project is a 'robust' one.

[22] After the allocation of indirect costs, the IRR Section B of Road 18B was reduced to just above 9%, but the EIRR for the standalone activities amounts to over 20%, so this section is also well justified. The EIRR of the southern part of 9001 (designated 9001A) is below the required thresholds if considered in isolation, but can be justified in the context of Road 9001 and the project as a whole.

367. A further standard test is to calculate the switching values. These are the amounts by which the costs would have to rise – or the traffic benefits fall – before the NPV (at 12% discount rate) falls to zero and the EIRR falls to 12%.

368. These are shown in red font in **Table 9.8**. As the benefits of the project are very high and the costs low, the traffic volumes could in almost all cases fall significantly from the predicted level and the traffic benefits would still 'pay' for the interventions. Similarly, the intervention costs could increase significantly before the viability of the project would be put in question. The economy of the area is very dynamic and the traffic levels more than warrant the planned level of investment for maintaining the roads – many of them recently developed – that have allowed the area's economy to flourish.

Table 9-8 Economic Analysis, Sensitivity Tests & Switching Values

	Net Present Values Discounted at 12%/year				
	Project Costs	VOC savings	Other benefits	Net Benefit	Economic IRR
Road 6901, Road 13 South - Paktaphan, base case	**2.43**	**7.27**	**1.93**	**6.77**	**39.1%**
Project cost +20%	**2.91**	7.27	1.93	6.29	34.5%
Project cost -20%	**1.94**	7.27	1.93	7.26	45.2%
Project cost +279%	**9.20**	7.27	1.93	0.00	12.0%
Traffic +20%	2.43	**8.72**	**2.32**	8.61	44.0%
Traffic -20%	2.43	**5.82**	**1.54**	4.93	33.5%
Traffic -74%	2.43	**1.90**	**0.51**	-0.02	12.0%
Road 20, south of B. Beng, base case	**0.68**	**0.92**	**0.20**	**0.43**	**18.9%**
Project cost +20%	**0.82**	0.92	0.20	0.30	16.2%
Project cost -20%	**0.55**	0.92	0.20	0.57	22.6%
Project cost +64%	**1.12**	0.92	0.20	0.00	12.0%
Traffic +20%	0.68	**1.11**	**0.23**	0.66	21.9%
Traffic -20%	0.68	**0.74**	**0.16**	0.22	15.6%
Traffic -39%	0.68	**0.56**	**0.12**	0.00	12.0%
Road 1H, B. Beng - Salavan, base case	**1.25**	**1.45**	**0.11**	**0.32**	**15.6%**
Project cost +20%	**1.49**	1.45	0.11	0.07	12.7%
Project cost -20%	**1.00**	1.45	0.11	0.57	19.1%
Project cost +26%	**1.57**	1.45	0.11	0.00	12.0%
Traffic +20%	1.25	**1.74**	**0.14**	0.63	18.4%
Traffic -20%	1.25	**1.16**	**0.09**	0.00	12.1%
Traffic -21%	1.25	**1.15**	**0.09**	0.00	12.0%
Road 7615, B. Lakkhao - B. Khamkok, base case	**1.57**	**7.04**	**3.83**	**9.30**	**55.9%**
Project cost +20%	**1.89**	7.04	3.83	8.98	50.3%
Project cost -20%	**1.26**	7.04	3.83	9.61	63.2%
Project cost +590%	**10.87**	7.04	3.83	0.00	12.0%
Traffic +20%	1.57	**8.45**	**4.60**	11.48	61.8%
Traffic -20%	1.57	**5.63**	**3.07**	7.12	49.1%
Traffic -86%	1.57	**1.02**	**0.55**	0.00	12.0%
Road 16, Champasak border - Xekong, base case	**0.56**	**25.96**	**14.64**	**40.04**	**103.5%**
Project cost +20%	**0.67**	25.96	14.64	39.93	110.8%
Project cost -20%	**0.45**	25.96	14.64	40.15	116.3%
Project cost +7200%	**40.95**	25.96	14.64	0.00	12.0%
Traffic +20%	0.56	**31.15**	**17.56**	48.15	113.7%
Traffic -20%	0.56	**20.77**	**11.71**	31.92	92.9%
Traffic -99%	0.56	**0.26**	**0.15**	0.00	12.0%
Road 9001 (A), Xaisettha - B. Paam, base case	**0.33**	**-0.27**	**0.24**	**-0.36**	**-0.8%**
Project cost +20%	**0.39**	-0.27	0.24	-0.42	-1.2%
Project cost -20%	**0.26**	-0.27	0.24	-0.29	-0.2%
Project cost -99%	**0.00**	-0.27	0.24	0.00	12.0%
Traffic +20%	0.33	**-0.32**	**0.29**	-0.35	-0.3%
Traffic -20%	0.33	**-0.21**	**0.20**	-0.34	-1.3%
Traffic +15900%	0.33	**0.26**	**0.15**	0.00	12.0%
Road 9001 (B), B. Paam - Xanxai, base case	**5.10**	**4.58**	**9.10**	**8.58**	**41.0%**
Project cost +20%	**6.12**	4.58	9.10	7.56	26.7%
Project cost -20%	**4.08**	4.58	9.10	9.60	56.1%
Project cost +170%	**13.77**	4.58	9.10	0.00	12.0%
Traffic +20%	5.10	**5.50**	**9.65**	10.05	44.0%
Traffic -20%	5.10	**3.67**	**8.56**	7.12	37.6%
Traffic -63%	5.10	**1.70**	**3.37**	0.00	12.0%
Road 18B (A), Attapu - Xaisettha, base case	**0.42**	**0.29**	**0.46**	**0.33**	**21.4%**
Project cost +20%	**0.51**	0.29	0.46	0.24	20.4%
Project cost -20%	**0.34**	0.29	0.46	0.41	22.8%
Project cost +79%	**0.76**	0.29	0.46	0.00	12.0%
Traffic +20%	0.42	**0.34**	**0.47**	0.39	22.5%
Traffic -20%	0.42	**0.23**	**0.46**	0.27	20.2%
Traffic -99%	0.42	**0.01**	**0.01**	0.00	12.0%
Road 18B (B), Xaisettha - Phoukeua, base case	**2.48**	**1.98**	**0.10**	**-0.40**	**9.2%**
Project cost +20%	**2.98**	1.98	0.10	-0.90	6.5%
Project cost -20%	**1.99**	1.98	0.10	0.09	12.9%
Project cost -16%	**2.09**	1.98	0.10	0.00	12.0%
Traffic +20%	2.48	**2.38**	0.12	0.02	12.1%
Traffic -20%	2.48	**1.59**	0.08	-0.81	5.9%
Traffic +19%	2.48	**2.36**	0.12	0.00	12.0%

9.2.5 Overall Project Viability

369. **Table 9.9** summarises the results of the economic analysis. As the project is intended to have national significance, the true economic value should prove to be considerably higher than shown in the table.

Table 9-9 Summary of Project Economic Analysis, All Project Components

(million USD, undiscounted)

	Increase in Road Agency Costs			*Decrease in Road User Costs*				*Exogenous Benefits*	*Net Benefits*
	Capital	*Recurrent*	*Special*	*MT VOC*	*MT Time*	*NMT*	*Accidents*		
2018	3.12	-0.28	1.71	0.00	0.00	0.00	0.00	0.00	-4.55
2019	3.12	-0.16	1.71	0.29	0.01	0.00	0.00	0.00	-4.37
2020	3.12	-0.42	1.71	0.73	0.03	0.00	0.00	0.00	-3.66
2021	3.12	-0.46	1.71	1.39	0.08	0.00	0.00	0.00	-2.90
2022	0.00	-0.56	-0.96	4.53	2.24	0.00	0.00	0.00	8.29
2023	0.00	-0.63	-0.96	4.88	2.47	0.00	0.00	0.00	8.94
2024	0.23	-0.65	-0.96	6.60	3.52	0.00	0.00	0.00	11.50
2025	0.00	-0.66	-0.96	8.87	4.77	0.00	0.00	0.00	15.26
2026	0.00	-0.54	-0.96	11.19	5.92	0.00	0.00	0.00	18.61
2027	0.52	-0.35	-0.96	15.20	7.79	0.00	0.00	0.00	23.78
2028	-0.68	-0.32	-0.96	22.77	11.08	0.00	0.00	0.00	35.82
2029	0.00	-0.12	-0.96	27.22	13.13	0.00	0.00	0.00	41.43
2030	0.22	-0.07	-0.96	30.84	14.80	0.00	0.00	0.00	46.45
2031	-3.83	-0.03	-0.96	31.56	15.13	0.00	0.00	0.00	51.51
								NPV@12%	65.09
								IRR	44.3%

370. The table includes the additional overhead (indirect) costs of the project, to confirm overall project viability. Because the benefits of the capacity-building have not been quantified, the real economic benefit is expected to be higher than that shown. Even with all costs included the economic internal rate of return for the recommended project will comfortably exceed the chosen 12% discount rate.

371. As an additional test, the HDM program was re-run using traffic forecasts of just half the growth rates used in the main traffic forecast. This was done for both normal and generated traffic, as an additional test over and above the normal sensitivity tests already presented. The purpose was to guard against 'optimism bias' which might be present, as traffic in the area has been forecast to grow much faster than the national average23. The resulting traffic forecasts and results from HDM are shown in **Tables 9.10 and 9.11**, which show that even with these halved growth rates the economic internal rate of return will still exceed the chosen 12% discount rate.

[23] The draft national development plan for 2016–2020 predicts that the regional economic growth rate, currently 12% a year, will continue throughout the period up to 2020. This is some 60% higher than the national average, forecast to be economic growth of 7.5% a year.

Table 9-10 Future Traffic if Traffic Growth Rates Halved

(conservative project assumption; average vehicles per day)

	MC	PC	LDV	Bus	LGV	MGV	HGV	VHGV	Total	ACAGR
Road 6901										
2014	406	4	56	27	74	8	9	10	594	
2018	594	6	82	57	104	11	13	16	884	10.4%
2023	775	10	123	121	138	16	18	27	1,227	6.8%
2028	417	18	158	169	159	20	22	36	999	-4.0%
Road 20										
2014	1034	56	182	43	136	53	15	8	1,527	
2018	1381	90	266	64	182	71	19	10	2,082	8.1%
2023	1718	151	401	94	233	97	25	13	2,732	5.6%
2028	924	212	513	117	268	121	31	16	2,203	-4.2%
Road 1H										
2014	1892	104	446	39	252	47	15	18	2,813	
2018	2527	167	653	58	337	63	19	23	3,845	8.1%
2023	3144	281	982	88	431	86	25	30	5,067	5.7%
2028	1691	393	1258	117	497	108	31	37	4,132	-4.0%
Road 7615										
2014	700	5	54	3	20	25	2	2	811	
2018	935	8	79	5	27	33	3	3	1,092	7.7%
2023	1163	13	119	7	34	46	3	3	1,390	5.0%
2028	626	19	152	8	39	57	4	4	910	-8.1%
Road 16										
2014	1754	126	405	62	147	44	20	33	2,591	
2018	2342	202	649	92	215	64	27	44	3,635	8.8%
2023	2915	340	1020	149	324	97	37	61	4,941	6.3%
2028	1568	490	1307	214	433	130	48	79	4,268	-2.9%
Road 9001, Section A										
2014	1239	25	160	3	63	55	11	5	1,561	
2018	1655	40	234	5	84	73	14	6	2,111	7.8%
2023	2059	67	352	7	108	101	18	8	2,721	5.2%
2028	1108	94	451	11	124	126	22	10	1,947	-6.5%
Road 9001, Section B										
2014	309	1	19	3	1	1	3	1	338	
2018	413	2	30	5	1	1	4	1	457	7.8%
2023	514	3	51	7	2	2	6	2	586	5.1%
2028	393	4	77	11	2	2	7	2	500	-3.1%
Road 18B										
2014	317	33	142	36	13	4	17	76	638	
2018	423	53	227	58	16	5	23	101	907	9.2%
2023	527	89	383	97	23	7	31	140	1,297	7.4%
2028	404	134	576	146	32	10	41	182	1,523	3.3%

MC = motor cycle
PC = passenger car
LDV = light delivery vehicle (utility)
LGV = light goods vehicle
MGV = medium goods vehicle
HGV = heavy goods vehicle
VHGV = very heavy goods vehicle
ACGR = annual compound growth rate

Table 9-11 Summary of Project Economic Analysis, All Project Components, if the Forecast Traffic Growth Rates Are Halved

(million USD, undiscounted)

	Increase in Road Agency Costs			*Decrease in Road User Costs*				*Exogenous Benefits*	*Net Benefits*
	Capital	*Recurrent*	*Special*	*MT VOC*	*MT Time*	*NMT*	*Accidents*		
2018	3.12	-0.28	1.71	0.00	0.00	0.00	0.00	0.00	-4.55
2019	3.12	-0.15	1.71	0.19	0.00	0.00	0.00	0.00	-4.49
2020	3.12	-0.39	1.71	0.41	0.01	0.00	0.00	0.00	-4.01
2021	3.12	-0.41	1.71	0.71	0.03	0.00	0.00	0.00	-3.68
2022	0.38	-0.44	-0.96	3.31	1.70	0.00	0.00	0.00	6.02
2023	0.00	-0.52	-0.96	3.79	1.95	0.00	0.00	0.00	7.22
2024	0.21	-0.59	-0.96	3.93	1.94	0.00	0.00	0.00	7.21
2025	0.38	-0.57	-0.96	4.68	2.34	0.00	0.00	0.00	8.17
2026	0.00	-0.63	-0.96	5.54	2.82	0.00	0.00	0.00	9.95
2027	0.21	-0.64	-0.96	5.59	2.83	0.00	0.00	0.00	9.81
2028	0.30	-0.50	-0.96	6.85	3.53	0.00	0.00	0.00	11.53
2029	0.00	-0.32	-0.96	8.38	4.16	0.00	0.00	0.00	13.82
2030	0.20	-0.31	-0.96	8.92	4.48	0.00	0.00	0.00	14.47
2031	-4.51	-0.09	-0.96	10.54	5.30	0.00	0.00	0.00	21.41
								NPV@12%	22.11
								IRR	29.8%

9.2.6 Least Cost Analysis

372. For each of the proposed interventions, two options were considered. This is explained in the engineering section of the report. The investment costs were considered under four headings – the backlog of routine maintenance; the necessary periodic maintenance and rehabilitation; miscellaneous and other works; and rehabilitation options. The annual cost of subsequent maintenance was also assessed.

373. To be effective, the Project must cover the backlog of routine maintenance and also the periodic maintenance and spot rehabilitation where pavements or structures have failed. The miscellaneous works cover such items as raising embankments in flood-prone areas. This is also necessary to allow the road to be maintained properly [i.e. by eliminating the frequent emergency maintenance interventions required] and thereby to be kept open through all seasons.

374. The options for further rehabilitation were studied and included appropriately in the cost estimates. After review of the basic requirements along each road, to allow for its subsequent retention in good condition, it was determined that the additional cost of major rehabilitation would not be justified for inclusion in this Project. Thus the low cost alternative was selected in each case, for all the project roads. Further details are contained in the engineering section.

9.2.7 **Risk Analysis**

375. As noted above, the project interventions have high benefit and low cost and also carry a low level of risk as the switching values demonstrate. The economic return is substantial over the assumed 10-year stream of benefits from the Project. There is also low construction cost and low traffic fluctuation risks attached as **Table 9.8** has shown.

376. Under ADB guidelines, quantitative risk assessment is needed for high-cost or marginal projects and it was concluded that this type of analysis is not required. There are some risks, however, which need to be guarded against and these are considered in the following paragraphs.

377. The greatest of these may be the budget risk. It is shown elsewhere in the study reports that the national Road Maintenance Fund (RMF) is no longer working as intended and that much of its income has been diverted to cover the cost of road construction projects.

378. In this report it is assumed that the roads will be maintained under the Project until 2021 sing PBC and CBM contract methods. From 2022 to 2031, however, it has been assumed that they will be maintained with domestic financing. Ideally this will be from the RMF but if such funds are not forthcoming, then funds for the maintenance will need to come from other national or provincial budgets.

379. It is not possible to predict the Lao PDR's budget situation for 2022 and beyond, but the budget is known to be under severe pressure in the current financial year (2014/15). It would be preferable for the RMF to be functioning as intended so that road users are financing the road maintenance, rather than the government budgets.

380. This risk can thus be mitigated by strengthening the oversight and workings of the RMF. There needs to be a concerted effort to demonstrate to Government that the RMF should function independently of the MPWT budget. This in turn will require additional budget funding to be allocated to MPWT, so that it can meet its overall obligations without drawing on the funds contributed by road users for road maintenance.

381. It will very likely take time to restore MPWT's budget to a level that will allow it to replace the funds that are now being drawn from the RMF. From the point of view of the proposed Project, time is available - but it is very important that the problem is solved before 2022. The project risk can be reduced if attention is paid to this aspect.

382. The other main risk is that after 2022 the Provinces may unable to keep their trained staff or otherwise, have adequately trained personnel available to replace any the staff members that leave. The Government is endeavouring to increase the general level of government salaries and this may help the situation. New road training facilities are being developed in Vientiane but skilled staff will be needed in the Provinces to monitor activities and assess priorities using PRoMMS, HDM or other software. By these means they would be able to help ensure efficient contract management as well as to provide professional oversight of any physical works to be carried out.

383. It is likely that technical expertise in road maintenance will be available through national training programmes but the necessary contract administration and computerised asset

management capabilities may prove not to be so well covered by the programmes currently envisaged.

384. To reduce these risks, the Project will need to be structured so that participants are fully aware of the content of the national training programmes in place and are able to supplement them with other training efforts at the local level during the Project. Such supplementary training might usefully be conducted jointly with staff of the four regional offices [or at least the three concerned DPWTs] - PTI staff might also be invited to participate and help in the training.

385. If the training sessions include all the concerned staff from the three Provinces, as well as the counterpart staff in PTI, they can assist each other in learning and building up an informal network which will be invaluable in the future. Then, when anybody leaves in any Province, the skills of others in the network can be called upon to help train the new incumbent in the vacant post, so that the institutional memory is not lost.

9.2.8 **Distribution Analysis**

386. This section considers the distribution of the costs and benefits among the different members of society.

387. Being a road maintenance project, the main beneficiary is the road user. The traffic counts have shown how many of the road users are motor-cyclists and this group is very vulnerable to the effects of deteriorated roads and to potholes. The road user benefits are substantial, as has been shown and the savings in operating costs would be of particular benefit to those who are using motorcycles or their own vehicles at the moment. In the case of goods transport, the benefits to the consumer are less direct but for trips to and from markets, particularly for perishable products, the savings can be significant and would add to household opportunities and incomes in the study region.

388. Bus services are not well developed at the moment, other than the long-haul services provided on the main national roads. Poor roads discourage bus operators and make it difficult for them to provide viable services for small population centres.

389. Local bus and sonteo (passenger service pickup) services are generally provided by members of transport associations. They set the fares (subject to government consent) and share the work. This tends to lead to low vehicle productivity (hence high costs), lack of fares competition and a general low level of service. It would not pay one operator alone to invest in a better vehicle for example, and the number of trips per vehicle depends on the number of operators in the association and how they decide to share the work.

390. It has been noted in an earlier report that the DPWTs have insufficient cognisance of these issues to regulate the services effectively[24] and that situation appears to remain the case today. The result is that benefits from improved roads tend to be captured by the operators and not passed on to the passengers.

[24] *Roads for Rural Development,* Scott Wilson for ADB/MCTPC, 2003

391. In the present context, there are few communities that depend on bus services, and motor cycle ownership is typically high. On the other hand the poorer or more elderly members of the community who are not motor-cyclists might benefit from improved passenger transport services that would also help village people carry goods. It is hoped that the Project can make some contribution to the provision of affordable public transport on all the subject roads, by working with the provincial authorities to identify the opportunities.

392. The Project through the community road maintenance initiative should provide employment to local village populations and contribute to reducing poverty by giving more employment opportunities for both sexes at village level.

393. The Project is likely to provide new opportunities to the urban and rural dwellers served by the subject roads in terms of production, employment, trade and social welfare. While these populations are generally not poor by Lao standards, incomes in the Lao PDR remain low by world standards and the project benefits will be widely welcomed and visible to all. Xanxai district is the exception as it is the poorest district in the country. The opening up of the Xanxai plateau, which will be accelerated by the works planned for inclusion in the Project, will make a profound difference to the livelihoods of the local district population.

394. The Project costs are to be met by Government, either directly or by loan repayment and they are thus paid for by the general taxpayer - with a resulting redistribution of wealth from society as a whole to the inhabitants of the study region. This is entirely proper and in fact the secondary benefits will be national, as the Bolavens and Xanxai plateaus are assets of national importance that, with investment, can lead to significant development of temperate crop production and export25. They also have tourism potential and several undeveloped mineral resources.

395. The contractors employed under the Project will also be beneficiaries and their skills should be enhanced as a result of the intended works.

396. Finally, the Road Maintenance Fund will benefit from increased revenue due to the generated traffic. This will be offset by the greater fuel economy from operating on the better maintained road sections. The income of the fund comes from the road users themselves, who in turn should benefit from its operations.

397. Overall the distribution of the benefits will be widespread throughout the society and relatively large when compared with the costs.

[25] Of the project roads, only LR 6901 is not located to serve one or other of these plateaus. LR 6901 serves as a useful link for local border trade with Thailand.

9.3 LR 6901, link to Paktaphan ferries

9.3.1 Road Function and Project Rationale

398. This provincial road is Salavan province's direct link with Thailand. The main routes for Salavan's trade with Thailand are to the south via Champasak province using National Roads 20 and 16 or using National Road 13 to the north to reach Savannakhet province and the Mekong bridge linking Savannakhet with Mukdahan in Thailand.

399. LR 6901, on the other hand, is a 17-km gravel road which leads directly west from near Salavan's Lakhonpheng district capital. It runs from Ban Phouangsavan on Road 13 South to the village of Paktaphan on the east bank of the Mekong River, which is the border between Laos and Thailand. Here there are small ferries for pedestrians and motorcycles. More recently, a vehicle ferry has opened up a few km north of the village. This was funded by a private Thai investor and caters mainly for Thai exports and occasional visitors to nearby parts of Salavan province.

400. There have been inter-governmental discussions with Thailand about a potential new Mekong River bridge to link Salavan province directly with Thailand but it is understood that the best location for this has yet to be agreed between the two countries. A site near Paktaphan is one possibility but such an investment cannot yet be assumed.

- LR 6901 thus has a triple role at the moment;
- To serve Paktaphan village and the other villages along the road;
- To link Lakhonpheng District with the corresponding border district in Thailand;
- To provide a route for Thai trucks bringing imported goods into Laos from the border region on the Thai side.

402. The road is a 17 km long gravel road in fair condition [due to ongoing regular maintenance interventions] but which has drainage problems in some parts leading to regular inundation and a high annual maintenance demand as a result. This lead to the proposal to raise the existing roadway above the surrounding terrain to provide year-round accessibility and reduce annual maintenance costs. The overall project road length includes a 5.5 km long branch to the vehicle ferry terminal, north of the village as well as a 5-km connecting link between the main village and the truck ferry terminal, forming a triangular network of roads at the western end of the corridor.

403. The works as defined include all these three road links, making a total of 27.5 km. Beside localized raises in elevation, the three section of road need re-grading with associated drainage improvements and some extension of the present short sections of DBST through the villages for environmental and health reasons. In all, some 6.5 km of roadway lies in flood-prone areas and needs to be raised. These interventions should lead to more efficient maintenance efforts in the future.

9.3.2 Existing Traffic and Forecast of Normal Traffic

404. From the traffic studies undertaken, the average daily traffic was assessed as being 406 motorcycles and 187 vehicles with four wheels or more, of which 101 were trucks. 19 of the trucks were classified as 'heavy' or 'very heavy' and most of these would be Thai registered vehicles carrying imported goods into Lao PDR or returning empty. With such a traffic load, the road should be considered a candidate for paved surfacing in the future.

405. The origin-destination survey showed that most of the light vehicle traffic is local and from within Lakhonpheng district but Savannakhet is also a popular destination. The buses go to Khongxedon (Lakhonpheng's neighbouring District in Salavan province), to Salavan provincial centre, or to Savannakhet. The trucks were found to carry a variety of freight, including bulk goods, mixed and perishable imports intended for Khongxedon or elsewhere in Salavan province.

406. The forecast for normal traffic26 is contained in Chapter 4 and its related Annexes. Growth is expected to be rapid and the ADT (excluding motorcycles) could reach 1,000 vehicles by 2025. A high standard of maintenance for this road is and will continue to be essential.

9.3.3 Proposed Interventions and the Effect on Traffic Volumes

407. The roads at present have only a laterite surface with poor drainage and some sections are flood-prone. On a dry day, and despite the generally good horizontal and vertical alignments, adequate width, low traffic and generally flat terrain, the average speed of a light vehicle was found to be only 22.9 km/h. The road roughness was assessed as IRI 20.

408. As a result of the proposed interventions it is assumed that the road can be regularly and efficiently maintained and that surfaces will thereby remain in good condition.

409. As the road is in such poor condition today and journey times will be better than halved after the project intervention, it is assumed that 20% more passenger journeys will be generated by the project. The effect on freight traffic will be less as for many of the journeys – from point of origin or manufacture to the point of consumption – the costs of using the project road length are just a small part of the sale price of the goods. Traffic generation for freight has therefore been assumed at 5%.

410. No diverted traffic has been predicted. It is unlikely that the road improvement alone will divert foreign trade traffic, presently using the main highway and bridge networks through Pakse and Savannakhet, to the Paktaphan route which is really only useful for local cross-border trade.

[26] Normal traffic is defined as that traffic which passes along the road today, and can be expected to grow in line with population growth and economic growth, independently of any road improvement. In this it differs from generated and diverted traffic (discussed below).

9.3.4 Results of the Economic Analysis

411. The project is primarily a maintenance project and it is assumed that the residual value of the works following a 10-year evaluation period will be just 9% of the cost of the initial works.

412. The analysis assumes that adequate maintenance will be carried out in the years 2022 to 2028 after the conclusion of the project based upon the assumed success of the institutional components of the Project.

413. On this basis and discounting at 12% per year, the HDM analysis shows an NPV of $7 million derived principally from the lower vehicle operating costs and time savings as compared with the existing situation. The internal rate of return is estimated to be of the order of 64% or 39% after the proportional allocation of the indirect costs of the Project. (These are the province-wide capacity strengthening and development activities to be included.)

414. The heavy traffic and the substantial annual maintenance costs after the project is completed together with the high IRR suggest that when funds permit, a more substantial improvement should follow including the provision of a fully paved surface.

9.3.5 Conclusions and Recommendations

415. The proposed project interventions can be expected to provide a substantial benefit to the existing traffic and will also generate new traffic and economic activity. They are economically justified as part of the larger Project and following this work which is considered to be urgent, the road could be considered for further upgrading in future years.

9.4 National Roads 20 and 1H

9.4.1 Road Function and Project Rationale

416. This section of the National road network is part of the route between the two provincial capitals of Pakse (in Champasak province) and Salavan. In earlier years it was known as NR-20 throughout but now the northern section [to the north of the Ban Beng intersection] has been renumbered as NR-1H as it is part of the main north-south spine route, National Road 1, which is being developed in stages. As the original National Road 20, the road was first bituminised in the early 1990's under an ADB project loan.

417. The project road starts at the Champasak-Salavan provincial border. National Road 20 runs from there, through Lao-Ngam district, for 30 km to reach the junction with National Road 1H at Ban Beng. The project then takes National Road 1H (this part of which is still referred to locally as National Road 20) for 26 km into the Salavan provincial centre.

418. The road is presently a bituminous (DBST) road in generally good condition. Its main weakness is a succession of steel, 'Bailey' type bridges, each of which is of single lane width and subject to a 20-tonne posted load limit - 1 crossing in fact is subject to a 15 tonne limit]. There would be economic advantage in replacing the four structures on National Road 1H [assigned as Section A under the study] which is part of a through route between Attapeu, Xekong, Salavan and Savannakhet provinces. There would be less benefit from the project replacing the four bridges on National Road 20 [study Section B] however, as the Project does not include work on National Road 20 further to the south in Champasak Province. The load restriction on the steel bridges in that part of the corridor would remain and continue to affect the passage of the heavier vehicle classes.

419. Salavan has two main trade routes to and from Thailand. National Road 15A links the provincial capital with National Road 13 South and Savannakhet. This route also gives access to Paktaphan but in the absence of a new Mekong River bridge and any major settlement on the Thai side, it has only a minor role for the provincial capital. The other main route for the province is National Road 20 (and then NR 16) to Pakse and from there across the Mekong River to the Thai border at Xongmek.

420. The road is thus mainly important as Salavan's direct link with Pakse and southern Thailand and is also a vital route for Lao-Ngam district though which it passes. Lao-Ngam is located on the Bolavens plateau and is one of the most productive agricultural districts of the country.

421. The proposed work on Sections A and B are mainly limited to overcoming the backlog of routine road maintenance interventions and making spot repairs to the base and sub-base. In addition, the proposed work on National Road 1H [Section A] includes the replacement of the existing four Bailey bridges with box culverts of sufficient length to carry 2 lanes of traffic. The road will then be maintained during the lifetime of the Project.

9.4.2 Existing Traffic and Forecast of Normal Traffic

422. The traffic studies undertaken, showed that the average daily traffic in 2014 was as follows:

- On National Road 20, 1,034 motorcycles and 431 vehicles with four wheels or more, of which 212 were trucks. 23 of the trucks were classified as being in the 'heavy' or 'very heavy' classification;
- On National Road 1H, 1,892 motorcycles and 921 vehicles with four wheels or more, of which 332 were trucks. 33 of the trucks were listed as being 'heavy' or 'very heavy'.

423. The origin-destination survey on National Road 20 showed that most of the light vehicle traffic flows between Salavan and Lao-Ngam or between Salavan and Pakse. The buses follow the same pattern. The trucks carry a variety of freight, the most frequent of which involves the movement of agricultural produce between Lao-Ngam and Salavan as well as between Lao-Ngam and a variety of other destinations in the southern provinces.

424. The forecast for normal traffic is contained in chapter 4 and the related Annexes to this report. Growth is expected to be rapid and on National Road 20 the ADT (excluding motorcycles) could reach 2,500 vehicles by 2025. National Road 1H is predicted to have double that volume by that same date and a high standard of maintenance for these roads will be essential.

9.4.3 Proposed Interventions and the Effect on Traffic Volumes

425. The proposed works are mainly limited to surface, base and sub-base repairs and the replacement of the 4 Bailey bridges on National Road 1H by concrete box culverts. Similar interventions are planned for Section B except that the steel bridges are to be subject to routine maintenance works only rather than full replacement.

426. The Project will then cover the maintenance of the roads up to 2021 and it is assumed that after that the roads will be regularly maintained and the surfaces will remain in good condition.

427. As the roads are in good condition today, and journey times will hardly be affected by the project intervention and no generated traffic has been assumed therefore.

428. There could be some use by larger trucks on National Road 1H once the weight restriction due to the existing Bailey bridges has been removed. There could be a small benefit from this source, but this has not been taken into account for the purposes of this study. Similarly, there will be some time savings from the elimination of the single-lane bridges, but these also have not been included in the analysis.

429. There is not expected to be any diverted traffic as a result of the project. All the Bailey bridges on the whole of National Road 20, including those in Champasak province (beyond the scope of this project), would need to be replaced to allow larger trucks to use this route. Now such trucks from Attapeu and Xekong will use National Road 16 not 20, and this is not expected to change. From Salavan to Pakse such trucks have to use National Roads 15A and 13 South and the Project as currently proposed does nothing to change this.

9.4.4 Results of the Economic Analysis

430. The Project is primarily a maintenance project. For National Road 20, it is assumed there is zero value of residual works following the 10-year evaluation period. National Road 1H, on the other hand, would have the new box culverts that will replace the Bailey bridges and as a result, a residual value of 40% after 10 years has been assumed.

431. The analysis also assumes that adequate maintenance will be carried out in the years 2022 to 2028, after the conclusion of the Project on the assumption that the institutional strengthening components of the Project are successfully introduced in the meantime.

432. On this basis and discounting at a rate of 12% a year, the HDM analysis showed an NPV of $0.4 million for National Road 20 and $0.3 million for National Road 1H. These benefits were expected to be derived principally from the lower vehicle operating costs and the continued good condition of the roads as a result of the planned interventions. The internal rate of return is about 44% for Road 20 and 28% for Road 1H (19% and 16% respectively after adding indirect costs).

9.4.5 Conclusions and Recommendations

433. The proposed project interventions should protect the road pavements and allow the projected rapid traffic growth to continue and thereby, to provide substantial and ongoing benefits. They are economically justified and the activities as part of the demonstration part of the Project should have lasting benefit.

9.5 LR 7615, Ban Lakkhao – Ban Khamkok

9.5.1 Road Function and Project Rationale

434. At its western end, this is a district road, which passes through a rapidly developing agricultural area on the Bolavens plateau. It links the villages and the local kum ban (village group) centre with the district centre of Thateng, in Xekong province, to which it is linked by the Pakxong-Thateng section of National Road 16. For Study purposes the road was divided into 3 Sections – A, B and C.

435. At its eastern end, the existing roadway forks - the right-hand fork leads to a new hydropower project being constructed in the valley below while the left hand fork [Allocated as Section B] is presently just a narrow track between the fields that leads down to two streams that are fast-flowing and presently impassable to all but 2-wheeled motor vehicles. The remains of an old wooden bridge can still be seen at one of the crossings. On the north side of these streams, the track continues for almost another 3 km to join National Road 16 at a point east of Thateng on the Thateng-Xekong section of the road.

436. The track in Section B was proposed for inclusion in the Project and although it is presently not an 'engineered' road it was considered useful to include some rehabilitation works in the Project to improve its condition and effectively link Sections A and c. There is little traffic on this section at the moment apart from some local village traffic (motorcycles and tractors) north of the rivers. The benefit will be to open up a through route to the eastern part of Thateng and from there on to Lamam. The populated part of Road LR-7615, in its western parts [Section A]; will continue to be a shorter route to southern and central Thateng for the several rural communities situated along it via the existing road.

437. The main part of LR 7615, as it exists today, is the western-most 14-km long [Section A] gravel road which caters primarily for local agricultural traffic and some generated by the dam project and the adjacent plantation lands. It serves several villages passes through undulating terrain and the alignment is generally fairly good.

438. However, the road is mostly unsurfaced and in poor condition due to regular flooding and drainage problems in the western areas where the elevation needs to be raised above the surrounding terrain to improve year round accessibility. The road needs complete re-grading and the placement of base and sub-base layers - this to be associated with the necessary drainage improvements and extended DBST sections within village boundaries. In all some 3.5 km needs the embankment to be raised in flood-prone areas. These interventions will lead to more efficient and less costly maintenance activities in the future.

9.5.2 Existing Traffic and Forecast of Normal Traffic

439. During the traffic studies undertaken, the average daily traffic was assessed as being 700 motorcycles and 110 vehicles with four wheels or more, of which 49 were trucks. Four of the trucks were classified as being 'heavy' or 'very heavy' and were thought to be associated with the dam construction and plantation operations. For this level of traffic a gravel road surface may be regarded as adequate although the forecast is for rapid growth and

bituminisation is likely to be justified in the future.

440. The origin-destination survey showed that almost all the traffic is local and from within Thateng district – there are no buses on the road. The predominant goods traffic was noted to be carrying agricultural produce.

441. The forecast for normal traffic is contained in Chapter 4 and the related Annex. Growth is expected to be rapid and the ADT (excluding motorcycles) could be over 500 vehicles by the year 2025. A high standard of maintenance for this road will be essential.

442. The track in the central section of the corridor [Section B], south of the stream crossings that cuts it in half, has little traffic. North of the stream [Section C] there is intermittent motor cycle and tractor traffic along the existing track passing through the village adjacent to the national road.

9.5.3 Proposed Interventions and the Effect on Traffic Volumes

443. Road LR-7615 at present has virtually no gravel surface remaining, poor drainage and is flood-prone. On a dry day, and despite the generally good alignment, adequate width, low traffic and generally flat terrain, the average speed in a light vehicle was found to average only about 20 km/h. The road roughness was assessed as IRI 25.

444. As a result of the proposed interventions it is assumed that the road sections could be regularly maintained and that the surface will thereby remain in good condition throughout.

445. As much of the road is in poor condition today, journey times will be better than halved after the project intervention. The journeys are local, so that this saving applies to a substantial portion of the journey. It is assumed that 15% more passenger journeys will be generated by the planned interventions. This includes traffic generated by the north-eastern extension. The effect on freight traffic will be less, but again the savings apply to a substantial part of predominantly short trips, often agricultural goods going to market. Traffic generation for freight has been assumed at 5%.

446. No diverted traffic has been predicted, as no traffic was identified in the origin-destination survey that wants to go in the Lamam direction. For Thateng town itself, the western route will be preferable for most of the population along the road and for whom the distance would be shorter. The north-eastern section is expected to have mainly local and generated traffic.

9.5.4 Results of the Economic Analysis

447. The work planned for inclusion in the Project is primarily maintenance but does include some embankment raising and the installation of a steel bridge [available from DPWT storage] as well as a new box culvert and it is assumed that the residual value of the works following a 10-year evaluation period will be 40% of the cost of the initial works.

448. The analysis assumes that adequate maintenance will be carried out in the years 2022 to 2031, after the conclusion of the Project. This assumes the success of the institutional strengthening components included in the scope of the Project.

449. On this basis, and discounting at 12% a year, the HDM analysis shows an NPV of over $9 million, derived principally from the lower vehicle operating costs and time savings as compared with the existing situation. The internal rate of return is about 67% (56% after the allocation of indirect costs).

450. The high level of forecast traffic growth, together with the high IRR, suggest that when funds permit a more substantial improvement should follow, to provide a fully paved surface, at least for the western end [Section A]. The extent of this can be decided after the Project has opened up the through route and the amount of traffic at the eastern end can be re-assessed.

9.5.5 **Conclusions and Recommendations**

451. The 14 km of Road LR-7615, shown as Section A in the engineering evaluation is badly in need of being brought up to a maintainable standard - and then subjected to appropriate regular maintenance interventions. The Bolavens plateau is a key area of the country for the planting of coffee and temperate crops and being near the market at Thateng, the villages along that part of the project road are well placed to take advantage of the opportunities presented. Putting the road into usable condition will have many benefits for the local communities.

452. Sections B and C of the road are presently separated by two small but fast-flowing rivers and which today are only used by the small populations of the two villages located along them. A significant improvement to open up a through route would generate some new local trip opportunities in both directions and can be expected to generate more significant traffic use. The proposed interventions under the Project for Road LR-7615 as a whole are evidently economically viable.

9.6 National Road 16

9.6.1 Road Function and Project Rationale

453. National Road 16 is an east-west highway between Vietnam and Thailand. From the west it enters Laos at Xongmek, crosses the Mekong at Pakse, climbs up to the centre of the Bolavens plateau at Pakxong and then turns northwards to reach Thateng. From there it turns east again and continues to the Xekong provincial capital in Lamam district.

454. A ferry then takes traffic across the Xekong River and the road continues up to Ditching district and the Vietnam border - the ferry is now to be replaced by a new bridge construction of which is already underway.

455. The subject part of the road starts at the Champasak-Xekong provincial border, a few km south of Thateng. It then passes into Lamam district to reach Xekong City - the total length of the single section [Section A] is 54 km.

456. The road has a bituminous surface and is presently in fairly good condition, although there are one or two sections where the pavement has failed on short stretches. The road was constructed in the mid-1990s with the help of an ADB project loan.

457. The road has been a key factor in the development of Laos's two most south-easterly provinces, Xekong and Attapeu. Prior to its construction there was only a seasonal track which could be used by four-wheel drive vehicles. To reach Attapeu in the rainy season it was necessary to take a boat from Xekong. Until very recently the road has remained the key artery and the only access from the rest of Laos to these two provinces27. In the past year, however, a new road, National Road 16A, has opened from Pakxong which gives Attapeu a shorter access route to Pakse. National Road 16 remains the key route for most of Xekong province and for Attapeu traffic to/from Salavan, Savannakhet and the north of Laos.

458. The subject road is thus has a very important role for the two provinces as well as for the districts of Thateng and Lamam through which it passes.

459. The works planned for the road are limited to overcoming the backlog of routine road maintenance and making spot repairs to the surfacing with associated surface, base and sub-base work. The road will then be maintained during the lifetime of the project.

9.6.2 Existing Traffic and Forecast of Normal Traffic

460. After the traffic studies undertaken during the PPTA, the average daily traffic was assessed as being 2,189 motorcycles and 803 vehicles with four wheels or more, of which 287 were trucks. A total of 61 of the trucks were classified as being 'heavy' or 'very heavy'.

461. The origin-destination survey on the road showed that almost one-third of the light

[27] Road 18A, which could potentially be a shorter route between Attapeu and Pakse, remains a seasonal track as its construction is technically difficult due to the susceptibility of the route to major flooding.

vehicle traffic travels between Attapeu/Xekong and Pakse. There is a significant amount of local traffic between Lamam and Thateng, while long-distance travel to Savannakhet and Vientiane makes up between 5 and 10 per cent of trips. There are no really dominant freight flows – all kinds of commodities were found travelling between a multitude of origins and destinations that are linked by the corridor.

462. The forecast for normal traffic is contained in Chapter 4 and the related Annex. Growth is expected to be rapid and the ADT (excluding motorcycles) could reach 6,000 vehicles by 2025. A high standard of maintenance for the road will be essential.

9.6.3 Proposed Interventions and the Effect on Traffic Volumes

463. The proposed works are mainly limited to surface, base and sub-base layer repairs as well as overcoming the large backlog of routine maintenance.

464. The project will then cover the maintenance of the roads up to 2021 and it is assumed that after that the road will be regularly maintained and the surface will remain in good condition.

465. As the road is in fairly good condition today and journey times will hardly be affected by the project intervention, no generated traffic has been assumed.

466. There is not expected to be any diverted traffic as a result of the project. The immediate improvement interventions are relatively small scale and would not seem to be enough to induce a switch from alternative routes. Such routes are limited and the main traffic flow that might be divertible is Attapeu to Lao Ngam, if this is now going via Pakxong - but there was no evidence that this is the case.

9.6.4 Results of the Economic Analysis

467. The project is primarily a maintenance project. There are no significant new structures and it was assumed there would be zero value of residual works following the 10-year evaluation period.

468. The analysis assumes that adequate maintenance will be carried out in the years 2022 to 2031, after the conclusion of the project based on the assumption that the institutional strengthening components to be included in the Project are successful.

469. On this basis and discounting at 12% a year, the HDM analysis shows an NPV of $40 million. These benefits are derived principally from the lower vehicle operating costs and the continued good condition of the road as a result of the project. The internal rate of return, even after allowance for the indirect project costs, reaches over 100 per cent, for the relatively small amount of the required initial investment.

9.6.5 **Conclusions and Recommendations**

470. The proposed project intervention protects the road pavement and allows the projected rapid traffic growth to continue and provide substantial ongoing benefits. It is economically beneficial and the activities as part of the demonstration part of the future Project should have lasting benefit.

9.7 LR 9001, Xaisettha – Ban Chaleunxai

9.7.1 Road Function and Project Rationale

471. Road LR-9001 is in Attapeu province and is the link between the provincial capital and Xanxai district, which is the poorest district in the Lao PDR. In fact most of the district is on a high plateau and it has great potential for growing coffee, fruit and temperate crops, but until recently it has been completely isolated and access from the plateau to markets and health services was impossible. Hence the population lived in poverty. The district centre, formerly in Ban Chaleunxai on the plateau, moved down some years ago to Ban Paam at the lowland edge of the district, because of the inaccessibility of the location of the former base. The steep climb up to the plateau defeated several attempts to complete a road.

472. This changed with the ADB-10 loan project, under which the present road reached Ban Chaleunxai in 2010. Although the road is now passable for most of the year it was never fully completed, and much of it is just a sub-base course layer with a very poor riding surface. It has steep slopes, up to 18% gradients, and some climbs are so difficult in the wet season that a maintenance team has to be on standby with heavy equipment in order to haul stranded vehicles past the main trouble spots. This creates a substantial financial burden for the Province.

473. The rewards are high, however. Electricity followed the road, and the transmission lines reached Ban Chaleunxai in 2012. There is now trade where none existed before, and the district has started exporting coffee. Motorcycles now pass along the road, where none could do so before – the only transport previously was on foot or in some cases, on horseback. KfW is presently supporting feeder road development up on the plateau and the district can now be optimistic about its future. It is early days in its development, however.

474. The subject road takes off from Xaisettha district, 14 km from Attapeu and for the first 17 km [assigned as Section A for PPTA study purposes] follows a good alignment through easy terrain, with a bitumen [DBST] surface provided under ADB-10. It then reaches Ban Paam where the district capital is now located. This village has grown significantly since becoming the capital.

475. The climb up to the plateau starts at Ban Paam [Assigned as Section B] and is 37 km long. It climbs from 134 m above sea level at Ban Paam (km 0 of this section) to 919 m above sea level at km 26. The remaining distance to Ban Chaleunxai is easier. After climbing further to 976 m at km 35, it then drops down to Ban Chaleunxai, km 37, at an altitude of 816 m. The alignment is tortuous and the horizontal curvature was measured as 292 degrees/km. The average speed on the section in a light vehicle was found to be 21 km/h up to Chaleunxai and 23 km/h on the return down to Ban Paam,

476. The principal function of the road is to serve the heart of Xanxai district, which is the Xanxai plateau where most of the people live. The KfW roads under development on the plateau will improve an existing link to Dakchung district in Xekong province so that an interprovincial link will exist that will allow through traffic and also allow Xanxai exports to Vietnam via Dakchung. The most important function of Road LR-9001, however, is the link

with the markets and medical facilities in Xaisettha and Attapeu and to enable supplies from Attapeu to reach the plateau.

477. One other potential role of the road is for tourism, as the plateau is home to a large and by all accounts spectacular lake, known as Nong Fa, potentially one of the most important tourist sites in the whole of Laos. The lake is located in the Dong Amphan National Biodiversity Conservation Area, which occupies the eastern part of the Xanxai plateau. Some tourists (on motorcycles) were already identified in the project origin-destination survey along the road.

478. The road from Ban Paam is little more than a gravel sub-base in poor condition but the several previously difficult river crossings, have been bridged under the previous intervention. Some of the steepest climbs have recently been given concrete surfaces though more of these are needed, however. There are drainage problems in some parts, where the road needs to be raised above the surrounding terrain and a major box culvert in Section B has failed and may soon collapse. Landslides have been a problem, and more slope protection is needed. The road in Section B needs widening, complete re-grading and a base course layer added. The various interventions will allow efficient maintenance in the future and should eliminate the need for the standby vehicle rescue teams.

9.7.2 Existing Traffic and Forecast of Normal Traffic

479. Following the traffic studies, the average daily traffic was assessed to be as follows:

- Between Xaisettha and Ban Paam (Section A): 1,239 motorcycles and 319 vehicles with four wheels or more, of which 134 were trucks, 16 of those were classified as ‘heavy’ or ‘very heavy’;
- Between Ban Paam and Ban Chaleunxai (Section B): 309 motorcycles and 26 vehicles of four wheels or more of which 6 were trucks (four ‘heavy’ or ‘very heavy’). It is not thought that trucks can climb the road fully loaded, as at least 10 sections were noted with gradients of between 14% and 18%.

480. West of Ban Paam (Section A), the road is clearly now suitable for all the traffic and the main need is to ensure its proper maintenance and sustainability. North of Ban Paam, however, there are very few vehicles that attempt the climb. The motorcycles seem to take more kindly to the surface and gradients and therefore comprise most of the traffic flow. They are of course also the most affordable to the Xanxai population at this stage in the District’s development.

481. The origin-destination survey was conducted on the northern section [Section B]. It also showed that most of the traffic is motorcycles that are travelling up and down between the plateau and the district centre in Ban Paam. Only a few of these go beyond Ban Paam to Xaisettha or Attapeu. About half the light vehicles (pickups and four-wheel drives) do continue to Attapeu.

482. The forecast made for normal traffic is described in Chapter 4 and the relevant Annex. Growth was expected to be rapid and the ADT on the western section (excluding motorcycles) could be over 1,500 vehicles by 2025. On the northern section this figure is predicted to reach about 250. A high standard of maintenance for this road will be essential.

483. The origin-destination survey on Road LR-9001 did not pick up any traffic to or from Dakchung or other parts of Xekong province. The link up to Dakchung is likely to be most useful for the inhabitants up on the plateau. From the Attapeu provincial centre National Roads 16 and 16B will remain a more suitable route to Dakchung.

9.7.3 Proposed Interventions and the Effect on Traffic Volumes

484. The western part of the road (Section A) between Xaisettha and Ban Paam needs little remedial work apart from some localized repairs and extensive routine maintenance. There is therefore some backlog to be made up and some attention to a section of base course is needed, together with attention to the drainage ditches. The result is a low cost intervention need under the Project to be followed regular by routine maintenance.

485. For the north-eastern section [Section B] a more substantial investment is proposed. The sub-grade and sub-base need repair over much of their length and then need to be topped with a gravel base course layer. On the steepest slopes some additional concrete pavement sections are proposed. There is one major box culvert that needs to be replaced and additional steel guard rails need to be provided in some presently steep and dangerous locations. These interventions were identified in order to bring all of the road up to a minimum safe and trafficable standard and to allow it to be sustained with normal routine maintenance in the future.

486. The steep slopes and winding alignment will never allow high speeds on the road but the improved surface will make a significant impact on comfort, safety and travel times. It is expected that the planned interventions will allow the traffic to develop as predicted in the project planning for ADB-1028. That implies generated traffic, for light vehicles, of 120% or normal traffic, and freight traffic generation of 60%. These figures are, of course, applied to the very low traffic count of today.

487. No diverted traffic has been predicted, for the reasons stated earlier. Because of the terrain and the basic nature of the feeder roads on the plateau, any traffic between Attapeu and Dakchung is likely to use National Roads 16 and 16B via the new river crossing bridge now to be constructed at Xekong.

9.7.4 Results of the Economic Analysis

488. For the western part of the road, Section A between Xaisettha and Ban Paam, the work planned is mostly only basic maintenance but it is proposed to raise the embankment in some areas. These interventions should result in the route having a residual value, after 10 years, in the order of 20% of the cost of the interventions required. On this basis the net present value of the investment has been calculated (at a 12% discount rate) at minus $50,000 with an internal rate of return of 9 per cent (negative after allocating the indirect costs).

[28] *Roads for Rural Development* project, Scott Wilson for ADB and the Lao PDR, 2003.

489. For the section between Ban Paam and Ban Chaleunxai (Section B) it is assumed that the residual value of the works following a 10-year evaluation period will be 50% of the cost of the initial works. This is because so much of the work is attention to the sub-base, the new base course provision, drainage and side slope improvements and also installation of more sections of concrete pavement. Combined, these should have an enduring value, in some cases up to 30 years from the time of the investment.

490. The analysis assumed that adequate maintenance will be carried out in the years 2022 to 2031, after the conclusion of the Project. This assumes the success of the institutional strengthening components to be included in the Project. It also assumes that the high cost of the standby maintenance and recovery teams can be avoided (said to be costing the province 8 billion kip a year).

491. On this basis and discounting at 12% a year, the HDM analysis showed an NPV of some $10.5 million, derived from the lower vehicle operating costs and time savings compared with the existing situation, and also from the major maintenance benefit. The internal rate of return was found to be in the order of 82% (41% after the allocation of indirect costs).

492. Combining the two sections, the HDM results for Road 9001 show an NPV at 12% discount rate of $10 million, with an internal rate of return of 75% (37% after the allocation of indirect costs).

9.7.5 **Conclusions and Recommendations**

493. The works included in the future Project will allow the intended benefits of the recently constructed road up to the Xanxai plateau to be realised and sustained as per the original intention. As such, it has a major contribution to make towards the alleviation of poverty in Xanxai district, and it will give substantial and lasting economic benefit to Attapeu province as a whole. It is a very important part of the project intervention and is fully justified on economic grounds.

9.8 National Road 18B

9.8.1 Road Function and Project Rationale

494. National Road 18B leads from Attapeu eastwards to the Vietnam border at Phoukeua. It was completed with Vietnamese assistance in 2006, and the border post was completed in 2012. Upgrading of the road on the Vietnamese side was completed in 2014.

495. Prior to the construction of NR-18B, there was only a track which was often impassable and therefore hardly used. The new possibility for imports and cross-border trade with Vietnam has caused a mushrooming of growth in Attapeu province and this is still in its early stages.

496. From Attapeu, National Road 18B first crosses the Xe Kong over a new bridge, and proceeds to Xaisettha, where at km 14 there is a junction with Project Road LR-9001 to Xanxai which starts in Xaisettha. National Road 18B then crosses the Xe Kaman, passes the new Attapeu Airport at km 36 (due to open in April 2015, and then proceeds through the sparsely populated and mountainous areas of Phouvong district, reaching the border with Vietnam at km 112.

497. For PPTA study purposes, the road has been divided into two sections. The westerly, Attapeu-Xaisettha section (Section A) is largely sub-urban in character and all situated within 14 km of Attapeu town. Xaisettha is a bustling market area which seems to have benefited from the completion of Road LR-9001 from Xanxai. There was no traffic count completed on this section and it is likely to become more and more built-up in the coming years. A traffic forecast would therefore be problematic and thus the economic evaluation for National Road 18B concentrates on the easterly 98 km section between Xaisettha and the border (Section B). Here there is less traffic and the traffic surveys and forecasts allowed the economic appraisal to be made. As the interventions were economically justified on this part of the road, similar interventions on Section A will no doubt be justified as the traffic volume is higher.

498. This 98-km length of Section B along National Road 18B, once the new airport site is passed, is mainly contained in Phouvong District though it does not serve the district capital which is located further west, to the south of Attapeu. The entire 76 km stretch beyond the airport serves only a very few small villages and long stretches of the road, where it winds through the mountains are almost completely uninhabited. There is one recent settlement at km 52 but after that there are no significant villages until the border zone is reached.

499. National Road 18B thus has three main purposes:

- Section A (14 km) is the suburban link between Attapeu and the Xaisettha district centre;
- Beyond Xaisettha, suburban-type traffic is likely to develop as far as the new airport (km 36) after this opens in April 2015;
- Beyond the new airport the road's principal function is for the international trade between Vietnam and Attapeu and beyond. There are few local residents who are served by the road. The international trade on this corridor, where none existed before, has grown very rapidly.

500. The road is mainly built of asphaltic concrete and is generally in good condition. There are one or two sections where the pavement has failed on short stretches (already repaired in some areas by MPWT using a DBST application) - some parts have been identified as being prone to landslides.

501. The road has made a huge difference to Attapeu province and is rapidly becoming an artery of national importance. It is also part of a potential international transit route (part of the Asian Highway network) between Vietnam and Thailand - via Attapeu and Pakse.

502. The works planned for inclusion in the Project for this road are mainly limited to overcoming the backlog of routine road maintenance, repairing parts of the surface, sub-base and base course and stabilising the side-slopes at critical locations. The road would then be maintained during the lifetime of the project.

9.8.2 **Existing Traffic and Forecast of Normal Traffic**

503. From the traffic studies completed under the PPTA, the average daily traffic on Section B was assessed as being 317 motorcycles and 322 vehicles with four wheels or more, of which 110 were trucks. 93 of the trucks were classified as 'heavy' or 'very heavy'.

504. The origin-destination survey completed for the road showed that the overwhelming majority (about 90%) of light vehicle traffic was to or from the Vietnam border. There was little other activity along the much of the rest of the route. About one-sixth of this traffic is to or from destinations in Laos that are north or west of Attapeu but most (about two-thirds) was found to be bound for Attapeu itself.

505. The majority of the surveyed trucks were noted as being empty – although it was not determined definitively why that was the case. There were some log exports and some imports of construction materials and fuel and only one or two container trucks were seen on the road - but the survey did pick up one load of manufactured goods travelling between Vietnam and Salavan. Some local bulk goods traffic at the western end of the road was thought to be associated with the airport or other construction work ongoing in the area.

506. The forecast for normal traffic was made and is contained in Chapter 4 and the relevant Annex. Growth was expected to be rapid and the ADT (excluding motorcycles) thought to reach over 2,000 vehicles by 2025. A high standard of maintenance for the road will be essential.

9.8.3 Proposed Interventions and the Effect on Traffic Volumes

507. The proposed works identified for inclusion in the future Project were mainly limited to surface, base and sub-base repairs as well as some side slope protection – in addition to overcoming the backlog of routine maintenance.

508. The future Project would then cover the maintenance of the roads up to 2021 and it is assumed that after that the time, the road will be regularly maintained and the surface will remain in good condition.

509. As the road was found to be in fairly good condition in 2014 and journey times likely to be little affected by the proposed interventions, only a small amount of generated traffic may be expected. It was decided not to include benefits from such traffic.

510. There was not expected to be any diverted traffic as a result of the proposed work. The immediate improvement would be relatively small and would not likely be enough to induce a switch from alternative routes. Such routes are limited as the nearest alternative border crossing is in Xekong province and users of that crossing are not likely to want to drive the additional distance to Phoukeua.

9.8.4 Results of the Economic Analysis

511. The interventions proposed for inclusion in the future Project are primarily only a package of maintenance works involving surface repairs and associated sub-base and base interventions as well as some limited side slope protection as a pilot sub-project. It was assumed therefore that the residual value of the works following the 10-year evaluation period, would amount to 33% of the initial cost.

512. The analysis completed assumed that adequate maintenance will be carried out in the years 2022 to 2031, after the conclusion of the Project and that the successful implementation of the institutional strengthening components of the project will be achieved.

513. On this basis and discounting at 12% a year, the HDM analysis showed an NPV of $1.3 million. These benefits were derived principally from the lower vehicle operating costs and the continued good condition of the road as a result of the project. The internal rate of return was calculated to be 31% (9.2% after the allocation of indirect costs was included).

514. A notional analysis was also undertaken for Section A, Attapeu–Xaisettha. No traffic count was available for this, so the Section B traffic count information was adopted. This understates the benefit as Section A is much more suburban in nature, being close to Attapeu and certainly carries more traffic than Section B. There is more local traffic, including many motor cycles, as well as some traffic between Attapeu and Road 9001 to Xanxai. It will also have the airport-related traffic flows in the future.

515. The cost per km for the proposed restoration of Section A is some 3.5 times that of Section B, but the nature of the works (surface, sub-base, base and some culvert work) suggest a higher residual value of say, 50%. On this basis, and discounting at 12% a year, the HDM analysis showed an NPV of $0.7 million. These benefits were derived principally from the lower vehicle operating costs and the continued good condition of the road as a result of the project. The internal rate of return was calculated to be 50% (21% after the allocation of indirect costs was included).

9.8.5 **Conclusions and Recommendations**

516. The proposed project intervention between Attapeu and the Vietnam border would protect the existing road pavement and allow the projected rapid traffic growth to continue – thereby providing substantial ongoing benefits. It was found to be economically beneficial and the activities proposed should have lasting benefit. The road is built of asphaltic concrete and up to now Laos has little experience in maintaining such roads – which will become more important in the future – and the proposed demonstration of modern maintenance techniques to be included in the proposed Project, seems to be well justified.

CHAPTER 10 FINANCIAL MANAGEMENT ASSESSMENT

10.1 Financial Management Assessments

517. Financial management assessments were carried out by the PPTA Consultant for the Ministry of Public Works and Transport (MPWT) and the Department of Roads (DOR) as well as of the Departments of Public Works and Transport (DPWT) in the Project Provinces. These assessments examined the financial management capacity of the MPWT/DPWTs using the ADB Financial Management Assessment (FMA) Questionnaire which identified areas for improvement and training needed with respect to financial accounting, reporting and auditing.

518. The Project's funds flow arrangements will be implemented by the MTPW and ADB and will not involve the Provincial Departments. Under these arrangements, any foreign exchange rate risks would be managed by the Ministry of Finance. The direct payment method will be used for infrastructure and consulting services contracts. Reimbursement and imprest fund methods for loan disbursement as described in ADB's Loan Disbursement Handbook (2015, as amended from time to time) will be used for small civil works contracts for maintenance works and to cover recurrent administrative expenditure such as office running expenses as well as capacity development activities.

519. The Government will establish a separate imprest account, to be administered by the MOF, at a bank to be agreed upon between the Government of the Lao PDR and ADB to facilitate the timely release of loan funds.

520. Staff numbers for the three DPWTs accounting sections range from two to seven members and they were all found to be suitability qualified and experienced having worked with externally financed projects in the past. They are all permanently appointed staff. MPWT/DOR Financial and Accounting staff are also well qualified and experienced in matters relating to the proposed project. While Provincial Staff are less prepared for ADB Projects per se, it is proposed that they will only be involved in minor Project accounting work which can be carried out using their usual manual and MS Excel based systems. Training will also be provided under the project.

521. The DOF's Accounting Manual 2010 (AM) and Financial Management Manual 2010 (FMM) describe a project accounting system capable of recording financial transactions and allocating expenditures by project component, disbursement category and source of funds. The accounting system is supported by the software tool ACCPAC (SAGE). DOF is using this accounting system and ACCPAC for the WB Lao Road Sector Project and other government funded projects.

522. Procedures for transaction preparation and approval are described in the Financial Management Manual (FMM). The FMM also includes fifteen Annexes containing financial management guidelines and forms. The forms are mostly in a dual Lao and English language format. Through the use of MS Excel and the existing manual systems, all Provincial DPWTs should be capable of properly recording of financial transactions; however it would be time consuming under the existing system to show disbursement categories as well as the source of funds. A standard Government Chart of Accounts is used by all DPWTs which can be adapted to project needs. Controls as prescribed by the MPWT are in place in the provincial accounting departments for the preparation and approval of transactions with the general and subsidiary ledgers being balanced on a monthly basis. Accounting policies are also detailed in the FMM and AM which are available within the DPWT and MPWT/DOR.

523. Due to the small size of some of the accounting departments in the DPWT (i.e. Xekong DPWT) staff from other departments often provide assistance with some accounting functions to ensure that there is appropriate output. Bank reconciliations which are prepared on a monthly basis are approved by the Provincial Director. Similar arrangements also apply to the functions of ordering, receiving, accounting for, and paying for goods and services. The functions of procurement and taking delivery of goods and services in the MPWT/DOR are separated from the functions of the DOF and include approvals for payment for goods and services issues from outside the DOF. Bank reconciliations are performed by the Accounting Division and Treasury Division which is excluded from any role in the processing of a payments and approvals in the MPWT/DOR.

524. The Ministry of Finance and Provincial Department of Finance controls the national budget. The Planning and Cooperation Department within MPWT and the Planning, Budgeting and Statistics Section within the DPWTs are responsible for requesting disbursements, monitoring and for following up of their budget allocations.

525. Local funds are administered by the National Treasury or the Provincial Treasury and are kept in local currency, the Lao KIP.

526. The budget identifies both physical and financial goals and they both are monitored in parallel. Actual expenditures are compared to the budget with reasonable frequency, and explanations are required for significant variations from the budget at both Ministry and Provincial levels. Approvals for variations from the budget are required in advance.

527. At the Provincial and Ministry levels, invoice-processing procedures are detailed in the FMM and provide for copies of purchase orders and receiving reports to be obtained directly from the issuing departments and for a comparison to be made of invoice quantities, prices and terms with those indicated on the purchase order and with records made of goods actually received. Comparisons are also made of invoiced quantities with those indicated on the receiving reports and a check is made of the accuracy of all calculations. Bank reconciliations are carried out on a monthly basis.

528. Financial transactions concerning the DPWTs are recorded by staff in the Planning, Budgeting and Statistics Section and financial data is reported to the Director of DPWTs in accordance with established internal reporting procedures. The DPWTs submit financial data to the Department of Planning and Cooperation for consolidation. The Department of Planning and Cooperation or the DPWTs are responsible for coordination and consolidation the accounting information and arrange for the distribution of financial reports to management.

Budget follow-ups for the DPWTs are reported on monthly basis, as a minimum requirement.

529. The Departments maintain adequate, up-to-date cashbooks, recording all receipts and payments. Controls also exist for the collection and recording of receipts at each collection location and all unusual items on bank reconciliations are reviewed and approved by a responsible official. MPWT/DOR prepares financial statements for each entity in accordance with the modified cash basis of accounting and these are prepared on both a quarterly and an annual basis. For the WB LRSP, semi-annual financial statements were also produced at the World Bank's request. The accounting system and ACCPAC (SAGE) tool is capable of preparing statements in accordance with IPSAS accounting standards. The existing reporting system can link the financial information with the project's physical progress.

530. The MPWT's Department of Inspection (DOI) has an Inspection Division tasked with internal auditing. Strengthening of the MPWT audit functions is included in the WB Laos Road Sector Project. Financial audit, including internal audit, is covered in the FMM. The DOF has also an Inspection Division with which the DOI coordinates internal audits. The DOI internal auditor reports to the Director General of DOI and the DOF internal auditor reports to the Director General of DOF. Internal audit in the DPWTs is performed by the Internal Control Division in the Department of Inspection.

531. All activities, components, and projects in the DPWTs are required to be annually audited by external auditors. The State Audit Organization (SAO) is responsible to audit all financial activities for DPWTs. If there is insufficient capacity in SAO to audit all records, the audit is procured from the private sector. In the case where Donor requirements specify external audit in their financing agreements private sector external auditors can be selected. The MPWT/DOR is audited by the State Audit Organization (SAO) annually. In addition a MOF budget performance review is required under the Budget Law.

532. Financial statements are prepared by the MPWT/DOR's Finance Division for the entity in accordance with the modified cash basis of accounting and are prepared on a quarterly and annual basis. For the WB LRSP, semi-annual financial statements were produced at the World Bank's request. The accounting system and ACCPAC (SAGE) tool is capable of preparing statements in accordance with IPSAS accounting standards.

533. The MPWT/DOR use the accounting system ACCPAC (SAGE) which is capable of preparing statements in accordance with IPSAS accounting standards. Through the use of Excel and manual systems all Provincial DPWTs use accounting systems that allows for the proper recording of financial transactions; however it would be time consuming under the existing system to show disbursement categories as well as the source of funds. A standard Government Chart of Accounts is used by the MPWT and all DPWTs which can be adapted to project needs.

10.2 Risk Analysis Summary

534. Table 10.1 provides a Risk Analysis Summary Table for the financial management of the project. The overall risk is considered low as the MPWT/DOR Financial and Accounting Staff are qualified and experienced for the proposed project. While Provincial Staff are less prepared for ADB Projects it is proposed that they will only be involved in minor Project accounting work which can be carried out on their manual and Excel based systems. Training will also be provided under the project.

Table 10-1 Risk Analysis Summary

Description	Risk Assessment	Proposed Mitigation
Risks		
1. Implementation	M	Accounting Staff has experience from recent World Bank Project, which can be used in the ADB Project. Previous experience by MPWT staff on ADB Projects as well
2. Funds disbursement arrangements. Use of Imprest Account(s) Use of Direct payment arrangements	M	Staff have some experience with disbursement arrangements and further training will be provided under the Project
3. Staffing	L	Accounting Staff at MPWT/DOR are well qualified and experienced with Bachelor and Master Degrees in Finance and Accounting. Have worked with previous projects, including ADB. Provincial Staff have relevant accounting qualifications. Some financial management training proposed under the Project
4. Accounting Policies and Procedures	L	Policies and procedures already established and detailed Accounting and Financial Management Manuals are available detailing systems and procedures to be followed
5. Internal Audit	L	Existing procedures can be used, similar to previous projects. Internal audit staff already carrying out the function in HO and the Provincial Departments
6. External Audit	L	Existing procedures can be used, similar to previous projects ToR will be prepared for audit of project accounts

7.	Reporting and Monitoring	L	Accounting system and ACCPAC (SAGE) tool is capable of preparing financial statements in accordance with International accounting standards which can be used for project reporting and monitoring
8.	Information Systems	M	Accounting system and ACCPAC (SAGE) is in use at MPWT and will be used for project purposes. Manual systems in Provinces will be sufficient for minor accounting work required
	Overall Risk	L	MPWT/DOR Financial and Accounting Staff are qualified and experienced for the proposed project. While Provincial Staff are less prepared for ADB Projects, it is proposed that they will only be involved in minor Project accounting work, which can be carried out on their manual and Excel based systems. Training will also be provided under the project
*__H__=High, __S__=Substantial, __M__=Moderate, __L__=Low			

10.3 Accounting and Audit Processes and Procedures - Implementing Agency

10.3.1 Accounting

535. The Implementation Agency's (DOR) accounting policies and procedures are as follows:

- The accounting period is based on the Government's fiscal year - 1st October to 30th September;
- Entering of transactions is based on the double entry principle;
- The currency for recording is the local currency, KIP. Certain accounts may also be kept in foreign currency;
- The accounting method used is the Modified cash basis, which means that transactions are recorded when paid during the fiscal year. Accrual accounting is used in the year end closing stage;
- As a general rule, all investments in terms of equipment, vehicles, furniture etc. are shown as expenses incurred. Each accounting unit is responsible for maintaining an up to date records of fixed assets;
- At the end of every month, all balances in the Balance Sheet; petty cash, bank, accounts receivables and accounts payables, are reconciled;

- Transactions in foreign currencies are converted to KIP according to the exchange rate prevailing on the day of payment;
- Assets and liabilities in foreign currency are periodically adjusted according to changes in the exchange rate;
- The organization that issues payments records the transaction and keeps the supporting documents.

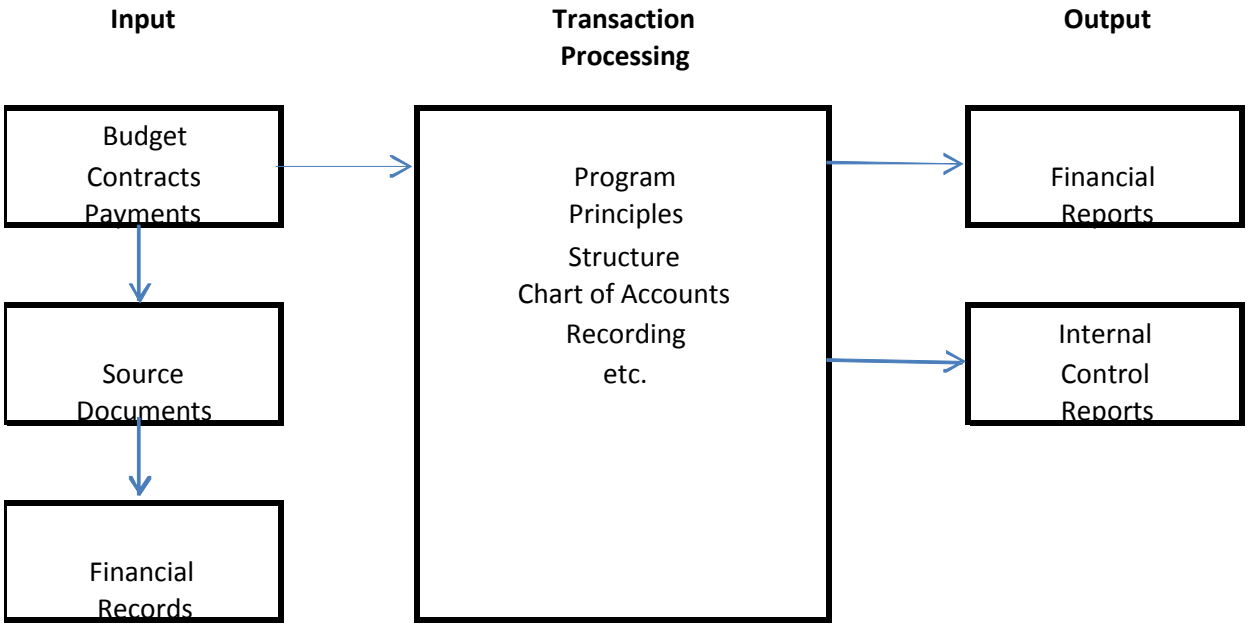


Figure 10-1 Basic Concepts MPWT Accounting System

10.3.2 Funding Flow

536. Disbursements for activities financed 100% by the Lao Government must follow Regulation No. 1706/MoF 22/10/2001. Foreign ODA funded projects must follow the Regulation for Disbursements for Projects No. 1803/MoF. Both regulations are further expanded upon in 0008/MoF dated 05/01/2010 regarding administration expenses. Any additions or modifications agreed between GOL: MPWT, the Provincial Governor's Offices and Donors needs to be detailed in a separate document and attached to the Government's approved financial guidelines.

537. Specific rules and procedures for disbursements from loan/grant accounts are further described in other documents, such as project-specific documents, financing agreements, disbursement letters and disbursement handbooks.

538. Withdrawals from loan/grant accounts are submitted to the Donor via the Department of External Finance (DEF) within the Ministry of Finance. Withdrawal applications are used for:

- Reimbursement of payments already made by MPWT/DPWT from its own resources;

- Advances to the Designated Account;
- Replenishment of Designated Accounts; and
- Direct payments to suppliers.

539. After approval by the Donor the disbursement is initiated through the loan/grant account in following ways:

- Reimbursements are transferred to the source from which the payment was made by GoL;
- Advances from the loan/grant account are deposited in the Designated Account in order to finance eligible expenditures;
- Replenishments of Designated Accounts are deposited to the Designated Account. If sub-accounts are agreed with the Donor, replenishments of sub-accounts are done upon submission of a transfer request from the sub component; and
- Direct payments to suppliers are disbursed directly to the account of the supplier.

540. Funds from Donors are transferred to Designated Accounts. A Designated Account is a bank account opened and is to be used to cover the Donor's share of eligible expenditures - in both local and foreign currencies. If agreed between the Ministry of Finance, MPWT and the Donor, management of Designated Accounts can be delegated to MPWT/DPWT in accordance with regulation 1803/MoF dated 12/09/2002.

541. The objective of the Designated Account is to overcome cash flow problems and to speed up the disbursement of Donor funds. Location of the Designated Account shall be at the Bank of Lao/Commercial Banks in Lao PDR and the currency is normally in USD.

542. Sub-accounts to the Designated Account can only be opened if agreed with the MoF and the Donor.

543. Withdrawals from the Designated Account can only be made for eligible expenditures under the financing agreement. Under no circumstances may funds be used from the Designated Account to finance local contributions of eligible expenditures.

544. The Donor's share of eligible expenditures that are pre-financed by local funds can be reimbursed from the Designated Account. Local funds must not be deposited in the Donor's Designated Account.

545. Replenishments of Designated Accounts are prepared by Department of Planning and Cooperation and sent to the Donor via the Department of External Finance in the Ministry of Finance. The Designated Accounts are replenished at least monthly.

546. The Minister of MPWT is a signatory for Designated Accounts managed by the MPWT. Signatories for Designated Accounts managed by the RMF are the Head of the Secretariat together with the Chairman of the RMFAB.

547. All bank accounts must be reconciled periodically but not less than once a month.

548. Funds from Donors are transferred to Designated Accounts. A Designated Account is a bank account opened to be used for the Donor's share of eligible expenditures in both local and foreign currencies.

549. No loan or Donor funds under the project will be deposited to the Road Maintenance Fund as a loan and Donor funds are required to be kept in separate accounts.

550. The direct payment method will be used for infrastructure and consulting services contracts. Reimbursement and imprest fund methods for loan disbursement, as described in ADB's Loan Disbursement Handbook (2015, as amended from time to time) will be used for small civil works contracts for maintenance and recurrent administrative expenditure such as office running expenses as well as capacity development activities. From experience with several ADB projects in the road sector, MPWT is familiar with the above disbursement methods. However the financial management team involved in implementing the project will benefit from further training in those methods, in particular with procedures for withdrawal application, reporting and audit specifics on the use of imprest funds.

551. The Government will establish a separate imprest account, to be administered by the MOF, at a bank to be agreed upon by the Government and ADB to facilitate the timely release of loan funds. The currency of the imprest accounts will be in US dollars. The imprest accounts will be established, managed, replenished, and liquidated in accordance with ADB's Loan Disbursement Handbook (2015, as amended from time to time) and the financial regulations of the Government. The DOR is allowed to withdraw funds from the Imprest Account. and prepares and submits claims through MPWT to MOF

552. The maximum ceiling of the imprest account will not at any time exceed the estimated ADB financed expenditures to be paid from the imprest account for the next 6 months or 10% of the respective loan amount, whichever will be lower. The request for initial advance to the imprest account will be accompanied by an Estimate of Expenditure Sheet setting out the estimated expenditures for the first six (6) months of project implementation and submission of evidence satisfactory to ADB that the imprest account has been duly opened. For every liquidation and replenishment request of the imprest account, the borrower will furnish to ADB (a) Statement of Account (Bank Statement) where the imprest account is maintained, and (b) the Imprest Account Reconciliation Statement (IARS) reconciling the above mentioned bank statement against the EA's records.

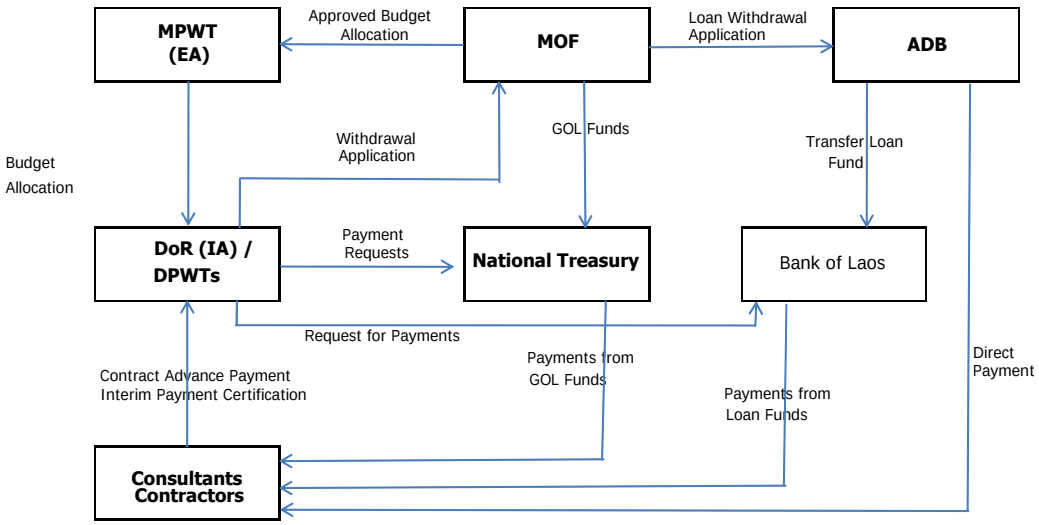


Figure 10-2 Funding Flow Arrangements

554. ADB's statement of expenditure (SOE) procedure will be used to reimburse eligible expenditures and to liquidate advances provided to the imprest account. The individual payments that may be reimbursed or liquidated under the SOE procedure will not exceed US$100,000 equivalent per payment. SOE records will be maintained and made readily available for review by ADB's disbursement and review mission or upon ADB's request for submission of supporting documents on a sampling basis - and for independent audit.

555. Before the submission of the first withdrawal application, the Government will submit to ADB sufficient evidence of the authority of the person(s) who will sign the withdrawal applications on behalf of the borrower, together with the authenticated specimen signatures of each such authorized person. The minimum value per withdrawal application will be US$100,000, unless otherwise approved by ADB. The Government will consolidate claims to meet this limit for reimbursement and imprest account claims. Withdrawal applications and supporting documents will demonstrate among other things, that the goods and/or services were produced in or from ADB members and are eligible for ADB financing. The currency of the imprest account will be the US Dollar.

10.4 Auditing

10.4.1 Internal

556. Internal audit is used to monitor and follow up on internal control matters, the management use internal auditing as a complement. Internal audit within MPWT and DPWT is performed by the internal control division in the Department of Inspection. The Internal Control Division, Department of Inspection, has the following duties and scope of responsibilities:

- Monitoring as advisor for the internal control unit within Departments in MPWT and DPWTs of all 17 provinces in order to ensure the operation administration follows relevant job description, internal manuals, guidelines, rules and regulations;
- Monitoring and inspection and coordination with the internal control unit in each of the Departments under MPWT to provide advice for internal audit planning, risk assessment, planning auditing schedules and to ensure that the implementation of the plans is conducted efficiently;
- Coordination and supporting information to assist external parties or external auditor who is working with MPWT; and
- Reporting the progress of works and providing an audit report to the MPWT on a monthly, quarterly and yearly basis.

557. The general financial internal audit includes the following areas:

- Assessment of adequacy of accounting and internal control systems;
- Ensuring safe custody of assets;
- Ensuring that rules, regulations and guidelines are adhered to;
- Ensuring that expenditures are in the nature of the operations and supported with proper documentation;
- Ensuring that expenditures and payments are approved correctly and if applicable, certified;

- Ensuring that all revenues are collected and deposited in the national treasury;
- Ensuring that no funds are diverted;
- Ensuring that supporting documents are filed and kept properly and logically; and
- Ensuring that all financial transactions are entered into the accounting system.

558. Regular internal financial audit of contracts is important since it involves a considerable amount of funding and is strictly regulated through procurement rules.

10.4.2 External

559. The procurement of the external auditors for the financial and technical audits is the responsibility of the Internal Control Division (ICD) under Department of Inspection (DoI) in the MPWT, with the cooperation of relevant department/implementation agencies. The final approval will be given by Minister of the MPWT to appointing the tendering committee.

560. All activities, components, and projects are audited by external auditors. The **State Audit Organization (SAO)** is responsible to audit all financial activities for MPWT/DPWT. If there is insufficient capacity in SAO to audit all GoL bodies, the audit is procured from the private sector.

561. In the case where the Donor requirements specify external audits in their financing agreements, private sector external auditors are selected.

562. Appointed auditors for foreign ODA-funded projects must be accepted by the Donor in accordance with agreed procedures.

563. A list of external audit firms is posted/announced by the Lao International Certified Public Accountants and Auditors.

564. Audit of foreign ODA funded projects is carried out in accordance with International Standards on Auditing (ISA).

565. The Auditor carries out the audit in accordance with ISA and the government's Financial Guidelines. The audit covers the entire project, not only the foreign ODA funded portion. Annual external audits include but are not limited to:

- An assessment of the adequacy of the accounting and internal control systems to monitor expenditures and other financial transactions and to ensure safe custody of project financed assets;
- A determination as to whether the recipient and project implementing entities have maintained adequate documentation of all relevant transactions;
- Verification that the expenditures submitted and/or reported to the Donor are eligible for the Donor's financing, and identification of any ineligible expenditures;
- Verification that the annual financial statements can be reconciled with relevant year to date amounts appearing in reports submitted to the Donor;
- The auditor shall furnish a written opinion and report indicating the extent to which the financial statements and supporting information provide a true and fair view of the financial condition and performance;

- The auditor shall also provide a separate management letter following the completion on any improvements required in the financial systems and controls and improved use of resources; and
- The audit reports and annual accounts are sent to the Borrower who in turn sends them to the Donor.

566. Audit guidelines are available from the Donor and must be followed and included in terms of reference for audits that are prepared.

567. Audit reports are submitted to the Donor according to agreed procedures between the recipient and the Donor.

568. Draft Terms of Reference have been prepared for the appointment of an external auditor for the Lao Road Sector Governance and Maintenance Project and are detailed in **Annex AB - Draft ToR for External Auditor.**

10.5 Financial and Management Training

10.5.1 Provincial Departments of Public Works and Transport

569. The Financial Management Assessments (FMA) shows that the Provincial DPWT's finance staff has no experience in implementing ADB-funded projects. The finance staff has experience only with the Government's accounting policies and procedures and are not familiar with ADB's Loan Disbursement Handbook. Their experience and past training have been limited to public financial management.

570. Establishing and organizing the EA/IA with competent staff, preferably by staff knowledgeable in implementing ADB or other Donor-funded projects will need to be a priority of the Project. The finance staff of the DPWTs are however, well qualified and eager to learn. Training them in appropriate financial management and reporting as well as ongoing accounting, budgeting and financial reporting procedures will assist the project to be implemented successfully.

571. The Provincial DPWTs have no computerized financial management and reporting system.

572. However, staff is aware of computerized accounting software but have no experience working with such systems. Financial reports are usually prepared using spreadsheets.

10.5.2 Ministry Public Works and Transport/Department of Roads

573. The results of the FMA indicate that MPWT/DOR has the financial reporting and management systems necessary to implement the Project. It has previous experience using an imprest fund and is familiar with the SOE procedures of the ADB. MPWT as in the case of previous ADB-funded projects will assign financial staff to the EA/IA.

574. All project transactions will be verified by the Finance Officer and approved by the Project Director. MPWT has an existing chart of account which is adequate to generate the financial reports of the Project. It has policies and procedures manual for projects which

comprises the standard operation procedures (SOP) - including a Procurement Manual, a Financial Management Manual and a Project Administration Manual.

575. Preliminary recommendations for improving the financial management system of MPWT/DOR for the project include:

(i) technical support in project financial management and administration, and

(ii) a computerized project accounting system. Staff training on financial management and project accounting needs also to be conducted.

Table 10-2 Financial Management Training

Description	Participants	Number
Financial Procedures – Training on financial management practices and procedures in accordance with Government and ADB requirements	EA, IA, DPWTs	10
Imprest Account and Funds Disbursement – Training on ADB procedures on preparation of requests for funds from ADB and administration of a Project Imprest Account	EA, IA, DPWTs	10
Project Financial Controls & Accounting – Development of financial controls for Project financial management, preparation of Project financial reports	EA, IA, DPWTs	10
Financial Accounting and Management – Preparation of budgets and final accounts	EA, IA, DPWTs	10

576. Comprehensive and detailed FMAs are included in the **Annex AC - Full Financial Management Assessment Report**.

CHAPTER 11 FINANCIAL ANALYSIS

11.1 Introduction

577. The Executing Agency for the Project will be the MPWT and the project Implementing Agency will be the Department of Roads (DOR) of the MPWT. The DOR will have overall coordination responsibility and will work closely with provincial Departments of Public Works and Transport (DPWTs) in Saravan, Xekong and Attapeu, which are the Implementing Units (IU) for Project. The three provincial DPWTs will be responsible for the direct supervision and execution of the rehabilitation and maintenance works in the Project.

11.2 Ministry of Public Works and Transport/Department of Roads

578. The MPWT is the Government ministry with the overall responsibility for public works and transport in Lao PDR. Funding for MPWT/DOR is allocated from the National Budget.

579. However, Government funding covers only about 24% of the total budget of the MPWT with over three-quarters coming from foreign sources by means of loans and grants. Over 70% of the Government funding is actually provided by road users through the Road Maintenance Fund (RMF), which is intended for road maintenance (and road safety improvement) purposes only, but in recent years it has been used also to fund road rehabilitation and construction projects.

580. Domestic funds provided from taxation through the budget system amount to just Kip 152.7 billion, only about 7% of MPWT's total budget. One result of the present situation is that there has been a lack of funds for road maintenance leading to fewer interventions which will result in much higher rehabilitation and reconstruction costs in the future. The RMF now meets less than 20% of the road maintenance needs

581. Under present circumstances it is difficult for the MPWT to continue to provide funds for small investment projects and also provide sufficient counterpart funds for the larger investments that are financed with foreign borrowing. These counterpart funding obligations form a significant proportion (about Kip 60 billion out of Kip 152.7 billion, or 40%) of the MPWT budget at the moment. Such expenditure cannot be avoided so long as the foreign-financed projects continue.

11.3 Provincial Departments of Public Works and Transport (DPWT)

582. The provincial Departments that are participating in the project are as follows:

- Salavan Provincial Department of Public Works and Transport
- Xekong Provincial Department of Public Works and Transport
- Attapeu Provincial Department of Public Works and Transport

583. Details of the individual Departments' Budgets and Expenses for 2010-2014 are included in **Annex AD - Provincial Budget Details [2010-2104]** of this Report. A summary of the information for 2012-2014 is shown in following Table 11.1.

Table 11-1 Summary of Budgets for Provinces 2012-2014 (million Kip)

Province	New Investment 2012-13			New Investment 2013-14		
	National Funding	International Funding	TOTAL	National Funding	International Funding	TOTAL
Salavan	18,165	0	18,165	31,110	0	31,110
Xekong	11,105	428	11,533	40,563	1,448	42,011
Attapeu	4,320	33,408	37,728	8,693	11,333	20,026
TOTAL	**33,590**	**33,836**	**67,426**	**80,366**	**12,781**	**93,147**

584. Above table shows that total allocation from the National Budget for the three provinces was 80.36 Billion Kip FY 2013-14, compared to 33.6 Billion Kip for the previous FY. For the same periods the total for all provinces increased from 67.4 Billion Kip to 93.1 Billion Kip.

585. In addition to these Budget allocations there are costs for ongoing projects which are funded from the Government budget as well as by International donors.

11.4 Road Maintenance Issues and Constraints

586. The devolution of road maintenance responsibilities to the Provinces has continued to be constrained by unclear institutional arrangements and weak coordination between the central and the local authorities. In addition to the inefficient decentralization of road maintenance responsibilities in the past, the key challenges faced by the MPWT and the provincial DPWTs for undertaking road maintenance activities are the in-adequate use of proper maintenance procedures for road maintenance planning, financial management, procurement and contract supervision that have already been developed[34].

587. Other constraints are the lack of the staff's technical capacity and experience in road maintenance management and the presence of various financial constraints for undertaking road maintenance responsibilities. Weak institutional capacity, poor governance and inadequate financial resources contribute to the MPWT and DPWT's inability to carry out necessary road maintenance works, resulting in poor road conditions.

11.5 Institutional Setup

588. The road sector is under the overall jurisdiction of the MPWT. Following the decentralization policy initiated in 2000, the MPWT has delegated road maintenance responsibilities to the DPWT in each province. The MPWT is now in the course of re-organization, particularly that for the road maintenance. There are new departments set up, such as the Department of Finance, ICT Division under the Cabinet Office as well as the four new Regional Maintenance Offices established under the DOR.

[34] During RMP1/ RMP2 WB and SIDA were supporting in this area and further assistance has been given by JICA and KfW subsequently.

589. The specific roles and responsibilities of the Regional Maintenance Offices have not yet been published in any decrees and discussions about the specific roles of the Regional Maintenance Offices are still on-going. However, responsibility for national roads maintenance, including planning, budgeting and implementation, comes under the Regional Maintenance Offices.

11.6 Relevant Other Projects

11.6.1 World Bank Initiatives

590. In 2000 the MPWT, with assistance from the World Bank and Swedish International Development Cooperation Agency (Sida), embarked on a long-term program to improve road maintenance in the country - primarily by strengthening road maintenance capacity and capability at the provincial DPWT level. One of the key outputs of the program was the establishment of a road maintenance fund (RMF) and the development of appropriate road maintenance management systems, i.e. the RMS and PRoMMS systems, which prioritize maintenance needs on the national and local road networks respectively and helps with the allocation of funds.

591. To support the Government in addressing the continued lack of institutional capacity and financial resource for undertaking proper road maintenance works at the provincial level, the Japan International Cooperation Agency (JICA) currently finances a project entitled Improvement of Road Management Capability Project (2011-2016). This is intended to improve governance, planning and management for road maintenance in Vientiane and Savannakhet provinces to ensure a sustainable approach to road asset management.

592. Strengthening governance and institutional capacity for road maintenance activities and supporting physical maintenance work at the provincial level will facilitate efficient decentralization and the effectiveness of road maintenance interventions and thereby help to achieve a sustainable road asset management process in the country.

11.7 Road Maintenance Fund

11.7.1 Revenue and Expenditure

593. The revenue gathered by the RMF, together with its expenditure, has rapidly increased since the RMF was introduced in 2001/02. In dollar terms, the revenue has been increasing at an annual growth rate of 21% over the last 5 years.

Table 11-2 RMF Revenues and Expenditures 2008 – 2013

Revenue/Expenditure	2008-09	2009-10	2010-11	2011-12	2012-13	Average between 2008-09 and 2012-13
Revenue ('000 USD)	25,920	30,775	36,689	44,836	48,324	
Annual Growth in Revenue	36%	19%	19%	22%	8%	21%
Expenditure ('000 USD)	25,720	30,291	38,690	38,231	54,293	
Annual Growth in Expenditure	32%	18%	28%	-1%	42%	24%

Source: ADB Consultant

594. Initially, when the RMF was introduced in 2001-02, the revenue of the Fund much relied on the amount of loans/grants obtained from donors. The contribution from donors to the Fund has gradually reduced and became zero in 2010-11. Currently, the revenue of the Fund heavily relies on the fuel levy, which accounts for 97% of the total revenue in 2012-13.

595. The rate of fuel levy has been gradually increased, initially imposed at 40 Kip per litre, from 300 Kip per litre in 2009 to 420 Kip per litre as of now. The following table summarizes the rate of fuel levy and the estimated fuel consumption in Laos and shows that an increase in both rate of fuel levy and fuel consumption contributes to increase the revenue of the RMF in future.

Table 11-3 Fuel Levy and Estimated Consumption 2008 - 2013

	2008-09	2009-10	2010-11	2011-12	2012-13
Rate of Fuel Levy (Kip/litre)	300	300	350	420	420
Estimated Fuel Consumption (million litre)	581	702	754	800	855
Growth Rate in Fuel Consumption (%)	14%	21%	7%	6%	7%

Source: ADB Consultant

596. Toll collection on roads and bridges in previous years was also a major contributor to the revenue of the Fund. Until 2009-10, the share of toll collection in the total revenue was around 15%. However, following the Prime Minister's notice on the removal of obstacles to facilitate international trade, the MPWT decided in 2011 to terminate toll collection [at the time containing 27 toll collection operations] and demolished most of the toll collection booths across the country. FY 2012-13 the revenue from toll collection accounted for only 2% of the total revenue.

11.7.2 Road Maintenance Funding

597. Currently the Road Maintenance Fund RMF (RMF) is able to provide about USD 57 million (about LAK 440 billion) per year for road maintenance purposes. Current policy is that 90% of the RMF funds will go to the maintenance of National roads and the remaining 10% to the maintenance of local roads. This corresponds to USD 51.3 million (about LAK 395 billion) per year for the National roads or about USD 7,100 (LAK 55 million) per km per year. The local - Provincial, District and Rural - roads (30,791 km) should receive USD 5.7 million (about LAK 45 billion) per year which translates into USD 185 (LAK 1.4 million) per km per year.

598. Unfortunately, it appears that during recent years, this 10% allocation of the RMF has not been used for the maintenance of local roads.

599. Table 11.4 contains estimates of the amounts of income and expenditure based on present trends to the year 2025/2026 - five years after the planned completion of the Project.

Table 11-4 Estimated RMF Income and Expenditure 2016 - 2026 ('000 US$)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
Projected Income	91,850	111,139	134,478	162,718	196,889	238,236	288,266	348,801	422,050	510,680
Projected Expenditure	85,095	103,816	126,655	154,520	188,514	229,987	280,584	342,313	424,468	517,850

600. Although the provision of maintenance funds via the RMF has increased annually and will continue to improve, it seems unlikely at present that the gap between funding requirements and available funds will be bridged in the near future. Currently the National Assembly is keeping a ceiling cap of LAK 370 Billion Kip (about USD 46 million) on the amount of RMF funds that can be used for road maintenance and rehabilitation annually thereby imposing a further constraint on available maintenance funds. Additionally, lack of regular maintenance will increase long-term repair costs as well as operating costs for road users.

11.8 Project's Financing Requirements and Sustainability

601. To ensure sustainability of the Project, the EA/IA will need to have the capacity to cover recurrent costs. As these entities do not have their own revenue raising capacity they will need to continue to rely on the approval of annual government budget allocations as well as on increased funding from the RMF.

602. The Ministry of Finance (MOF) has advised that the MPWT needs to secure budget allocations for the Government's contribution to the Project. The GOL financing requirements for the five-year term of the project is US$ 460,000 as detailed in Table 11.5. This includes 'in-kind' costs for Project Management Consultants. The MPWT prepared and submitted to the MOF and Ministry of Planning and Investment (MPI) by middle of 2015 a budget allocation to be considered by the National Assembly in June 2015 for approval.

603. Annual loan instalments will commence after the eight year grace period and will be the responsibility of the MOF.

Table 11-5 Project Financing Costs - EA/ IA

US$ 000'

Description	Year 1	Tear 2	Year 3	Year 4	Year 5	Total
In-kind & Administration Costs	92	92	92	92	92	460

604. To ensure continued financial sustainability of the Project, recurrent costs will require continued funding. As Project owners, the DOR and the three provincial DPWTs will be required to fund these costs from future budget allocations. It is estimated that these recurrent costs for the next five years will total approximately US$100.000 per year to be used to cover additional staff and administration costs in the provinces as well as the DOR.

605. The Ministry of Planning and Investment (MPI) has advised all central ministries and provincial departments to prepare annual budgets with 10% increases included for each year which should assist with this additional funding requirement.

606. The Government is also demonstrating a continued commitment to the principle of fully funding maintenance priorities and providing budgetary support to the RMF to meet all maintenance needs. It has also demonstrated a commitment for increases to be made to the fuel levy to levels that will enable the attainment of a fully sustainable cost recovery mechanism for road maintenance.

607. Further, the Government is implementing an effective method of the collection and utilization of traffic count, road condition and other road data to be used for prioritizing investments.

608. Institutional capacity enhancements across the multiple agencies involved in the sector, are being implemented and the growth and efficient operation of the Fund encourages Donors' participation in an identified sector-wide approach. This approach for the medium-term, has showed better coordination and has lead towards a more effective and sustainable approach to planning and financing.

11.9 Reorganization for Road Maintenance Activities

609. The MPWT as a whole is undergoing reorganization and restructuring in line with the Government's decentralization policy (Sam Sang Policy). There remains unclear or fragmented duties/responsibilities and lack of transparencies among the concerned departments where decision needs to be made in the road maintenance sector. This is an issue, which the forthcoming project is assisting with to achieve the targets of sustainable road asset management at both central and local levels.

610. Since the road maintenance fund is seriously underfunded, the funds should be allocated to priority roads using priority maintenance methods. The routine and periodic maintenance on the most heavily used national roads should be given the highest priority from a sustainable road asset management viewpoint. However, in Laos such work has often been neglected and instead a considerable amount of funding has gone to rehabilitation works.

611. Since the Road Maintenance Fund was established in 2001, it has generated considerable amount of funds for road maintenance and contributes to maintaining both the national and local road networks. However, the analysis of the RMS (Road Maintenance System) indicates that there is a need to use the available funds, so that the funds are better matching the actual maintenance needs.

612. Accordingly, the PPTA suggests the strengthening the financial capacity of the MPWT in order to instill a more sustainable approach to road asset management. This could be achieved by equipping the MPWT with a long-term financial plan in road asset management as well as with a more suitable RMF revenue generation mechanism. This can be accomplished by the review and revision of the current RMF law and the enforcement of related decrees/regulations.

11.10 Recommendations

11.10.1 Road Maintenance Fund

613. A recent study of the Road Maintenance Fund under the World Bank Funded Lao Road Sector Project made a number of recommendations for improving road maintenance funding. These recommendations are fully supported by this project and are detailed in an **Annex AE - LRS Recommendations for Improved Road Maintenance Funding.**

614. The implementation of these recommendations will assist in making the benefits from this Project becoming more sustainable.

11.10.2 Financial Covenants

615. It is recommended that the following covenants will be included in the Loan Agreement:

- The rate of the fuel levy applying to the RMF to be reviewed at least annually;
- The Borrower to maintain separate accounts for the Project;
- Annual accounts and financial statements to be audited annually in accordance with international auditing standards and carried out by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB;
- The EA/IA to furnish the ADB, as soon as it becomes available [but in any event not later than 6 months after the end of each related fiscal year] with certified copies of such audited accounts and financial statements and of the report of the auditors relating thereto. This should also include the auditors' opinions on the use of the Loan proceeds and on compliance with the financial covenants of this Loan Agreement as well as on the use of the procedures for the required imprest account. All documents need to be prepared in the English language;
- The EA/IA to furnish the ADB with such other information concerning accounts and financial statements and the audits thereof as the ADB may from time to time, reasonably require.

CHAPTER 12 PROCUREMENT

12.1 Introduction

It is an ADB requirement to conduct a Procurement Risk Assessment at the project preparatory stage in order to identify risks and possible means to mitigate them ahead of the project implementation stages. The ADB's "Guide on Assessing Procurement Risk and Determining Project Procurement Classification" states that the intent of procurement risk assessment is to:

(i) Identify risks in country sector, agency or project systems and/or practices that could result in sub-optimal use of ADB resources;

(ii) define the severity of the risks; and

(iii) Develop a practical risk management plan with which to address those risks that could adversely impact project implementation and/or achievement of project outcomes.

12.2 Procurement Risk Assessment

616. Procurement Risk Assessment is a tool used by the ADB in assessing the country/sector/agency representatives' readiness and capability to undertake the procurement process. A country procurement risk assessment for Lao PDR was already conducted by the World Bank in 2006. Hence, the procurement risk assessment for this PPTA only focused on project-related issues.

617. The project procurement risk assessment aims to determine the overall procurement capability at the level of the Executing Agency (EA) and the Implementing Agency (IA) and assess their capacity in completing the procurement process for this particular project. If found to be deficient, the assessment will also help establish appropriate review and supervision processes (including thresholds) for application during the project implementation.[35]

618. The current assessment was conducted through the use of the pro-forma ADB questionnaire which focused upon:

(i) Present organizational and staff capacity;

(ii) Information management processes adopted;

(iii) Procurement practices in place; and

(iv) Effectiveness and accountability measures used.

[35] Guide on Assessing Procurement Risks and Determining Project Procurement Classification-ADB, August 2014

619. The subjects of the assessments were the Department of Roads of the Ministry of Public Works and Transport (MPWT) being the Implementing Agency (IA) of the project and the different Departments of Public Works and Transport in the three provinces, Salavan, Xekong and Attapeu being the Implementing Units (IUs) of the project.

12.3 Project Procurement Classification

620. In addition to the Procurement Risk Assessment, a Project Classification was also determined by assessing the DOR-MPWT using the Template for Project Classification. The assessment showed that the project procurement classification is under category "B". The Project Procurement Classification is also stated in **Annex AF - Procurement Plan**.

12.4 Initial Findings

12.4.1 Overview

621. The Lao PDR rating is 'High' in the preliminary risk ratings used by the ADB countries benefitting from agency intervention[36]. The high rating pertains to overall country assessment and this is due to persistent issues/weaknesses in the procurement framework[37], which often directly impede project implementation. On the other hand, the risk categorization as shown in the Concept Paper for this project is categorized as "low risk" because (i) the loan amount is below $200 million; (ii) ADB has considerable transport experience in Lao PDR; (iii) the EA, MPWT has adequate capacity in terms of externally financed project administration and (iv) safeguard categorizations are other than A[39]. With the contradictions in the risk ratings, this subject assessment has been conducted to act as project 'readiness filter'.

622. The answers given in the questionnaires and comments received in interviews with the MPWT-DoR, and DPWT procurement staff indicated similar results, i.e. that there is a common demand for regular training programs aimed at procurement - specifically on procurement for multilateral donor funded projects (e.g. ADB, WB, JICA, etc.). The perception is that training is needed to improve the procurement process at both the central, regional and provincial levels of Government.

12.4.2 Strengths

623. The Lao PDR has an existing Procurement Decree, a Decree by the Prime Minister on Government Procurement of Goods, Construction, Maintenance and Services, No. 03/PM dated January 2004. This Decree includes an Implementing Rules and Regulations section dated March 2004 – subsequently amended in May 2009. A Procurement Manual was also drafted in 2009 to reflect the amendments made to the IRR. The Decree, the IRR and the Procurement Manual cover all the steps, policy and principles of procurement. It is also drafted in line with the guidelines published by the Multilateral Donors on procurement

[36] Preliminary Risk Ratings for ADB Countries with Operation

[37] Risk Assessment and Risk Management Plan (Summary) - Country Partnership Strategy: Lao PDR, 2012-2016

[39] Risk Categorization – Concept Paper: Lao PDR Road Maintenance Project, Project Number 47085, October 2013. This was confirmed during the PPTA

methods.

624. Competitive Bidding remains to be the procurement method employed in most of the government projects, although other methods of procurement can be used as stipulated in the Procurement Decree.

625. Standard harmonized bidding documents have been drafted and are about to be approved for use in local competitive bidding in Laos. The document includes a standard request for quotation (a method commonly used for 'shopping'), which is also undergoing revision following the harmonization of the procurement procedures and documentation by the donor agencies.

12.4.3 Weaknesses

626. The assessment of the project procurement risk within the MPWT-DOR and the three DPWTs shows that there are still gaps and deficiencies in several areas. See **Annex AG - Procurement Risk Assessments (PRA)**.

Organizational and Staff Capacity

627. The organizational and staff capacity is weak as there is no established procurement unit within the MPWT-DOR/DPWTs. A Procurement Committee (PC) is established on a need/project basis through a decree by the Minister. The same goes for the PC's secretariat which is formed as an ad-hoc committee. Selection of procurement committee members are not based on their qualifications/ experience on procurement but more on their position and involvement in the project.

628. As a result of non-permanency of procurement staff, there is lack of continuity in the performance of the procurement tasks. This also prevents staff from becoming fully proficient in procurement activities - a lack of regular training sessions and peer reviews further detracts from the staff capabilities and prevents them from acquiring the necessary procurement skills.

629. English language proficiency is another weakness noted amongst the procurement staff. The need for bi-lingual proficiency seems not to be high on the priority list of the staff interviewed, as government procurement is mainly conducted in the Lao language and on foreign-funded projects they are normally supported by international consultants.

Information Management

630. Another area of weakness is the information management system. The MPWT-DOR/ DPWTs have no de-centralized procurement information management system. Procurement documentation referencing systems are invariably set up on a project-by-project basis, as are record keeping, progress tracking and monitoring efforts.

Procurement Practices

631. The DPWT's procurement committee and staff have experience mostly in procuring works (e.g. for road rehabilitation, road construction and maintenance works), but none on procuring goods and services. The DPWT's have no processes in place for the collection and

clearance of cargo and no established procedures in receiving goods. Moreover the DPWTs do not have any experience or have not had any involvement, in the hiring/recruitment of consultants and professional services. Recruitment/hiring of consultants and services are normally done at the central level under the MPWT.

Effectiveness

632. Contractual performance is being monitored on a project basis and by the department concerned - but often, no comprehensive records or reports are generated. The Finance Office/Road Maintenance Fund/Budget Offices monitor contractual payment obligations and keep financial records.

Accountability Measures

633. The Procurement Decree, its IRR and the Procurement Manual have clauses on accountability measures on procurement for committee members to follow. It identifies sanctions to be brought on each breach of the provisions of the Procurement Decree. Most of the sanctions involve court proceedings and disciplinary measures provided under the civil service law and are usually based on the severity of the action done. However, the procurement staff do not have any experience in handling complaints and hence, a defined mechanism should be put in place.

12.4.4 E-Procurement

634. The EA was also assessed in terms of its readiness to conduct e-procurement. According to the DOR-MPWT any improvement on public procurement should be initiated by the Prime Minister's Office (PrMO); thus an interview/assessment was also conducted in the PrMO. During the discussion with the PrMO General Director, it was mentioned that the government is not yet ready to establish e-procurement as this entails funding, which at the moment they don't have. Although the PrMO has set-up a website allotted for Procurement Notices i.e. Invitation for Bids and Contract Awards, this is not being maintained and updated due to lack of funds and staff to handle the website operation. Presently the MPWT also has a website and a link for procurement notices, in particular Invitation for Bids. No other procurement related linkages has been developed to-date, i.e. Contract Awards Notice and Contractors/Suppliers Registration Lists are not on-line. Therefore, today the GOL in general and MPWT in particular are not capable of handling e-procurement.

12.4.5 Contractors' Capacity

635. The Contractors' capacity in the country was also looked into to determine if there are enough contractors that can be invited to join the bidding process so that sufficient competition in bidding can be achieved. MPWT maintains a registry of Contractors with classification based on contractor's contracting capacity e.g. Class I for contract values of more than USD 600,000, class II for contract values less than USD 600,000 but not less than USD 300,000 and class III for contract values less than USD 300,000. There are ample numbers of contractors within the region and provinces on the identified project areas. Although these contractors may not have experience bidding under ADB funded projects, this can be remedied by conducting Contractor's training/orientation on ADB Procurement procedures and requirements. In this way a fair and open competition on project's bidding will be assured.

12.4.6 Procurement Risk Assessment and Management Plan (P-RAMP)

636. After the assessment based on the completed questionnaires and round table discussions held, a 'Procurement Risk Assessment and Management Plan' (P-RAMP) was prepared. The P-RAMP for the Lao Road Sector and Governance and Maintenance Project is shown below.

Table 12-1 Project Procurement Risk Assessment and Management Plan, P-RAMP

Reference Number in the Questionnaire	Risk	Impact	Mitigation Measure and Risk Management Plan
A6, A7, A9, A16, A17, A23, C1, C2, C22, C23	Procurement department has insufficient qualified staff to efficiently undertake the procurements required to implement project	Medium	The EA/IA has extensive experience implementing previous ADB projects. Competent and experienced consultants will be engaged to support the EA/IA for project implementation. Ensure that qualified staff is assigned to the IA.; Trainings on procurement rules of various multilateral donor vis a vis National Procurement Law; English proficiency requirement on staff involved in procurement.
A19-A20	The Agency uses practices inconsistent with national procurement law or bidding documents unsuitable for ADB-funded procurement	Medium	Direct oversight and reviews of procurement activities by the consultants to ensure that the project uses Standard Bidding Documents and follow ADB procurement Guidelines.
B2-B3	Record-keeping is inadequate to enable external audit of procurement processes	Medium	The consultants will assist the IA in establishing a project document control system. Basic facilities for the IA should at least include a secured office and equipment to ensure adequate and efficient record-keeping. Provide IT support on procurement documentation.
A25, C4-C12, C24-C44, C47, D5, E7	Agency does not promote non-discriminatory participation, transparent tender processes (including advertisement, tender documentation, tender evaluation, complaints mechanism)	Medium	Standard ADB bidding documents and procedures will be used. The EA/IA will be required to take necessary measures, including maintaining a project website, to disclose contract awards and the use of loan proceeds..

Reference Number in the Questionnaire	Risk	Impact	Mitigation Measure and Risk Management Plan
C15, E1-E6	The Agency has inadequate ethics and anticorruption measures in place	Medium	Relevant provisions of ADB Anticorruption Policy (1998, as amended to date) will be incorporated into the loan and bidding documents, for example as shown below. Submission of **Declaration on Ethical Conduct and Fraud and Corruption by the** procurement committee members when appointed as members; Inclusion of **Statement on Ethical Conduct and Fraud and Corruption of Bidders** in the Bidding Documents; Establishment of complaint mechanism, with specific procedures and subsequent actions.

12.5 Project Specific Procurement and Consulting Thresholds and Methods

637. Except as the Asian Development Bank (ADB) may otherwise agree, the following procurement thresholds shall apply to procurement of goods and works.

Table 12-2 Procurement Thresholds of Goods and Works

Procurement of Goods and Works		
Method	**Threshold**	**Comments**
International Competitive Bidding for Works	US$ 3,000,000	Prior review by ADB
National Competitive Bidding for Works	Beneath that stated for ICB, Works	The first NCB is subject to prior review by ADB; thereafter post review
International Competitive Bidding for Goods	US$ 1,000,000	Prior review by ADB
National Competitive Bidding for Goods	Beneath that stated for ICB, Goods	First round of NCB is subject to prior review by ADB; thereafter post review
Shopping for Goods	Below $100,000	Post review by ADB

638. Except as the Asian Development Bank (ADB) may otherwise agree, the following Consulting Methods shall apply.

Table 12-3 Consulting Methods

Consulting Services	
Method	**Comments**
Quality and Cost Based Selection (QCBS)	Prior Review
Least-Cost Selection (LCS)	Prior Review

12.6 Procurement Plan

639. The following table provides an indicative list of procurement of works, consulting services and goods over the 5 years life span of the project. The detailed Procurement Plan is in **Annex AF - Procurement Plan**.

Table 12-4 Indicative List of Procurements

General Description	Estimated Values* ($Million)	Estimated No. of Contracts	Procurement Method	Advertisement Date (Quart/Year)	Responsible Agencies	Financed by
NR 20 PBC Rehabilitation and Maintenance Works	2.161	1	NCB	2nd Quarter 2017	EA/IA	ADB
LR 6901 PBC Rehabilitation and Maintenance Works	2.063	1	NCB	2nd Quarter 2017	EA/IA	ADB
NR16 PBC Rehabilitation and Maintenance Works	1.002	1	NCB	2nd Quarter 2017	EA/IA	ADB
LR 7615 PBC Rehabilitation and Maintenance Works	1.894	1	NCB	2nd Quarter 2017	EA/IA	ADB
NR 18B PBC Rehabilitation and Maintenance Works	3.225	1	ICB	2nd Quarter 2017	EA/IA	ADB
LR 9001 PBC Rehabilitation and Maintenance Works	5.974	1	ICB	2nd Quarter 2017	EA/IA	ADB
Total	**16.319**					
Project Management Consultant	6.156	1	QCBS	4th Quarter 2015	EA/IA	ADB
Independent Financial Auditor	0.150	1	LCS	3rd Quarter 2016	EA/IA	ADB
Total	**6.306**					
Maintenance Tools	0.100	1	Shopping	1st Quarter 2017	EA/IA	ADB
Road Asset Management System	0.450	1	ICB	4th Quarter 2018	EA/IA	ADB
Total	**0.550**					

640. The procurement schedule for all contract packages (bar chart) together with the Project Implementation Schedule are shown in the **Annex AH – Procurement- and Project Implementation Schedules [Bar Charts]**. In addition following Annexes related to procurement are included in this FR:

- **Annex AI - Standard RFP, Selection of Consultants & Evaluation Criteria;**
- **Annex AJ - Standard Bidding Documents [SBD] for Procurement of Goods.**

641. Separate ADB hired consultants have prepared the '*Master Bidding Documents (MBD) for Maintenance Works*' as well as the '*ToR for the Project Management Consultant*'.

12.7 Conclusion and Recommended Actions

642. The above findings reiterate those of previous procurement capacity and risk assessments carried out by various institutions, e.g. the World Bank and ADB. The procurement capacity of the Government's line agencies - such as the MPWT and MOF through the PrMO - need to implement the recommendations stated in this and the other reports and to monitor if those recommendations are indeed followed.

643. MPWT/ DOR as EA/ IA has been assessed to have a low to medium procurement risk as they have implemented previous ADB funded projects and have adequate knowledge in ADB Procurement as well as sufficient staffing. With the findings, it can be concluded that DOR-MPWT is capable of handling the ADB funded project including any advance action e.g. advance contracting that needs to be undertaken in the project.

644. DPWTs as Implementing Units (IUs) has a medium to high procurement risk assessment as they don't have previous experience in ADB funded projects although they have had and currently have on-going JICA and KFW funded projects. Procurement under those donors is mostly conducted by the consultants. DPWT also lack English-proficient staff.

645. Based on the above assessments and results, the following are the recommended actions to be implemented by the EA/IA during the project period:

1. Provide support to the Asset Management Unit/ Procurement Unit (DoF) at the central level, which acts as a Secretariat to the Procurement Committee. This unit has an administrative function and assists the Procurement Committee in all procurement undertakings. This unit serves as the central depository of all procurement related documentation. The unit should at the minimum, have 3 staff with experience and sufficient understanding on bidding procedures, recording/filing systems and in organizing/coordinating formal meetings. The basic function of this unit should include to:
    a. Provide administrative support to the Procurement Committee;
    b. Organize and coordinate meetings for the Procurement Committee and prepare minutes of meetings;
    c. Act as the custodian of all procurement documents and other related records;
    d. Be in charge of the sale and distribution of bidding documents to bidders;
    e. Monitor all the procurement activities and milestones and undertake formal reporting to all concerned agencies such as the MOF and MPI;

f. Act as the central channel of communications related to procurement issues;
g. Manage procurement funds generated from the sales of bidding documents and ensure that they are only to be used on procurement related activities.

2. Conduct regular training for MPWT/DPWT staff on procurement procedures in order to advance, professionalize and sustain the abilities of the procurement staff. Specific training on multilateral donor's procurement guidelines vis a vis the Government's Procurement Decree is perhaps the foremost training need. Arrange training sessions and participatory workshops on the procurement process for the appointed staff. Particularly important would be training on bid evaluations, as this is a key component of the procurement process. Another important subject is the selection/recruitment of consultants and professional services - members of the procurement committees interviewed reported that they have no experience in this important area.

3. Conduct training/orientation to private contractors on multilateral donor's specifically ADB procurement guidelines vis a vis the Government's Procurement Decree to improve contractor's tendering and management capacity.

4. Establishment of complaint mechanism, with specific procedures and subsequent actions and sanctions to strengthen the integrity of public procurement.

5. Inclusion of *Statement on Ethical Conduct and Fraud and Corruption of Bidders* in the Bidding Documents as well as submission of procurement committee members of *Declaration on Ethical Conduct and Fraud and Corruption.*

CHAPTER 13 PRIVATE SECTOR INVOLVEMENT

13.1 General

646. MPWT is working hard to maintain the national road networks in good condition. However, the MPWT faces difficulties in maintaining the roads effectively due to insufficient technical and financial capacity. Lack of adequate road maintenance will hinder the provision of a safe and reliable transport network and hence will jeopardize the development of regional economic activities. As a result of low investment, the road networks have been deteriorating – this is due to the lack of regular maintenance interventions in both routine and periodic maintenance terms. Although a Road Maintenance Fund [RMF] has been set up and operationalized in recent years, the revenue generated has often been diverted for other purposes to the extent that any remaining funds are insufficient to cover the maintenance expenditure required. This has resulted in an unfortunate neglect of road maintenance work on a national scale. Faced with this situation, Government of the Lao PDR has looked for other sources of the necessary funding including different mechanisms by which the private sector can be involved.

13.2 Opportunities for Public Private Partnership (PPP) in Road Maintenance

647. Several types of PPP mechanisms can be usefully applied in infrastructural rehabilitation and maintenance works by which funding can be raised and risks and responsibilities shared between private and public sector participants. Different forms of PPP arrangements can be made with varying degrees of risk borne by the respective parties – some of these are applicable to operations such as the design, construction and/or maintenance of a road.

- BOT (Build Operate Transfer);
- BOO (Build Own Operate);
- Leasing;
- Joint Ventures;
- Operations or management contracts;
- Cooperative arrangements.

648. The ownership ratios as well as the obligations to provide financing are dependent upon the contract and organizational models, which are shown in Figure 13.1.

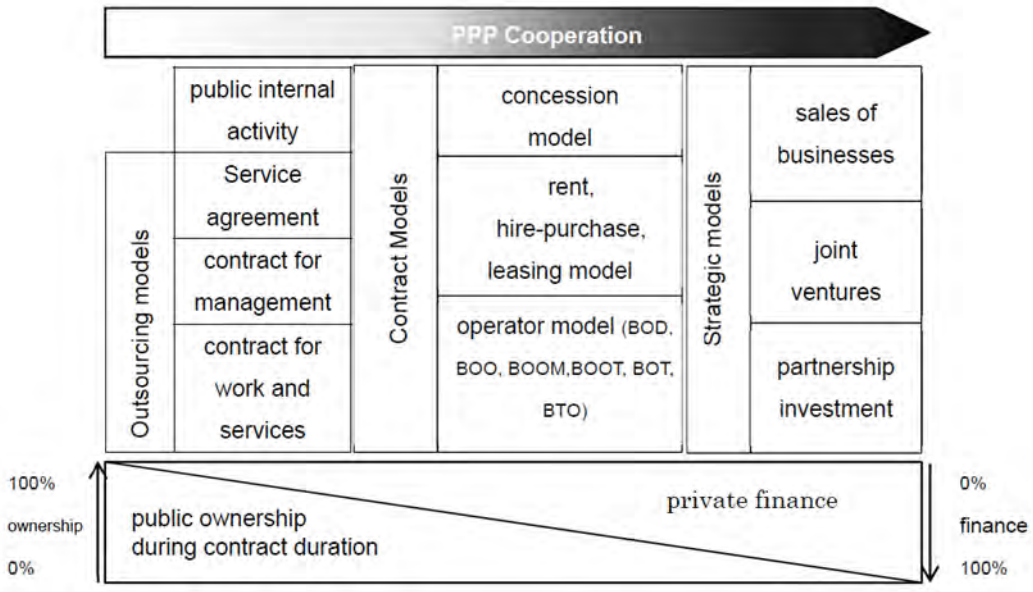


Figure 13-1 **Types of Model / Contract Structure FRP PPP**

649. The types of model and contract structures are different in that they contain different degrees of participation cooperation from the partners involved. Outsourcing models, which have normally been adopted in the road sector in Lao PDR, have one of the lowest levels of private sector involvement. Contract models have typically been based on long-term contracts with more extensive engagement of the private sector. The 'strategic' model approach contains a higher level of private sector involvement which requires public-private companies to be established as proportionate shareholders.

650. In practice, the Government has often selected the 'operator' featuring the "BOT" or "BOO, approach using private sector engagement for the provision of road assets. The private sector needs to invest in the construction of road, and then to provide regular operation and maintenance interventions over a long, pre-determined time period – at the end of which responsibility is transferred to the Government. In those models, the private sector assumes the greater risk. The private sector can also take on various roles – including designing, building, operating, maintaining or financing a facility for an agreed fixed term. Therefore, it is necessary to study a number of PPP models in order to establish the best approach to the road maintenance sector in Lao PDR taking into account the degree to which private sector is expected to provide the finances and bear the risk.

651. Other types of PPP; such as an Operation and Maintenance Contract (O&M) can also be applied to private sector involvement. The Government would design and construct a road using traditional works procurement method before a private contractor is retained to operate and manage the asset over an extended contract period. O&M contracts provide limited potential for improvements in efficiency and performance, though they may introduce some, such as improved revenue collection. This contract type can be useful where the private sector is unwilling or unable to accept a high proportion of the risk.

652. O&M models seem advantageous as the contract and organizational structure for road maintenance is already in place. The road remains the property of the public sector, which

also continues to finance the maintenance work. The private sector is only committed to carry out the physical maintenance of the asset. However there remains some risk of a revenue shortfall in the event that the traffic volume does not meet the target level. This is one of the reasons that PPP involvement in / toll collection is not attractive to private sector in Lao PDR where traffic volumes and user demands are relatively low leading to insufficient revenue collection.

653. In Lao PDR, routine maintenance is essential to the sustainability of road assets over the long-term. Failure or neglect of routine maintenance work drastically reduces the lifespan of any road asset and increases the lifecycle cost. Rehabilitating severely damaged road is obviously much more costly than preventive routine maintenance – it also can minimize costs for the road users. This is in view of the fact that poorly-maintained roads cause damage to vehicles and increase safety risks for drivers. Travelling times inevitably increase as road conditions deteriorate due to inadequate investment and drivers are forced to travel at lower speeds increasing journey times and fuel consumption thereby undermining any other economic benefits provided by the road. It is therefore desirable that routine maintenance be considered to be the key element of successful road asset management practices in Lao PDR.

654. Among the range of possible PPP models it can be envisaged that the adoption of a PBC approach would be a suitable model in Lao PDR.

13.3 Strategy Promoting Private Sectors for Road Maintenance (PBC)

655. Since 2013, MPWT has reformed the road maintenance sector by creating autonomous regional offices (RO) that will cover the country in four jurisdictional regions. The road maintenance sector in Laos has embarked on reformed initiatives including the use of long-term, maintenance contracts such as Performance Based Contracts (PBC) in different parts of the country.

656. PBC can help build the Government's capacity to implement PPP. PBC can also serve as an introduction to PPP for road maintenance and to modify the public sector's role and responsibility for ownership of road assets. Private financing through the use of PPP arrangements are expected to result in benefits from the transfer of risks to the private sector where they can be managed more effectively than by Government alone. By such means, maintenance works can be expected to be delivered to a higher quality resulting in a better level-of-service for road users. Also, they can reduce the cost of works and can assist in the securing adequate maintenance funding over the longer-term.

657. PBC usually does not require large capital investments and can be simpler to implement than other types of PPP. Maintenance by PBC can therefore be a good starting point for the Lao PDR Government and can help the Government introduce a solid approach to PPP forms of contracts in road maintenance sector.

658. Several factors need to be considered when introducing PBC in order to achieve optimum "Value for Money" and for higher levels of efficiency to be captured as compared to the more traditional maintenance methods. These include;

- Contract eligibility; the scope of the contract must be consistent with and manageable by the relevant public authority;
- Term of contract; the contract period should be long enough to transfer life-cycle

risks to private operators and be sufficiently attractive for private investors to secure return on the required investment.

- Financial liabilities; the Government should provide adequate commitment to cover any future financial liabilities;
- Inventive structure; The specifications of the contract should encourage private operators to be efficient, innovative, transparent, responsible and reliable;
- Risk allocation; the risks are allocated to the public and private parties in proportion to their ability to bear them. This is in the interests of optimizing the outcome of the works included in the contract.

Table 13-1Characteristics of Performance Based Contracts

Items		Descriptions
Deliverable		- Reduce government and make good use of private sector - Reduce road maintenance costs - Increase efficiency in use of maintenance funds - Ensure adequate and stable maintenance funding - Strengthen road administration management
Support	Government	- Reduce scale of public service - Improve efficiency in providing infrastructure - Promote private sector - Respond to public demands for better roads
	Road agency	- Better fulfill mandate to manage road infrastructure - Secure stable funding for road maintenance - Insufficient in-house technical resources
	Funding agency	– Sustainable maintenance for road investments
Maintenance Cost saving	Private sector	- Lower direct costs from private sector; Competitive bidding Greater flexibility >> increased efficiency Trial experience and innovation Well-defined performance standards = reduced waste
	Road agency	- Reduced staff and administration costs - Reduced facilities and equipment
Development of Private Sector Capacity		- Opportunity to attract investment in road engineering, construction and equipment - Opportunity for contractors of all sizes - Leads to beneficial spiral: • More competition • Higher technical and financial capacity • More up-skilling and professionalism • Improved efficiency and reduced prices
Stability of Funding		- Road agency program and budget for multi-year contracts - Government commits to provide funding in future years - Maintenance contracting becomes a specific line item in budget - Difficult for government to reduce funding during term of contracts - Avoids reductions in direct expenditure on road maintenance

Items	Descriptions
Strengthening of Road Agency	- Frees road agency from day-to-day maintenance operations - Change from a maintenance organization to a road manager - Focus on higher-level road management activities:– • Asset management • Level of service to road users • Road safety • Environmental measures • Strategic planning • Technical innovation • But: requires strengthening of road agency in PBC preparation, procurement and contract administration
Advantages	- Simplified contract administration - Reduced Employer workload and supervision costs - Risks between Employer and Contractor can be balanced - Opportunity and stimulus for innovation - Greater % of total maintenance budget spent on the road - Long-term contracts provide stable financial environment for both Employer and Contractor - Employer can focus on higher-level road management activities.

659. Performance-based contracting approach encourages investment programs and private management initiatives to participate in the road sector. PPP methods allow the Government to hold the private sector service provider contractually accountable for performance potentially to a greater extent than may be possible than with its own governmental departments. The performance-based contract can be said to offer greater benefits than a more traditional maintenance method as indicated below.

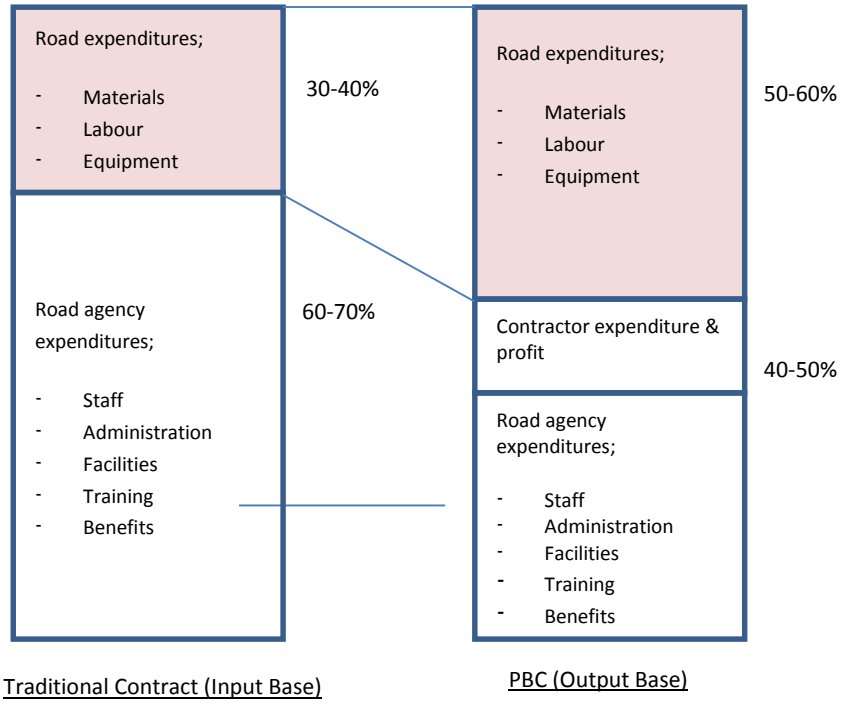


Figure 13-2 Differences between Traditional BOQ Contract and PBC

Table 13-2 Differences between Traditional BOQ Contract and PBC

Items	In-put based (BOQ)	PBC
Input & Output	Employer prepares BOQ for all maintenance works	Employer specifies performance standards for each road element Contractor estimates method and quantities needed to comply with performance standards
Variation	Employer bears all risk for variations in quantities	Contractor bears risk for variations in quantities unless specified in contract
Supervision	Employer or Supervision Engineer measures all quantities provided by Contractor for payment	Employer or Supervision Engineer inspects compliance with performance standards and only measures defects for payment
Payment	Payments based on quantities and vary each period	Fixed lump sum payment each period less any penalties for defects
Supervision Task	Employer retains Supervision Engineer full time for measurement and quality checks	Employer requires Supervision Engineer for spot checks and monthly inspections
Responsibilities	Employer responsible for all emergencies and closures	Contractor responsible for all emergencies and closures except specified in contract

660. As mentioned above, PBC has lots of advantages compared with traditional in-put based contracts – this is borne out by the fact that PBC methods have been applied world-

wide and usually proven to be the most cost-effective contract form for maintaining roads. Traditional contracts (i.e. in-put based contracts) for road maintenance are invariably based on a Bill of Quantity [BOQ]. In this framework, the works are planned and designed by the Client. The Contractor is paid according to contractual unit prices agreed in advance and on as the executed quantities as controlled by an appointed Supervision Consultant – this requires a substantial investment in personnel resources. Consequently, these input-based arrangements leave limited room for private sector efficiency in terms of maintenance planning, works design, innovation in maintenance methods and management optimization. In addition, the Contractor's interest is obviously to maximize its inputs / work quantities (in particular those generating the maximum profit) to the detriment of cost-effectiveness. PBC is based on a very simple but logical principle which is to refocus maintenance arrangements directly on final results/outputs expected by the asset's owner in this case, the MPWT.

13.4 Review of Existing Performance-Based Contracts

661. Trial Performance Based Contracts (PBC) for the maintenance of roads were conducted with the assistance of World Bank from 2006 to 2012, as shown in the tables below. Firstly, trial PBC contracts were implemented during 2006 - 2009 and 3 Provinces were selected - 132 km of national roads were thereby rehabilitated for which the allocated budget was 13,293 million kip. Subsequently, a second trial PBC-package was implemented during 2007-2010 and 15 provinces selected having a total length of 2,557 km of national roads – the allocated the total budget was 11,574 million kip. A third trial PBC-package was then implemented during 2008-2011 and 6 Provinces were selected including 881 km of national roads – the allocated total budget was 49,979 million kip. The fourth and latest trial PBC-package was implemented during 2009- 2012 for which 3 Provinces were selected with a length of 299 km of national roads and allocated the total budgets of 13,387 million kip.

Table 13-3 Performance-Based Contract, 2006-2009

No.	Province	Road	Section	Length (km)	Pavement	Contract Amount m Kip
1	Luang Prabang	13N	246-296	50	DBST	6,195
2	Vientiane	Ditto	196-246	50	DBST	4,500
3	Vientiane Cap.	Ditto	012-044	32	DBST	2,599
Total						**13,294**

Table 13-4 Performance-Based Contract, 2007-2010

No.	Province	Road	Section	Length (km)	Pavement	Contract Amount m Kip
1	Phongsaly	19	000-082	82	DBST	367
2	Bokeo	3	000-034	34	Asphalt	158
3	Oudomxay	2W	000-070	70	DBST	420
4			070-139	69		414
5	Huaphan	1C	228-275	47	DBST	281
6	Xiengkhuang	7	042-266	224	DBST	1,344

No.	Province	Road	Section	Length (km)	Pavement	Contract Amount m Kip
7	Luang Prabang	7	000-042	42	DBST	305
8		13N	296-386	90	DBST	675
9		13N	386-496	110	DBST	573
10	Vientiane	13N	044-094	50	DBST	124
11		13N	094-144	50		150
12		13N	144-176	32		96
13		13N	176-196	20		90
14		13N	196-246	50		750
15		10	033-096	63		125
16	Vientiane Cap	13S	012-066	54	DBST	130
17		10	000-033	37.5		96
18	Borikhamxay	8	000-132	132	DBST	416
19		13S	066-249	183		357
20	Khammuan	12	055-147	92	DBST	365
21		13S	249-384	135		497
22	Savannakhet	13S	384-436	52	DBST	154
23		13S	437-541	104		312
24	Salavan	13S	541-623	82	DBST	197
25		1H+20	0-26&26-56	56		503
26	Champasak	13S	623-660	37	DBST	95
27		13S	675-719	44		110
28		13S	719-774	55		145
29		13S	774-821	47		127
30		16E	008-050	42		109
31		16E	050-085	35		95
32		16W	001-044	43		32
33		13S	660-675	15		7
34		20	000-039	39		29
35	Xekong	16E+1I	87-138,0-18	69	DBST	272
36	Attapue	1I	000-059	59	Asphalt	231
37		18B	00-15&46-55	24	(DBST)	306
38		18B	15-26&70-80	21		268
39		18B	26-37&80-90	21		268
40		18B	37-46&99-111.9	21.9		279
41		18B	55-70&90-99	24		306
Total						**11,578**

Table 13-5 Performance-Based Contract, 2008-2011

No.	Province	Road	Section	Length (km)	Pavement	Contract Amount m Kip
1	Phongsaly	1B	000-055	55	DBST	2,571
2		1B	055-109	54		2,522
3		2E	052-100	48		1,723
4	Luang Prabang	3+3A	000-084.9	84.9	DBST	5,469
5			000-070	70		3,768
6			000-072	72		4,406
7			046.8-118.8	72		4,638
8	Oudomxay	2E	000-052	52	DBST	2,289

No.	Province	Road	Section	Length (km)	Pavement	Contract Amount m Kip
9	Huaphan	1C	275-347	72	DBST	3,882
10		6	000-092	92		4,951
11		6	092-120	28		1,509
12	Luang Prabang	1C	000-102	102	DBST	5,143
13	Vientiane Cap		Inner city	27.17	DBST	2,521
14			Ditto	35.27	DBST Asphalt Concrete	2,726
15			Ditto	17.20	Asphalt	1,858
Total						**49,976**

Table 13-6 Performance-Based Contract, 2009-2012

No.	Province	Road	Section	Length (km)	Pavement	Contract Amount m Kip
1	Xiengkhuang	1D	000-031	31	DBST	1,667
2		1C	000-084	84		4,532
3	Vientiane	11	140-204	64	DBST	3,859
4	Luang Prabang	13N	246-296	50	DBST	3,330
Total						**13,388**

662. In 2011, a JICA technical cooperation project (CaRoL) commenced. The CaRoL project was initiated upon a request from the MPWT to strengthen the capacity and ensure the sustainability of road maintenance management through providing the various technical assistances by JICA experts. These included; supporting the maintenance of Road Maintenance System (RMS), the provision of technical manuals (for maintenance of road, bridge and embankment slopes), and to conduct pilot projects with various approaches to on-the-job training. In addition, the MPWT requested JICA for assistance to strengthen its implementation of PBCs by identifying issues and improving the contractual environment using international practices. JICA experts of CaRoL conducted reviews of past PBCs and recognized that the maintenance works previously conducted by private contractors mostly did not meet performance expectations due to insufficient experience with and capacity to perform PBC work. This limited the potential benefits of the intended structure of PBC. The CaRoL project recommended the training of private operators to help them meet contracts' performance requirements. In addition, the CaRoL project team noted that existing data collection was insufficient to enforce the PBC. It was felt to be essential that the MPWT staff be trained to collect the road data in order to establish appropriate performance baselines, to determine contract standards and ensure that private contractors were properly incentivized.

663. The CaRoL project also recommended the setting of simple performance indicators matching Lao contractors' capacity, and to improve contract management and to create an effective penalty system. The major findings and the lessons learnt from past PBCs are described below;

- The contractors need more training in the PBC system to further enhance their

PBC capacities, as PBC is different from the BoQ based maintenance system applied in the past;

- Difficult management of the entire process of PBC due to poor Contractor's capacity;
- Significant Government commitment needed to supervise the day-to-day monitoring and payment processing;
- Advantage is to transfer road maintenance skills to private sector;
- Care has to be taken when applying PBC contracts covering large road networks and in areas subject to cost variations due to different terrain and natural conditions;
- PBC contracts of some years durations are needed to allow the contractors to fully understand the system and fully utilize their potential, as well as get the optimal benefits of PBC.

664. MPWT has tried to address this situation, by encouraging the growth of private contracting firms and awarding contracts to them. MPWT has also reformed the road maintenance sector by creating regional road maintenance offices and adopting performance-based contracts for road maintenance. Currently 4 PBC are implemented in Laos, financed by the RMF.

665. When it comes to the private sector contractors, most of them lack experience and capacity, both in technical and commercial aspects. In order to fully utilize the additional resources the private sector can contribute, the private contracting firms need capacity building in all aspects of contract management, from bid preparation to effective implementation of the contractual works. Another constraint for many contractors is their limited financial capacities, resulting they often face difficulties in obtaining equipment and completing the works on schedule.

666. Following experiences were gained from the in the past implemented Performance-Based Contracts (PBC) in Laos.

- Initially an international consultant with extensive experience in PBC is needed for support and supervision of PBC;
- Capacity building is needed for contractors to fully understand the PBC payment system and its linkage to the performance criteria;
- PBC needs to be hybrid models, including initial rehabilitation works;
- The implemented PBC contracts were beneficial for revising performance criteria in the specifications.

667. Although PBC has several benefits over traditional maintenance contracts, it can be challenging for the Government to implement it. The issues addressed above from the past trial PBCs experiences serve as practical references for designing and implementing future PBCs. While these useful practices apply to most contexts, the local context should be considered before applying the points discussed below.

668. Need for sufficient fiscal resources and setting of realistic performance expectations: In the previous PBC, the MPWT had high expectations on what PBC maintenance could achieve and sometimes underestimated the level of fiscal resources required for the contracts. PBC is an instrument that can generate various benefits, but it does not solve the underlying

needs for the Government to continue providing sufficient funds for road maintenance. This is particularly salient when the existing road infrastructure is in a poor state. In this situation, it will require substantial regular investments in order to rehabilitate and keep stable road conditions. The Government needs to make a realistic estimate of the required budgets from fiscal resources (e.g. the resources form the RMF). Otherwise, private sector operators will be anxious to see evidence that the Government can afford and be committed to payment obligations so that the risk of payment default can be minimized.

669. Educating government officials in the use of PBC and the benefits can be achieved from using them can improve the implementation and monitoring of PBC - and sustain private sector appetite.

670. Need for incentives to facilitate private sector involvement: Monthly or quarterly flat rates (based on per kilometer unit prices) can be used for the payment of PBC. Deductible payments are normally made according to the calculation of satisfactory performance in the form of a penalty applied for sub-standard maintenance of a road section. The payments need additionally to be influenced by a bonus system which gives the private operator additional incentives. So, for example, the private partner can be rewarded if his maintenance of the road satisfies – completely - the specified performance targets for long duration. Also, the local authority can apply penalty on the private operator for roads that are blocked or only partially useable during repair, so that the duration of repair works can be minimized.

671. Need clear baseline data with which to establish and monitor performance indicators and quality standards: Both public and private parties do not fully understand the actual road conditions before signing the contract and therefore cannot precisely estimate the cost of the works required to achieve the designated performance standards. If the road condition is worse than anticipated, the private Contractor may not be able to finance all the repairs needed within the specified time. This implicates that the Contractor might miss the performance targets established in the contract and jeopardize the implementation of the works. Also, the payment for successful performance might not be sufficient to cover the cost of the works if the road condition is worse than anticipated. This removes the financial incentive to fulfil performance targets and causes the contract to fail. If the road condition is initially much worse than expected, for example, the Government could rehabilitate the road by other means before procuring the PBC Contractor. Collecting baseline data may require a comprehensive action plan to improve the management of information taking into account the stakeholder environment and any budgetary constraints. Assistance by multilateral institutions or donors, such as ADB and World Banks, etc. could help the Government design suitable action plans to obtain clear baseline data and thereby to establish and monitor performance indicators and quality standards.

672. Need simple performance indicators and user monitoring systems to improve contract performance: The lessons learnt from the past trials of PBC show, Lao contractors have limited capacity. Simple and unambiguous performance indicators will reduce the resources needed to monitor PBC activities. Overly complicated indicators can lead to misinterpretations among the parties involved in PBC. The Government authorities should often assess the indicators whether they are applicable to the measurement methods or not, and assess all indicators applicable to the actual status. Otherwise, Contractors may misinterpret figures leading to disputes over payment and performance. Setting simple performance indicators and clarifying how those indicators will be evaluated can prevent disputes occurring from misinterpretation

by either party.

673. Need assessment survey and capacity building for private operators in the implementation of PBC: In the practices of past PBC, it was clearly found that private firms have limited capacity and misunderstood the intricacies of PBC. In this respect, the Government should carry out assessment surveys, which will enable it to refine the contents of future contracts so that sufficient numbers of private firms can participate in the bidding process. If local firms lack financial resources or expertise to bid, international firms could be encouraged to associate with local firms to build the necessary capacity. Training and capacity building programs that improve private Contractors' understanding of the structure of PBC can improve a Contractor's performance and increase the number of firms able to bid for PBC.

674. Need control of overloading vehicle to implementing effective road maintenance: Overloaded vehicles are one of essential issues affecting any maintenance program and directly impact on PBC efforts. Uncontrolled overloaded vehicles make it difficult to foresee and maintain the desired pavement conditions. As a result, it is difficult to evaluate a Contractor's performance under the PBC. The Government faces this issue and tries to solve it to offset the cost of maintaining its roads. Currently, the Department of Transport (DOT) of MPWT takes the initiative to establish clear vehicle weight regulations along with strong enforcement policy. The Government is required to play a significant role in enforcing weight control otherwise the private sector will not want to be involved in road maintenance sector works.

13.5 Proposal for Private Sectors involvement in Performance Based Contract

675. Laos is a landlocked country surrounded by five nations in Indochina peninsula. The provision of robust transport network is expected to receive poised benefits from increased trade with its fast growing neighbors like China, Thailand and Vietnam. To achieve such a strong transport network and vision for the land-linked country in ASEAN, Laos should prioritize best practice in road maintenance as well as look into PPPs contract structures. The PBC will be a possible way on PPP structures to build and finance infrastructure. The lessons learnt from the previous PBC experiences and practices will enable the country to select the most suitable PPP maintenance structure, given the project needs, the availability of finance and the country's economic situation.

676. PBC would be able to help the MPWT improve road maintenance sector and build experience implementing PPPs. The MPWT has learnt valuable lessons from the past trial PBCs. Setting realistic expectations and dedicating sufficient fiscal resources, training private operators, gathering clear baseline data, defining simple performance indicators, setting clear roles in monitoring and addressing vehicle overloading can help the MPWT successfully use PBC to improve the quality of the road assets in Laos.

677. In view of the above, the PPTA recommends to conduct monitoring and assessment of the PBCs during the period of execution of PBCs in Salavan, Xekong and Attapeu. The facilitation and training programs for capacity building of all relevant players should also be provided. The successful introduction of the PBC concept makes it necessary for establishment of suitable PPP structures to enhance sustainable road asset management procedures in the country.

13.6 Details for Implementation of Performance Based Contracts

678. The proposed Performance Based Contract (PBC) for the Road Sector Governance and Maintenance Project includes initial Rehabilitation Works to restore the road to good condition, followed by Routine Maintenance to maintain the road at a prescribed service level for the duration of the contract. The initial Rehabilitation Works are paid on a quantity basis (BOQ), while the subsequent Routine Maintenance is paid on a performance basis. The contract also includes Emergency Works to repair damage from an extraordinary event (flooding, serious collapse of a road section or a major landslide, which affects the road). The PBC contract is suitable for roads which are in poor condition and require considerable Rehabilitation Works, and as well suitable for roads already in good condition. The contract period will be three years during which the contractor will be required to complete the initial Rehabilitation Works expeditiously, within the first 12 months.

679. The PBC contracts will be awarded through open bidding (ICB/ NCB) which should provide greater competition resulting in lower prices and the selection of a well-qualified contractor. DOR will be the Employer and an independent Project Supervisor, through the PMC, will be appointed by DOR.

680. The contractors will be paid for the Rehabilitation Works based on measured quantities and unit prices contained in the BOQ. Similarly they will be paid for Emergency Works which are approved by the Employer based on output quantities and unit prices. For the Routine Maintenance, the contractor is responsible for designing and carrying out the works, services and actions necessary to maintain the service level as defined by the performance standards contained in the contract. The definition of the exact nature of the maintenance works, their timing, their costing and their implementation is left to the judgment of the contractor. The Employer will pay the contractor a fixed monthly lump-sum covering the expenses of these maintenance works, including both maintenance and management charges.

681. The Project Supervisor (acting for the Employer) and the contractor will jointly carry out monthly formal inspections to determine if the road is in compliance with the performance standards. Deductions will be made from the monthly lump-sum payment where any defects are found exceeding the performance standards and have not been repaired within stipulated time. The Project Supervisor may also carry out informal inspections at any time and alert the contractor of defects but deductions will only be made for non-compliances at the time of formal inspections.

682. The proposed performance standards cover only the carriage way features (therefore the community based maintenance is suggested for the road side maintenance). Each performance standard describes either a condition to be achieved in clearly understandable terms, or provides the allowance of the defect which must not be exceeded. The service level standards are shown in Table 13.7. The allowances for the pavement defects are consistent with the allowable distress levels for a road in good condition. If a defect exceeds the allowance defined in the performance standards, then the contractor is required to repair the defect within allowable time (Tolerance for Repair) according to the Ministry of Public Works and Transport (MPWT) technical specifications for road maintenance and construction which are prescribed in the contract. The standards also prescribe the amount of deduction from the monthly lump-sum in case of non-compliance. During the formal inspections each km of road is inspected independently and a percentage of the payment is deducted for each defect found

in that kilometre (but only, if the repair of the defect has not been done within allowable time), with the qualification that the deduction will not exceed 100% of the payment for that km.

683. The contractor is taking over responsibility for the operation and maintenance of the road and, as such, must comply with a broad range of Employer requirements covering public safety, the environment and the contractor‘s obligations under Lao law. The contractor will be required to complete the following plans and submit them to the Employer for approval: Contractor‘s Quality Assurance Plan; Health and Safety Plan; Emergency Procedures; Traffic Management Plan; Monthly Statements; and Handover Reports. The contractor must also comply with the Environmental Management Plan (EMP).

684. The PBC contract includes a provisional quantity of work for rectifying defects beyond routine maintenance, e.g. landslides, road failures or blockages. Rectifying these defects falls under the emergency maintenance category. After approval for the use of the provisional quantity of work from the employer’s supervisor the contractor is responsible for repairing the defect.

Table 13-7 Service Levels in PBC

Defect Type	***Allowance***	***Tolerance for Repair / Deduction***
	Carriageway and Shoulders	
Usability of the road	- There shall not be interruption of motorized traffic	No tolerance allowed / 20%
International Roughness Index	- Maximum IRI 6 m/km, based on baseline survey	Next quarterly meeting / 20%
Potholes	- Potholes greater than 300mm must not exist - Maximum 5 Potholes greater than 100 mm	14 days / 50%
Cracking and multiple cracks	- Cracking width larger than 3mm must not exist - Maximum Multiple Cracks area 2m2	14 days / 50%
Rutting	- Rutting deeper than 30mm must not exist - Maximum length of rutting is 50m	56 days / 33%
Ravelling	- Ravelled areas must not exist	56 days / 50%
Loose Pavement edges	- There shall not be loose pavement edges, or pieces of pavement breaking off at the edges.	56 days / 10%

Another component of the performance-based maintenance works is done by the communities living along the project roads, who will be responsible for the road side maintenance, as wells as clearing of culverts and bridge channels. These works will be performed fulfilling simple performance criteria, e.g. the grass growing along the road not allowed to be higher than specified.

The contractors are encouraged to hire the communities along the project roads for above-mentioned performance based maintenance works.

CHAPTER 14 INSTITUTIONAL ISSUES FOR SUSTAINABLE ROAD ASSET MANAGEMENT

14.1 Assessment on Road Maintenance Funding Mechanism

14.1.1 Allocation of Fund

685. The Road Maintenance Fund (RMF) was set up in 2001 by the Prime Minister's Decree[40] in order to mobilize contributions from road users for the maintenance of public roads. According to the decree, the Fund can be used for the following activities:

- Routine, periodic and emergency maintenance;
- Rehabilitation of existing roads, but only if all routine, periodic and emergency maintenance works have been adequately financed;
- Road safety;
- Fund administration and management.

686. The decree also implies allocation of the Fund, stating that the Fund should be channelled first for maintenance of national roads, then progressively to the maintenance of other local roads. Local roads receive 10% of the Fund's revenue for their maintenance and this proportion can increase once the needs for maintenance of national roads are met and covered by the Fund.

687. A new ministerial guideline was issued in November 2011, relating to the activities and procedures of the Fund[41]. The objectives and sources of the RMF in the ministerial guidelines are restated exactly as in Decree 09/PM. However, new guidelines specify the proportion of the fund allocation as follows;

- 10% should go to Local Roads (Provincial, District and Rural);
- 5% should go to road safety activities;
- 5% should go to the Vientiane Urban Development Administration Authority (VUDAA), for urban roads;
- The remaining should go to National Roads and the administration of the Fund.

[40] Decree of the Prime Minister on Road Maintenance Fund (No.09/PM), issued on 15 January, 2001

[41] Decision number 18710 of the Minister of MPWT dated 25 November 2011. This replaced MCTPC Decision 36 of 7 January 2002.

14.1.2 Source of Fund

688. The 2001 Decree established the following sources of revenue for the Fund:

- Fuel levy;
- Heavy vehicle surcharge;
- Fines for overloading of heavy vehicles;
- Tolls on roads and bridges
- International transit charges on trucks;
- Funding from local and foreign sources;
- Other revenue including interest or dividends on investments.

689. A new agreement[42] was made by the MPWT itself in April, 2013. The agreement mainly discusses management and procedures of the Fund, but also gives the following possible additional sources of revenue:

- Fuel levy;
- Levy on alcohol imports;
- Traffic and transport fines;
- Overloading fines;
- Fee for issuing new number plates;
- Border crossing fees;
- Permits for public transport services;
- Road user fees;
- Toll roads;
- Contributions;
- Other revenue such as vehicle insurance, technical control fees.

690. According to the staff of RMF, this agreement is not yet effective and the Fund still collects the revenue specified in the 2001 Degree. Also, the amount collected from new revenue sources, including a levy on alcohol imports and permits for public transport services, is minimal and does not significantly increase the revenue of the Fund.

14.1.3 Revenue of Road Maintenance Fund

691. The tables, attached to the following pages, summarize revenue and expenditure of the RMF between 2008/09 and 2012/13. These tables show the amount of revenue and expenditure in Kip and also converted to US dollars at the exchange rate prevailing in the middle of each fiscal year. From these tables, there are several findings summarized below.

692. The revenue of the RMF, together with its expenditure, has rapidly increased since the RMF was introduced in 2001/02. In dollar terms, the revenue has been increasing at the annual growth rate of 21% per annum in the last 5 years.

[42] MPWT Agreement 5131/PWT of 22 April 2013

Table 14-1 RMF Revenues and Expenditures 2008-2013

Revenue/Expenditure	2008/09	2009/10	2010/11	2011/12	2012/13	Average between 2008/09 and 2012/13
Revenue ('000 USD)	25,920	30,775	36,689	44,836	48,324	
Annual Growth in Revenue	36%	19%	19%	22%	8%	21%
Expenditure ('000 USD)	25,720	30,291	38,690	38,231	54,293	
Annual Growth in Expenditure	32%	18%	28%	-1%	42%	24%

Source: ADB Consultant

693. Initially, when the RMF was introduced in 2001/02, the revenue of the Fund much relied on the loan/grant from donors. The contribution from donors to the Fund has gradually reduced and became zero in 2010/11. Currently, the revenue of the Fund heavily relies on the fuel levy, which accounts for 97% of the total revenue in 2012/13.

694. The rate of fuel levy has been gradually increased, initially imposed at 40 Kip per liter, from 300 Kip per liter in 2009 to 420 Kip per liter as of now. The following table summarizes the rate of fuel levy and estimated fuel consumption in Laos and implies that an increase in both rate of fuel levy and fuel consumption contribute to increasing the revenue of RMF in recent years.

Table 14-2 Fuel Levy and Estimated Consumption 2008-2013

	2008/09	2009/10	2010/11	2011/12	2012/13
Rate of Fuel Levy (Kip/liter)	300	300	350	420	420
Estimated Fuel Consumption (million liter)	581	702	754	800	855
Growth Rate in Fuel Consumption (%)	14%	21%	7%	6%	7%

Source: ADB Consultant

695. Toll collection on the roads and bridges in the previous years was also a major contributor to the revenue of the Fund. Until 2009/10, the share of toll collection in the total revenue was around 15%. However, following the Prime Minister's notice on removal of obstacles to facilitate international trade, the MPWT decided to terminate toll collection on most of the roads, once 27 toll collections in operation, and demolished toll collection booths across the country in 2011. Currently, the revenue from toll collection accounts for only 2% of the total revenue in 2012/13.

696. Other than fuel levy and toll collection, the fine against overloading trucks contributes to the revenue of the Fund. However, similar to the toll collection exercise, the MPWT terminated operation of weigh stations across the country, following the Prime Minister's notice on removal of obstacles to facilitate international trade, and currently there are only weigh

scales at the cross border points, which collect a minor amount of the fines, which goes to the fund revenue.

14.1.4 Expenditure of Road Maintenance Fund

697. The following bullet points summarize the findings on expenditure of the RMF.

698. Like the revenue of the Fund, the expenditure of the Fund sharply increased since 2001/02 when the RMF was introduced. However, looking at the itemized expenditure by road class/maintenance type, the amount and proportion of these expenditures differ year by year. It implies that there seems neither policy nor strategic approach to determine which road/which type of maintenance/rehab should be given priority to allocate the Fund.

699. Taking an example of proportion of the expenditure between national roads and local roads, most of the Fund was initially allocated to the maintenance of national roads, following the proportional distribution (nearly 80% for national roads and 10% for local roads) suggested by the decree and guideline on the RMF. However, since 2006/07, the proportion of expenditure for the national roads decreased significantly and nearly half of the funds allocated for the maintenance of local roads in recent years. During these years, surface condition of national roads deteriorated due to the shortage of funds for maintenance as well as termination of weight control against overloading trucks, and therefore, the national roads again started to receive more funds, particularly for rehabilitation works on the deteriorated road sections.

700. Laos can be said to be a disaster prone country. Occasionally, typhoons and unexpected rain falls cause massive scale of flooding and landslides, which damages roads in disaster areas. In 2009/10 and 2010/11, over 35% of the Fund was allocated for emergency works, used for restoration of roads in disaster areas. Needs for emergency works are unpredictable, which makes it difficult for road administrators to prepare optimal budget plans.

701. Although the decree and guideline on the RMF limit the use of Fund to maintenance/rehabilitation/emergency works, considerable amount of the Fund is allocated for construction works. In 2011/12 and 2012/13, 6% of the total expenditure was utilized for construction works of local roads. Over 10% of the funds were utilized for construction works of local roads in 2013/14. Again, this proves that there is no control on how the Fund is spent, allowing the RMF to be utilized as part of the general budget of the MPWT.

702. Routine and periodic maintenance should be given priority since they contribute to maintaining the pavement condition for a designed life period. The economic rate of return of the investment on routine and periodic maintenance is relatively higher than that on rehabilitation. However, the common exercise in many countries shows, when the maintenance budget is scarce, the expense for routine and periodic maintenance tends to be reduced in the first place. But, the experience in Laos shows a good example. Looking at the fund allocation by type of works, routine and periodic maintenance maintains to receive over 40% of the total maintenance funds in recent years[43].

[43] Maintenance works are classified based on the Maintenance Activity Codes (MAC) adopted in 1999 by MPWT.

Table 14-3 RMF Expenditure by Work Type 2008-2013

Type of Work	2008/09	2009/10	2010/11	2011/12	2012/13
Routine Maintenance Work	40%	23%	10%	21%	10%
Periodic Maintenance Work	18%	20%	29%	28%	34%
Rehabilitation	6%	11%	14%	21%	39%
Emergency	22%	38%	38%	18%	5%
Bridge Maintenance	5%	1%	3%	4%	1%
Construction Work	4%	2%	2%	6%	6%
Others	5%	4%	3%	3%	3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Source: ADB Consultant

Table 14-4 RMF Annual Revenue and Expenditure 2001/02 - 2012/13 [m Kip]

2001/02 to 2012/13 RMF Annual Revenue and Expenditure

(Unit: million Kip)

No	Description	FY 2001/02	FY 2002/03	FY 2003/04	FY 2004/05	FY 2005/06	FY 2006/07	FY2007/08	FY 2008/09	FY 2009/10	FY 2010/11	FY 2011/12	FY 2012/13
1	Fuel tax	7,783	13,819	20,660	35,319	61,001	98,206	127,024	174,246	210,724	263,978	335,923	359,086
2	Toll-bridge fee	1,027	8,927	13,599	15,947	16,885	20,288	21,943	30,409	40,469	20,163	9,133	8,517
3	Weighting fee	410	2,479	2,513	3,266	835	508	31	10	0	0	0	0
4	Overloading fines	0	0	0	0	2,302	1,544	2,490	2,511	3,399	9,739	12,272	2,935
5	Other revenue	5,839	1,308	132	7	1	1	0	3	12	0	60	60
6	Loan/grant from donors	42,148	122,532	46,178	59,122	66,258	33,899	16,158	14,971	96	0	0	0
7	Adjust exchange rate	-3,657	-3,673	-85	-292	-3,054	-1,860	-1,854	-13	-3	0	0	0
	Total Revenue	**53,550**	**145,392**	**82,997**	**113,369**	**144,228**	**152,586**	**165,793**	**222,137**	**254,696**	**293,879**	**357,388**	**370,598**
	Ovening Balance		**18,286**	**4,493**	**-9,786**	**5,014**	**8,346**	**3,254**	**-3,679**	**1,713**	**4,009**	**-16,024**	**52,650**
	Total Revenue + Opening Balance		**163,678**	**87,490**	**103,583**	**149,242**	**160,932**	**169,048**	**218,459**	**256,409**	**297,888**	**341,364**	**423,248**
a	**National Roads**	**34,436**	**132,920**	**85,569**	**98,651**	**113,221**	**103,862**	**105,532**	**114,828**	**176,039**	**167,445**	**145,667**	**286,277**
	Rountine Maintenance Work	0	2,375	6,938	6,431	7,838	19,674	69,624	72,839	54,337	30,517	59,142	40,783
	Periodic Maintenance Work	34,164	125,630	51,420	60,449	52,722	55,932	6,275	8,176	12,652	9,024	13,442	96,201
	Rehabilitation	0	0	6,946	4,736	16,581	9,816	759	3,000	10,500	12,044	25,299	126,840
	Emergency	82	2,289	13,924	19,351	25,362	11,209	22,783	24,413	94,155	108,696	39,910	16,720
	Bridge Maintenance	190	2,625	6,339	7,683	10,718	7,230	6,092	5,709	2,324	7,164	7,874	5,733
	Construction Work	0	0	0	0	0	0	0	690	2,070	0	0	0
b	**Local Roads**	**0**	**2,701**	**1,666**	**3,882**	**15,974**	**36,292**	**53,503**	**95,143**	**65,529**	**134,462**	**149,770**	**117,026**
	Rountine Maintenance Work	0	0	387	1,806	0	0	15,644	16,065	2,591	1,659	3,705	2,217
	Periodic Maintenance Work	0	1,649	1,000	151	10,932	24,924	24,577	31,331	37,643	82,292	70,577	47,064
	Rehabilitation	0	0	0	808	3,066	9,152	5,959	10,458	18,304	30,659	37,798	37,224
	Emergency	0	1,051	279	503	738	0	5,655	23,017	1,734	10,324	16,357	3,598
	Bridge Maintenance	0	0	0	312	1,140	2,216	1,669	6,398	1,185	2,788	3,889	423
	Construction Work	0	0	0	302	99	0	0	7,873	4,072	6,740	17,444	26,500
c	5% fuel tax to VUDAA	49	673	935	848	693	2,035	1,743	1,728	1,759	939	805	0
d	Compensate on parkig fee to VUDAA	0	0	0	0	900	900	900	900	900	900	900	900
e	Road fund administration	780	4,606	4,613	4,973	4,747	5,844	7,156	7,173	6,461	5,586	4,780	2,938
f	Weight control station construction	0	0	0	0	347	400	636	653	0	571	1,680	1,512
h	Road safety	0	0	0	0	0	0	0	0	0	0	1,136	7,718
	Total Expenditure	**35,264**	**140,899**	**92,782**	**108,355**	**135,882**	**149,332**	**169,472**	**220,425**	**250,688**	**309,903**	**304,738**	**416,371**

Table 14-5 RMF Annual Revenue and Expenditure 2001/02 - 2012/13 ['000 USD]

2001/02 to 2012/13 RMF Annual Revenue and Expenditure

(Unit '000 USD)

No	Description	FY 2001/02	FY 2002/03	FY 2003/04	FY 2004/05	FY 2005/06	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11	FY 2011/12	FY 2012/13
1	Fuel tax	1,024	1,818	2,622	3,360	6,131	10,239	14,629	20,332	25,462	32,956	42,143	46,823
2	Toll-bridge fee	135	1,175	1,726	1,517	1,697	2,115	2,527	3,548	4,890	2,517	1,146	1,111
3	Weighting fee	54	326	319	311	84	53	4	1	0	0	0	0
4	Overloading fines	0	0	0	0	231	161	287	293	411	1,216	1,540	383
5	Other revenue	768	172	17	1	0	0	0	0	1	0	8	8
6	Loan/grant from donors	5,546	16,123	5,860	5,625	6,659	3,534	1,861	1,747	12	0	0	0
7	Adjust exchange rate	-481	-483	-11	-28	-307	-194	-213	-2	-0	0	0	0
	Total Revenue	**7,046**	**19,131**	**10,533**	**10,787**	**14,495**	**15,909**	**19,094**	**25,920**	**30,775**	**36,689**	**44,836**	**48,324**
	Ovening Balance		**2,406**	**570**	**-931**	**504**	**870**	**375**	**-429**	**207**	**500**	**-2,010**	**6,865**
	Total Revenue + Opening Balance		**21,537**	**11,103**	**9,856**	**14,999**	**16,780**	**19,469**	**25,491**	**30,982**	**37,189**	**42,826**	**55,189**
a	**National Roads**	**4,531**	**17,489**	**10,859**	**9,386**	**11,379**	**10,829**	**12,154**	**13,399**	**21,271**	**20,905**	**18,275**	**37,329**
	Rountine Maintenance Work	0	313	881	612	788	2,051	8,018	8,499	6,566	3,810	7,420	5,318
	Periodic Maintenance Work	4,495	16,530	6,525	5,752	5,299	5,832	723	954	1,529	1,127	1,686	12,544
	Rehabilitation	0	0	882	451	1,666	1,024	87	350	1,269	1,504	3,174	16,539
	Emergency	11	301	1,767	1,841	2,549	1,169	2,624	2,849	11,377	13,570	5,007	2,180
	Bridge Maintenance	25	345	804	731	1,077	754	702	666	281	894	988	748
	Construction Work	0	0	0	0	0	0	0	81	250	0	0	0
b	**Local Roads**	**0**	**355**	**211**	**369**	**1,605**	**3,784**	**6,162**	**11,102**	**7,918**	**16,787**	**18,789**	**15,260**
	Rountine Maintenance Work	0	0	49	172	0	0	1,802	1,875	313	207	465	289
	Periodic Maintenance Work	0	217	127	14	1,099	2,599	2,830	3,656	4,548	10,274	8,854	6,137
	Rehabilitation	0	0	0	77	308	954	686	1,220	2,212	3,828	4,742	4,854
	Emergency	0	138	35	48	74	0	651	2,686	210	1,289	2,052	469
	Bridge Maintenance	0	0	0	30	115	231	192	747	143	348	488	55
	Construction Work	0	0	0	29	10	0	0	919	492	841	2,188	3,455
c	5% fuel tax to VUDAA	6	89	119	81	70	212	201	202	213	117	101	0
d	Compensate on parkig fee to VUDAA	0	0	0	0	90	94	104	105	109	112	113	117
e	Road fund administration	103	606	585	473	477	609	824	837	781	697	600	383
f	Weight control station construction	0	0	0	0	35	42	73	76	0	71	211	197
h	Road safety	0	0	0	0	0	0	0	0	0	0	143	1,006
	Total Expenditure	**4,640**	**18,539**	**11,774**	**10,310**	**13,657**	**15,570**	**19,518**	**25,720**	**30,291**	**38,690**	**38,231**	**54,293**
	Exchange rate (Kip/USD)	7,600	7,600	7,880	10,510	9,950	9,591	8,683	8,570	8,276	8,010	7,971	7,669

Table 14-6 RMF Annual Revenue and Expenditure 2001/02 - 2012/13 [%]

2001/02 to 2012/13 RMF Annual Revenue and Expenditure

(Unit: %)

No	Description	FY 2001/02	FY 2002/03	FY 2003/04	FY 2004/05	FY 2005/06	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11	FY 2011/12	FY 2012/13
1	Fuel tax	15%	10%	25%	31%	42%	64%	77%	78%	83%	90%	94%	97%
2	Toll-bridge fee	2%	6%	16%	14%	12%	13%	13%	14%	16%	7%	3%	2%
3	Weighting fee	1%	2%	3%	3%	1%	0%	0%	0%	0%	0%	0%	0%
4	Overloading fines	0%	0%	0%	0%	2%	1%	2%	1%	1%	3%	3%	1%
5	Other revenue	11%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	Loan/grant from donors	79%	84%	56%	52%	46%	22%	10%	7%	0%	0%	0%	0%
7	Adjust exchange rate	-7%	-3%	0%	0%	-2%	-1%	-1%	0%	0%	0%	0%	0%
	Total Revenue	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
a	**National Roads**	**98%**	**94%**	**92%**	**91%**	**83%**	**70%**	**62%**	**52%**	**70%**	**54%**	**48%**	**69%**
	Rountine Maintenance Work	0%	2%	7%	6%	6%	13%	41%	33%	22%	10%	19%	10%
	Periodic Maintenance Work	97%	89%	55%	56%	39%	37%	4%	4%	5%	3%	4%	23%
	Rehabilitation	0%	0%	7%	4%	12%	7%	0%	1%	4%	4%	8%	30%
	Emergency	0%	2%	15%	18%	19%	8%	13%	11%	38%	35%	13%	4%
	Bridge Maintenance	1%	2%	7%	7%	8%	5%	4%	3%	1%	2%	3%	1%
	Construction Work	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%
b	**Local Roads**	**0%**	**2%**	**2%**	**4%**	**12%**	**24%**	**32%**	**43%**	**26%**	**43%**	**49%**	**28%**
	Rountine Maintenance Work	0%	0%	0%	2%	0%	0%	9%	7%	1%	1%	1%	1%
	Periodic Maintenance Work	0%	1%	1%	0%	8%	17%	15%	14%	15%	27%	23%	11%
	Rehabilitation	0%	0%	0%	1%	2%	6%	4%	5%	7%	10%	12%	9%
	Emergency	0%	1%	0%	0%	1%	0%	3%	10%	1%	3%	5%	1%
	Bridge Maintenance	0%	0%	0%	0%	1%	1%	1%	3%	0%	1%	1%	0%
	Construction Work	0%	0%	0%	0%	0%	0%	0%	4%	2%	2%	6%	6%
c	5% fuel tax to VUDAA	0%	0%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%
d	Compensate on parkig fee to VUDAA	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%
e	Road fund administration	2%	3%	5%	5%	3%	4%	4%	3%	3%	2%	2%	1%
f	Weight control station construction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
h	Road safety	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
	Total Expenditure	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

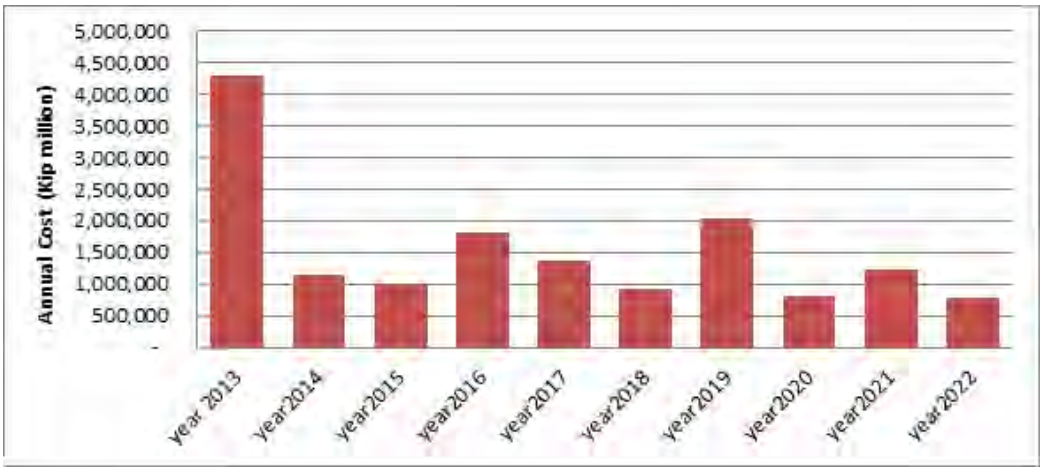
14.1.5 Future Maintenance Needs by RMS Analysis

703. The Public Works and Transport Institute (PTI) prepares an Annual Road Asset Report each year, which explores the current road status and analysis on the future maintenance needs. The latest report was prepared in February 2014.

704. The following discussion summarizes the key findings on the maintenance needs, from the Annual Road Asset Report.

705. The figure below shows maintenance needs for both national and local roads over 10 years. The total maintenance needs over 10 years are estimated at about 15.8 trillion LAK (1.97 billion USD, **average of 197 million USD per year)**. A majority of the maintenance needs falls within the first year. As the analysis is carried out with no budget constrain assumption, the majority of this backlog maintenance is included in the first analysis year.

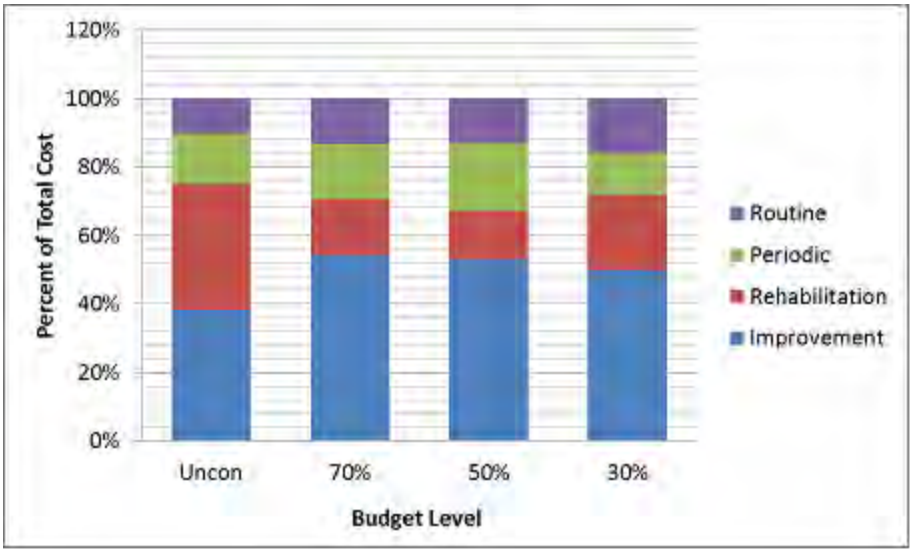
Table 14-7 Annual Maintenance Costs - Unconstrained Assumption



Source: PTI (2013) Annual Road Asset Report

706. As the MPWT, like any other road administration, experiences budget constraints, the needs are analysed for different budget levels (no constraint, 70%, 50% and 30% of the cost needed). The figure below shows the distribution of the budgets between the maintenance/improvement works. As the budget constraint is increased, the portion of the routine maintenance is increased, which implies that the routine maintenance generate more economic benefit than other type of maintenance works and should be given the priority when allocating the maintenance fund. The combined routine maintenance needs for roads and bridges are 850 billion LAK over the 10 years (106 million USD, **average of 11 million USD per year**).

Table 14-8 Maintenance Budget Distribution under Different Budget Levels



Source: PTI (2013) Annual Road Asset Report

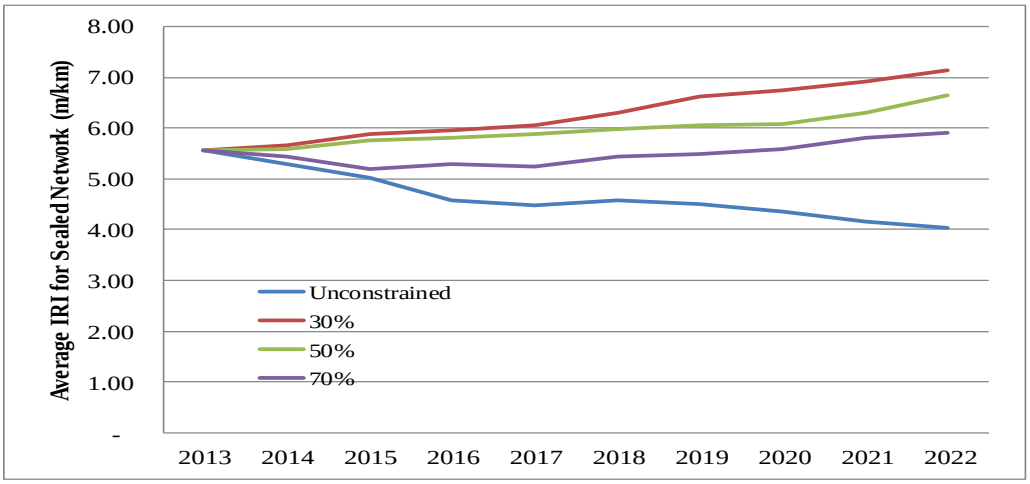
707. The figure below shows the maintenance needs distributed on road class and asset type (roads or bridges). National roads require the total maintenance cost of 4.9 trillion Kip over 10 years (614 million USD, **average of 61 million USD per year**), where local roads require 10.9 trillion Kip over 10 years (1,363 million USD, **average of 136 million USD per yea**r).

Table 14-9 10-year Maintenance Costs - Unconstrained Assumption

Type	National Roads [m Kip]		Local Roads [m Kip]	
Routine maintenance	513,950	10%	338,289	3%
Periodic maintenance	2,399,526	49%	2,809,293	26%
Rehabilitation and Improvement	1,999,690	41%	7,789,548	71%
Total	**4,913,166**	**100%**	**10,937,130**	**100%**

Source: ADB Consultant based on PTI (2013) Annual Road Asset Report

708. The figure on next page shows the development in road condition (roughness) under the above mention budget constraints. Under unconstrained budget assumption, the roughness index would improve from 5.6 in 2013 to 4.0 in 2022. Under the assumption of budget level of 30% of the total needs, the roughness index would continuously increase over the period to 7.0 in 2022.



Source: PTI (2013) Annual Road Asset Report

Figure 14-1 Roughness Development under Different Budget Levels

14.2 Recommendation for revenue growth in RMF for Sustainable Road Asset Management

14.2.1 Key Findings

709. The issues of the present revenue and expenditure situation on the RMF are profound as listed below.

- **The RMF is seriously underfunded to meet the road maintenance needs.** As discussed above, the maintenance of both national and local roads requires the average of 197 million USD per year over the next 10 years. The revenue of RMF in 2012/13 (48 million USD) covers only 25% of the maintenance needs. Assuming that the revenue of RMF increases at the same rate as in the last 5 years (20% per annum), the average revenue of RMF in the next 10 years (125 million USD) could cover 63% of the needs;
- The source of RMF, written in its degree and guideline, varies widely; however, **the actual fund revenue heavily relies solely on the fuel levy**. In 2012/13, the revenue from the fuel levy contributed to 97% of the total fund revenue;
- The amount and proportion of fund expenditures to road class/maintenance type differ year by year. It implies that there seems **neither policy nor strategic approach to determine which road/which type of maintenance/rehab should be given priority to allocate the Fund**;
- **Proportional distribution (nearly 80% for national roads and 10% for local roads) suggested by the decree and guideline on the RMF seems neglected**. Nearly half of the funds were allocated for the maintenance of local roads in recent years. During these years, surface condition of national roads deteriorated due to the shortage of funds for maintenance;
- **Needs for emergency works are unpredictable, which gives road administrators difficulties to prepare the optimum budget plan;**

- Although the decree and guideline on the RMF limit the use of Fund to maintenance/rehabilitation/emergency works, **considerable amount of the Fund is allocated for construction works**;
- Each year the RMF income has a budget ceiling imposed by the National Assembly, which puts the cap of the RMF annual expenditure. Thus the sums in excess of the budget ceiling paid by the road users and intended for roads maintenance are unused and left idle in the RMF accounts or used for other purposes.

14.2.2 Recommendations for Revenue Growth in the RMF

710. The aim of this first set of recommendations is to enhance the funding capacity of the RMF, through increasing and restoring the levy and charges of the Fund and introducing new source of the fund revenue.

- **The rate of the fuel levy should be increased to an acceptable level by road users and local industries.** When the RMF was introduced in 2001, the rate of the fuel levy was designed to increase from 40 Kip per liter to 800 Kip per liter by 2009. However, due to the hike of fuel price in the market, the government failed to increase the rate as originally planned. It is understood that the government would like to maintain the fuel price below 10,000 Kip per liter, considering public interests and the fuel price in neighboring countries such as Thailand. Having said so, the current rate (420 Kip per liter) of the levy is still at a low level, accounting only for 4% of the fuel price in the market. The hike of the fuel levy charge could obtain public support, demonstrating the benefits that the road users can enjoy;
- **The vehicle registration charges, including transport service fees, should be consolidated into the RMF.** The number of vehicles imported and registered in Laos has annually increased at over 10% the recent years. This trend is expected to continue since Laos is predicted to enjoy a strong economic growth at 7% per annum in the coming years and local purchasing power is to increase accordingly. The charges on vehicle registration and transport service fees should be re-considered and consolidated into the RMF;
- **Operation of toll gates and weigh stations should be reinstalled.** Following the Prime Minister's notice on removal of obstacles to facilitate international trade, the MPWT terminated toll collection and operation of weigh stations across the country in 2011. Since then, more overloaded trucks are observed, which contributes to deteriorating of the road conditions in the entire country. The neighboring countries, such as Myanmar, still practices toll collection nationwide to maintain their roads and which does not show any evidence that the toll collection is a major obstacle to facilitate the international trade;
- **The taxes and surcharges proposed in the 2013 agreement should be imposed and consolidated in the RMF.** The new taxes and surcharges, including alcohol import levy, public transport service fees, are said not to contribute to increasing the fund revenue significantly. The level of these taxes and surcharges should be re-examined and acceptable and appropriate tax level should be proposed and agreed among the RMF advisory members;

- **The road maintenance can be a privately driven business.** In neighboring countries such as Myanmar and Cambodia, the operation and management of heavy loaded roads and/or high traffic roads are contracted out to the private sector. For instance, the entire trunk road network in Myanmar is operated and maintained by private contractors, which collect road user charge at every 100 km of the road section on the average. The benefit of this PPP-based road maintenance is the 'early inspection and early maintenance' which contribute to a reduction in lifecycle cost of the road asset. For instance, the contractors can maintain instantly when they find the defects along their roads without waiting for fund disbursement and the public sector can also minimize their burden only to monitor the contractor's performance. The same approach can be applied to the high traffic roads, such as NR-13 and NR-9. To do so, there needs to be a careful consideration on a fair level of the toll charge, which should not exceed the benefit that the road users can enjoy;
- **The cost sharing with local governments should be also considered to generate the road maintenance fund.** Another alternative source of the maintenance fund is the local government budget. The cost for road maintenance, -particularly that for local roads-, can be shared between the central government and provincial government(s). For instance, if the local government has urgent needs to maintain a certain local road, the local government secures, e.g., 50% of the total maintenance cost, from the general budget and the central government subsidize remaining amount of the cost from the Road Maintenance Fund. Although the local road, which the local government requests for the subsidy, needs to be carefully justified in terms of its necessity and priority, this approach also generate the road maintenance fund and prompt response to the local needs.

14.2.3 Recommendations for Effective Use of the RMF

711. The aim of the second set of recommendations is to improve effectiveness in use of the RMF.

- **There should be a long-term maintenance policy and strategy** which governs all aspects of the maintenance rules, including planning procedures, revenue generation, budget allocation, and performance control. It also provides directions to institutional and organizational development, which may assist on-going re-organization under the DOR (newly established Regional Office under the DOR will be responsible for planning and implementation of the national road maintenance). Following the long-term maintenance policy, in particular, the long or mid-term investment plan should be prepared, identifying the possible financial source of the Fund and appropriate allocation of the Fund by road class/maintenance method;
- **There should be also strict rules to determine how the Fund is utilized.** Looking at the allocation of the Fund in recent years, there seems no rule to determine which road/which type of maintenance/rehab should be given priority to allocate the Fund. As already suggested in the discussion paper, prepared under the World Bank supported Sector Planning and Management, (i) the RMF/DOR should regard the Annual Road Asset Report, prepared by the PTI, as its primary tool in preparing its annual program. (ii) the RMF should fully cover the needs for

routine, periodic and emergency maintenance, and then remaining funds can be utilized for other maintenance activities. Also, the DOR currently faces serious debt to major rehabilitation works conducted in recent years by the IOU[44] contracts, therefore, (iii) the expenditure should be strictly controlled and met within the revenue, which allows road administrator to secure sufficient funds for routine, periodic and emergency maintenance;

- As discussed in Chapter 15, **a fair and transparent procurement procedure also contributes to improving effectiveness in use of the Fund**. Also, **the maintenance business should be attractive to private contractors**, allowing a larger contract period/road length for creating an economy of scale and rewarding for good performance, in order to develop a competitive maintenance business;
- As discussed in Chapter 13, **both technical and financial capacities of middle and small contractors in Laos are still low and need to be improved**. Skilled staff and staff training as condition of registration/pre-qualification of contract, introduction of technical certificate, corporate bank/public bank support with government subsidies for innovative technology, lower import tax for commercial vehicles, etc. all contribute to improving capacities of middle and small contractors in Laos;
- **Low cost sealing technology should be introduced in Laos**. Many developing countries, particularly countries in Africa, have introduced a low cost sealing technology to low traffic volume roads. Fewer vehicles are observed on a majority of local road sections in Laos and a low cost sealing technology, together with development of manuals/guidelines, could contribute to reducing the maintenance cost on local roads;
- **RMS and PRoMMS should be improved and updated regularly**. Database update through condition and traffic surveys, update of unit cost/ VOC/ time value, calibration of the pavement models, revision of MCA, improvement of reporting system, etc. all contribute to improving quality of analysis results.

14.3 Long Term Technical and Financial Strategies for Sustainable Road Asset Management

14.3.1 Review of Donor Funded Projects

(1) WB initiatives

712. The World Bank, together with SIDA (Swedish International Development Cooperation Agency), embarked on a long-term program in 200 to improve road maintenance in Laos, primarily by strengthening road maintenance capacity at the provincial DPWTs. One of the key outputs of the program was the establishment of the Road Maintenance Fund (RMF) and the development of the Road Management System (RMS) and Provincial Road Maintenance Management System (PRoMMS) to help allocate funds and prioritize the maintenance needs in the country.

[44] IOU (I-Owe-You) contract: Build and transfer contract using the private fund. Currently, the GOL prohibits any IOU contract due to an increasing and large amount of the government's debt.

713. Between 2004 and 2010, the WB and SIDA financed Road Maintenance Program Phase 1 and Phase 2 (RMP1 and 2), aiming to (i) scale up the RMF financing mechanism to a sustainable level, (ii) operate efficient systems to manage road assets in all provinces, and (iii) expand institutional capacity at both central and local levels. In general, RMP 1 and 2 were able to realize much of their primary objectives and has provided a good foundation towards achieving sustainable road maintenance in the country. However, much is left to be accomplished in terms of capacity development and financial sustainability.

(2) KfW initiative

714. The Federal Republic of Germany, through KfW, has been supporting the road sector in Lao PDR since the early 1990s, with a focus since 2006 on rural infrastructure. Phases III, IV and V of the Rural infrastructure Program (RIP) have recently been finalized in Sayaboury, Attapeu and Xekong provinces and phase VI has just commenced in Saravan province. The main emphasis is on new construction and rehabilitation of local roads and bridges to all-weather standard, together with some rural markets and boat landing ramps. But RIP also aims to build local capacity through:

- OJT of DPWTs and OPWTs in road design and construction works;
- Capacity building for DPWTs and OPWTs in road maintenance management systems;
- Developing village participation in road maintenance;
- Training courses for DPWTs and local contractors on procurement and construction management;
- Training of Trainers (ToT) courses for DPWTs and OPWTs on management and road maintenance.

715. Under RIP-VI support is being provided to upgrade the facilities at, and build the training capacity of, the Public Works and Transport Training Centre (PTTC) to enhance MPWT's training capacity.

(3) JICA initiative

716. The JICA-financed Project for Improvement of Road Maintenance Capability in Lao PDR, known as CaRoL (Capacity Development for Road Maintenance in Laos) commenced in late-2011, and will continue for five years. The overall goal of the project is that roads and bridges in Laos will be properly maintained. It has three outputs:

- Maintenance planning ability for road and bridge maintenance is enhanced. CaRoL is currently completing a comprehensive nationwide updating of the road maintenance database (RMS + PRoMMS) and will subsequently work on more effective management of the database, including development of standard unit maintenance costs for planning, prioritization and monitoring of road maintenance;
- Technical manuals for road maintenance are enhanced. CaRoL will develop improved technical manuals for road maintenance, bridge maintenance and slope protection;

- Capability of physical road and bridge maintenance work in the pilot provinces is enhanced. This will be achieved through pilot rehabilitation and maintenance projects and on-the-job training (OJT) in two pilot provinces – Vientiane and Savannakhet.

717. The project is also emphasizing construction of asphaltic concrete road pavements as a means to reduce maintenance costs. The project also reviews and revises the Performance Based Contract (PBC) documents, which is being introduced in four provinces.

14.3.2 Proposed Strategy for Sustainable Road Maintenance Financing

718. As mentioned earlier, sustainability in road management can be attained through proper road asset management, and sustainable road asset management embraces all the processes, including policies, planning tool/database, financing and quality assurance in procurement and implementation. The proposed strategy for sustainable road asset management therefore varies from policy down to implementation aspects.

719. The following strategies cover all aspects of the maintenance procedures and are based on discussions in the earlier chapters and those in circulated Working Papers, and are confirmed through interviews with the concerned departments and donors, describing the content of the strategies, their timelines and potentially responsible department(s) to implement these strategies. These strategies were discussed and fine-tuned during meetings and discussions between the DDG of DOR, ADB, WB and PPTA Oct, 2014 to Jan, 2015.

720. Considering the purpose and activities of past and ongoing road maintenance projects supported by the different donors and their interests for inclusion in their future projects, the road maintenance strategies are distributed to responsible departments and potential supporting donors. These strategies are also proposed with timeline of short-term (to be accomplished within 1-2 years), mid-term (within 3-5 years) and long-term (6-10 years).

721. The following table summarizes the PPTA Consultant's proposal on road maintenance strategies and potential supporting cooperation partners.

Table 14-10 Preliminary Road Maintenance Strategy

Proposed Strategies	Timeline	Involved Department	Supporting Donors (Tentative)
(1) Policy			
S-1: Development of maintenance policy: Institutional arrangement to equip the MPWT with all aspects of maintenance development directions, including planning procedures, revenue generation, budget allocation, and performance control	Short-term	DPC/DOR	WB
(2) Legal framework			
S-2: Revision of the decree on the RMF: Institutional set up to follow conditionality to achieve optimum fund allocation (national roads vs. local roads, routine/periodic maintenance vs. rehab./improvement) and set up proper decision making mechanism	Mid-term	RMFB/DPC・DOF/DOR	WB/ADB
S-3: Development of PPP bylaw/regulation: Institutional arrangement to enhance private sector investment for road improvement and maintenance in line with MPI's PPP law	Mid-term	DPC/ DOR	WB/ADB
S-4: Revision of the regulation on axle control: Institutional arrangement to improve enforcement of the axle control through e.g., maximum loading capacity, green-light company, sampling rate based on risk analysis, enforcement for overloaded trucks, revision of fine, etc.	Short-term	DOT/DPWT	ADB
(3) Planning and budgeting			
S-5: Development of long-term maintenance plan/mid-term investment plan: Institutional arrangement to foresee future maintenance needs under several scenarios in line with RMS analysis	Short-term	DOR/DPC/PTI	WB
S-6: Development of system for maintenance unit cost analysis: To equip the MPWT to develop/update market-based maintenance cost	Short-term	DOR/DPWT	ADB
S-7: Improvement and update of GIS-based road reference data: To establish a system to maintain road maintenance inventory database to enhance transparency in road asset management	Mid-term	DOR/Cabinet Office/PTI	WB/ADB
S-8: Revision of road classification/ numbering /standards: To conform recent and on-going administrative change and institutional reorganization	Mid-term	DOR	ADB
S-9: Improvement of RMS/PRoMMS: To improve maintenance planning tools through e.g., Update of unit cost/ VOC/ time value, calibration of the models, interface with web-based road database under ICT project, exporting data for WB/ADB's disaster project, revision of MCA, improvement of reporting system	Short-term	PTI/DPWT	JICA

Proposed Strategies	Timeline	Involved Department	Supporting Donors (Tentative)
(4) Procurement			
S-10: Development of PPP bidding/contract documents: For road improvement and maintenance in line with PPP bylaw/regulation	Mid-term	DOR/DPC	WB/ADB
S-11: Improvement of standard bidding/contract documents: Harmonizing with multi-donor standards	Mid-term	DOR	ADB
S-12: Revision of technical specifications: Road and bridge design manual, prepared in 1996, to be revised in line with international (AASHTO) and ASEAN standards	Short-term	DOR/DPWT	ADB
S-13: Revision of PBC bidding/contract documents	Short-term	DOR/DPWT	ADB
S-14: Development of procedures in community-based contracting	Short-term	DOR/DPWT	KfW/ADB
S-15: Improvement of private contractors registry/database: Through revision of contractors registration, introduction of technical certificates, set-up of Engineers Registration Board and/or Contractors Registration Board	Mid-term	Private Contractors/ DOR/DPWT	JICA
S-16: Improvement of tendering capacity for private contractors	Short-term	Private Contractors/ DOR/ DPWT	ADB
(5) Implementation			
S-17: Improvement of quality/quantity assurance and procedures: Includes routine/periodic inspection under PBC, procurement of VIMS for performance evaluation, reporting system and payment approval procedures	Short-term	DOR/DPWT	JICA
S-18: Development of community based maintenance techniques: Includes preparation of manuals for labor-based road maintenance, procurement of equipment, set-up/management of Village Maintenance Committee	Short-term	DOR/DPWT/ OPWT	KfW/ADB
S-19: Improvement of national/local road maintenance techniques: Includes development of technical maintenance manuals and operational guideline of PBC, development of training materials, contract management, site supervision, quality control	Short-term	DOR/DPWT/ OPWT	JICA/KfW/ADB
(6) Monitoring and Evaluation			
S-20: Development of monitoring and evaluation function in road maintenance implementation: Through publication of quarterly and annual report, regular RMF advisory committee meetings, internal and external audit	Mid-term	DOI/DOR	WB/ADB

Note: DOR - Department of Roads, DPC - Department of Planning and Cooperation, RMFB - Road Maintenance Fund Board, DPWT - (Provincial) Department of Public Works and Transport, OPWT - (District) Office of Public Works and Transport, DOI - Department of Inspection, DOF - Department of Finance, DOT - Department of Transport, PTI - Public Works and Transport Institute

Source: ADB Consultant

CHAPTER 15 CAPACITY BUILDING & GOVERNANCE STRENGTHENING

15.1 Issues Identified in Road Asset Management

15.1.1 Issues on Procurement and Governance in Road Asset Management

722. The MPWT as a whole is undergoing reorganization and restructuring in line with the ongoing and upcoming road maintenance projects under different multilateral donors e.g. ADB, WB, JICA etc. With the foregoing, personnel and staff are being reshuffled and assigned to new positions, hence the absence of fixed and orderly organizational arrangement to date. For example the Regional Road Maintenance Project (RRMP) which was established in 2013 has no clear mandates as to date. The DOR-MPWT is currently revisiting and revising the mandates of the said RRMP and until such time that a resolution or decree of the Minister has been executed, all the responsibility in road maintenance project implementation falls on the DOR and DPWTs. The RRMP responsibility as stipulated in the Minister's letter to the all department's director general is only to monitor and coordinate the various road maintenance and improvement projects.

723. The Procurement Risk Assessment (PRA) questionnaire's answers showed that the MPWT-DOR and DPWT's have sufficient knowledge in terms of public procurement. However, only MPWT-DOR has an ADB-funded project experience and the DPWT's though having other multilateral donor's funded project, relied on the assistance of consultants in terms of procurement. Hence, DPWTs' personnel have just basic knowledge on multilateral funded projects' procurement process. With this situation in the MPWT and DPWT's, the current reorganization/ restructuring and revision of mandates of the RRMP are very important. It is only when this reorganization and revision of mandates has been realized that institutional capacity can really be fully determined and identified. However, it can be noted that all assistance in terms of training and guidance on procurement still can be arranged for the concerned DPWTs, RRMP and MPWT-DOR.

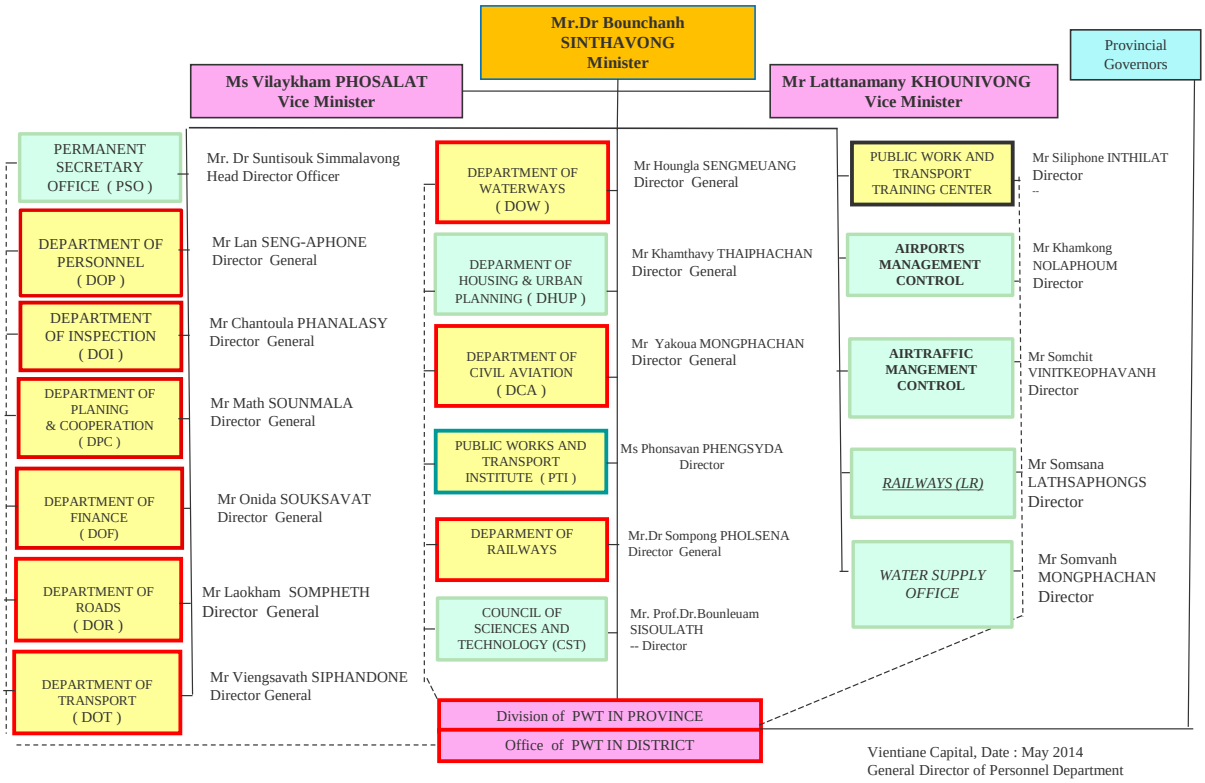
(1) Legal Framework

724. It is imperative that the MPWT comes up with the legal framework in which the RRMP functions will be stipulated and show RRMP linkages/connection to the other MPWT departments and DPWT. The framework should also list the function, delegation of duties and responsibility of DOR, DPWTs and RRMP.

725. There is no established permanent procurement unit at the MPWT. A procurement committee (PC) is established on a need or project basis through a decree by the Minister. Selection of procurement committee members is not based on qualifications/experience on procurement but more on the staff position and involvement in the projects.

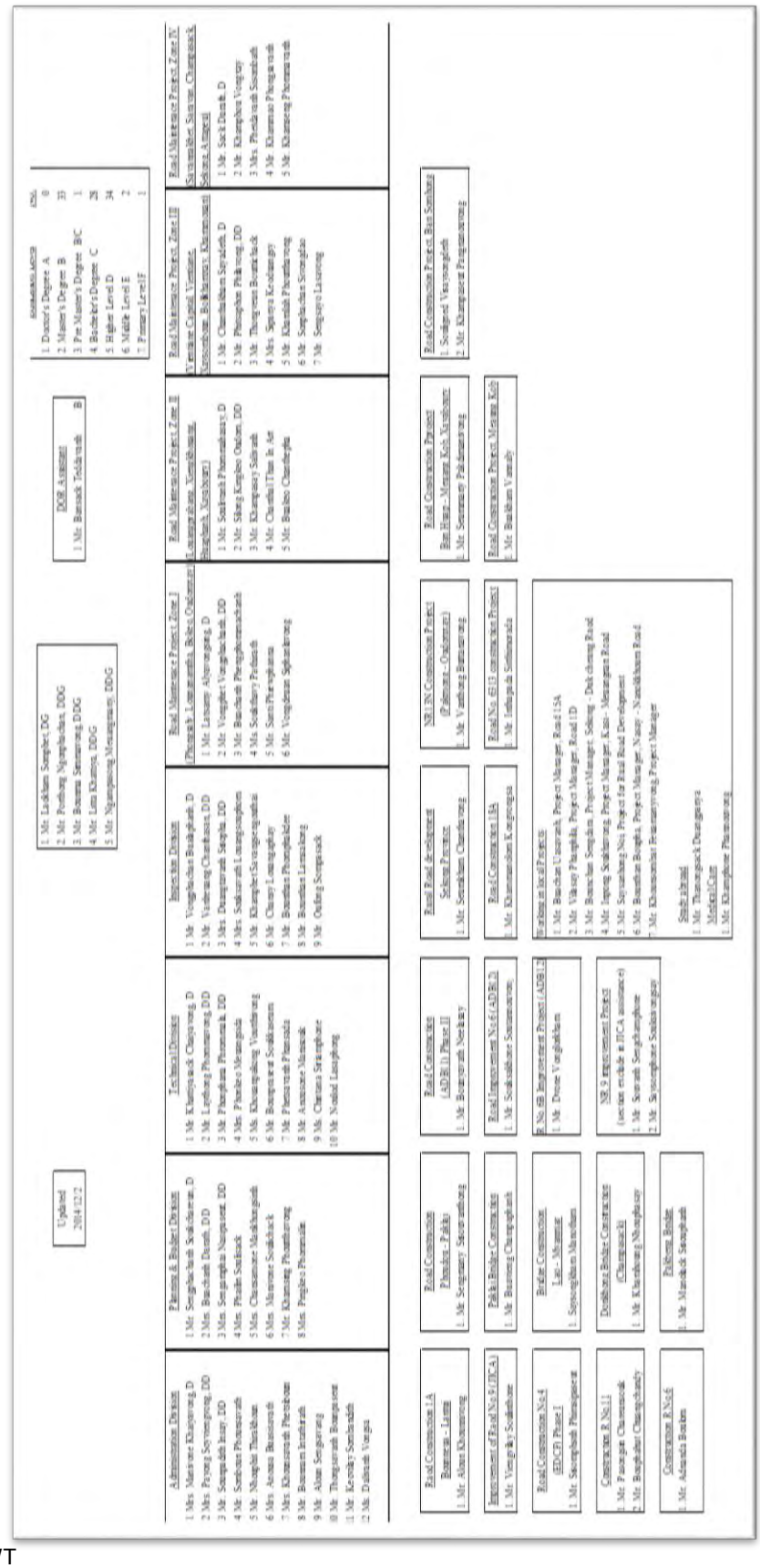
(2) Organization

726. The current organization of MPWT-DOR shows that the RRMP is under the jurisdiction of DOR (see below organization chart of DOR and MPWT). The current organization does not clearly identify the linkages of various divisions specifically the RRMP to the provincial DPWTs. Likewise in DPWTs organization, its connection to RRMP is not clearly reflected hence there is confusion on the real function of the RRMP. This should also be clarified in the ongoing drafting of RRMP mandates.



Source: MPWT

Figure 15-1 MPWT Organization Chart



Source: MPWT

Figure 15-2 DOR Organization Chart

(3) Support and Control

727. MPWT is the custodian of all road networks in Lao PDR. DPWT supports the MPWT in all road related activities e.g. construction, rehabilitation and maintenance. With the establishment of Regional Road Maintenance Project (RRMP), added support and control was put in place. However as mentioned above, mandates and functions of this unit is not yet finalized and institutionalized. The MPWT clearly needs to fast track the finalization of the RRMP mandate before the effectiveness of the loan.

(4) Record Keeping

728. The current record keeping of the MPWT, DOR and DPWT is on a project basis. No centralized record keeping system is in place. A more efficient and systematic record keeping is important for any organization's effective operations, especially in the procurement area. Systematic record keeping will make monitoring and auditing easier.

729. The establishment of procurement unit will play an important role in record keeping. This unit can be tapped to be the custodian of all records related to procurement from procurement plan, requisition, correspondences, minutes of meetings, bid documents, bid evaluation reports, contract awards and contract implementation documents up to contract closing reports. This way, there would be a complete set of documentation pertaining to a certain contract package. Referencing system could be generated easier, if there is a centralized record keeping mechanism. This will also improve the agency's operation and monitoring capacity.

(5) Procurement Capacity of Staff

730. MPWT, DOR and DPWT have adequate staff and personnel; Most of these staffs are not familiar with procurement, which is further complicated by most of them not being proficient in English. Only staff who has been involved in projects are familiar in procurement, its processes and procedures although they have not been fully engaged in the procurement activities, due to the presence of consultants recruited doing the work for the agency.

731. These staff should be tapped and capacitated to conduct procurement activities to institute professionalization, continuity and sustainability in procurement staffing.

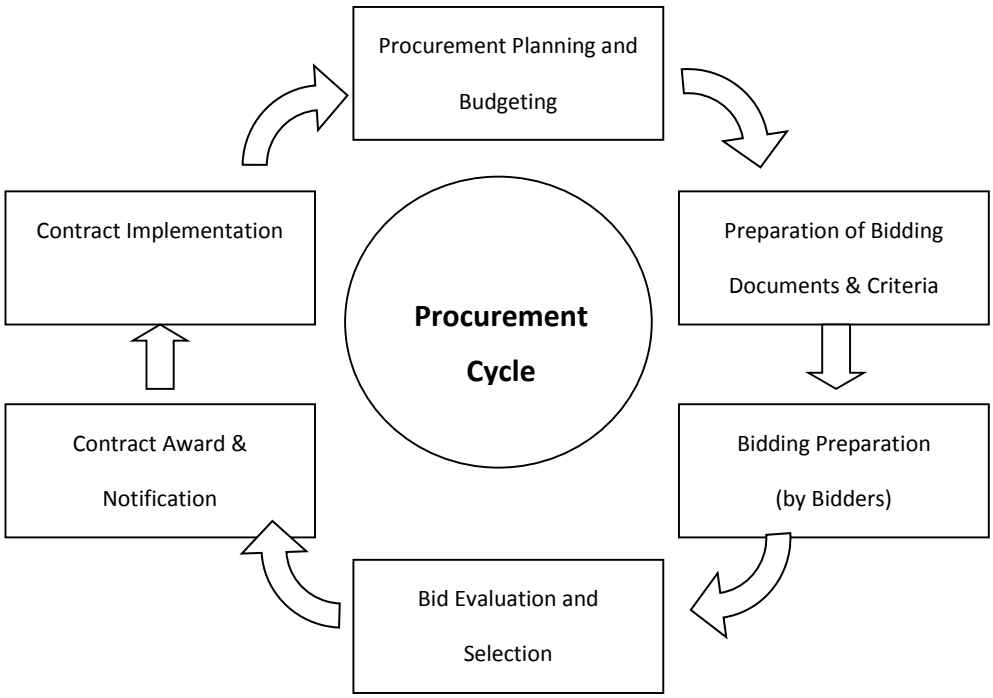
732. Capacitating the staff can be done through trainings/workshops and hands-on participation in all procurement activities. A continuing and regular training on different types and stages of procurement should be included in the agency's priority and project planning.

(6) Procurement Planning

733. Procurement planning in the agency starts at the district and provincial level. The DPWT's are tasked to submit their procurement plans during the annual public works and transportation meeting. The procurement plans takes into consideration the budget allocation and availability for each province; hence the DPWT has to prioritize the road maintenance project in terms of its conditions, accessibility and importance to the road network.

(7) Procurement Cycle

734. Procurement cycle shows the key stages in which goods, works and services are acquired which normally starts at drafting of the procurement plan together with budgeting and scheduling and setting out priorities in terms of project implementation. The standard procurement cycle is as shown below:



Source: ADB Consultants

Figure 15-3 Procurement Cycle

735. The current cycle of MPWT procurement process involves pre-registration of contractors by submitting pertinent documents e.g. legal documents on the establishment of the contractor, financial documents and list of previous contractual experiences including copies of contracts. Contractors that are not registered are not allowed to join any bidding process under MPWT.

15.1.2 Institutional Capacity Risk Assessment

736. The MPWT down to its different departments has to improve its institutional and organizational set-up. All the departments have to have clear and distinct mandates so as not to overlap duties and responsibilities but to complement each other's function to operate efficiently.

737. The current set-up specifically on the Road Asset Management is still vague and does not fully identify whose responsibility the Road Asset Management and Maintenance is. This

has resulted in mismanagement/misuse of the Road Maintenance Fund, which is being used on construction/rehabilitation of roads rather than on maintenance works.

738. It is more of a rule than an exception that the prioritization of road maintenance and improvements are done without sufficient and comprehensive road network database, i.e. prioritizations are not based on current road conditions, which is necessary to correctly prioritize roads for maintenance.

739. Neglecting the road maintenance is regularly resulting in seriously bad road conditions that in turn makes the rehabilitation/reconstruction works more expensive compared to if early maintenance had been done.

15.1.3 Issues on Organizational Capacity in Road Asset Management

(1) General Organizational and Road Features

1) Road Class and Length under MPWT Jurisdiction

740. Laos currently has a road network of total length of 45,825 km with national roads accounting for 7,377 km. The national road network links major towns and provincial capitals and connects neighbouring countries. The rest of the roads include provincial, district, urban, rural roads and special roads (i.e. forestry and mining roads), accounting for remaining 38,448 km. Road lengths by road class are shown in the below table.

741. One of the notable features is that the road length under MPWT's jurisdiction has increased year by year and in the last 10 years it increased by 3-4% per year. This increase in the road length requires good planning to sustain the road asset in Laos.

Table 15-1 Road Classes with Lengths in Lao PDR

Code	Province	Road Length (Km) by Road Classes						Total (km)
		National	Provincial	District	Urban	Rural	Special	
1	Vientiane Capital	255.6	285.9	444.2	587.7	631.5	99.4	2,304.2
2	Phongsali	474.0	205.1	204.5	53.8	1,764.6	107.6	2,809.5
3	Louang Namtha	300.1	492.8	111.0	76.0	638.5	69.8	1,688.2
4	Oudomxai	314.5	303.3	452.9	60.4	555.7	12.8	1,699.6
5	Bokeo	175.7	264.9	150.3	64.7	524.6	13.2	1,193.5
6	Louang Phabang	608.0	565.1	301.7	102.4	1,651.2	175.1	3,403.4
7	Xaignabouli	528.9	874.8	505.8	238.9	754.6	182.7	3,085.7
8	Houaphan	446.0	579.7	504.7	75.1	2,080.5	395.9	4,081.8
9	Xiengkhouang	466.0	655.8	75.0	44.1	1,169.9	66.9	2,477.7
10	Vientiane	652.0	1,121.8	565.7	184.1	779.6	135.1	3,438.3
11	Bolikhamxai	510.0	608.1	325.8	65.1	517.4	31.0	2,057.5
12	Khammouan	594.2	315.6	436.0	161.0	1,838.1	47.2	3,392.0
13	Savannakhet	604.0	860.1	426.1	128.1	3,615.7	57.0	5,691.0
14	Salavan	428.4	198.0	324.9	74.1	1,239.8	33.0	2,298.1
15	Champasak	460.8	624.6	473.0	156.3	1,830.3	653.2	4,198.1
16	Xekong	201.6	64.4	281.3	54.5	277.6	7.3	886.7
17	Attapeu	358.0	189.1	60.0	89.4	388.1	35.7	1,120.4
18	Xaysomboun	DATA UNDER SURVEY						
Total		**7,377.7**	**8,209.0**	**5,642.7**	**2,215.6**	**20,257.6**	**2,122.7**	**45,825.4**

Source: TED/DOR

2) Road Density

742. The road density in Laos varies between provinces. The highest road density (0.59 km/km2) is observed at Vientiane Capital and lowest road density (0.11 km/km2) is at Attapeu and the average road density in Laos is 0.19 km/km2. In general, the maintenance cost increases where the road density is low, considering higher transport expenses, material cost and lower availability of quality local contractors.

Table 15-2 Road Density by Province

Code	Province	Road Length (km)	Area (km2)	Road Density (km/km2)
1	Vientiane Capital	2,304.2	3,920	0.59
2	Phongsali	2,809.5	16,270	0.17
3	Louang Namtha	1,688.2	9,325	0.18
4	Oudomxai	1,699.6	15,370	0.11
5	Bokeo	1,193.5	6,196	0.19
6	Louang Phabang	3,403.4	16,875	0.20
7	Xaignabouli	3,085.7	16,389	0.19
8	Houaphan	4,081.8	16,500	0.25
9	Xiengkhouang	2,477.7	16,358	0.15
10	Vientiane	3,438.3	22,554	0.15
11	Bolikhamxai	2,057.5	14,863	0.14
12	Khammouan	3,392.0	16,315	0.21
13	Savannakhet	5,691.0	21,774	0.26
14	Salavan	2,298.1	10,691	0.21
15	Champasak	4,198.1	15,415	0.27
16	Xekong	886.7	7,665	0.12
17	Attapeu	1,120.4	10,320	0.11
18	Xaysomboun	NA	NA	NA
Total		**45,825.4**	**236,800**	**0.19**

Source: ADB Consultant

3) Staffing and Road under his/her Jurisdiction

743. According to the Department of Personnel (DOP) of the MPWT, around 100 staffs work for the DOR and 326 staffs for the Road Division of the 18 DPWTs in Laos. The number of staff in the Road Divisions of the DPWTs also differs among provinces. Both Vientiane Capital and Vientiane Province have 35 staff in their road divisions but newly established Xaysomboun has only one staff assigned to manage local roads. Also, the road km per staff is quite distorted between provinces. Xekong has 22 staffs in the Road Division and each staff manages 31 km of the local road section on the average, whereas one staff of Houaphan manages 280 km of the local road section on the average. Again, the more staff per road section, the more management/administration cost is required to maintain their roads.

Table 15-3 Staffing by Province and Road

Code	Province	No. of Staff in Road Division (nos)	Total Km/Staff (km/nos)	Km of Local Roads/Staff (km/nos)
1	Vientiane Capital	35	66	59
2	Phongsali	15	187	156
3	Louang Namtha	14	121	99
4	Oudomxai	18	94	77
5	Bokeo	13	92	78
6	Louang Phabang	18	189	155
7	Xaignabouli	11	281	232
8	Houaphan	13	314	280
9	Xiengkhouang	19	130	106
10	Vientiane	35	98	80
11	Bolikhamxai	22	94	70
12	Khammouan	12	283	233
13	Savannakhet	21	271	242
14	Salavan	15	153	125
15	Champasak	22	191	170
16	Xekong	22	40	31
17	Attapeu	20	56	38
18	Xaysomboun	1	NA	NA
Total		**326**	**141**	**118**

Source: DOP, ADB Consultant

(2) Overall Maintenance Procedures

744. Key stakeholders in the road asset management in Laos include DOR, PTI, DPWTs, RMFB (Road Maintenance Fund Board) and PTTC (Public Works and Transport Training Center). DOR functions to oversee all the maintenance procedures, setting visions and strategies, developing long-term and annual investment plans, managing the maintenance works (procurement, monitoring and evaluation) of the national roads. DPWTs like the DOR, functions to manage all the maintenance works of the local roads and part of maintenance management (daily inspection, survey and preparation of BOQ) of the national roads. PTI is the system manager of the maintenance planning tools (RMS and PRoMMS) which collects and analyses road/traffic data and prepares the road asset report. RMFB is tasked to monitor the road maintenance procedures, mobilize funds and keep the public informed. PTTC is a focal for training both central and local staff in road asset management.

745. The major activities of each department (excluding PTTC) are summarized by calendar month as shown in table 15.4. However, according to the interviews with concerned departments, most of these activities tend to be delayed behind the schedule, which adversely affects timely implementation of the road asset management. Moreover, some activities tend to be ignored and are not in place, which results in fragmentation among the activities of concerned departments in road asset management.

746. The maintenance planning work at DOR and PTI is not well coordinated, considering the budget cycle of the Lao Government. The DOR, in general, starts to prepare the maintenance budget plan of the following financial year in June-July and the proposed budget plan is approved by the national assembly by September. Ideally, the RMS/PRoMMS data analysis needs to be available in June when the DOR starts the planning woks. However, the actual practice in recent years shows the PTI was able to provide the result of the RMS/PRoMMS analysis to DOR only in October 2013 and in December 2014 due to delay of the budget disbursement for data collection survey for RMS and excessive time spent for data validation. This resulted in that the RMS/PRoMMS analyses were not used for the maintenance planning during the last two years.

747. The procurement of the local contractors generally starts in October when the budget is approved and a new financial year starts. However, past experience in Laos shows the procurement of local contractors is delayed and always requires considerable time for internal approval process. More time has been spent on procurement during the dry season (October to May) and therefore, less time has been spent for the physical maintenance works during the dry season, which is the optimal time for maintenance activities. Sometimes, the contractors have needed to implement major maintenance works during the rainy season, which adversely affects the quality of maintenance works.

748. The RMFB does not function as it should. The RMF Secretariat is comprised of its Director, a finance manager, an accounts assistant and a secretary. In 2014 the finance manager was also acting Director of the Unit, so the total staff was down to three. The pressures on the small staff have multiplied since 2008 – about 400 maintenance contracts a year are being let. This in turn means that the Secretariat is not in a position adequately providing support and guidance to the RMFB, which appears to function only sporadically. Accordingly, the DPC has now been mandated a key role in MPWT in establishing the long-term and annual expenditure plan of the Fund.

749. All the departments, including DOR, DPWTs, PTI and RMFB, have responsibility to monitor the performance of their works. DOR and DPWTs, for instance, prepare the progress reports and evaluation reports regularly and the PTI prepares the annual road asset reports and RMS analysis reports. However, there seems not be any two-way reporting and approval mechanism between concerned departments. For instance, the PTI submits the report to the DOR but there is no check and balance function to ensure the DOR uses the PTI's report for preparation of annual maintenance plans. The RMFB is unable to provide any reports, including meeting minutes.

Table 15-4 Maintenance Procedures Used by Different Departments

Month	PTI	DOR	DPWT	RMFB	Contractor
Oct	Plan data collection survey for national roads and bridges. Train out-sourced person(s) for data collection survey.	Procures and implements road and bridge maintenance works for national roads. Request DPWT for collection of road and bridge inventory and condition data for local roads.	Procures and implements road and bridge maintenance works for local roads.		Maintenance works
Nov	(Data collection)	Oversees and supervises works contract procurement and implementation on national roads.	Oversees and supervises works contract procurement and implementation on national roads. Collection of road and bridge inventory and condition data for local roads.	Quarterly meeting	
Dec	(Data collection)	Ditto	Ditto		
Jan	(Data collection)	Ditto	Ditto		
Feb	(Data collection)	Ditto	Ditto	Quarterly meeting	
Mar	Receive data from DPWT. Checks and validates surveyed data for national and local roads and bridges.	Ditto	Analyses maintenance needs and prepares an annual maintenance works programs for local roads and bridges .(using PRoMMS)		
Apr	Consolidate all road and bridge information.	Ditto			
May	Ditto	Ditto		Quarterly meeting	
Jun	Analyze RMS and prepare Annual Road Asset Report and Analysis Result Report	Participates in the strategic expenditure analysis and multi-year programming performed by PTI.	Recommends to DOR sections of the national road network to be maintained. Undertakes detailed project level surveys of road sections included in the annual work program for national roads.		(Rainy season)
Jul	Submit Annual Road Asset Report and Analysis Result Report to DOR	Prepares annual maintenance works program for national roads and bridges based on input from RMS.	Ditto		
Aug	Prepare a budget plan for data collection survey for national roads. Submit the budget plan to DPC/DOF.	Prepare evaluation report on the road and bridge maintenance works and submit to MPWT/RMFB.	Prepare progress report (evaluation report) on the road and bridge maintenance works and submit to DOR	Quarterly meeting Approve budget plan by MPWT/RMFB.	
Sep				Approval budget plan by National Assembly.	

Source: ADB Consultant

(3) Maintenance Planning

750. Two road management planning tools, originally developed by the World Bank and SIDA, are used primarily for prioritization of road sections/maintenance methods: the Road Management System (RMS) for the national road network and the Provincial Road Maintenance Management System (PRoMMS) for the local roads.

751. RMS was developed in 2003 by the World Bank, comprising a road information database, initially for the national roads in Laos. The system also comprises a number of analysis modules, most importantly Pavement Management System (PMS). The PMS analyses maintenance and rehabilitation needs for national roads and optimize these under given budget constraints. The PMS, using the HDM-4 as the analysis engine, can output strategic expenditure plans over 10 years.

752. PRoMMS was developed in 2001 by the SIDA. The system comprises a road database, mainly for provincial, district and rural roads. In 2009, the system was enhanced to also store information on urban roads. An analysis module can analyse the immediate maintenance needs and prioritize these under budget constraints. This outcome, a one-year maintenance program, is designed to be used by the DPWTs in preparation of their annual maintenance plans.

753. Unfortunately, these comprehensive maintenance planning tools are not fully utilized due to a number of reasons, identified through the interviews:

- The capacity level of system operators, especially at the provincial level, is still very low. The PRoMMS data collection is regularly done at each DPWT; however the PRoMMS data analysis is seldom carried out at the DPWT. Currently, analysis of PRoMMS data is done centrally by the PTI and the DPWTs have a limited responsibility;
- The duties of DPWTs in maintenance planning are left as data collectors and data providers, which has resulted in that the DPWTs having low interests in providing quality data. According to JICA's CaRoL Project, some DPWTs only occasionally conducted the data collection survey and instead they submitted the same data they submitted the previous years. The data submitted by the DPWTs also regularly have several logical errors, which require a considerable time to fix in order to get a clean master database. There are also other constraints; for instance, (i) the DPWTs are understaffed to implement the surveys, (ii) the DPWTs are not well equipped to implement the surveys, and (iii) technical skill and knowledge of the DPWTs are still low in maintenance planning;
- The system improvement and data update work still heavily relies on donor assistance. Since the WB and SIDA phased out from maintenance projects in 2009, both the system and database have been neglected. Although JICA, through the CaRoL Project, took over the responsibilities to maintain the system and database, there is still no self-sustainable mechanism on place.

(4) Maintenance Budgeting

754. Since established in 2001, the RMF contributes to providing a considerable amount of funds for maintaining both national and local roads. However, RMF is still seriously underfunded to meet the road maintenance needs, and considerable amount of the Fund is

allocated for construction works instead of maintenance works. See the detailed discussion in the Chapter 14 'Institutional Issues for Sustainable RAM'.

(5) Performance Monitoring and Evaluation – DOP, JICA and KfW's Organizational Performance Evaluation

755. DOP conducted an organizational performance evaluation in 2013, through a structured questionnaire survey. The objective of this evaluation was to assess the organizational capacity of the DPWTs and to develop the training plan for management staffs in the DPWTs to increase skills and knowledge of the management staff and hence enhance the organizational capacity. Although the area of this evaluation was not limited to the road asset management, but covers also general organizational capacities, it is worth being presented to draw the implications for better road asset management in terms of organizational capacity. Some of the findings of the organizational performance evaluation in the DPWTs are summarized below.

- Specified results, in the organization plan and objectives, are sometimes not in accordance with stated MPWT's policy priorities;
- Specified results are not measured in many cases;
- Specified results are not clearly assigned to respective DPWT and related to the job description;
- Planned and actual results are not shared within Government and concerned staff at central and local level;
- Specified reports are not delivered on time and with specified quality and contents;
- Planning process is not based on systematic planning tools such as PRoMMS;
- Information system is not effectively used for monitoring targets and reviewing strategy;
- The role and responsibilities in planning, monitoring and reporting are not clearly defined and widely used in practice;
- Planned budget allocations are not sufficient to meet agreed targets as specified in the programs;
- Cash release is not timely and does not match approved budget.

756. JICA, through the CaRoL Project, conducted a performance evaluation to assess the organizational capacity in the concerned departments, including DOR, DPWTs in target provinces, PTI and PTTC, related to the road asset management. The evaluation was carried out in 2014, through a structured interview survey, by ranking the current organizational capacity according to following ranking system:

> Level 1: Procedures/routines under development. Permanent staff targeted for the capacity building activity cannot /do not know how to achieve the result/ No guidelines or formats from central level.
>
> Level 2: Operated with external support. The result will be achieved provide that staff is fully support by the project (not sustainable).
>
> Level 3: Operated with limited external support. The result will be achieved that staff is periodically supported, or continuously supported to a limited extent (removal of

support will slow the pace at which the result will be achieved).

Level 4: Operated without external support. Capacity to achieve the result without support from the project (sustainability).

Level 5: All procedures fully functional without external assistance. Possible to strengthen capacity further at the end of the project.

757. Some of the findings of the organizational performance evaluation are summarized below.

- The departments in the central level, including DOR, PTI, and PTTC, have acquired relatively higher performance indicators, while the DPWTs in the target provinces have lower performance indicators in all aspects of the road asset management;
- The survey result suggested that the DOR and PTI have obtained the capacity at operational level with very specific area of external assistance and concluded that DOR and PTI are able to conduct their current routine duties;
- On the other hand, the DPWTs in the target provinces still requires capacity development, especially in the area of maintenance planning, technical skills and knowledge for physical maintenance works.

Table 15-5 Performance Evaluation Result, JICA CaRoL Project

Maintenance Procedure	DOR	DPWTs	PTI	PTTC
1. Data verification and analysis for planning	4.0	2.8	3.6	2.0
2. Maintenance planning	3.7	2.8	4.0	2.7
3. Procurement	4.0	3.3	NA	4.0
4. Performance monitoring and evaluation	4.0	3.2	NA	3.0
5. Maintenance skill and knowledge	4.0	2.7	NA	4.0

Source: JICA CaRoL

758. KfW, through a preparatory study for the RIP VI (Rural Infrastructure Program Phase VI), conducted a training needs assessment at the organizational level in road asset management and a series of structured interviews were conducted in the target provinces and districts to assess the organizational capacity. There are several constraints in road asset management cited during the interview survey.

- Lack of sufficiently trained and experienced staff;
- Lack of funds for maintenance, particularly for Community based Maintenance, for operating costs;
- Lack of vehicles, office equipment, field equipment to carry out the duties effectively.

15.1.4 Issues on Individual Capacity in Road Asset Management – Training Needs Assessment

759. DOP has also conducted an individual performance evaluation by the structured questionnaire survey in 2013 and collected 149 answer sheets from 17 different provinces. The objective of this evaluation was to assess the technical skills and knowledge of the individual DPWT staff in the Road Division by ranking the current technical capacity according to the system described on previous page (Level 1 – Level 5) and hence to develop a training

plan for technical staffs in the DPWTs to increase skills and knowledge of the technical staff and hence enhance their capacity. Some of the findings of the organizational performance evaluation in the DPWTs are summarized below.

- The technical staff in DPWTs obtained skills and knowledge in road asset management, with the capacity at operational level with limited external support (average rating of 3.1). However, the technical skills and knowledge of DPWTs staff are found much distorted between provinces and type of asset management works;
- For instance, the technical level for maintenance planning works (data collection, data analysis and maintenance planning by PRoMMS) is relatively lower than other asset management works. Also, the technical level of the staff in Oudomxai (average rating of 1.2) and Savannakhet (average rating of 2.5) is relatively lower than that of other provinces.

Table 15-6 Individual Technical Performance Evaluation [DOP 2013]

Province	Routine Inspection	Road Inventory	Maintenance Planning (includes	Budgeting and Financing	Selection of Maintenanc	Procurement	Supervision of Maintenanc	Accounting	Reporting	Average
Phongsali	3.5	3.7	2.9	3.3	3.7	3.4	3.4	3.2	3.2	**3.4**
Louang Namtha	4.0	4.0	3.5	2.0	4.0	4.0	3.5	2.7	3.0	**3.4**
Oudomxai	1.0	1.0	1.0	2.0	1.0	1.0	1.3	1.5	1.3	**1.2**
Bokeo	3.0	3.7	3.0	4.0	3.8	4.0	4.0	2.0	3.3	**3.4**
Louang Phabang	3.6	3.7	3.3	4.0	3.6	3.3	3.2	4.0	3.6	**3.6**
Xaignabouli	NA	NA	NA	NA	NA	NA	NA	NA	NA	**NA**
Houaphan	5.0	5.0	4.0	4.3	4.5	5.0	3.5	4.0	5.0	**4.5**
Xiengkhouang	3.7	2.7	3.3	3.5	4.0	3.5	3.7	3.3	3.3	**3.4**
Vientiane	3.5	3.3	2.8	3.5	3.0	3.3	3.4	3.4	3.4	**3.3**
Vientiane Capital	3.3	3.0	2.3	2.8	2.4	3.2	3.4	2.5	2.8	**2.8**
Bolikhamxai	3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0	**3.1**
Khammouan	3.3	3.3	2.5	3.0	3.2	3.3	3.7	2.0	2.5	**3.0**
Savannakhet	3.0	2.8	2.3	2.3	2.8	2.3	2.8	2.0	2.5	**2.5**
Salavan	2.8	3.0	3.2	3.7	2.8	3.0	3.7	3.3	3.2	**3.2**
Champasak	3.8	3.0	3.5	3.0	4.0	4.0	4.0	3.0	3.7	**3.5**
Xekong	3.3	3.1	2.8	2.5	3.1	3.1	3.5	2.9	3.5	**3.1**
Attapeu	5.0	3.5	3.0	3.5	4.0	3.0	4.0	2.0	4.0	**3.6**
Average	**3.4**	**3.2**	**2.8**	**3.1**	**3.2**	**3.2**	**3.4**	**2.8**	**3.1**	**3.1**

Source: ADB Consultants

15.2 Governance Strengthening and Capacity Building Plan

15.2.1 Governance Strengthening and Capacity Building Plan in MPWT/Donor Projects

760. Using the result of institutional, organizational and individual performance evaluation in road asset management, DOP, JICA and KfW developed the training plan, as summarized below.

(1) DOP's Training Plan

761. The DOP's Annual Training Plan 2014/15 consists of three main areas, including Strategic Management Training, Technical Training, and workshops and seminars covering the contract management, technical skills development, financial management, procurement, and safeguard compliance monitoring.

762. The training plan, especially the technical training, focuses on the governance strengthening/capacity building in all aspects (planning, procurement, and implementation) of the road asset management. The trainees for these technical trainings also vary from the central level to the local level, including the DPWTs and selected OPWTs.

Table 15-7 Governance Strengthening / Capacity Building Plan [DOP 2014-15]

No	Training topics	Training objectives	Target participants	Expected outcomes
I	**Strategic management training**			
1	Technical English training	To enhance the speaking, writing and presentation skills in technical English. Improve the English for procurement skills, the use of computer and internet skills in the workplace.	Deputy head, Head of section of the provincial DPWTs and Head of district OPWTs and selected technical staff who has a work related to the use of technical English skills.	Able to provide information, communicate and make presentation in English to the meeting and international conferences. Able to attend the meetings and seminars at local and foreign countries.
2	Effective management & administration for Middle Management	To improve the knowledge in management, administration, leadership and team building in the organization. Know how to manage and use of human resource, and other issues related to the HRD.	Directors of provincial DPWTs, Head of the selected section under DPWTs and OPWTs.	Know how to apply strategic management concepts in their work result to their work performance. Know how to manage their staff to a high performance outcome.
3	Training on inspection and internal control	To improve the inspection and internal knowledge and skills. To understand steps and procedure of internal control, and transparency	Deputy head of provincial DPWTs and Head of inspection units at DPWTs and OPWTs	Steps and procedures of inspection and internal control are in place and implementation has been done correctly.
II	**Technical Training**			
1	PROMMS training	To refresh the knowledge on data collection procedures, data collection forms, evaluate the data collection for maintenance purpose	Technical staff at provincial DPWTs and district OPWTs staff	Data collection information is timely in place .Data collection forms are available at all time, and submit to the authority concern on time.
2	Maintenance Planning and management of local road network	Technical staff at district OPWTs	Understand the maintenance planning procedure. improve knowledge in managing road works	Maintenance planning procedures are in place, PROMMS system is in place.
3	Capacity building of road maintenance for the 4 regions	To strengthen the management and cooperation capability of the directors of the 4 regions	Head and deputy head of the 4 regions , head of road section of DPWTs and OPWTs	The directors of the region have the capacity on road maintenance
4	Project administration and management for district OPWTs of Xiangkhouang province	To improve the capacity of the district staff on project administration and management at district level	Head and deputy head of the road section, head and deputy head of the OPWTs. technical staff responsible for road works.	The district staff have a capacity to manage road works activities

No	Training topics	Training objectives	Target participants	Expected outcomes
5	Rural road planning and maintenance	Update road planning and maintenance of district and village road technician	Head of DPWTs and OPWTs road section, road engineers and others	Capacity in road planning and maintenance improve, rural road in good condition
6	Site supervision for project managers	Strengthen the project management skills, work supervision and quality control	Site engineers, head of road section of DPWTs and OPWTS staff	Forms of site supervision are in place , road inspection quality , good road quality improve
7	E-document training course	To upgrade the knowledge of IT staff at MPWT and DPWTs in e-doc and E- staff , and ministry WWW	IT staff at MPWT	E-document is in place and utilize properly
III	**Workshop and other activities**			
1	Road Maintenance	Share ideas and improve maintenance capacity of district engineers	Technical staff of DPWTs and OPWTs of the road engineers	Knowledge of road maintenance improve, road in good condition
2	New employees workshop and training	To improve the understanding of MPWT mandate, transport rules and regulations	New employees both at central and provincial/district level	Understand the MPWT mandate, rules and regulation, civil servant regulation
3	FMS Yearly workshop	To share ideas and learn from different provinces on financial implementation	Head of DPWTs and financial staff	Financial system is in place and utilized, financial report is on time.
4	Vehicle inspection workshop for northern provinces	To improve the knowledge of Provincial and district PWTs in vehicle inspection and safety	Technical staff of DPWTs and OPWTs of transport section and technical staff of vehicle inspection agencies	Increase number of vehicle inspection , reduce road accidents
5	Study visit on gender carrier and development	To share ideas and learn from different culture on gender development and gender involvement in transport sector	Head of gender promotion division , gender staff and other agency concerned	Number of Gender have been involved in decision making process
6	Workshop on Public Works and Transport Inspection Authority	Disseminate of the mandate and establishment of PWTIA	Director of DPWTs , OPWTs and other related organization	Establishment of PWTIA

Source: DOP

(2) JICA's Training Plan

763. The governance strengthening/capacity building training under JICA's CaRoL Project concentrates on the technical aspects of the road asset management skill and knowledge. It covers routine patrol, inspection, evaluation and implementation of the road, bridge and slope maintenance works. The approach applied to the capacity building training is On-the-Job Training (OJT), using the pilot projects funded by JICA and MPWT. The trainees involved in JICA's training are not limited to the DOR/DPWTs but also include the private local contractors and PTTC.

Table 15-8 Governance Strengthening / Capacity Building Plan by [CaRoL Project]

Category	Items	Description	Frequency	Equipment/ References
Road Patrol	Safety & Routine	Routine Patrol shall be conducted to monitor the road conditions and remove the objects on the road in order to secure a road safety and maintenance of road structure.	Twice a week	Manual, Records Camera, GPS Logger, etc.
	Emergency Patrol	Emergency patrol shall be carried out to find the damage of road facilities and collect the fallen objects to secure passage of road at the disaster events such as during heavy rain, and tropical typhoon, in order to take appropriate measure. Also, when abnormal event such as traffic accident, was happened abnormal event, the prompt measure shall be conducted to secure safety traffic flow.	At emergency	Manual, Records
	Cleaning	① Road Surface Cleaning Cleaning of road surface shall be carried out to facilitate the drainage of water by removing the debris and stones along the shoulder near the road edge. The frequency of the cleaning shall be at least once a year in principle. ②Cleaning of sidewalk Cleaning of sidewalk should be carried out to secure safety of pedestrians and cyclist particularly on the way for school route by removing dust, stone and fallen leaves.	As necessary	Manual, Records, camera
Supervision of PBC	Visual Inspection	Surface type, pavement width, shoulder type, shoulder width, topography, photos	Annually	Contract, Manual, Camera, GPS logger
	Visual survey for Road condition	Surface integrity index, predominant defect, type of access constraint, predominant effect of constraint	after repair done by contractor	Contract
	Check the service levels (performance index)	To make sure of different service level in the contract requirement,; Road user service and comfort Road durability Management performance measures	Quarterly	Contract, VIMS Manual
Routine maintenance of AC	Routine Inspection	Routine inspection will be conducted to determine the sections to conduct detailed inspection by visual inspection in the vehicle. Condition ranking from A to D will be selected by each sub-section (1km). Ranking B to D will be the target for the detailed inspection.	Weekly	Inspection manual Inspection sheet Camera GPS Vehicle
	Detailed inspection	Detailed inspection will be conducted by tool and foot. Each defect will be identified, measured and recorded for planning of the implementation program of the repair work. The work will be done by lane. Traffic controller and safety tools will be arranged during work.	Dry: Monthly Wet: every 2 weeks	Inspection manual Inspection sheet Camera Tape & staff GPS Safety tools White board Vehicle

Routine maintenance of AC	Urgent inspection	Urgent inspection will be conducted by tool and foot after following events. (i) After Heavy Rain (ii) After Reports of Problems from Road users and/or Residents (iii) After Major Traffic Accidents Measurement of defects will be done for planning of mitigation measure due to above events.	Various	Inspection manual Inspection sheet Camera Tape & staff GPS Safety tools White board Vehicle
	Evaluation of defect & selection of treatment method	Inspected defects will be evaluated to classify the category of treatment methods namely routine maintenance and periodic maintenance. Treatment method will be determined in accordance with severity and extent of the defects.	Monthly or every 2 weeks (after detailed inspection)	Evaluation manual Inspection records Photos
	Repair work execution	The repair work with proper resources (labor, material, equipment) and procedure will be planned and executed. The work result will be recorded for planning of prospective maintenance program.	Dry: Monthly Wet: every 2 weeks	Execution manual Work record Camera Tool & equipment Safety tools White board Vehicle
Bridge Maintenance	Bridge Inspection & Inventory	Location data, bridge type, spans, span length (min/max), width of carriageway, wearing course type, max vehicle load, year of construction, photos	Annually	Manual
	Bridge condition (visual inspection)	Condition rating of each element, condition rating of bridge, damage description, replacement needs of each element, proposed maintenance works	Periodically	Manual Inspection tools
	Maintenance Repair	Condition rating of each element, condition rating of bridge, damage description, replacement needs of each element, proposed maintenance works	Annually/ Periodically	Manual
Road Disaster Prevention	Inspection & Inventory	Location data, slope type, length (cut/ embankment), section of carriageway, existing protection measure (natural vegetation or plantation, N/A), year of construction, photos	Annually	Manual
	Slope / drainage condition (visual inspection)	Clarification of slope failure, assessment of cause, seriousness of failure, damage description, requirement of countermeasure, proposed maintenance works	Periodically	Manual Inspection & Survey tools
	Maintenance Repair	The cleaning of drainages (gully and side ditch, etc.) should be carried out to keep smooth draining water by dust and cumulated debris. The cleaning of drainages where necessary shall be conducted once a year in principle. For slope failure, a suitable combination of countermeasures should be studied after assessment of slope failure and its mechanism, importance of the assets to be protected and cost effectiveness.	Annually/ Periodically	Manual

(3) KfW's Training Plan

764. KfW, through forthcoming RIP VI, will conduct a series of trainings for road maintenance management and for climate adaptation for rural infrastructure. These trainings cover all aspects of the road asset management procedures, including planning, budgeting, design, procurement, and supervision and reporting works. Since the RIP emphases community involvement for the local road maintenance, much of these trainings are related to Community-based Maintenance. The trainees are mainly staff from DPWTs and OPWTs in the target provinces/districts.

Outline Training Specifications for Road Maintenance Management

1. Road Network Management (optional), 2. Local Road Maintenance Management System, 3. Road Maintenance Management (alternative specification), 4. Road Survey & Design, 5. Procurement Procedures, 6. Surface Dressing, 7. Bridge Inspection & Maintenance, 8. Contract Management and Construction Administration, 9. Site Administration & Supervision (alternative specification from PTTC), 10. Village Maintenance Community Modified System (VMC-M), 11. Workshop on Village Maintenance Community Modified System (VMC-M), 12. Village Maintenance Community Modified System (VMC-M) and Mini-contract Labor Intensive Maintenance System (Mc-LIM), 13. Workshop on Tender Pricing, 14. Training/Pilot Road Contract

Outline Training Specifications for Climate Adaptation for Rural Infrastructure

1. The Principles of Climate Adaptation, 2. Climate Impact and Adaptation Assessment, 3. Adaptation Options, 4. Selection of Low-Cost Engineering Adaptation Options, 5. Design of Low-Cost Engineering Adaptation Options, 6. Construction and Quality Control for Adaptation Options, 7. Maintenance and Monitoring for Climate Adaptation Options

15.2.2 Proposed Governance Strengthening and Capacity Building Plan of Project Agencies

765. Based on the findings in this report, the PPTA proposes following components for the governance strengthening and capacity building of project agencies in the forthcoming 'Lao Road Sector Governance and Maintenance Project'.

(1) Impact and Outcome

766. The expected impact of the project will be delivery of public services in road asset management improved. As the central level is in high degree involved in the ensuing project, the impact will be felt country-wide. The outcome will be sustainable road maintenance implemented in the provinces of Salavan, Xekong and Attapeu.

(2) Proposed Outputs with Governance Strengthening and Capacity Building of Project Agencies

767. The outputs of the Project are thresholds: (i) governance and practice for road asset management improved, (ii) institutional capacity for road asset management strengthened.

768. The third output (iii) road asset rehabilitation and maintenance completed is discussed in detail in chapters 4 and 8 of this report.

1) Output 1: Governance and practice for road asset management improved

769. This output will provide improvement measures to address the identified inadequacy of governance and practice that are crucial to delivering a successful road asset management. The output includes (i) revised axle load monitoring regulation(s), (ii) revised RMF regulation(s), (iii) web-based road asset management registry developed for public disclosure, and (iv) upgraded road asset management manuals and technical specifications

770. **Output 1.1 - Revised axle load monitoring regulation(s) put forward for government approval:** As discussed in chapter 2.2.1 'Overloading', overloading control is crucial to maintain roads in good condition during the design-life period of the pavement. The overloading control was terminated in 2011 due to the Prime Minister's Notice and since then the road condition has rapidly deteriorated and a number of bridges along the national roads, including that along National Road No. 20, collapsed. According to the DOR, 35% of the recently surveyed trucks along the National Road No.9 were found overloaded. Although the MPWT is now working to reinstall the overloading control across the country, most of the weigh scales are reported being out of service. MPWT is allowed to charge only a small fine for overloaded trucks and there is no effective regulation to force those trucks to un-load the overloaded cargos. Also there are fundamental issues as the current degree instructs the weigh controls to be done on the gross vehicle weight and not the axle-loads, different axle load limits are applied on different national roads.

771. Accordingly, the PPTA suggests supporting the MPWT to strengthen the government's institutional framework, including drafting procedures and regulations for overloading control, through planning and designing feasible measures for monitoring axle loads (including addressing modification of vehicles), drafting and proposing revision of the current axle-load control regulation, and provides support to institutional set-up for proper enforcement on overloading control.

772. **Output 1.2 - Revised Road Maintenance Fund (RMF) regulation(s) put forward for government approval**: As discussed in Chapter 14 'Institutional Issues for Sustainable RAM', since the Road Maintenance Fund (RMF) was established in 2001, it generates considerable amount of funds for road maintenance and contributes to maintaining both national roads and local roads. However, the current maintenance needs and the analysis of RMS (Road Management System) shows that the RMF is seriously underfunded to meet the road maintenance needs. Also, there seems neither policy nor strategic approach to determine which road and which type of maintenance/ rehabilitation should be given priority in respect of fund allocation. Proportional distribution (nearly 80% for national roads and 10% for local roads) suggested by the decree on the RMF is also neglected. Although the decree and guideline on the RMF limits the use of Fund to maintenance/ rehabilitation/ emergency works, considerable amount of the Fund is allocated for construction works.

773. Accordingly, the PPTA suggests supporting MPWT and RMFB to strengthen financing mechanism of RMF for sustainable road asset management, drafting a long-term financing plan and proposing a revised RMF regulation .

774. **Output 1.3 - Web-based road asset management registry developed for public disclosure**: The MPWT as a whole is undergoing re-organization and re-structuring in line with the government decentralization policy (Sam Sang Policy). However, the PPTA has identified that there remains unclear or fragmented duties/responsibilities and lack of transparency among the concerned departments where decision needs to be made in the road maintenance sector, and which hinders sustainable road asset management at both central and local levels.

775. For instance, the MPWT has been equipped with comprehensive planning tools for road asset management (i.e., RMS and PRoMMS). However, these planning tools are not fully utilized in the MPWT, and it is still a common practice in Laos that unreasonable justification (not conforming to the available asset management tools) on the selection of priority roads is made by the high level decision makers.

776. Since the road maintenance fund is seriously underfunded, the funds should be allocated to the priority roads, implementing priority maintenance activities, i.e., routine and periodic maintenance on the heavily trafficked national roads; this should be the top priority in sustainable road asset management. However, recently routine and periodic maintenance in Laos has been neglected and instead considerable amount of funds has gone to the rehabilitation works.

777. All the procurements in the road sector including road maintenance work are done on the project basis. For instance, there is no procurement unit in the DOR and each project manager of the specific project is responsible for all procurement works. Also, there is no centralized record keeping system, thus the monitoring and audit of the project is difficult to do effectively and shared among the concerned departments.

778. Accordingly, the PPTA suggests setting up web-based registry system with consolidated information about all stages of road asset management including planning, budgeting, procurement, implementation and monitoring; and make the information available to public to improve governance transparency. This activity will incorporate a web-based registry system into the on-going WB-supported ICT project in the MPWT (ICT Department of the Cabinet Office) that will establish a platform for the road asset management system. This activity also includes procurement/development of (i) road condition survey tools (e.g., video recorder, image analysis system), (ii) road roughness survey tools (e.g., accelerometer, GPS devices, roughness analysis system) and (iii) computers/network/servers.

Output 1.4 - Upgraded road asset management manuals and technical specifications approved: The absence of standard bidding documents for maintenance works has resulted in inappropriate use of bidding documents for works, which in turn has resulted in non-completion or sometimes even non-payments to the contractors, though contractually obliged.

Accordingly, it is suggested to develop standardized procurement procedures through development or improvement of existing bidding documents for maintenance works, in particular performance based contract bidding documents and ensuring its harmonization to multilateral donor's standard bidding documents. There is also a need to develop system and data base for unit cost analysis for maintenance works to be used as basis in preparing engineering estimates and budgets for future maintenance works.

In summary this activity will include updating of (i) Technical Specifications for Road Construction and Maintenance, (ii) Road Design Manual, (iii) Road Maintenance Manual, and (iv) improving performance-based maintenance bidding and contract documents for acceptance and approval of MPWT. This activity will also standardize procedures for road maintenance planning, budgeting, procurement, and implementation.

(3) Output 2: Institutional capacity for road asset management strengthened

779. This output will strengthen institutional capacity at national and provincial levels of MPWT and relevant stakeholders for road asset management. The output includes (i) capacity of MPWT and DPWTs for road asset management strengthened, (ii) private contractors' contract tendering and management capacity improved, and (iii) community-based road asset management capacity improved.

780. **Output 2.1 - Capacity of MPWT and DPWTs for road asset management strengthened**: MPWT has recently established four Regional Road Maintenance Project Offices (RRMPO) and has planned to delegate key responsibilities, including planning, budgeting and monitoring, of the national roads to the RRMPOs, as well as the physical implementation works of the national roads. All the road maintenance responsibilities of the local roads remain within the DPWTs.

781. There are several issues on the institutional capacity of the MPWT in road maintenance, identified by the PPTA. For instance, the RRMPOs are seriously understaffed (5 to 7 staffs in each RRMPO), which plans and monitors the maintenance work of over 7,000 km national road network country-wide. Likewise, DPWTs are understaffed and are often not able to provide even the basic road statistics for the central level.

782. In the past the donors have channelled considerable amount of fund for capacity building and training in all aspects of road maintenance works. However, the result of capacity assessment implies that technical level of key departments including Department of Roads (DoR), Departments of Public Works and Transport (DPWT), Public Works and Transport Institute (PTI), Public Works and Transport Training Center (PTTC), is still low and varies among departments.

This activity will provide capacity building/training for the management and staff of concerned departments of MPWT and DPWTs. This activity is directly linked to above discussed Output 1, but could also include developed training material from earlier donor supported projects, e.g. 'Maintenance Procedures for Lao Roads' developed during WB and SIDA supported RMP1/ RMP2. The capacity building/training need to be based on needs assessment and requirements of MPWT and DPWTs staff.

783. **Output 2.2 - Private contractors' contract tendering and management capacity improved**: In the past and still today the Lao contractors demonstrates poor understanding on used tender documents and they have difficulties with even the most basic forms and documents forming part of the tender documents. Also the contractors have performed poorly in the implementation of road works, not properly understanding their contractual obligations as well as not having the required capacity for required level of implementation.

784. The PPTA suggests that the forthcoming project will improve private contractors' capacity by providing training sessions for them in all components of the tender documents and the tendering process as well as efficient management on implementation of performance-based maintenance contracts. This would result in more responsive tenders, which increases the competition and thus selection of better contractors for contract implementation. The contractors' performance on the ground would improve thanks to the contract management training they receive, giving as an end result better roads.

785. **Output 2.3 - Community-based road asset management capacity improved**: Routine maintenance should be given priority since it contributes to maintaining the road for its full design life. The economic rate of return of the investment on routine maintenance is relatively higher than that on rehabilitation. However, routine maintenance tends to be neglected in Laos. The road agencies in Laos tend to leave the road side without proper routine maintenance and hire contractors for rehabilitation works once the road has deteriorated. These contracts have normally been BOQ-based maintenance contract, which has been practiced in Laos for many years. Due to the lack of routine maintenance, the Community-based Contract for road maintenance was introduced and has now been in practice for more than a decade in many provinces, financed by both donors and the Lao government. The communities that has done the maintenance work have proved that they can contribute to good quality routine maintenance. Involvement of communities in routine maintenance works contributes to generating local employments and ownership of the road and the project, which helps to enhance sustainability of the road asset management.

The PPTA suggest assisting DOR and DPWTs to facilitate full range of community development support services including (i) setting up and managing Village Maintenance Committees, and (ii) improved routine road maintenance and management skills which will contribute to generating local employments and ownership of the road asset and the project.

CHAPTER 16 BENEFIT MONITORING & EVALUATION

16.1 Objective of Chapter

786. This chapter discusses the monitoring and post-evaluation of the benefits of the project. It differs from the design and monitoring framework, which is more concerned with the successful completion of the project activities. The benefit monitoring, however, is concerned with the overall benefit of the project to the Lao economy and society, and the beneficiary. It is concerned at how well the project has achieved its intended purpose.

16.2 Project Purpose

787. The Terms of Reference (ToR) do not define the project purpose, other than stating that the project supports the Government's priorities of increasing the capability of the DPWTs in road asset management. The ToR then goes on to indicate the activities and outputs.

788. On the other hand, economic analysis has been requested, to include economic indicators for each project road, which should include vehicle operating cost savings and generated economic activity. The success of the project is thus best judged from these quantifiable economic indicators.

789. The project also has the potential to facilitate the improvement of transport services. This is particularly significant on the local roads, where their poor condition militates against the provision of commercial passenger transport services. LR 6901 in Salavan province is the only one of the three local roads where regular passenger transport services operate at present.

790. It has been found elsewhere[45] that local access road improvements can stimulate household ownership of motorised means of transport, particularly motor cycles. Thus it would be useful for the monitoring to include this aspect also.

791. There are of course more indirect indicators such as greater production and trade, and possibly in-migration where people choose to move to an improved road. Such effects are linked to the amount of generated traffic, however, and are represented in that measure. As the project is primarily a maintenance project, it is expected that it will make incremental improvements in the local economies rather than any kind of step change. The main exception is LR 9001 in Attapeu province, where the project proposals can make a big difference to the export and tourism potential of the Xanxai plateau, which is being opened up by the stepwise development of the road.

[45] E.g. Northern GMS Transport Network Improvement Project, ADB Grant 0082-LAO (SF), Final Report, 2014

16.3 Key Parameters to Identify Project Impact

792. Three main kinds of benefit are considered for the monitoring and evaluation.

793. The quantifiable economic benefits are those for the project roads, and are considered as being:

a. Vehicle operating cost savings. These depend on road roughness and passing ability. They also depend on external factors such as world fuel prices, price inflation, etc. To evaluate the benefit in real terms, the road roughness and passing ability information will be essential.
b. Time savings. These can be measured in minutes and thus can be assessed directly through travel time surveys and traffic counts.
c. Benefits from traffic generation. The amount of generated traffic, in percentage and absolute terms, will be an indicator of the economic growth stimulated by the project. It will be important to have a 'control' section (where there is no project intervention). This will help the assessment of how much of the observed traffic, after the project is complete, is in fact traffic generated by the project.
d. Net benefits after taking into account the investment and maintenance costs. This will be a recalculation of the economic internal rate of return for the project, based on the outturn costs, journey times and traffic levels.

794. The project's wider objective is to support the Government's priorities of increasing the capability of the DPWTs in road asset management. Thus the effect should be felt throughout each province, with benefits of improved travelling conditions and greater sustainability of the network, reducing the need for exceptional repairs or rehabilitation. For effective asset management, systems need to be in place, sufficient skills available, and an adequate budget provided.

795. Future success does not depend solely on the project, but if the budget is insufficient, the project should be able to support the prioritisation of the local road maintenance activities. The aim should be to allocate the available funds to ensure that the overall transport costs on the network are the lowest that can be achieved, while ensuring sustainability. During the life of the project the funds for the project roads will be ring-fenced, but the DPWTs will have to develop appropriate systems to manage their other road assets.

796. Finally, the project will need to show benefits to the communities through which the roads pass. The value of the benefits can be assessed as above but the nature of the benefits also needs to be considered. This can be done by asking questions such as - how are peoples' lives affected and is there an improvement in the quality of life for the local populations served by the roads?

797. This is particularly important for the local roads, which are intended to have local benefits. The benefits to the national roads will be more dispersed around the country, but the villages along the line of route should have benefits too.

798. In Table 16.1 key performance indicators are proposed to measure the success of the project interventions. For each, the data collection needs are specified. The data should be collected before the start of the project, at the conclusion of the project, and some 2-3 years after project completion. Where possible, there should be control sections (roads that are not

being maintained under the project and are not improved during the project period). This will enable better consideration of whether the observed changes are as a result of the project or independent of it.

Table 16-1 Key Performance Parameters for Implementing Agencies

Benefit	***Parameter***	***Data Collection Needs***
A. For Project Roads		
Vehicle operating cost savings	Average roughness of each project road (IRI)	Drive-over surveys using equipment available to DoR
Time savings	Average speed on road, by vehicle type	Simultaneous vehicle number-plate surveys at beginning and midpoint of road, or equivalent sites
Generated traffic	Additional traffic, over and above the expected general traffic increase, found on the road 2-3 years after completion	Classified traffic counts on project roads, before, after, and 2-3 years after project completion. Similar counts on similar roads where there has been no project intervention
Net benefits	NPV and EIRR	To be recalculated 2-3 years after project completion, taking into account outturn project costs, road condition, vehicle operating costs, traffic levels and travel times
B. Road Asset Management Capability		
Equipment resources	Equipment, vehicles, computers, software, etc., available and in working order, and its availability/use	Inventory at start and end of project, expressed in available units in terms of km of road network to be maintained
Skills resources	Skilled staff available and being used on the available equipment and on contract management	Assessment of activities and skills at project start; training needs assessment; training provided; result at end of project and identification of further skills development needs after project completion
Financial resources	Available road maintenance budget for non-project roads	Annual assessment of road network maintenance needs and resources, expressed in funds per km by road type. Process in place for two-way communication with PTI and road fund activities
Asset Management	Best overall road network condition, taking into account resource constraints	RMS/PRoMMS and/or HDM in use in provinces and used to optimise maintenance activity on network, within available budget. Based on the software in use, the available budget, and annual traffic counts and road condition surveys on the whole network, demonstrate that the programme that results in the least overall road user operating and time costs has been selected[a)]

Benefit	***Parameter***	***Data Collection Needs***
Benefit	***Parameter***	***Data Collection Needs***
C. Accessibility and Community Benefits *(also in control villages)*		
Village level benefits	Assessed trips/head/year of villagers to nearest town, by transport means	Before, mid-term and after household surveys in key villages along road, recording trips out of village (by gender) by walking, cycling, motor cycle, bus or other means, and household cycle/vehicle availability
	Percentage of school journeys by walking, cycling or motor-cycle	
	Cycle and vehicle ownership	
	Available public transport	Bus and *sonteo* services, timetables and fares
	Employment or increased production	Jobs or income provided directly by project, or attributed by households to the opportunities opened up by the project (by gender)
	Poverty impact	Number of poor villages and poor households within catchment area of road
	Village opinion on project progress and success	From household surveys and from structured interviews with village leaders
Other benefits	Size of truck that can be used and extent to which truck can be fully loaded	This particularly applies to (a) Roads 16 and 1H as the weak bridges on 1H will be replaced, and larger or heavier trucks can then be used; and (b) Road 9001, as the steep slopes that will be improved should allow well loaded medium and heavy trucks to use the road for the first time. This can have a significant effect on the cost of bringing supplies to and from the plateau.

[a)] *A minimum service level may be specified so that low volume roads maintain a certain standard, particularly when provincial priority is given to ensuring adequate access to an area proposed for development.*

799. The initial data collection should be carried out at the start of the project, before the start of the activities and the works. It is proposed that there should be a 'mid-term' household survey, while the works are going on, to pick up any points of concern or any suggestions from the villages along the road. All the surveys should then be repeated at the end of the project, and again 2-3 years after project completion. The reporting should be in the Lao language as well as in English.

Annex A – Terms of Reference for PPTA

LAO: ROAD MAINTENANCE PROJECT
Project Preparatory Technical Assistance
TERMS OF REFERENCE FOR CONSULTANTS

A. Introduction

1. The Government of Lao PDR has requested the Asian Development Bank (ADB) for a project preparatory technical assistance (TA) to prepare the Road Maintenance Project. This project supports the government's transport sector priorities of increasing the capability of local Departments of Public Works and Transport to manage road assets that have been transferred to provincial control.

2. The Ministry of Public Works and Transport (MPWT), the executing agency, has proposed about 1,521 kilometers of roads in Sarvavan, Xekong and Attapeu (Appendix 1) to be considered for the ensuing investment project in 2015. The consultants will need to review all the proposed roads, and the list of project roads for investment will be finalized based on multi-criteria to be developed by the project preparatory TA consultants in close consultation with MPWT and the provincial Department of Public Works and Transport (DPWTs). The criteria will include but not limited to: (i) traffic volume and initial costs estimates; (ii) proximity with ongoing Road Maintenance Project; (iii) environmental sensitiveness; (iv) road connectivity; and (v) overall project funding availability. The project roads will need to be in close proximity/geographical area rather than spread thinly over a wide geographical area to have a focused project impact.

3. The priority roads will need to be identified within one month of the commencement of the TA, at the latest, so that detailed analysis on all aspects to prepare the project for ADB Board consideration can commence without delay.

B. Scope and Outputs

4. Major activities of the TA are: (i) finalization of nominated road sections for inclusion in the project; (ii) road/bridge maintenance condition surveys; (iii) cost estimates; (iv) economic analyses and financial analyses; and financial management assessment; (v) environment and social safeguards due diligence; (vi) poverty and social analysis, including an analyses to assess the viability of creating a community-based maintenance groups; (vii) assessment of existing road maintenance funding mechanism and recommendation for revenue growth in road maintenance fund (RMF) for sustainable road asset management; (viii) design of capacity development components; (ix) preparation of a project implementation schedule; and (x) assistance in preparing the Report and Recommendation of the President (RRP) and linked documents. The major outputs and activities are summarized in Table 1

5. Surveys in this TA will mainly include basic topographical, road/bridge condition, geological and hydrological, traffic, origin-destination, travel-time, sex-disaggregated, gender, social and environmental including for preparation of poverty impacts and gender related aspects. The consultants are required to define and propose any other surveys as deemed necessary to prepare the project, subject to ADB's approval prior to start of survey activities.

6. The TA is expected to commence in June 2014 and close in May 2015. It should be

noted that though the TA Final report is expected in March 2015 thus completing the majority of TA activities. The Team Leader will be required to support the ADB and Government in processing of the ensuing project.

7. The three tripartite meetings are the minimum essential meetings necessary during TA implementation. Each of these needs to produce outputs as shown in Table 1, and need to ensure participation of all stakeholders, as relevant to TA implementation. While such meetings provide training for the MPWT/DPWTs staff, the consultants should also ensure that their daily TA activities provide training to the MPWT/DPWTs staff by involving them in TA activities effectively.

8. The consultants during TA implementation will consult with the stakeholders, including communities, non-governmental organizations, and labor unions to keep all of them informed of the project, and take their views into the design of the project, keep a record of all such meetings and documents including photographs, and how their comments have been incorporated in to the project design.

Table 1: Summary of Major Outputs and Activities

Major Activities	Expected Completion Date	Major Outputs	Expected Completion Date
1. Inception 1.1 Stakeholder consultations 1.2 TA methodology and work program	July 2014	Inception report with tripartite meeting	July 2014
2. Feasibility study 2.1 Technical/ engineering study 2.2 Economic and FMA 2.3 Environment and social safeguards 2.4 Maintenance financing option assessment 2.5 capacity development components	Oct 2014	Mid-term report with tripartite meeting	Oct 2014
3. Project design 3.1 Prepare RRP inputs 3.2 Prepare PAM	Jan 2014	Draft final report With tripartite meeting Final report	Jan 2014 March 2014

PAM = project administration manual; RRP = report and recommendation of the president; FMA = Financial Management Assessment; TA = technical assistance
Source: Asian Development Bank estimates

C. Outline

9. The key tasks for the services under the TA will be :

(i) Project Design and Management; overall coordination and management of the services and preparation of documentation suitable for processing the ADB loan;
(ii) Undertake analyses of priority road links within the provinces as provided by the MPWT of the Government of Lao PDR to determine the economic, financial and technical feasibility, and social and environmental acceptability of conducting maintenance work of existing roads. Initial findings for each long-list road, including need for any amendments to the methodology or schedule, will be discussed during meetings in the Project provinces along with DPWTs. A tripartite meeting will be held in Vientiane to finalize the identified roads for detailed investigations and study; and
(iii) An evaluation of key road sector issues related to road maintenance in the

selected provinces.

10. All economic, financial, social analyses, and social and environmental safeguards must meet the requirements of ADB's policies and guidelines in addition to the requirements of the Government of Lao PDR. Technical standards must be consistent with international best practice and the laws and regulations of Lao PDR.

11. In addition, the consultants will have the following responsibilities:

(i) Prepare the overall design of the Project, taking into account the concept and priorities for the project prepared by the MPWT. The design of the Project should be based on a preliminary estimated total cost for ADB financing of $20 million, and Government and/or co-financing of $5 million. The total project cost will be $25 million. The proposed contract packages should be such that a co-financier can finance a stand-alone civil work package.

(ii) Provide inputs, including technical, economic and financial, governance ,poverty and social, safeguards, and risks and mitigating measures parts, for a draft report and recommendation of the President (RRP) for submission of the Project for approval by ADB's Board of Directors.

(iii) Design a project performance monitoring system in accordance with ADB's *Guidelines for Project Performance Monitoring* (1999). Develop a detailed evaluation and monitoring framework for the Project, including impacts, outcomes, and outputs with corresponding measurable performance indicators and targets, monitoring mechanisms, risks, and assumptions. Provide baseline data for all proposed indicators. Identify agencies responsible for monitoring activities and when these activities should be undertaken.

D. Key Specialists' Tasks – International and National

12. The **Road Maintenance Specialist/Team Leader and Deputy Team Leader** will undertake the following tasks:

(i) Review current governmental road maintenance works and the experience of the road maintenance projects funded by the World Bank, Kreditanstalt für Wiederaufbau (KfW) and the Japan International Cooperation Agency (JICA) to identify implementation problems, including road maintenance technical, financial management, procurement and supervision procedures at MPWT/DPWTs;

(ii) Keep close relation with the World Bank, KfW, and JICA to develop project, its implementation procedures and harmonization.

(iii) Prepare a report on streamlining project implementation procedures related to routine and periodic road maintenance, including well-defined functions, roles, and responsibilities of different government entities; alignment of government approval procedures and project cycles of ADB and other developing partners, as well as implementation arrangements and capacity development strategy and requirements;

(iv) Examine the participation of executing and implementing agencies in all stages of the road maintenance project cycle and assess the effectiveness and efficiency of those implementation arrangements;

(v) For the purposes of confirming project sustainability, undertake a review of the activities for the road maintenance projects funded by the World Bank KfW and JICA. Conduct a critical analysis of road expenditure projections, revenues, and expenses required to maintain the national road network. Assess maintenance

planning, implementation procedures, and institutional capacity for routine and periodic road maintenance. Review the status of policy dialogue between development partners and the Government, and recommend actions that can be taken by ADB to further the dialogue to determine concrete proposals that could help ensure adequate maintenance funding for subsequent investment in the road infrastructure;

(vi) Prepare, along with the team, a good governance framework to assess various risks and develop a risk mitigation plan, to include, as minimum aspects, governance, public financial management, procurement, and corruption;

(vii) Together with financial specialist, look into overall road maintenance aspects in Lao PDR, how it is planned, programmed, budgeted, and financed, looking at sources of funds, how Government prioritizes road maintenance, and implements it to ensure sustainability, to avoid issues such as deferred maintenance;

(viii) Together with procurement/governance specialists and private sector specialist, evaluate performance-based contracts that combine the civil works with the maintenance works, adequately assess capacity of MPWT/DPWTs to implement performance-based contracts, and propose a procurement plan based on preference, capacity, and experiences of international and national contractors. Assist MPWT/DPWs in preparing procurement documents, and if found suitable, prepare performance-based contracts. Assist MPWT/DPWTs in taking advance action for procurement;

(ix) Assist MPWT/DPWTs to formulate a technically and financially sustainable long-term strategy for road maintenance;

(x) Assess the capacity development needs for road maintenance and propose a strategy, methodology, and requirements for developing capacity for the proposed implementation arrangements and the time frame for undertaking such capacity development develop suitable capacity building programs. Undertake an institutional capacity review of MPWT/DPWTs in road maintenance and monitoring, identifying necessary training and strengthening programs. Analyze the status of institutional capacity-building efforts and ongoing and planned efforts of other international agencies, including cost-recovery measures for road maintenance and recommend the best use of technical assistance for further institutional capacity building;

(xi) Prepare a program to improve the road maintenance capability of MPWT/DPWTs. This will include personnel inputs, estimated costs, and implementation schedule and implementation arrangements for: (i) design review and construction supervision consultants for project implementation; (ii) all the capacity-building programs of MPWT/DPWTs including procurement, management, gender and development, and safeguards compliance; (iii) stakeholder communications strategy; and (iv) improved community participation in road maintenance activities in coordination with community development manager for improving community participation program and in promoting road safety;

(xii) Define project implementation arrangements, including organizational structure, demonstrate the relationship between relevant institutions, and indicate the responsibilities of each unit in a framework;

(xiii) Review the selected long list of road links and prepare road inventories, including geometric features, type, and condition of drainage and bridge structures, including an estimate of their load carrying capacity, pavements, and other major features, by utilizing existing survey results and data undertaken by MPWT/DPWTs and other development partners. Assess and/or quantify potential

problems relating to cutting of trees, relocation of utilities, etc. which should be addressed before tendering of construction contracts;

(xiv) Together with Pavement Design/Specification Specialist, review survey results and identify key issues for road maintenance;

(xv) Assess cross drainage requirements and propose new structures, culverts, and causeways as appropriate, or improvements to existing structures where these are otherwise structurally sound;

(xvi) Investigate the suitability of locally available construction materials, and where necessary, locate new quarries and borrow pits and assess the quality and quantity of materials and the hauling distance;

(xvii) Study the existing hydrological regime, based on an analysis of rainfall and flood records, including subsurface water characteristics supplemented by detailed field investigations, to establish adequacy of road embankment levels, culverts, and side ditches;

(xviii) Based on the findings of the initial environmental examination (IEE) completed as part of this project preparatory TA, together with the environmental specialist(s),incorporate in the road designs measures to prevent, avoid, or mitigate adverse environmental impacts predicted to occur during the construction and operation periods;

(xix) On the basis of traffic counts and projected traffic levels, pavement structure studies, and axle load considerations, determine the most cost-effective improvement option for each Project road section;

(xx) Develop updated unit rates of routine and periodic maintenance work for roads, bridges, and culverts, including taxes and customs duties, taking into account the bid price and completion costs of similar works recently undertaken in the Project provinces. Prepare feasibility engineering designs to include road safety and climate resilience features and bill of quantities, and calculate detailed costs estimates for civil works;

(xxi) Prepare details of budgets, implementation arrangements, and implementation schedules for the project including for construction supervision consultants to be engaged during the implementation of the project;

(xxii) Assess the degree of vehicle overloading, the condition and operating procedures of existing weighbridge stations in the project provinces. Review and assess recent measures to facilitate operation to improve sustainability. Assess institutional capacity of all relevant agencies to implement policies and regulations to determine capacity development requirements;

(xxiii) Assess the level of road accidents, the degree of road safety awareness of local communities, and road safety measures applied to roads in the project area. Carry out a road safety audit on the Project road sections using International Road Assessment Programme road safety audits and identify road engineering, traffic management, motor cycle path, pedestrian facilities, and other measures that need to be incorporated into the detailed designs[1] to eliminate hazards;

(xxiv) Prepare stakeholders communication strategy and implement it during project preparatory TA implementation; review project readiness filter and include it in the project documents as required; and

(xxv) Prepare all inputs for such as draft RRP, related linked documents including draft

[1] Separate lanes for motor cyclists, overtaking zones, road safety features, road signs, cats eye, proper road traffic management, climate resilience features, service lanes in developed areas, modern technology for road speed monitoring and axle load control, pilot solar lighting of some sections of roads, solar powered sign boards, and intelligent transport systems, need to be considered and proposed to DGH for their consideration.

PAM, good governance framework,[2] and other documents necessary to get the project approved by the ADB Board.

13. The **Pavement Design/Specification Specialist** tasks will comprise of the following:

(i) Undertake all surveys required to assess road condition, and undertake preliminary pavement design based on survey results;
(ii) Undertake necessary surveys and investigations, including bridge condition surveys, pavement and soil tests, required to assess condition of existing roads and identify key issues for road maintenance, and also major constraints and issues that impede smooth project implementation, and recommend options for mitigating the constraints;
(iii) Assess the load bearing capacity of the various existing pavement sections, including surfacing, base and subbase courses and subgrade, along project roads;
(iv) Propose the most cost effective guidelines and procedures for undertaking periodic maintenance; and
(v) Prepare the technical specifications.

14. The **Road Maintenance Institutional Capacity Specialist** tasks will comprise of the following:

(i) Review and assess existing road maintenance management system presently used by MPWT/DPWTs, particularly the Provincial Road Maintenance Management System (ProMMS) and the Road Maintenance System (RMS)[3];
(ii) Coordinate with developing partners, especially World Bank, KfW, and JICA, and assess the system and procedures presently used on other projects;
(iii) Assess the existing road maintenance funding mechanism and recommend possible revenue growth options for sustainable road asset management; and
(iv) Identify training needs for MPWT and DPWT staffs in road maintenance management and design capacity building programs in cooperation with Team Leader.

15. **Construction Planning/Cost Engineer** tasks will comprise of the following:

(i) Prepare the construction methods for work items and construction sequence over the project duration;
(ii) Conduct survey and investigation of market condition including prices of materials, depreciation/operation cost of construction machines and equipment, wages, taxes and duties; and
(iii) Prepare bill of quantities and cost estimates.

16. **Procurement/Governance Specialist and Document/Procurement Specialist** tasks will comprise of the following:

(i) Make an overall assessment of the decision making processes at both the

[2] Also called Risk Assessment and Risk Management Plan.
[3] The Lao MPWT version of RMS is based on the Highway Development and Management Model (HDM-4) originally developed by the World Bank, and is used in Lao PDR primarily for prioritization of improvements and maintenance interventions on the national road network. PRoMMS is significantly less sophisticated than the RMS, and is used by DPWT's to provide budget allocations for all local roads, primarily regarding periodic maintenance priorities.

national and provincial level regarding funding, procurement, implementation and management of road maintenance, and develop a realistic program for increasing good governance in these processes to minimize procurement and financial management risks;

(ii) Undertake a procurement capacity assessment[4] of the MPWT/DPWTs and fill up questionnaire as provided in Appendix 2;

(iii) Explore the feasibility of e-procurement for improving governance and transparency of procurement process;

(iv) Design procurement packages in ADB's format as required in the PAM for project life along with projections of contract awards and disbursements schedules, indicative implementation schedule with proposed sequencing of consultant recruitment and procurement bidding and awarding. The bid packages need to be separate for ADB financing and for any co-financing as a separate package;

(v) Prepare the good governance framework for the ensuing project implementation in consultation with the team leader, and the procurement documents and other contracts; and

(vi) Draft the PAM in close coordination with the Team Leader and submit it to ADB before the midterm review of the TA, for comments, and finalization before the ensuing project's fact-finding mission;

(vii) Review the Government regulation on minimum regional wages, health and safety, and other social welfare including laborer's overtime and insurance aspects, to assess compliance with International Labour Organization regulations, in consultation with labor unions. In case of deficiency, recommend actions needed to be taken under the project to ensure that international practices and labor laws are followed.

17. The **Transport Economist** tasks will comprise of the following:

(i) Conduct economic analysis for project roads to confirm economic viability of the Project. The analysis will cover all the key aspects of economic analysis including demand assessment, alternative analysis, least cost analysis, benefit cost analysis, sensitivity and risk analysis, and sustainability and fiscal impact analysis.

(ii) Prepare the benefit monitoring framework for the ensuing project along with the safeguards specialists. More information on these aspects can be accessed through http://www.adb.org/documents/key-areas-economic-analysis-projects-overview;

(iii) Evaluate the economic growth potential of the project areas on the basis of existing and planned investment projects. Estimate the potential agriculture, industry, and tourism development potential and population growth in the project area and project roads;

(iv) Conduct traffic surveys for each road section at appropriate locations; conduct origin–destination if essential and axle-load surveys to establish the pattern and volume of vehicle, passenger, and cargo movements, including details of passenger characteristics and types of freight being shipped. Assess the possibilities of passenger and freight traffic diversion from other routes. Prepare traffic forecasts by representative vehicle type, taking into account economic and population growth, production and increases in economic activity, and income in the hinterland of the project roads;

[4] ADB. 2010. *Guide to EA Procurement Capacity Assessment*.

(v) Analyze the current and expected traffic characteristics for each project road and recommend the most appropriate method for calculating the EIRR and net present value (NPV) for each road, including analysis of vehicle operating costs for roads with significant traffic levels and generated economic activity for roads with low traffic levels;

(vi) Assess the EIRR and NPV by homogeneous road section based on ADB's Guidelines for the Economic Analysis of Projects (1997). Derive appropriate sensitivity and switching values by varying the major parameters affecting project viability. Conduct a full distribution analysis in accordance with ADB's Handbook for Economic Analysis of Subregional Projects, and among project beneficiaries and stakeholders. Describe the provision of transport services along the project roads, make an initial evaluation of competitive forces on the provision of services and tariffs, and make a determination of the potential of the project to improve these services. Determine the extent to which the benefits from improvements to the project roads will be passed on to end users for different road user groups. The economic analysis will assess the total life cycle costs. The analysis must identify risks and undertake a risk and sensitivity analysis of the EIRR in accordance with ADB's *Handbook for Integrating Risk Analysis in the Economic Analysis of Projects (2002).* Attention is drawn to the contents of Appendix 3, which contains a copy of Appendix 1 of the ADB's Guidelines for Economic Analysis of Project that summarizes the main issues that should be addressed in preparing an economic analysis of a project. The contents of this Appendix will be the basis for evaluation of all economic analyses.

18. The **Financial Specialist** tasks will comprise of the following:

(i) Conduct financial management capacity assessments of MPWT/DPWTs and financial analysis of the project in accordance with ADB's Financial Management and Analysis of Projects (2005). Assess the financial management capacity of MPWT/DPWTs using the ADB Financial Management Assessment (FMA) Questionnaire and identify areas for improvement and training needed with respect to the financial accounting, reporting and auditing. A suggested questionnaire for this work is included in Appendix 4. Work with the procurement specialists to design a fund-flow mechanism and identify appropriate ADB disbursement procedures based on the project needs and the capacity of MPWT/DPWTs to manage fund flow and disbursements. Assess the budgetary implications of the financing requirements of the proposed project to MPWT/DPWTs. Prepare a FMA report to document all the findings and recommendations;

(ii) Work with the team leader and economists to prepare detailed itemized project cost estimates and financing plan in the format as required in the PAM and to provide inputs for RRP;

(iii) Describe the accounting and audit processes and procedures of the implementation agency. This description should include document and funds flows with particular attention to the integrity and completeness of auditing. This work will include undertaking an assessment of the capacity of responsible institutions to plan, manage, implement and finance. Identify capacity building measures to address deficiencies that may be included in the Project, develop terms of reference, budgets, and implementation arrangements for measures identified;

(iv) Prepare program to implement the strategies, training needs, capacity building,

and other interventions identified above. These must include detailed budgets, personnel requirements and implementation schedules;

(v) Conduct financial analyses based on the ADB's Financial Management and Analysis of Projects (2005). Assess the budgetary implications and fiscal impact of the financing requirements of the proposed project on the EA and IA, in particular the recurrent expenditures of operating and maintaining the project to ensure the sustainability of the Project. Undertake financial projection of the project's owner, including budgetary revenue and expenditure to appraise its future budget position and financial capacity for covering the recurrent expenditures of the Project. The projection period should cover the entire project implementation and no less than 5 years of full operation upon the completion of the project.

19. The **Social Safeguards/Gender Specialist** tasks will comprise of the following:

(i) **Social Development and Gender Issues**. Collect quantitative and qualitative data in the field and prepare poverty and socioeconomic profiles of the affected communities in the project areas;

(ii) identify vulnerable groups in relation to the project and analyze reasons for their vulnerability, including their exposure to risks identified in the *ADB Handbook on Social Analysis (2012)*;

(iii) elaborate a risk and vulnerability profile by (a) quantifying the incidence, frequency and severity of risks in the affected populations by age, gender, ethnic group and location, and (b) assessing the capacity of each group to mitigate the risks;

(iv) identify project components or design options to mitigate risks and improve opportunities for the vulnerable groups to access project benefits such as being involved in the community-based maintenance groups and identify the relevant institutions to be involved in the design and implementation of activities and monitoring and provide the required trainings and workshops to the involved institutions.

(v) Based on the social, poverty and gender impact assessment prepare a social/gender action plan, with clear responsibilities, cost estimates, and indicative schedule.

(vi) Identify explicit social/gender development impact, outcomes, outputs, activities, and inputs, performance targets and indicators, data sources and reporting mechanisms, and assumptions and risks to be included in the Project's Design and Monitoring Framework.

(vii) I**ndigenous peoples (IP) issues**. Prepare a socio-economic profile of the ethnic populations in the project areas which include the dominant ethnic groups and minority ethnic groups. Identify existing problems perceived by the IPs, needs, demands, constraints, and capacities

(viii) Describe the different culturally defined roles of men and women with indigenous communities and assess relevance of these differences to the implementation of project benefits in general and activities that involved IPs direct participation (e.g. community-based maintenance)

(ix) Identify anticipated positive and negative impacts on IPs and prepare a communications and participation strategy for IPs. Document all consultation and disclosure activities carried out during TA implementation.

(x) Assess the institutional, personnel and financial capacities of the executing and

implementing agencies and other stakeholders working with and for indigenous peoples and develop a strategy for their participation in the project

(xi) Prepare an indigenous peoples plan or other measures, including appropriate budget and implementation arrangements to ensure meaningful participation of IPs and involvement of NGOs/CSOs where appropriate

(xii) Identify explicit IP development impact, outcomes, outputs, activities, and inputs, performance targets and indicators, data sources and reporting mechanisms, and assumptions and risks to be included in the Project's Design and Monitoring Framework.

(xiii) **Involuntary Resettlement Issues**. Carry out assessment in the context of involuntary resettlement to confirm if the project will not entail land acquisition or restriction of access to land. If the assessment states otherwise, i.e., the ADB Social Safeguard Policy Statement is triggered, prepare the required resettlement planning document/s.

20. The **Environmental Specialist** tasks will comprise of the following:

(i) Conduct site visits and describe existing conditions of physical, natural, and social environment in the project area and vicinity through review of available data and field observations and interviews;

(ii) Screen and categorize the proposed project in light of the ADB environmental safeguards requirements (fill out ADB's rapid environmental assessment checklist for relevant sector);

(iii) Depending on the environmental category, prepare Environmental Impact Assessment report (category A) or Initial Environmental Examination (category B) for the entire Project in accordance with government environmental guidelines and ADB's Safeguard Policy Statement (SPS 2009), recommend on required mitigating measures and prepare the environment management plan (EMP) including monitoring plan;

(iv) Assess potential environmental impacts of the proposed project, including negative and positive impacts, short-term and long-term, direct and indirect, cross-media and cumulative, induced, significant and minor, and unavoidable and irreversible impacts for the project's construction and operation stages.

(v) Review and document the country's relevant environmental law, regulations and standards. Document the country's legal and administrative framework for approving environmental clearance for the Project and proposed schedule for approval of environmental clearance by the Government;

(vi) Document and compare available environmental baseline data to national standards and relevant guidelines in the World Bank Group's Environmental, Health, and Safety Guidelines;

(vii) Confirm the presence or absence of ecologically sensitive areas (national, provincial, and district levels) and areas of historical, cultural, or archaeological significance within and/or in the vicinity of the project location that may be affected by proposed activities. If such areas exist, include detailed descriptions as well as map showing project alignment in relation to the location of these sensitive sites;

(viii) Confirm the presence or absence of rare, threatened, and/or endangered species of flora and fauna in the project location and vicinity;

(ix) In coordination with the resettlement/social development/gender specialist, document existing socio-economic condition and land use pattern in the Project

area and vicinity;

(x) Prepare a summary of environmental mitigation measures based on the format below:

Type of Impact	Mitigation Measures	Project Component	Institutional Responsibilities		Cost Estimates
			Implementation	Monitoring	
Pre-construction					
Construction					
Operation					

(xi) Prepare an environmental monitoring plan following the format below:

Issue	What to monitor	Where to monitor	How to monitor	When to monitor	Who will monitor	Estimated Cost
Pre-construction						
Construction						
Operation						

(xii) Assess current capacity of responsible institutions (in terms of number of environmental staff, skills, experience, etc.) to ensure proper implementation of environmental mitigation measures and monitoring plan;

(xiii) Identify requirements for capacity building and/or institutional strengthening activities;

(xiv) Estimate and provide a breakdown of costs for implementation of environmental mitigation measures, project monitoring, and institutional capacity development;

(xv) Document the public consultation process in terms of: (a) date and venue, (b) number of participants and groups represented, (c) project information disclosed, (d) environmental issues and concerns raised, and (e) how issues and/or concerns raised will be addressed in the Project. Prepare a summary matrix of public consultation;

(xvi) Prepare draft TOR for the consulting services support to implement mitigation measures and monitoring plan during the implementation phase of the Project.

21. The **Private Specialist** tasks will comprise of the following:

(i) Examine the possibility for private sector participation (PSP) in the project, recommending the most appropriate PSP in road maintenance;

(ii) Explore private sector operations/participation in community based maintenance; and

(iii) Formulate a sustainable strategy to foster local construction companies for road maintenance;

(iv) Review existing performance-based contracts and adequately assess capacity of MPWT/DPWTs to implement performance-based contracts, and propose a procurement plan based on preference, capacity, and experiences of international and national contractors.

22. The international consultant for each of the above positions will have a minimum Bachelor's degree and at least 5 years related experience in his/ her respective areas of expertise. The international consultants will have relevant working experience in developed countries and will bring international best practice to the project. Relevant experience working in developing countries, in particular Lao PDR and Southeast Asia will be an advantage. The

international consultants must have excellent oral and written communication skills in English. The international consultants will be responsible for carrying out the tasks described above and preparing project documents and reports with supports from national consultants.

23. The national consultant for each of the above positions will have appropriate degree/ diploma qualification and at least 5 years' related experience working in Lao PDR. The national consultants must be fluent in both oral and written in Lao and must have adequate oral and written communication skills in English. The national consultants will support the international consultants to undertake the tasks described above and will assist the preparation of project documents and reports, in particular those to be presented in Lao. Experience working with international organizations and/ or multilateral financial institutions will be an advantage for national consultants.

E. Reporting Requirements

24. The consultants will prepare the following reports for the Project Steering Committee and ADB:

(i) **Inception Report:** To be submitted four weeks after commencing the services.
(ii) **Progress reports:** Brief reports submitted monthly, based on the inception report implementation and staffing schedules.
(iii) **Midterm Report:** To be submitted at the end of the fifth month after the commencement of services that will present the interim findings and outcomes of the TA including improvement options for the selected roads, analysis results; and key issues for the project. The report will include the assessment of implementation capacity of MPWT/DPWTs.
(iv) **Draft Final Report:** To be submitted at the end of the seventh month after the commencement of services to present all aspects of the study results including surveys, findings, recommendations, suggested approaches to implementation, and all other matters leading to a recommended project for possible ADB financing.
(v) **Final Report**. To be submitted one month after receiving comments on the draft final report from MPWT/DPWTs and ADB. All reports will be in English, with all the executive summaries (See Appendix 5). A short summary of IEE or EIA, if required, will be translated into Lao.

25. A Tripartite meeting will be held after the submission of the Inception, Midterm, and Draft Final Report in Vientiane, each to present the Project to the Government, NGOs, and other stakeholders.

26. The consultants will also provide inputs for RRP and linked documents; and PAM as specified in Table 1 at the end of the seventh month after the commencement of services. In addition to the above formal reporting requirements, the consultant will prepare and submit working papers in English to DPWT and ADB on an intermittent basis[5]. The intent is to allow ADB and DPWT to give guidance during each stage of the development of the project preparatory TA, thus reducing the need for reworking of material at the draft final stage. The working papers will contain, as appropriate, the results of surveys and analyses developed in the various tasks and will, usually, correspond to a chapter or an appendix in the consultant's

[5] The working papers need only be submitted by email to the DPWT and ADB, with an additional 5 paper copies provided to the Project Steering Committee.

draft final report. The issuance of the various working papers will be marked as milestones in the consultant's proposed detailed work program in the inception report. The milestone will indicate the title of each working paper that, in turn, will relate to the content of the working paper and its relation to the list of contents for the draft final report (Example: dd-mm-yy: Issuance of "Working Paper on Economic Analysis - Report Chapter 3"). The working papers will not be subjected to a formal review and commenting process and it is not expected that they have passed final editing. The purpose is to document progress and give ADB and DPWT an advance opportunity to review critical aspects of the TA product with a view to give early guidance whenever relevant. The 14working papers required in this TA are listed below. The consultants may propose additional working papers if it is deemed necessary to fulfil the TA scope and outputs. The consultants are required to propose the milestone dates for the submission of the working papers in the work program, consistent with the overall TA approach and methodology.

Working Paper Requirements:

- Road selection criteria and economic analysis methodology
- Initial survey, improvement options and data collections
- Initial environmental and social impact assessment
- Poverty, social, and gender analysis
- Assessment of overloading issues
- Road maintenance sustainability
- Road safety assessment
- Engineering design and cost estimates
- Needs assessment (financial and institutional capacity) and capacity building plan of project agencies
- Road safety audits
- Initial environmental examinations
- Economic analysis
- Financial management assessment and financial analysis

F. Staffing and Equipment

27. An international consulting firm will be engaged to implement the TA. The TA will require 9 positions in international and 8 positions in national consultants. The requirement of international consultants is 20 person-months and 17 person-months for national consultants. ADB will select and engage the consulting firm in accordance with ADB's *Guidelines on the Use of Consultants* (2010, as amended from time to time). ADB will use the quality- and cost- based selection (ratio 90:10) with full technical proposal to select the consulting firm. Table 2 shows the summary of consulting services requirement.

Table 2: Summary of Consulting Services Requirement

International Name of Positions	Person-months	National Name of Positions	Person-months
Team Leader/Road Maintenance Specialist	6	Deputy Team Leader	6
Pavement Design Specification Specialist	2	Pavement Engineer	2
Road Maintenance Institutional Capacity Specialist	3	Construction Planning/Cost Engineer	2

International Name of Positions	Person-months	National Name of Positions	Person-months
Procurement/Governance Specialist	3	Document/Procurement Specialist	2
Transport Economist	1.5	Transport Economist	1
Financial Specialist	1.5	Financial Specialist	1
Social Safeguards/Gender Specialist	1	Social Safeguards/Gender Specialist	2
Environmental Specialist	1	Environmental Specialist	1
Private Sector Specialist	1		
Total	**20**	**Total**	**17**

Source: Asian Development Bank estimates.

G. Implementation Arrangements

28. The executing agency (EA) for the project preparatory TA will be the Ministry of Public Works and Transport (MPWT) and the implementing agency will be the Department of Road (DOR). TA proceeds will be disbursed in accordance with Technical Assistance Handbook (May 2010, as amended from time to time). DOR will assign a coordinator who will be responsible for day-to-day interaction with the consultants. The Project Manager of the Road Maintenance Project of Region 4, recently established under the DOR, will facilitate coordination between the PPTA consultants and the respective provinces.

J. Facilities to be Provided

29. The contributions of the executing agency to the project preparatory TA will include provision of counterpart staff and office accommodation. MPWT will also provide maps and detailed designs of the roads already undertaken, and supporting documents as available.

30. The consultants will be reimbursed under the TA for all transport, including local transport, required by the consultant for implementing the services, up to the limits prescribed for vehicles and air travel indicated under the final contract for consulting services.

31. The consultants will supply and utilize the equipment as provided in the approved concept paper for this TA. At the end of the services, the consultants shall hand over the equipment to the executing agency.

32. MPWT will provide the following data:

- Basic topographical survey
- Road condition survey
- Geological and hydrological survey