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Exchange rate (April 2004)

US\$1.00 = Kip 10,600

(Note: Some recent reports cited have used an exchange rate of US\$ = Kip 10,400)

ABBREVIATIONS

ADB	- Asian Development Bank
ADT	- Average daily traffic
CMC	- Community Road Maintenance Committee
CRM	- Community Road Model
DCTPC	- Department of Communication, Transport, Post and Construction
DOR	- Department of Roads
DPC	- Department of Planning and Cooperation (province level)
GoL	- Government of Lao PDR
IDA	- International Development Agency
LRD	- Local Roads Department
LRN	- Local Road Network
LSRSP	- Lao Swedish Road Sector Project
MCTPC	- Ministry of Communication, Transport, Post and Construction
MES	- Monitoring and Evaluation System
NPEP	- National Poverty Eradication Programme
OCTPC	- Office of Communication, Transport, Post and Construction (district level)
PRMB	- Provincial Road Maintenance Board
PRMF	- Provincial Road Maintenance Fund
PRTP	- Participatory Rural Transport Planning
PTD	- Planning and Technical Division
RAD	- Roads Administration Department
RMAB	- Road Maintenance Advisory Board
RMF	- Road Maintenance Fund
RMP	- Road Maintenance Project
VMC	- Village Road Maintenance Committee



EXECUTIVE SUMMARY AND RECOMMENDATIONS

Substantial progress has been made in Lao PDR towards developing a sustainable maintenance strategy for the road network. Most progress has been made with the National roads though adequacy of domestic funds remains an issue. Maintenance of the Local road network (Provincial, District and Rural roads) is also receiving attention but the resources and planning approach have focused on Provincial roads with a village based model relying on voluntary contribution of labour proposed for District and Rural roads. This paper reviews the policy, institutional, funding and operational contexts relevant for the maintenance of District and Rural roads, assesses the situation in two provinces (Champasak and Hoauphanh) and Soukhouma district in Champasak province as illustrations, identifies issues to be investigated further and makes recommendations on the way forward.

For the maintenance of Local roads, there have been a number of positive developments:

- (a) the Road Law setting out (i) the classification of roads according to their functions and (ii) the responsibilities of public agencies at different levels (national, provincial and district) for managing them and providing resources for maintenance;
- (b) setting up of the Road Maintenance Fund with a share of the funds to be allocated for maintenance of “Local” roads;
- (c) a shift in emphasis on the part of GoL and donors towards Local roads and towards maintenance instead of new construction;
- (d) establishment of the Local Roads Department (LRD) and the development of maintenance management capacity and systems in MCTPC and the seven provinces (Borikhamxai, Champasak, Kahmmouane, Louang Namtha, Luang Phabang, Oudomxai and Savannakhet) supported by SIDA and World Bank, and
- (e) implementation of maintenance in the LSRSP2 and RMP provinces and other initiatives from which there are useful lessons for developing a national strategy.

For developing a maintenance strategy for District and Rural roads, the maintenance management capacity and systems developed by the LRD provide a good starting point. However, their focus on Provincial roads has reduced the applicability of the approach for maintaining District and Rural roads in a number of ways.

- (a) District and Rural roads are lumped together for the purpose of maintenance. This makes it difficult to develop a coherent strategy for preserving and improving access for the rural population.
- (b) The VMC (Village Maintenance Committee) model under which contracts with villages requiring voluntary contribution of labour in return for financial and technical support is being tested for District and Rural road maintenance. There are a number of problems with this model:
 - It is unsuited for the maintenance of the longer and more important district roads because establishment of ownership and continuing commitment to maintenance are difficult if a road provides access to a number of widely dispersed villages.
 - As a consequence, they are likely to lead to a piecemeal approach to maintenance of short roads or road sections providing access to one or two villages only.
 - The resources devoted to supporting the maintenance of short roads could be better used in maintaining longer roads serving more important

functions at the district level, an important issue when resources and capacity are limited.

- (c) The specifications of roads and maintenance treatment for District and Rural roads based on those for Provincial roads are too high leading to unnecessarily high maintenance treatment specifications and high costs.

Rough cost estimates for labour-based routine and periodic maintenance made in this paper are about US\$420 per year (US\$170 per km for routine maintenance and US\$250 per km for periodic maintenance where the periodic maintenance cost assumes an average 8 year cycle of treatment). Based on these estimates, the annual costs of routine and periodic maintenance for all the maintainable District and Rural roads in Lao PDR (excluding Vientiane Municipality) are about US\$590,000 and US\$860,000 respectively giving a total cost of about US\$1.45 million or equivalent to about US\$0.33 per head of rural population. The estimated cost is about 8.6 per cent of the annual maintenance requirement for all maintainable roads in Lao PDR but equivalent to about 66 per cent of RMF revenue in 2003-4, emphasising the need to generate more revenue to underpin the application of the “user pays” principle for road maintenance.

At the province level there seems to be some scope for redirecting resources from road improvement and construction to maintenance. In Champasak, the estimated annual routine maintenance requirement was about 22 per cent of the provincial expenditure on road sector investment from domestic funds only and the routine and periodic maintenance was about 54 per cent of this investment expenditure. In Houaphanh, the maintainable network is much smaller, road sector investment expenditure is also smaller and the estimated maintenance requirement is about 23 per cent of the investment expenditure. However, these two provinces may not be representative of the rest.

In developing a maintenance strategy for District and Rural roads, it is necessary to distinguish between roads on the basis of their function and importance. A network approach at the district level makes a distinction between roads which constitute the core network for the district (i.e. the longer roads which provide access for the district population to the district centre and to the provincial and national network) and the remaining relatively short roads linking villages to the core network. For securing the existing access level for the rural population, the core network should have priority and should be managed by local government (district OCTPCs with DCTPC support) while the remaining roads could be left to communities. A core network maintenance strategy would:

- (a) identify the existing core network in maintainable condition and providing 12 month access based on the population served and other relevant criteria (the PRTP process for consultation would be important in identifying the core network and priorities for network extension), and
- (b) maintain the maintainable part of the core network to the required standard by appropriate labour-based contracting.

The contributions of the proposed strategy to the NPEP goals on poverty reduction are (i) preservation of existing access for the rural population and (ii) provision of a base from which access can be improved by extending the core road network as resources permit.

The core network strategy requires commitments and changes in policy, funding and institutional aspects and planning and management at the district, province and national levels. These are briefly summarised here (see section 8 and Table 24 for details):

- (a) Acceptance of asset management principles and the core district network strategy by province and district administrations (with national level support) for District

and Rural roads and development of priorities and plans in line with asset management and the core district network strategy.

- (b) Adequate funding from a combination of (i) allocation from RMF, (ii) additional provincial and district revenue, and (iii) redirection of provincial budget funds from rehabilitation to maintenance, but in the short-term, continued external support will be required and may provide the leverage to develop local funding sources and bring about the necessary institutional changes.
- (c) Establishment of provincial road maintenance funds (PRMFs) managed by boards emulating the RMF at the national level.
- (d) Development of planning and management capabilities at the district and province levels to include:
 - identifying the core network and collecting information on its condition, prioritising and programming;
 - inspection, procurement and supervision, and
 - implementation of labour-based routine and periodic maintenance through contractors (commercial, community and individual as appropriate).

District level OCTPC capacity is too weak to play a full role in planning and management initially. The DCTPCs would have to be responsible for these aspects. LRD's role of providing technical support and guidance and strategic planning would include development and adoption of suitable road standards and maintenance treatments for core District and Rural roads, testing of alternative technical and contracting models and supporting the DCTPCs in implementation and capacity building.

The initiation of these changes would require external technical and financial support. In the first instance, the project could focus on two provinces such as Champasak and Houaphanh representing different characteristics, resources and capabilities. The aims of the project would be to support LRD and the provinces in:

- (a) improving their planning capacity based on the core network model;
- (b) introducing the required institutional changes and developing capacity at the province and district levels;
- (c) adapting the maintenance management systems and procedures to District and Rural roads;
- (d) testing and implementing labour-based methods where necessary;
- (e) developing private sector capacity, and
- (f) implementing the maintenance programme.

The next phases of the World Bank and SIDA support for Local road maintenance (RMP2 and LSRSP3) are currently being developed and could incorporate an initiative to develop a sustainable strategy for the District and Rural roads.

1 BACKGROUND AND ISSUES EXAMINED

At the end of the 1980s, the road network in Lao PDR was in a state of disrepair and deteriorating further. Since the early 1990s, very substantial progress has been made in the improvement of the road infrastructure and in the capacity to manage it. About US\$ 600 million was spent on the rehabilitation of the national and provincial network in the 1990s with bilateral and multilateral donors contributing almost 80 per cent of the expenditure (World Bank, 2001a). About 3000 km of roads have been rehabilitated or substantially improved. These include National Road 13 (NR13), the north-south backbone of the road system and important east-west links connecting Thailand and western Lao PDR to the eastern border with Viet Nam (NR6, NR7, NR8 and NR9).

The heavy investment was focused on the National network leaving much of the Provincial, District and Rural network in need of rehabilitation and maintenance. Improvement of the primary road network was the priority in the early stages of the economic reform and national reconstruction programme initiated in 1986. A recent study (MCTPC, 2004) shows that only about 38 per cent of the Local Road network¹ is in a maintainable condition. The proportion of District and Rural roads in a maintainable condition is even lower. Roads in “good” and “fair” condition are normally maintainable² and passable throughout the year³. The remainder are passable with more or less difficulty for six months in the year.



The rehabilitated National roads and the better provincial, district and rural roads require resources for maintenance to preserve assets. In addition, maintaining or improving access for rural people is an important element in the rural poverty alleviation strategy. In this context, there have been two major shifts in the roads sector strategy at the beginning of the 21st Century. The first is a shift in emphasis from road construction and rehabilitation to preserving the existing road network through maintenance. The second is the high priority given to the maintenance of the rural road network as a component of the

¹ The Local Road network consists of Provincial, District and Rural roads. Provincial roads provide important links at the province level while District roads do the same for the district. Rural roads are mainly roads providing access for villages (see section 2.2 for more details).

² See section 2.1 for definition of maintainability.

³ The Local Roads Department (LRD) has well defined criteria for road condition categories based on drainage and surface conditions (MCTPC, 2004).

National Poverty Eradication Programme (NPEP) (MCTPC, 2003a). As a part of its contribution to the GoL poverty reduction initiative, MCTPC (2003a) has identified the improvement and maintenance of the transport infrastructure as an important requirement.

With substantial and continuing support from external agencies, GoL has directed a major effort at developing and implementing maintenance management systems and programmes for National roads throughout the country and provincial roads in seven provinces. The major donors in this area are SIDA which supports the Lao-Swedish Road Sector Project 2 (LSRSP2) and World Bank / IDA which supports the Rural Maintenance Project (RMP)⁴. LSRSP2 and RMP have divided their support for the maintenance of local roads in seven provinces between them with LSRSP2 supporting Borikhamxai, Kahmmouane and Oudomxai and IDA supporting Champasak, Louang Namtha and Savannakhet. Both IDA and SIDA support Luang Phabang. The issue of developing a sustainable maintenance system for the Local Road Network (LRN) is being addressed at present by the Local Roads Department (LRD) within MCTPC with LSRSP2 support. The rural road network consisting of District and Rural roads is in an especially poor state and in need of a coherent strategy and commitment of resources. An effective and sustainable maintenance regime requires a combination of suitable policy, institutional, funding and operational conditions. The purpose of this paper is to contribute to the development of a rural transport strategy for Lao PDR by assessing the current situation with respect to the maintenance of the District and Rural road network (the full terms of reference are set out in Annex I).

The context for rural road maintenance (the rationale for and types of maintenance, a description of Lao PDR road network, especially the Local Road Network, and available data on the vehicle fleet and traffic) is set out in section 2. Section 3 outlines the policy context followed by an examination of the institutional and funding aspects (section 4). The operational aspects are discussed in section 5, Section 6 makes an assessment of the maintenance needs and costs for rural roads and Section 7 examines the situation at the province and district levels through case studies. The broad conclusions and the resulting recommendations and actions are set out in section 8.

⁴ The next phases of the two projects are at present at a formative stage.

2 THE CONTEXT FOR A RURAL ROAD MAINTENANCE STRATEGY

2.1 Importance and types of maintenance

Internationally, inadequate maintenance of roads has wasted resources invested in roads. An early World Bank study (Harral and Faiz, 1988) demonstrated that spending US\$12 billion on maintenance in developing countries would have saved US\$40 to US\$45 billion of reconstruction expenditure. Later studies developed and elaborated the asset management model which has been widely accepted as a means of improving resource allocation in the roads sector.

For most countries the road infrastructure is a major, if not the most expensive, national and public asset. The asset management model seeks to preserve the investment in roads and ensure that roads deliver a high level of net benefits to society. Therefore, asset management does not solely focus on engineering aspects but also considers the requirements of the users. The World Road Association (PIARC) has defined asset management as a systematic process of effectively maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing the tools to facilitate a more organised and flexible approach to making decisions necessary to achieve the public's expectations. Application of the asset management model has demonstrated that in many cases, preserving, maintaining, and maximising the operations of the existing road network provides higher benefits than investment in more roads.

Nevertheless, effective implementation of asset management of roads has been slow to materialise, especially in developing countries, because of the difficulty of ensuring the configuration of appropriate policy, institutional, financial and operational elements (Malmberg Calvo, 1998). Establishment of an effective asset management model requires (Heggie and Vickers, 1999):

- (a) clear assignment of responsibility for managing the network to agencies at the appropriate level (e.g. at the national level for national highways, for tertiary roads at the appropriate local government level);
- (b) ownership and ownership mode (e.g. the roads may be in public ownership but they are managed on commercial principles with service provision related to user charges and user representation in decision making) to ensure efficient use of resources;
- (c) adequate and steady financing, preferably based on user charges, and
- (d) effective planning and operation of maintenance activities.

The preceding discussion emphasises the importance of maintenance as a part of road asset management. Maintenance is the range of activities aimed at retaining roads in a condition to fulfil their function or to restore them to the required condition. Maintenance activities are typically divided into three distinct categories defined according to their timing and nature of work, routine maintenance, periodic maintenance and emergency maintenance (Table 1). The table also makes a distinction between maintenance activities to preserve the road assets and rehabilitation and improvement activities.

Table 1: Types of road maintenance and improvement

Maintenance activities	
Routine maintenance	Operations such as vegetation control, shoulder rebuilding, drainage and pothole repair required to be carried out one or more times per year on a section of road. These operations are typically simple and on a small scale, but are widely dispersed. They usually require unskilled or semi-skilled labour which can be estimated and planned for on a regular basis.
Periodic maintenance	Operations such as resurfacing required after a number of years. These operations are normally large scale and require specialist equipment, skilled resources and materials (e.g. gravel) to implement, and usually necessitate the temporary deployment of resources on one road section at a time. These operations are costly and require specific identification and planning for implementation, and may require design.
Emergency Maintenance	Emergency operations to repair road sections, culverts and bridges damaged by natural calamities - floods, storms, earthquakes or traffic accidents.
Improvement activities	
Rehabilitation	Operations to restore the original standard of a road, typically when maintenance has been neglected for many years.
Improvement or upgrading	Improvement in the original standard of an existing road or track, for example application of a gravel wearing course and construction of culverts but not total reconstruction.
Spot improvement	Rehabilitation or improvement of short deteriorated sections of roads which are otherwise in an acceptable condition. This can be effective on roads with low traffic volumes.
Reconstruction and new construction	Reconstruction is a major improvement of the original standard of an existing road, almost equivalent to new construction. New construction is a completely new road.

If maintenance is inadequate, roads deteriorate and cease to provide the intended level of service. Any savings in not maintaining the roads are typically far exceeded by the costs imposed on the users and the high cost of rehabilitation of the road. Improvement and reconstruction are normally justified because of higher traffic volumes and benefits. Sometimes the different levels of treatment are combined. For example, periodic maintenance may include elements of rehabilitation and even upgrading. For rural roads, important for access but carrying low traffic volumes, a low cost maintenance regime combined with spot improvement may be the most appropriate.

MCTPC fully recognises the importance of the asset management approach. With external support, significant progress has been made in addressing the issues of assignment of responsibility, ownership, funding and effective planning and operation for National roads. With LSRSP2 and RMP support, the issues are also being addressed for Provincial roads, effective maintenance systems have been developed by LRD in MCTPC and these are being implemented in seven provinces. The design of an appropriate asset management strategy (including assignment of responsibility, ownership and ownership mode, financing and adequacy of funds and planning and operations) for District and Rural roads is an issue which needs attention and is addressed in this paper.

The asset management approach requires that maintenance of the existing road network should have the highest priority. However, if the network has not been maintained for some time and roads have not been recently constructed, rehabilitated or repaired, many roads may be unmaintainable. Therefore, it is necessary to identify the maintainable part of the network and preserve these assets by setting up an appropriate maintenance regime. MCTPC (2004) defines maintainable Local roads as “all engineered roads (roads with drainage and gravel surface) that are in a reasonable condition, so that routine maintenance is possible without need for extensive rehabilitation.”

This definition is specific to Local road network conditions in Lao PDR. Very small proportion of Local roads are paved and almost all the earth roads are in poor unmaintainable condition. There is close a association between road condition and maintainability. In general, roads in “good” and “fair” condition are passable all year round and maintainable. For unmaintainable roads, a systematic approach to appraisal is needed to determine whether they should be rehabilitated or upgraded. In the context of asset management, such an approach should take account of the life cycle costs of the road, its function and benefits and availability of resources.

2.2 The Lao PDR road network

The Road Law has formally defined road categories according to their functions⁵. Table 2 briefly describes the most important categories for the purpose of this paper. Additional categories are urban roads and “specific” roads serving specific economic or national defence and security purposes. For administration and management purposes a distinction is made between the National Road Network (NRN) consisting of National roads and the Local road network (LRN) consisting of the Provincial, District and Rural roads are grouped together. MCTPC has responsibility for managing National roads on behalf of GoL while Local roads are the responsibility of provinces. The role of ministries and agencies at the national level and within provinces has been considered in more detail in section 4.1.

Table 2: Road categories in Lao PDR

Road category	Brief description
National roads	Connecting the national capital to the provincial and special zone capitals and to international borders and other major roads of strategic significance for national defence and security.
Provincial roads	Linking provinces to the national capital and to other provinces and provincial capitals to district centres and other important locations within the province.
District roads	Connecting districts and district centres to villages and other important locations within the district.
Rural roads	Connecting villages to other villages and to production and service centres serving the village.

Source: Road Law, No 04/99/NA, 3rd April 1999

The Planning and Technical Division (PTD) and LRD in MCTPC have recently reclassified roads and compiled revised estimates of the size of the network by categories. For Local roads, the reclassification has reduced the length of provincial and district roads and increased the length of rural roads. Table 3 shows that the Lao PDR road network amounts to about 31,219 km consisting of 7,141 km of national roads, 6,485 km of provincial roads, 3,865 km of district roads and an estimated 11,365 km of rural roads. District and Rural roads make up 48 per cent of the road network. Over half of the National roads are paved while 16 per cent are still earth. Only 3 per cent of Provincial roads are paved and half of them are earth. About 52 and 84 per cent of District and Rural roads respectively are earth (about 76 per cent for District and Rural roads together) and about 24 per cent are gravel.

⁵ National Assembly (1999) *Road Law*, No 04/99/NA., 3rd April. The law also specifies the responsibilities of central ministries, local government and agencies with respect to roads (see section 3.3)

Table 3: The Lao PDR road network

Road type	Road Surface						All surfaces km %	
	Paved		Gravel		Earth			
	km	%	km	%	km	%		
National	3,771	53	2,244	31	1,126	16	7,141	23
Provincial	198	3	3,038	47	3,249	50	6,485	21
District	31	0.8	1,826	47	2,008	52	3,865	12
Rural	14	0.1	1,815	16	9,527	84	11,356	36
Urban	429	24	871	49	465	26	1,765	6
Special	54	9	304	50	249	41	607	2
Total	4,497	14	10,098	32	16,624	53	31,219	100

Source: Department of Roads Summary of road statistics, 2003, MCTPC

Table 3 does not indicate the condition of roads. Earlier evidence indicates that about 60 per cent of the District and Rural road network is likely to be in “Poor” or “Bad” condition (World Bank, 2001a). Following the completion of the recent reclassification of roads, a recent study (MCTPC, 2004) has estimated the size of the maintainable road network⁶ in all the provinces. In the seven LSRSP2 and RMP provinces, this has been done by a rapid road inventory while in the remaining provinces, it is based on the road reclassification approach. The results are summarised in Table 4.



About 8176 km (or 38 per cent of the total Local road network) have been assessed to be maintainable. Overall, the length of Provincial roads in maintainable condition is about the same as the length of maintainable District and Rural roads put together. However there are significant differences between the provinces and between the road categories. Ignoring Vientiane municipality and the apparent errors in the

data for Luang Namtha and Luang Phabang, the table shows that:

- (a) about 38 per cent of the total Local road network appears to be maintainable;
- (b) a much larger proportion of Provincial roads (63 per cent) than the District and Rural roads (27 per cent) is maintainable;
- (c) there are large variations between the provinces in the size of the network, partly reflecting their relative sizes but also the development of their road infrastructure (see Annex 2), and
- (d) there are also large variations in the proportion of the network in maintainable condition (between 0 per cent to almost 100 per cent for provincial roads and between 6.3 per cent and 73.6 per cent for the District and Rural roads).

The proportion of roads in maintainable condition in the LSRSP2 and RMP provinces (shown by bold italics in Table 4) are much higher than those in the remaining

⁶ Generally representing the size of the “good” and “fair” network.

provinces⁷. This is to be expected because of the additional resources and attention these provinces have received. Table 5 shows that the LSRSP and RMP provinces contain well over 50 per cent of the Local road network. Further, while a much higher proportion of the Provincial network is maintainable in the LSRSP2 and RMP provinces, the maintainable proportion of District and Rural roads is about the same in the two groups of provinces indicating that the improvement and maintenance efforts in LSRSP2 and RMP provinces have focused on Provincial roads⁸. Details of the road network in two provinces (Champasak and Houaphanh) and in one district in Champasak are considered in section 7 below.

Table 4: An estimate of the maintainable part of the Local road network

Province	All Local roads (km) (1)	Provincial roads (km)	District and Rural roads (km)	Maintainable Local roads					
				Provincial Roads		District & Rural Roads		Total	
				km	%	km	%	km	%
Attapeu	561	189	372	62	32.8	47	12.6	109	19.4
Bokeo	668	138	530	51	37.0	59	11.1	110	16.5
Bolikhamxai	1,049	483	566	433	89.7	338	59.7	770	73.4
Champassak	2,249	486	1,763	320	65.8	499	28.3	819	36.4
Houaphanh	1,143	460	683	115	25.0	75	11.0	190	16.6
Khammouanne	1,916	462	1,454	311	67.4	369	25.4	680	35.5
Luang Namtha (2)	814	383	432	401	104.8	118	27.3	519	63.7
Luang Phabang (2)	572	434	138	433	99.8	338	245.8	770	134.7
Oudomxai	844	248	596	209	84.3	326	54.7	535	63.4
Phongsali	538	142	396	0	0.0	74	18.7	74	13.7
Salavan	1,040	101	939	72	71.3	188	20.0	260	25.0
Savannaketh	4,111	815	3,297	730	89.6	188	5.7	918	22.3
Vientiane	1,523	623	900	387	62.1	395	43.9	782	51.3
Vientiane municipality	1,111	235	877	220	93.7	673	76.8	893	80.4
Xainabouli	1,321	674	647	161	23.9	65	10.0	226	17.1
Xaisomboun	573	402	171	10	2.5	52	30.3	62	10.8
Xekong	427	48	379	0	0.0	27	7.1	27	6.3
Xiengkhouang	1,245	163	1,082	140	85.7	292	27.0	432	34.7
Total	21,706	6,485	15,222	4,055	62.5	4,123	27.1	8,176	37.7

Source: MCTPC (2004) Five years maintenance plan for Local roads in Lao PDR for the years 2004/5 – 2008/9, revised March 2004.

Notes: (1) Data from the Department of Roads Summary of road statistics, 2003. For two provinces (Xaisomboun and Xeking) the Five years maintenance plan are different. (2) For Luang Namtha and Luang Phabang, there appear to be errors in the figures since the length of maintainable roads for one of the categories exceeds the total road length. The broad conclusions are not affected.

⁷ There is inconsistency in data for between data on all Local roads and maintainable roads for Louang Namtha and Louang Phabang (see note (2) under Table 5).

⁸ Though the proportion of maintainable roads in the non-LSRSP2/RMP provinces looks better because this group includes Vientiane Municipality with a high proportion of maintainable roads.

Table 5: Maintainable Local roads: Comparison of LSRSP2 and RMP and other provinces

	All Local roads (km) (1)	Provincial roads (km)	District and Rural roads (km)	Maintainable Local roads					
				Provincial Roads		District & Rural Roads		Total	
				km	%	km	%	km	%
LSRSP and RMP provinces (1)	10,983	2,875	8,108	2,404	83.6	1,838	22.7	4,241	38.6
% of total	52	48	54	66		49		57	
Remaining 11 provinces	10,152	3,175	6,976	1,218	38.4	1,947	27.9	3,165	31.2
% of total	48	52	46	34		51		43	

Source: Consultants' calculations from Table 4 data.

Note: (1) Six provinces excluding Luang Phabang because of data quality.

2.3 Vehicle fleet and traffic volume

As Table 6 shows, vehicle ownership started from a low base in 1980 but has been rising sharply since then. The total number of registered motorised vehicles (two, three and four wheeled) rose by 67 per cent between 1980 and 1990 and a further 218 per cent between 1990 and 2003. The most rapid growth has been of three wheelers, pickups, mini buses and jeeps though 77 per cent of motorised vehicles are two wheelers.

Table 6: Registered vehicle fleet in Lao PDR, composition and growth calculation

	Motorcycles		Light vehicles				Heavy vehicles		Total
	2 wheel	3 wheel	Cars	Pickups	Mini bus	Jeep	Trucks	Buses	
1980	30,408	802	4,877	5,156	392	883	3,799	1,432	47,749
1990	57,878	897	5,730	5,983	473	1,090	6,236	1,625	79,912
% increase (80-90)	90.34	11.85	17.49	16.04	20.66	23.44	64.15	13.48	67.36
2003	195,353	6,407	8,045	25,490	2,729	5,832	8,424	2164	254,444
% increase (80-03)	542.44	698.88	64.96	394.38	596.17	560.48	121.74	51.12	432.88
% increase (90-03)	237.53	614.27	40.40	326.04	476.96	435.05	35.09	33.17	218.41

Source: MCTPC

Traffic volumes are low but have been growing in line with the growth of the vehicle fleet. A traffic survey at selected locations on National roads in 2000 (MCTPC, 2000a) showed that the average volume of traffic of four wheeled motorised vehicles was 318 vehicles. Traffic volumes at the same sites in 1995 averaged 117 vehicles. The growth in traffic between 1995 and 2000 was 172 per cent (an annual average growth rate of 22 per cent). Four wheeled vehicles were about 29 per cent of the total traffic with the remainder being two wheelers, tuk-tuks and single axle tractor trailers. The four wheeled vehicle traffic consisted of about 15 per cent heavier vehicles (trucks and buses) and about 14 per cent light vehicles (cars, pickups and minibuses).

On the more important National Roads, four wheeled motorised traffic is in the 250 to 500 vehicles per day range. Traffic data on Provincial and other roads are limited but

traffic on Local roads is generally thought to be (1/10)th of the range of the more important National Roads. Traffic data for the year 2001/2 for selected Local roads shows that traffic volumes are low, typically less than 50 ADT of 4 wheeled motorised vehicles and in many cases less than 25 ADT. Four wheeled traffic on District and the more important Rural roads is likely to be below 25 ADT and even lower on the remaining Rural roads. Bicycle, single axle tractor-trailer, motorcycle and tuk-tuk traffic is higher, typically 3 to 4 times higher than four wheeled traffic on Local roads in general and possibly an even higher proportion on District and Rural roads. Maintenance contracts under LSRSP2 include the conduct of traffic counts but so far very limited traffic data have been collected and analysed.

Traffic volume data are required for engineering, economic and socio-economic reasons⁹. The engineering reasons are the assessment of wear and tear and damage to roads and implications for road design and maintenance treatment. The economic and socio-economic reasons are the assessment of benefits and potential for raising revenue for maintenance from users. The engineering focus emphasises four wheeled traffic and especially heavy vehicles but for a rounded examination of maintenance strategy, data on all transport modes on District and Rural roads are needed. The significance for maintenance planning and estimating costs, of traffic data and assumptions made in the absence of data, are considered in section 6 below.

⁹ If reliable traffic counts are expensive or difficult to collect, proxies for traffic volume based on indicators such as local population should be considered.

3 THE POLICY CONTEXT

3.1 Introduction

The policy context has implications for the development of a maintenance strategy and its implementation in two crucial ways:

- (a) The broader GoL policy objectives and framework are important contexts for developing priorities and designing solutions.
- (b) It is essential that the importance of maintenance is recognised by policy makers at the highest level and based on this recognition, high priority is assigned to it, adequate resources are made available, the necessary legal context is set up and appropriate institutional arrangements are made. For District and Rural roads, this involves policy within MCTPC, other parts of GoL with influence on rural development and finance and in the provincial administrations.

The rest of this section briefly describes these two aspects of the policy context and assesses their implications for the development of an effective maintenance strategy.

3.2 The broader policy context

3.2.1 Main elements of the broader policy context

At the broad policy level, the three elements of greatest importance are:

- (a) the high priority given to poverty eradication under the NPEP (World Bank, 2001b) and the contribution of improving and maintaining access for the rural population to reducing poverty;
- (b) the recently initiated policy of decentralisation of administration;
- (c) the policy making and implementation framework for managing District and Rural roads, and
- (d) the resource limitations within which GoL operates.

The first two of these elements are considered here. The last two are discussed briefly and considered in more detail in the next section on institutional and funding aspects.

3.2.2 Policy on rural poverty

About 80 per cent of the Lao population is rural and large sections of the rural population are poorly served by roads. About 41 per cent of the rural population lives more than 6 km from an all-weather road and 38.4% of villagers have no road access (Lam and Hoorweg 2003). Poverty assessments in Lao PDR show that poor access is a major contributor to rural poverty. The Lao household Expenditure and Consumption Survey, 1997/8, LEC II showed that villages with rural road access were better off compared with villages with no access. An earlier study (see Table 7) showed that households in villages with poorer access had substantially lower expenditure levels.

Table 7: Village road access and average per capita expenditure

Region	Village accessibility by truck			Per capita expenditure comparison	
	Never	Dry season only	Always	"Never" as % of "always"	"Never" as % of "dry season"
North					
% of population	48.9	17.7	33.4		
% of villages	54.9	11.4	33.7		
Average per capita expenditure (kip)	107,085	103,556	139,356	76.8	103.4
Centre					
% of population	5	33.2	61.8		
% of villages	7.2	38.6	54.2		
Average per capita expenditure (kip)	96,454	151,149	172,081	56.1	63.8
South					
% of population	13.2	35.3	51.5		
% of villages	14	35	51.1		
Average per capita expenditure (kip)	130,225	114,354	146,142	89.1	113.9
National					
% of population	21.7	28.4	49.9		
% of villages	33.5	29.4	37.2		
Average per capita expenditure (kip)	109,030	131,019	158,947	68.6	83.2

Source: World Bank (1995) Lao PDR Social Development Assessment Strategy

Given the relationship between poor access on rural poverty, the transport sector in general and rural roads and their maintenance in particular have been given high priorities in the NPEP. The role of improved roads in poverty alleviation (MCTPC, 2003a) is through better access to: (a) markets; (b) extension services for production, and (c) education and health services. A broader benefit is to integrate poorer remote populations into the economic and socio-economic life of the country and offer such populations with better opportunities for economic and social enhancement.

In addition, to the extent that routine and periodic maintenance use paid rural unskilled labour, continuing local employment is created though typically such employment creation is on a small scale in relation to the total population. For maintaining and improving village access roads, in line with decentralisation principles, the policy is to involve the rural population in the decision making and planning process and expect a contribution to road maintenance costs from the local population. The models for local participation and voluntary contribution of labour and their efficacy in road maintenance are considered in more detail in section 5.2. The related policy issues are highlighted here.

To the extent that maintenance relies on voluntary contribution of labour for maintenance, MCTPC (2003b) expresses concern that rural people may be burdened with assisting in road maintenance activities without pay where they do not benefit from the road. UNDP (2001) also noted that there may be contradiction between pro-poor infrastructure policies and "inviting Districts and Villages to participate in road maintenance, without giving them additional support and means to execute these tasks" and therefore the desired

results may not materialise¹⁰. MCTPC (2003b) recognises that “non-paid systems will be successful only on roads where a clear sense of ownership can be established, for example on a road that gives access for a village to a bigger road and that when villagers work on other roads they should be paid.”

The decentralisation policy allows villages to keep a percentage of revenue collected, but this is insufficient to pay for road maintenance (see section 3.2.2). MCTPC (2003b) also notes that Local road users already pay fuel levies, directly and indirectly, and therefore support for maintenance from these taxes for District and Rural roads is justified and additional tax on the village population would be too heavy a burden. Voluntary contribution of labour supported by technical and financial support is seen as a possible solution in these circumstances.

Therefore the issues requiring attention are:

- (a) the roads for which voluntary contribution of labour supplemented by technical and financing support would be appropriate and those for which it would not be appropriate, and
- (b) source of funds for fully or partially financing the maintenance of District and Rural roads.

3.2.3 *Decentralisation*

A policy of decentralisation of the development effort was initiated in 2000 (World Bank, 2001b). A Prime Ministerial Instruction (Instruction No 01/PM (11/03/2000) sets out the general principles to build up “provinces as strategic units, districts as planning and budgeting units and villages as implementation units”. This was complemented by a more detailed recommendation by the State Planning Committee (Recommendation No. 128/SPC (11/03/2000) on the competence, functions and responsibilities of the stakeholders regarding planning and a Ministry of Finance Recommendation No. 475/MF (22/03/2000) on establishing and implementing provincial budgets.

The decentralisation policy puts provinces in charge of formulating 5-year and annual socio-economic plans and related budgets and collecting revenues to go towards covering the expenditures associated with the 5-year annual plans of provinces. The expenditures are divided between administrative, capital and subsidies for the central and district budgets.

Under the decentralisation, districts are to become planning and budgeting units for district level socio-economic plans. Villages as the implementing units are required to formulate development and revenue collection plans and collect data at the village level on the living conditions of village households to categorise them as wealthy, self-sufficient or poor. The data are to be used to identify families requiring support. Districts and villages are to share responsibility for collecting revenues at the village level. The sources of revenue are land taxes (to be set by the district), resource taxes, fees from fluvial transport, animal registration, registration of television sets and from the leasing of public assets. The revenues are to be used for socio-economic development which could include building access roads and anti-flood dams, irrigation and water supply projects and improvement of medical and educational services. The proportion of village revenue generated which the villages are permitted to keep is very small and there are many claims on it.

¹⁰ In principle, voluntary contribution within cost-sharing and technical support goes some way to overcoming this problem.

In principle, decentralisation is highly desirable as it improves the efficiency and effectiveness of policy making and implementation. However, the decentralisation initiative is also based on the recognition that GoL resources are limited and therefore decentralisation is a means of shifting the burden to provinces, districts and villages. This broad policy is reflected in the transfer of responsibility for maintenance and improvement of rural roads to districts and villages discussed in section 3.2.1 above and examined in more detail in sections 4 and 5.

3.3 Specific policy context for District and Rural road maintenance

There have been a number of policy and institutional developments broadly favourable for establishing asset management and sustainable maintenance. They include:

- (a) the Road Law (1999) setting out (i) the classification of roads according to their functions and (ii) the responsibilities of public agencies at different levels (national, provincial and district) for managing them and providing resources for maintenance;
- (b) strategic directions for the development of the road sector (MCTPC, 2000) outlining (i) the establishment of roads sector management institutions and systems, (ii) principles for sustainable management of roads as assets, and (iii) decentralisation of planning and implementation;
- (c) a shift in emphasis on the part of GoL and donors towards “Local” roads and towards maintenance instead of new construction;
- (d) setting up of the Road Maintenance Fund with a share of the funds to be allocated for the maintenance of “Local” roads, and
- (e) establishment of LRD within the Department of Roads (DOR) in MCTPC.

The Road Law sets out the framework for managing the road network in Lao PDR. The framework includes principles, regulations and measures related to management, planning, survey, design, construction and maintenance of public roads. The law specifies: (a) the duties of Ministries at the national level and departments and agencies at the provincial level to manage roads; (b) the government’s authority to create a road development fund and (c) the liabilities of road users to contribute to construction, repair and maintenance.

MCTPC (2000b) identified maintenance of the Lao road network to avoid loss of capital invested in the roads as a key issue. In line with the new strategic direction, important steps have been taken to improve the road maintenance organisation and financing. The Department of Roads (DOR) has been set up to manage the road network and within DOR the Road Administration Division (RAD) is responsible for National roads and Local Roads Division (LRD) is responsible for Local roads. The Road Maintenance Fund (RMF) was established in 2001 and the Road Administration Division (RAD) and the Provincial DCTPCs have been strengthened to cope with road maintenance management and implementation.

4 INSTITUTIONAL AND FUNDING ASPECTS

4.1 Institutional structure for road maintenance

Figure 1 sets out the organisational structure within which road maintenance operates and Table 8 provides an overview of more detailed arrangements with respect to management, implementation and funding. The road sector falls within the fields of responsibility of the Ministry of Communication, Transport, Post and Construction (MCTPC). However, as Figure 1 shows, the Central Planning Committee (CPC) and the Ministry of Finance provide the national planning guidance and public funds. DOR is responsible for the overall management of the whole road network. The senior management of DOR sets goals, objectives and standards, decides on systems and procedures to be implemented, approves plans, allocates funds and monitors the implementation of performance. Within DOR, the Road Administration Division (RAD) is responsible for the maintenance of National Roads. RAD is also responsible for road maintenance policies overall and coordination of maintenance issues. The Local Roads Division (LRD) is responsible for developing policies on maintenance of “Local” roads (i.e. Provincial, District and Rural roads).



The Provincial Divisions of Communication, Transport, Post and Construction (DCTPCs) are the provincial offices of the MCTPC and responsible for the whole range of MCTPC sectors at the provincial level. They are responsible for the implementation of road maintenance on all roads within the province. For maintenance of National roads, their line of responsibility is directly to the Road Administration Division. For Local roads, LRD sets out the directives, instructions and priorities for the provincial maintenance programmes. The provincial programmes are subject to approval by LRD. It monitors and evaluates the results. However, under decentralisation, the provinces have been made responsible for Local roads and the DCTPCs also act as agencies of the provincial administrations in managing the road network. Formally, expenditure on Local roads comes under the provincial government budget though this budget has to be agreed with GoL.

On Local roads, the DCTPC answers to both the MCTPC and the provincial administration.

This raises issues of lines of responsibility and differences in objectives. Road sector policies of MCTPC and LRD are based on the asset management model. There is however a possible conflict between MCTPC and LRD mission and objectives (especially with the emphasis on maintenance and asset preservation) and provincial objectives which are not fully attuned to these objectives. Because of limited resources, acute needs, local interests and pressures and continuation of past practices, the provincial authorities may put greater emphasis on constructing or rehabilitating roads and minimise resources allocated for regular (routine and periodic) maintenance activities. Since the DCTPCs answer to both the MCTPC and provincial administrations, a continuing difference in objectives between the two bodies could be a serious obstacle to the establishment of an effective maintenance strategy for District and Rural roads.

Table 8 complements Figure 1 and provides an overview of the management, implementation and funding structure for the road sector. Policy and strategy for all types of roads are developed at the national level by departments in the MCTPC, though the responsibility is divided between two departments, RAD and LRD. The setting up of LRD shows MCTPC's commitment to developing a strategy for Local roads. LRD has also been responsible for developing a planning framework for Local roads, developing planning capability in the seven LSRSP2 / RMP provinces and supporting the planning process. For implementation of maintenance, there are different institutional arrangements for different Local road categories. Provincial roads are implemented by DCTPCs through contracts (commercial contracts for periodic maintenance and contracts with families along the road for routine maintenance).

In line with the decentralisation policy the district Offices of Communication, Transport, Post and Construction (OCTPCs) are responsible for planning and supervising the maintenance of District and Rural roads under supervision, technical guidance, training and assistance provided by DCTPCs. For District and Rural roads, LRD/LSRSP2 are currently testing a village based model in which Village Road Maintenance Committees (VMCs) representing villages along a road are responsible for routine maintenance. For longer roads forums for coordination and agreement on the maintenance of the road are proposed. The term Community Road Maintenance Committee (CMC) has been suggested for the multiple village committees. However, the extent to which such multiple village committees are operational at present is not clear.

Figure 1: Organisational structure for road maintenance

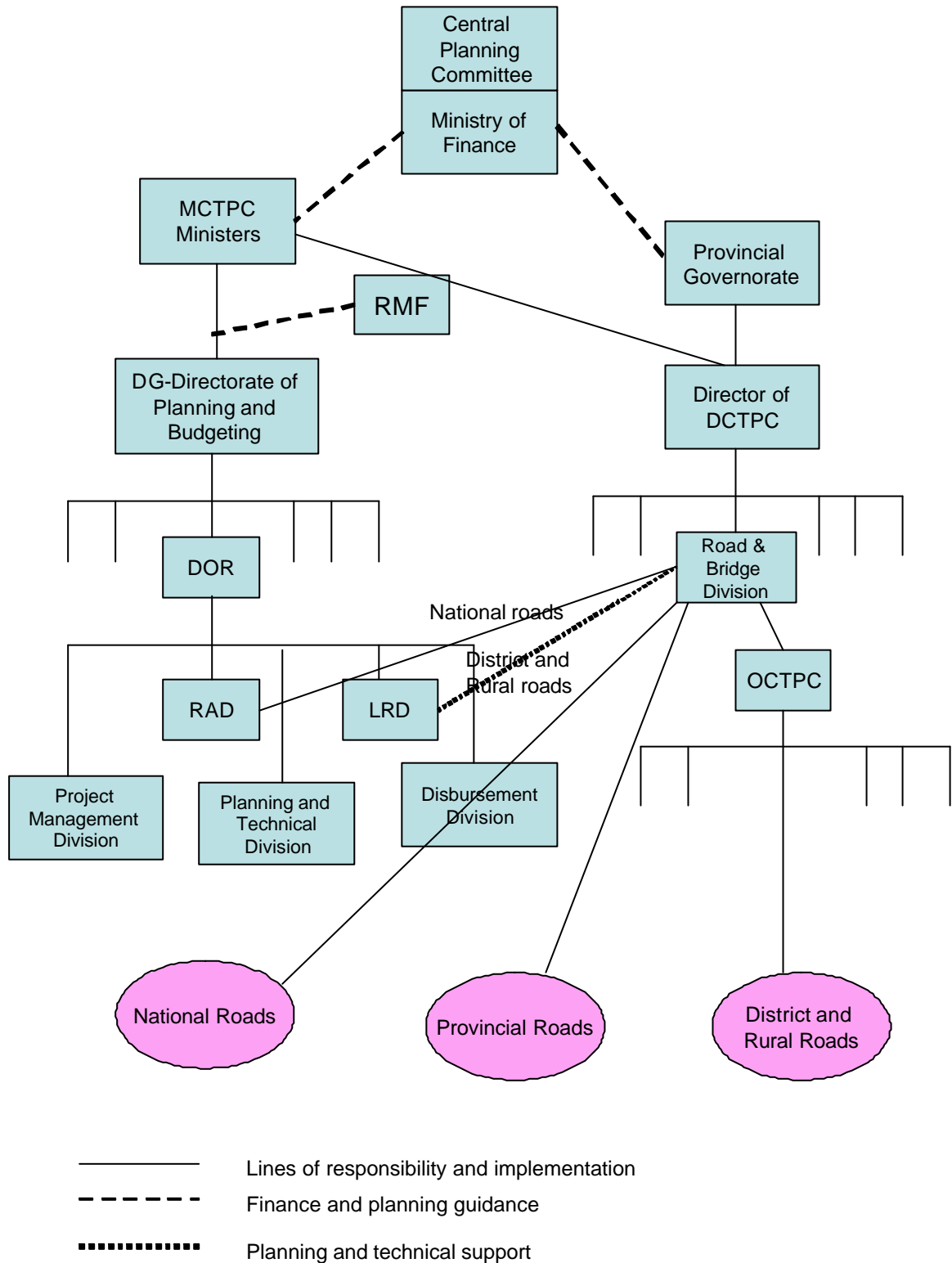


Table 8: Overview of institutional and funding arrangements for road maintenance (1)

Road category	Policy and strategy	Planning	Implementation	Monitoring	Funding
National	LRD (in DOR, MCTPC)	RAD and DCTPCs	DCTPCs by contract - commercial contractors for periodic - family contracts for routine	RAD	RMF for routine Co-financed and GoL budget for periodic
Provincial	LRD (in DOR, MCTPC)	DCTPCs (LRD/LSRSP2 systems and support)	DCTPCs by contract - commercial contractors for periodic - family contracts for routine	LRD and Provincial administration	RMF for routine (very small amount at present) Co-financed in 7 LSRSP2 and RMP provinces Provincial budget
District	LRD (in DOR, MCTPC)	DCTPCs (LRD/LSRSP2 systems and support) OCTPC when capacity permits	VMC contracts	OCTPCs with DCTPC support	Voluntary contribution of labour Subsidies (initially co-financed)
Rural	LRD (in DOR, MCTPC)	DCTPCs (LRD/LSRSP2 systems and support) OCTPC when capacity permits	VMC contracts	OCTPCs with DCTPC support	Voluntary contribution of labour Subsidies (initially co-financed)
Sub-rural	LRD (in DOR, MCTPC)	DCTPCs (LRD/LSRSP2 systems and support) OCTPC when capacity permits	VMC contracts	Village level body	Voluntary contribution of labour Subsidies (initially co-financed)

Note (1) The institutional and funding arrangements for National roads and Provincial roads in the LSRSP2 and RMP provinces are functioning. The VMC model is being tested in all provinces and in early 2004, most of the provinces had a budget for routine maintenance, some of which was for maintenance through VMCs (MCTPC, 2004).

4.2 Funding for maintenance

The shift in emphasis from rehabilitation and new construction to maintenance at the policy level is being reflected in funding. The Road Maintenance Fund (RMF) was established in 2001 to raise revenue on the “user pays” principle which makes a close connection between the service provided and payment made for maintenance expenditure on the National and Local road network. The RMF sits within the organisational structure of the MCTPC but is supervised and directed by an advisory board (Road Maintenance Advisory Board, RMAB) which consists of representatives from ministries and the private sector. Decisions on fund allocation require approval of the MCTPC Minister and the RMAB. The board can also make recommendations on charges based on maintenance requirements. The RMAB has many features of an independent roads board.

The sources of revenue are:

- (a) fuel duty (by far the largest component currently accounting for 80 per cent of revenue);
- (b) annual heavy vehicle fee;
- (c) overloading fines;
- (d) toll fee for roads and bridges;
- (e) border pass fee for trucks;
- (f) contributions from the government, private sectors and international funds, and

(g) others including interest earned.

When the RMF was set up, there was an expectation that the fuel levy would be increased rapidly to meet the bulk of maintenance requirements for the National and Local networks. The latest target is to achieve this situation by 2009. However, in April 2004, the fuel levy was still 40 kip per litre and the expected rapid increases in RMF revenue has not materialised. However, there has been a steady increase in RMF revenue because of the growth in traffic. An increase in the levy to about 3.5 cents per litre (equivalent to about 365 kip) and increases in other charges, especially the heavy vehicle surcharge, are required to increase revenues to fully meet maintenance requirements from domestic resources. GoL has set the challenging target to achieve self sufficiency by 2009 but it is likely that external support for road maintenance will be needed beyond 2009.

Table 9: RMF Fund: Value and allocation summary, FY 2003/04

	For National Roads		For Local Roads (Provincial, District and Village)	
	Kip	US\$	Kip	US\$
Proportion	90%		10%	
Provinces	18		18	
Fund/province	1,161,000,000	109,528	129,000,000	12,170
Sum	20,898,000,000	1,971,509	2,322,000,000	219,057
Total RMF	23,220,000,000	2,190,566		

RMF revenues for 2003-4 are estimated to be about US\$2.2 m (see Table 9), about 14 per cent of the US\$16 m estimated annual road maintenance needs (Table 10). With foreign assistance, about 45% of road maintenance needs are currently being met. Within the resource limitations, a high priority has been given to improve the maintenance of national roads with 90 per cent of RMF funds allocated for National roads and RAD has established a system for routine maintenance on national roads based on household contracts. The remaining 10 per cent of funds are allocated for Local roads. As table 9 shows, this leaves about US\$220,000 for Local roads in all the provinces, on average about US\$12,000 per province or about US\$27 per km of maintainable Local roads. The very limited resources for maintenance of Local roads are mainly spent on Provincial roads.

Table 10 shows an estimated breakdown of the overall requirement for maintenance. The requirements for Local roads are about 23 per cent and the requirement for District and Rural roads are 8.6 per cent of the total. The RMF allocation of US\$220,000 (Table 9) is less than 6 per cent of the estimated requirement of US\$3,913,796 for Local roads. If the allocations are to be made on the basis of requirements, the proportional allocations for Provincial, District and Rural roads would be higher.

Table 10: Estimated annual maintenance costs

	US\$	%
National roads (1)	13,015,000	76.9
Provincial roads (“Five Year Plan”) (2)	2,461,346	14.5
District and Rural roads (labour-based) (3)	1,452,450	8.6
All roads	16,928,796	100.0

Notes

(1) “Policy Workshop on the Establishment of a Road Maintenance Fund for Lao PDR” estimate made for 1999/2000.

(2) MCTPC (2004) Five years maintenance plan for Local roads in Lao PDR for the years 2004/5 to 2008/9, Department of Roads, LRD/LSRSP2, revised March 2004

(3) Lower cost, labour-based estimate (section 6 and Table 14)

Provincial plans include expenditure on roads from their own revenue generation and allocation from GoL (including external funding). As the Champasak and Houaphan case studies in section 7 show, available funds at the province level tend to be spent on rehabilitation and construction rather than maintenance. Further, there is also pressure to spend RMF funds on rehabilitation. Revenues are also collected at the village and district levels (mentioned in an earlier section). However, they are very small at present.

In the longer run, funds for maintenance of Provincial, District and Rural roads will come from some combination of the following:

- (a) RMF with increased levies and charges;
- (b) provincial funds, and
- (c) district and village funds from tax revenue.



The principle of financing maintenance from “user charges” is a sound one and therefore whatever combination of sources of funds is used, the “user pays” principle should be retained as far as possible. There is also a need to combine additional funding with acceptance of the asset management principle at the province and district levels. Increased user charges at the national level through the RMF appears to be the most satisfactory approach since the levies are based on the “user pays” principle and the system would become complex and lead to anomalies between provinces if additional levies were imposed at the province level. However, provinces could be given the

discretion to raise further revenues at the province or district level, for example through licence fees for selected vehicles¹¹.

Establishment of provincial road maintenance funds (PRMFs) managed by boards (Provincial Road Management Boards or PRMBs) to allocate maintenance funds and make recommendations on adequate funding levels and related matters, emulating the RMF at the national level would enable clarity of objectives and transparency with respect to the finances for maintenance and stabilise the availability of funds. Sources of revenue for the PRMF would be the allocation for Local roads from the RMF, additional levies at the province level, allocations from the provincial and national budgets and donor support. In the short-term, continued external support will be required for maintenance operations and institutional development. This may provide the leverage to develop local funding sources and bring about the necessary institutional changes.

4.3 Summary of institutional and funding issues

The institutional structure and funding situation outlined above raises the following capacity and operational issues:

- (a) DCTPCs are responsible for all the areas of ministry responsibility and may not have the staffing levels and the technical and planning capacity to manage the District and Rural road network and to provide adequate support for the OCTPCs (see sections 5 for the discussion of capacity in the LSRSP2 and RMP provinces and section 7 for case studies of two provinces).
- (b) Typically, a small complement of OCTPC staff with very limited resources are responsible for all the areas of ministry responsibility at the district level. Decentralisation of administration and the development effort has made the OCTPCs responsible for managing the district road network and implementing the current initiative to organise maintenance through VMCs. In most cases, the OCTPCs are unlikely to have the capacity to manage these elements even if adequate funds were available for implementation (see section 7 for the province and district case studies which illustrate these problems).
- (c) The VMC model is being tested on a number of roads and appears to be effective, at least in the short run for relatively short roads directly serving the communities responsible for maintenance. Questions still remain about the longer-term sustainability of the model, the capability of the OCTPCs and DCTPCs and provincial authorities to continue to provide technical support and funds, the types of roads for which the model is suitable, and options for maintaining roads for which the model is not suitable (see sections 5.2 and the Soukhouma district case study in section 7.3 for further discussion).
- (d) Adequate funds and the manner in which they are managed remains a major issue requiring difficult decisions at national and provincial levels.

¹¹ For example, Savannakhet requires registration and annual licence fees for single axle tractors used for transport.

5 MAINTENANCE PLANNING AND OPERATIONAL ASPECTS

5.1 Maintenance management procedures

With the help of LSRSP2, LRD has developed maintenance management systems and procedures for Local roads. The management and implementation process is separated into 10 result areas set out in a manual (MCTPC, 2003b) for managing maintenance and was finalised in December 2003 and briefly described in Table 11. Result areas 1 to 9 provide a sound structure for planning and implementation of maintenance of Local roads. The procedures for inspection, inventory and condition survey, maintenance planning and selection of maintenance treatment are well suited in general to maintenance of Provincial roads. In the seven LSRSP2 / RMP provinces, training in the implementation of the systems and procedures has been provided and the DCTPCs in the seven provinces are implementing the systems with the assistance of LRD.

However, most of the implementation has been on Provincial roads and therefore the procedures in the manual are based on this experience with similar specifications and treatment for maintenance assumed for District and Rural roads. The result areas 1 to 9 need to be adapted for District and Rural roads. For example, for result area 5 (selection of maintenance treatment) much more low cost treatment may be justified for District and Rural roads. Periodic maintenance and repair under RMP of all Local roads in Champasak are done by equipment and the specifications for District and Rural roads are the same as those for Provincial roads (e.g. carriageway width of 5.5m and gravel surface thickness of 0.15m). Given the low traffic volumes on District and Rural roads (see section 2.3), the technical standards for District and Rural roads should be lower¹².

Labour-based methods are now accepted for routine maintenance on all categories of roads in Lao PDR. Their suitability for periodic maintenance and improvement has also been demonstrated in Lao PDR and elsewhere. Labour-based methods are expected to be cheaper and would also contribute to the employment generation and poverty alleviation objectives.

Result Area 10 deals specifically with the maintenance of District and Rural roads. Village based maintenance with cost sharing between villages and the provincial administration has been proposed. This area is considered in more detail in the next section.

5.2 District and village participation in road maintenance

The district and village participation in the road maintenance initiative is closely associated with the high priority given to the rural road network as a component of the National Poverty Eradication Programme (NPEP) (MCTPC, 2003a) under which provision of basic access to rural communities as a means of contributing to poverty alleviation has a very high priority. The initiative is based on the premise that GoL and provinces do not have the resources to make a significant impact on the problem of poor rural access, but the current situation in which districts and villages are left with the full responsibility for District and rural roads is unsatisfactory. A middle route could be the sharing of responsibility and costs between the rural population and the province. The third objective of LSRSP2 is to develop and test a model for district and village participation in construction and maintenance of rural roads. MCTPC (2002) proposes a

¹² LRD/DOR/MCTPC (2003) has proposed two lower design classes VII and VIII with narrower carriageways (5m and 3.5m respectively) for District and Rural roads.

model under which maintenance responsibility is delegated to VMCs who sign maintenance contracts with OCTPCs and DCTPCs.

VMCs receive technical support and subsidies under these contracts in return for maintaining specific roads to an adequate standard. The system has been piloted in six of the seven LSRSP2 and RMP provinces with more than 120 villages participating. The exception is Louang Namtha where a paid labour system is being tested. The road sections to be maintained by VMCs are typically short. For example, the total length of the first 26 trial roads is 167 km i.e. an average length of 6.4 km per road.

The extension from routine maintenance to improvement and construction of roads serving villages through the Community Road Model (CRM) is intended to offer assistance to any communities wanting to sustain or create access for themselves (MCTPC, 2004c). The communities wishing to benefit from assistance should register with the relevant authorities and accept responsibility for the road. The community should carry out most of the works using labour-based methods (possibly employing a small local contractor). In return, the communities would be eligible for investment subsidies justified on the grounds of the reduced costs of the investment for the government. Two million Swedish krone from the LSRSP2 budget have been allocated for piloting CRM. The CRM model also includes maintenance subsidies similar to those for VMCs.

The objectives of the CRM model are to create or sustain access, help generate rural employment opportunities, and help reduce the cost to the government of managing rural roads as an asset. It is claimed that the model provides a win-win situation where villages benefit, poverty is reduced and both in the short and long terms, the government's costs of managing the asset are reduced.

There are clearly a number of issues of concern with respect to implementing VMC and CRM. Under the VMC model, village households contribute 2 person-days per month of labour. Routine maintenance activities are separated into two groups. Group 1 includes manual works (clearing culverts and ditches, filling potholes and bush clearing) and emergency maintenance and Group 2 includes maintenance of camber and ditches. Subsidies of 50 per cent and 70 per cent respectively are proposed for these two groups. The model does not make provision for periodic maintenance though arguably the CRM model could accommodate it if there are sufficient resources.

The VMC and CMC structures for maintenance have been set up at least partly in response to the lack of capacity at the OCTPC level. The principle of local contribution is based on the premise that villages as "owners" of the road and the main beneficiaries should make a contribution to maintenance costs. In principle, this is consistent with the "user pays" principle which underlies the RMF. However, there are a number of problems in implementing the voluntary contribution model. The model can work well in the following circumstances:

- (a) the road is short (normally not exceeding 5 km) and specifically serves a village or villages close to each other;
- (b) the VMC is highly motivated, well organised and effectively led;
- (c) the VMC receives adequate and timely support from the DCTPC and OCTPC in the form of training, guidance, tools and funds, and
- (d) there is effective supervision and inspection with payment (e.g. of subsidies) related to satisfactory performance.

Table 11: Maintenance management procedures in the LSRSP2 and RMP provinces

1. Routine inspection	To detect urgent maintenance and traffic safety hazards to identify emergency maintenance actions on maintainable roads to ensure safety and preserve assets. DCTPC and district staff have been trained and contracts have been signed between DCTPCs and district offices stipulating routine inspections duties and operational costs .
2. Road inventory and condition survey	Procedures for conducting rapid road inventories and condition surveys have been established and a Road Maintenance Management System (RMMS) for local roads has been set up. DCTPC and district staff have been trained in conducting the surveys (district staff are responsible for conducting surveys). DCTPC staff have been trained to operate the RMMS software. They are responsible for managing the road inventory database and using RMMS for maintenance planning. Traffic count data are also essential for maintenance management. While some routine maintenance contracts include traffic counts, data available to date are very limited.
3. Maintenance planning	Road inventory and condition surveys and RMMS are being used to identify the maintainable Local road network and to assess maintenance requirements and costs. DCTPC staff are being trained and supported in carrying out these procedures and the procedures and models are being improved.
4. Budgeting and finance	Standardised budget procedure and forms have been prepared by the Department of Roads (DOR). The budgeting procedure involves preparation of budgets by the DCTPCs followed by consolidated national budgets for the projects (LSRSP2 and RMP).
5. Selection of maintenance treatment	Recognising priorities (e.g. between routine and periodic maintenance), selecting appropriate treatments and estimating input requirements and costs. Training has been provided to staff in all DCTPCs leading to improvement in practice and hence in the quality of the works.
6. Procurement	This is concerned with procedures for selecting contractors for projects (pre-qualification, preparation of bidding documents, bidding, preparation of contracts and bid evaluation). Under LSRSP2, training has been provided and DCTPCs have the capacity to manage procurement with varying levels of support from RAD/LRD. Contract documents and procedures for routine maintenance of "community roads" by local communities with VMCs (Village Maintenance Committees) as contractors have been designed. The contracts are signed by the DCTPCs, OCTPCs (district offices of CTPCs) and VMCs.
7. Implementation	Execution of routine and periodic maintenance is by contractors with DCTPCs as clients being responsible for site supervision including quality and quantity control, keeping records and operating the financial management system (FMS) and handling claims, payment certificates and contractual letters. DCTPC staff and contractors have been provided training. A Monitoring and Evaluation System (MES) for implementation of works has been developed and tested.
8. Accounting	An integrated financial management and accounting system is being developed and implemented. It will incorporate planning and allocation of funds from external and local sources and will be used by the DCTPCs.
9. Reporting	LRD is responsible for assessing maintenance needs and preparing overall plans for the LRN (Local Road Network). The reporting system has been designed to provide relevant financial and physical works information for the planning, implementing and monitoring agencies and external donors. A Monitoring and Evaluation System (MES) has been developed to produce reports on contractual works.
10. District and village participation in road maintenance	The VMC model described in MCTPC (2002) (<i>Tentative principles for delegation of rural ownership to districts and villages</i>) is being tested as the village based routine maintenance component for District and Rural roads. This result area now incorporates the Participatory Rural Transport Planning (PRTTP) process and the Community Road Model (CRM) which aims to transfer ownership of roads, tracks and paths serving villages to them with technical and financial support being provided by provincial and district authorities.

In the absence of these conditions, maintenance work based on voluntary contribution is difficult to organise and supervise effectively, leading to productivity and quality control problems. On a long road serving a number of villages or a district road, the VMC model is unlikely to work. It is a mistake to think of a contract with selected community representatives (VMC) as a binding contract which commits the whole village. The VMCs or the CMC will find it difficult to motivate voluntary labour contributors to work effectively on roads which benefit a wider population and other users (for example, commercial vehicle operators) of the road because the commitment based on ownership will be lacking. It is proposed that the supervision of works will be done by the VMCs or

CMCs. If the VMCs are contractors, they cannot also be supervisors and managers of funds. The precise role of VMCs and their accountability and the separation of the contractor and supervision and management roles need to be clarified.

There is conflicting evidence on the willingness of villagers to make voluntary contribution of labour. LRD has found that in LSRSP2 and RMP supported projects, it has been possible to set up some VMC based maintenance arrangements on short roads serving one or two villages. A study for the RMP project proposal (World Bank, 2001a) found that while paid employment would make a contribution to the rural economy, there was an unwillingness to contribute voluntary labour. Relying on voluntary contribution based on VMCs is unlikely to be effective for district roads and the more important longer rural roads.

It is also acknowledged in LRD documentation (*Sub-procedure 10, District and village participation* in MCTPC, 2003c) that funds may not be available to provide the specified levels of subsidies if the VMC and CRM models are extended on a substantial scale. The VMC model has been proposed for routine maintenance only. It is recognised that a budget for periodic maintenance, spot improvement and major emergency repairs needs to be established. Some tentative proposals for such maintenance have been put forward in the manual. It is suggested that initially the fund would be established at the DCTPC. Eventually it would be delegated to the OCTPCs from which the VMCs would request funds for periodic maintenance. Requests for funds would be scrutinised and prioritised by the DCTPC in cooperation with the OCTPC, and funds allocated to the VMCs. With a suitable scheme for allocating resources and adequate technical support, the proposed system may be appropriate for allocating funds for village roads. Even if the scheme can be applied for allocation of funds, questions about the technical implementation of periodic maintenance remain unanswered.

The focus on the VMC and CRM models for the District and Rural road network is based on the assumption that all such roads are short and serve close-knit communities. Access for a community does not depend entirely on the road directly linking that community to the more important roads and therefore access requires an establishment of priorities for the road network serving a district and communities within it. For example, a district road may serve a number of villages directly where villages are on the road itself or indirectly where villages are further away from the road but linked to it through village roads. District roads serving a number of villages should clearly have a higher priority with respect to maintenance than a village road connecting one village only to the existing network. Reliance on VMC and CRM models may lead to few short roads for which VMCs are effective but the longer District roads serving a much larger population do not get maintained. A district wide approach to establishing priorities to maintain the core district road network is required. This issue is examined in more detail with a district case study in section 7.2.

6. ASSESSMENT OF MAINTENANCE COSTS OF DISTRICT AND RURAL ROADS

This section starts with a brief description of the recent exercise undertaken by LRD/LSRSP2 to assess the maintenance requirements and costs for Local roads in Lao PDR (MCTPC, 2004b). The study used the maintenance management system and procedures developed for the seven LSRSP2 and RMP provinces, estimates of costs from the two projects and recent estimates of the maintainable Local road network. The provincial Road Maintenance Management System (RMMS) was used to make the assessment. The requirements and costs were for preserving the assets embodied in the maintainable roads. Economic feasibility of the maintenance expenditure was not considered.

Maintainable road length in all provinces is based on condition surveys of roads in the LSRSP2 and RMP provinces done by DCTPC staff and the reclassification of roads in all the provinces recently completed by LRD. All engineered roads (i.e. roads with drainage and gravel surface) that are in a “reasonable condition”, so that routine maintenance is possible without need for extensive rehabilitation, are maintainable roads (section 2.1). This is a reasonable working definition for an initial assessment of rural roads, though a more precise assessment would be necessary for the development of a more detailed strategy and plan. All paved roads are assumed to be in good to fair condition and therefore maintainable. This may not be the case, though the issue is of little relevance for District and Rural roads since a very small proportion of these roads are paved. In effect all gravel roads in “good” or “fair” condition are considered to be maintainable.

Table 12 also shows the “Five Year Plan”¹³ estimates of total and per km maintenance costs for Local roads. On average the total maintenance costs for all Local roads (i.e. Provincial, District and Rural) for 2004-5 is estimated to be US\$589 per km. There are variations in costs between provinces reflecting differences in the conditions and assumptions which are discussed below. The average maintenance cost for District and Rural roads at US\$572 per km per year are somewhat lower than US\$607 per km per year for Provincial roads. However, they still seem to be high for rural roads with low traffic when compared with earlier estimates in Lao PDR and international experience. It is likely that assumptions and parameters valid for more important Provincial roads may not be appropriate for District and Rural roads. Therefore, the assumptions are examined in more detail and some tentative revised estimates are put forward.

In MCTPC (2004b), maintenance includes routine labour-based maintenance, routine equipment-based maintenance for higher traffic roads, emergency works and periodic maintenance. Traffic groups indicating traffic volume (see Table 13) are an important factor in determining the maintenance treatment and cost¹⁴.

In the absence of traffic data, the traffic group classification of roads is based on the road function and condition. District roads in a maintainable condition are therefore put in a high traffic class (3 or 4) irrespective of the actual volume of traffic. Since RMMS stipulates that roads with traffic groups 3 and above require equipment based routine maintenance (heavy grading and ditch clearing) in addition to labour-based routine maintenance, the estimated maintenance cost for District roads is raised by an assumed high traffic volume which may not exist. In addition, higher traffic volume roads are also assumed to require more frequent periodic maintenance which increases maintenance costs further. On the other hand, the cost of labour-based routine maintenance to the

¹³ In the rest of this section, for ease of comparison MCTPC (2004) is referred to as “Five Year Plan”.

¹⁴ While this has not been clearly specified, it is assumed that the term “vehicles” in the table refers to all motorised vehicles and “heavy vehicles” are trucks and buses.

province is assumed to be zero on these roads because of the assumption of voluntary contribution of labour under VMC contracts and no allowance is made for the costs of supervision and tools, equipment and materials.

In general, traffic volumes on District and Rural roads are likely to be low (mainly in traffic groups 1 and 2 with a few roads with group 3 traffic level) and therefore maintenance requirements will be lower than estimated. There are also lower cost labour-based alternatives to equipment-based maintenance which will be appropriate for traffic group 3 roads. This issue requires more detailed examination on a future project. In this report, some tentative alternative cost estimates have been made based on the following assumptions:

- (a) costs associated with traffic groups 1 and 2 and possibly for group 3 (with a labour-based substitute for the equipment based component) are more appropriate for District and Rural roads;
- (b) for realistic cost estimates, labour-based maintenance costs (with an allowance for the associated costs of supervision, tools, equipment and materials) should be included (labour cost assumed to be 60 per cent of labour-based routine maintenance costs), and
- (c) three alternative periodic maintenance cost assumptions are made, two based on the “Five Year Plan” and another on low-cost assumptions for low volume roads (see Table 14).

In Table 14, the first alternative represents the “Five Year Plan” assumptions for District and Rural roads. The only difference between the assumed costs and the assumptions for provincial roads is that for the former, the cost of labour-based routine maintenance is assumed to be zero. Equipment-based part of routine maintenance is added if the road is in traffic group 3 or higher. Routine and emergency maintenance costs are very low under this alternative but the high periodic maintenance cost¹⁵ brings the costs up to, for example, US\$455 for a road with traffic group 2 in rolling terrain.

The second alternative is based on the “Five Year Plan” with labour costs for routine maintenance included. The “Five Year Plan” does not include the cost of tools, supervision and delivery of material (e.g. for filling in potholes). Based on international experience, it is assumed that labour costs are about 60 per cent of labour-based maintenance operations. The periodic maintenance cost estimates under this alternative are identical to those in alternative 1. Effectively, this alternative provides costs identical to those for the maintenance of Provincial roads. Therefore it does not take account of the lower level of maintenance required for District and Rural roads with lower traffic volumes. It also assumes an equipment based approach for part of routine maintenance for Traffic Group 3 and for periodic maintenance.

¹⁵ The annual periodic maintenance cost figure is calculated from assumptions on periodic maintenance cost and the frequency of periodic maintenance which depends on the traffic group and terrain. For example, for traffic group 1 in flat terrain, periodic maintenance is required every 9 years while for traffic group 3 in mountainous terrain, it is required every 4 years. The default periodic maintenance cost assumption in RMMS was US\$3,894 per km. This was found to be too high and therefore the “Five Year Plan” estimates were based on costs reduced by 31 per cent in the South, 29 per cent in the Centre and 19 per cent. A rehabilitation cost of US\$2,675 (i.e. 30 per cent lower than default) has been assumed for this alternative.

Table 12: Estimated maintenance cost for Local roads: Five Year maintenance plan 2004/5-2008/9

Province	Maintainable Road Network (km)			Maintenance Cost (Mkip)					Maintenance Cost (US\$)				
	Provincial Roads	District & Rural Roads	Total km	Provincial Roads		District & Rural Roads		Total	Provincial Roads		District & Rural Roads		Total
	km	km		Total Cost	km-Cost	Total Cost	km-Cost		Total Cost	km-Cost	Total Cost	km-Cost	
Attapeu	62	47	109	419	6.8	306	6.5	725	40,288	650	29,423	626	69,712
Bokeo	51	59	110	474	9.3	405	6.9	879	45,577	894	38,942	660	84,519
Bolikhamxai	433	338	770	2,123	4.9	1,815	5.4	3,938	204,135	471	174,519	516	378,654
Champassak	320	499	819	1,679	5.2	2,116	4.2	3,795	161,442	505	203,462	408	364,904
Houaphan	115	75	190	1,398	12.2	751	10.0	2,149	134,423	1,169	72,212	963	206,635
Khammouann	311	369	680	2,041	6.6	1,839	5.0	3,880	196,250	631	176,827	479	373,077
Luang Namtha	401	118	519	1,469	3.7	446	3.8	1,915	141,250	352	42,885	363	184,135
Luang Phrabang	433	338	770	2,337	5.4	2,005	5.9	4,342	224,712	519	192,788	570	417,500
Oudomxai	209	326	535	1,398	6.7	2,143	6.6	3,541	134,423	643	206,058	632	340,481
Phongsali	0	74	74	0	-	893	12.1	893	0	-	85,865	1,160	85,865
Salavan	72	188	260	527	7.3	920	4.9	1,447	50,673	704	88,462	471	139,135
Savannaketh	730	188	918	4,160	5.7	960	5.1	5,120	400,000	548	92,308	491	492,308
Vientiane	387	395	782	3,233	8.4	2,447	6.2	5,680	310,865	803	235,288	596	546,154
Vientiane municipality	220	673	893	1,527	6.9	3,917	5.8	5,444	146,827	667	376,635	560	523,462
Xainabouli	161	65	226	1,350	8.4	456	7.0	1,806	129,808	806	43,846	675	173,654
Xaisomboun	10	52	62	123	12.3	435	8.4	558	11,827	1183	41,827	804	53,654
Xekong	0	27	27	0	-	163	6.0	163	0	-	15,673	580	15,673
Xiengkhouang	140	292	432	1,340	9.6	2,487	8.5	3,827	128,846	920	239,135	819	367,981
Total	4,055	4,123	8,176	25,598	6.3	24,504	5.9	50,102	2,461,346	607.0	2,356,154	571.5	4,817,500

Source: MCTPC (2004) Five years maintenance plan for Local roads in Lao PDR for the years 2004/5 – 2008/9, Revised March 2004

Table 13: Traffic groups for maintenance treatment

Class code	Class name	Description
1	Very light traffic	< 20 vehicles, no heavy vehicles
2	Light traffic	20 – 50 vehicles or 1 – 4 heavy vehicles
3	Medium traffic	51 – 150 vehicles or 5 – 10 heavy vehicles
4	Heavy traffic	151 – 500 vehicles or 11 – 100 heavy vehicles
5	Very heavy traffic	> 500 vehicles or > 100 heavy vehicles

The third alternative assumes the same labour-based maintenance and related tools, supervision and other costs as alternative 2 above with three adjustments:

- (a) Alternative 2 includes four days of traffic counts for every km which seems excessive. Traffic count days are reduced from four to one per km since it is unlikely that traffic counts are needed on every road. Counts on a judiciously selected representative sample of roads are likely to produce much more useful information.
- (b) The second adjustment is to assume replacement of the mechanical grader by a towed grader leading to an estimated 30 per cent reduction in cost.
- (c) Based on international evidence¹⁶ on labour-based periodic maintenance on low traffic rural roads and observations on local conditions¹⁷, an average cost of US\$1,500 per km has been assumed for periodic maintenance. It is assumed that for some low traffic volume roads, spot periodic maintenance may be sufficient.

Table 14: District and Rural road maintenance costs: Alternative estimates

	Flat			Rolling			Mountainous		
	Tr Gr 1 (1)	Tr Gr 2	Tr Gr 3	Tr Gr 1	Tr Gr 2	Tr Gr 3	Tr Gr 1	Tr Gr 2	Tr Gr 3
Alternative 1: Five Year Plan assumptions									
Routine and emergency	8	8	145	9	9	216	9	9	284
Periodic	297	382	446	334	446	535	446	535	669
Total	305	390	591	344	455	750	455	544	953
Alternative 2: Five Year Plan (labour cost assumed to be 60% of cost of labour-based operations)									
Routine and emergency	143	143	280	171	171	377	172	172	447
Periodic	297	382	446	334	446	535	446	535	669
Total	440	525	726	505	616	912	618	707	1,115
Alternative 3: Lower cost estimates for District and Rural roads (labour cost assumed to be 60% of cost of labour-based operations)									
Routine and emergency	143	143	240	171	171	315	172	172	364
Periodic	167	214	250	188	250	300	250	300	375
Total	309	357	490	358	421	615	422	472	739

Source: "5 Year Plan" and consultants' calculations.

Note (1) Tr Gr stands for Traffic Group.

In making cost estimates for maintenance in this report, the middle of Alternative 3 estimates (i.e. for rolling terrain with traffic group 2) have been used. The costs are US\$171 per km for routine maintenance and US\$250 per km for periodic maintenance (based on US\$1500 per km at 8 year intervals assuming low traffic, or a spot improvement approach with similar costs. Alternative 3 is a tentative estimate for

¹⁶ See Annex 3 for a summary of selected international evidence.

¹⁷ MCTPC (2003b) notes that gravel roads can be reshaped for less than US\$1,000 per km and "Five Year Plan" reduced the estimated periodic maintenance costs substantially below their initial assessment.

providing indicative costs. Important tasks at the next stage would be to assess road conditions and traffic in more detail, appraise alternative design standards and maintenance treatments and assess the applicability of low cost approaches.

At present, when considering maintenance options, all District and Rural roads are lumped together. This is not satisfactory since roads in these two categories differ in their functions and importance¹⁸. A network approach is required to make a distinction between roads which constitute the core network at the district level (i.e. the longer roads in a district which provide access for the district population to the district centre and to the provincial and national network) and the remaining relatively short roads serving villages (i.e. connecting villages to essential services or the core network). For maintenance, these two types of roads should be treated differently. In general, the core network should be managed by local government (district OCTPCs with DCTPC support) while the remaining roads could be left to communities. The Soukhouma District case study (section 7.3) elaborates further on the distinction between core network and other roads.



While the size of the maintainable District and Rural road network has been estimated, there is no estimate at present of the size of the maintainable core network which may include roads which are at present classified as District or Rural. In future work, it will be necessary to define the core network concept more precisely and make estimates at the district level. In identifying the core network,

evidence on (a) the physical structure of the road network and relevant geographical features in a district, and (b) accessibility and transport issues facing villages (assessed through the PRTP process) will be required.

Table 15 shows the costs of maintaining the network of maintainable District and Rural roads. In the absence of data on the core network, the whole network of maintainable District and Rural roads are assumed to be part of the core network. This is a reasonable initial assumption since the more important rural roads are likely to have received more attention in the past and are therefore likely to be in better condition. The total costs of routine and periodic maintenance for all the maintainable District and Rural roads in Lao PDR (excluding those in Vientiane Municipality) are about \$590,000 and US\$860,000 respectively giving a total cost of about US\$1.45 million. This is equivalent to about US\$0.33 per head of rural population. The cost per province ranges between US\$210,000 (Champasak) and US\$11,367 (Xekong) with the average cost per province being US\$85,000.

¹⁸ See section 5.2 above for a discussion of this issue.

Table 15: Estimated maintenance cost for maintainable District and Rural roads (excluding Vientiane Municipality): Lower labour-based cost assumption (Alternative 3 from Table 14)

Province	Maintainable (km)		Total (km)		Cost (M Kip)	
	(km)	% of total		Routine	Periodic	Total
Attapeu	47	43.1	109	85	125	210
Bokeo	59	53.6	110	107	156	263
Bolikhambxai	338	43.9	770	613	896	1,508
Champassak	499	60.9	819	904	1,322	2,227
Houaphanh	75	39.5	190	136	199	335
Khammouann	369	54.3	680	669	978	1,647
Luang Namtha	118	22.7	519	214	313	527
Luang Phrabang	338	43.9	770	613	896	1,508
Oudomxai	326	60.9	535	591	864	1,455
Phongsali	74	100.0	74	134	196	330
Salavan	188	72.3	260	341	498	839
Savannaketh	188	20.5	918	341	498	839
Vientiane	395	50.5	782	716	1,047	1,763
Xainabouli	65	28.8	226	118	172	290
Xaisomboun	52	83.9	62	94	138	232
Xekong	27	100.0	27	49	72	120
Xiengkhouang	292	67.6	432	529	774	1303
Total	3,450	47.4	7,283	6,253	13,536	19,790

Province	Maintainable (km)		Total (km)		Cost (US\$)	
	(km)	% of total		Routine	Periodic	Total
Attapeu	47	43.1	109	8,037	11,750	19,787
Bokeo	59	53.6	110	10,089	14,750	24,839
Bolikhambxai	338	43.9	770	57,798	84,500	142,298
Champassak	499	60.9	819	85,329	124,750	210,079
Houaphanh	75	39.5	190	12,825	18,750	31,575
Khammouann	369	54.3	680	63,099	92,250	155,349
Luang Namtha	118	22.7	519	20,178	29,500	49,678
Luang Phrabang	338	43.9	770	57,798	84,500	142,298
Oudomxai	326	60.9	535	55,746	81,500	137,246
Phongsali	74	100.0	74	12,654	18,500	31,154
Salavan	188	72.3	260	32,148	47,000	79,148
Savannaketh	188	20.5	918	32,148	47,000	79,148
Vientiane	395	50.5	782	67,545	98,750	166,295
Xainabouli	65	28.8	226	11,115	16,250	27,365
Xaisomboun	52	83.9	62	8,892	13,000	21,892
Xekong	27	100.0	27	4,617	6,750	11,367
Xiengkhouang	292	67.6	432	49,932	73,000	122,932
Total	3,450	47.4	7,283	589,950	862,500	1,452,450

Source: MCTPC (2004) and consultants' calculations.

7. PROVINCE AND DISTRICT LEVEL SITUATION – CASE STUDIES

7.1 Case study provinces and district

The context for and factors influencing maintenance of Local roads and especially District and Rural roads in Lao PDR have been reviewed in the previous section. In this section, the specifics at the province and district level are examined through case studies. The provinces compared are Champasak, a relatively better off southern province benefiting from external funding and technical assistance in the roads sector and Houaphanh, a relatively poorly resourced province with mountainous terrain in the north. Soukhouma, one of the poorest districts in Champasak, has been chosen for the district case study.

7.2 Champasak case study

Champasak is a southern province in mostly flat terrain with some hilly areas. It is the second most populous province after Savannakhet (excluding Vientiane Municipality) and has the highest population density outside Vientiane Municipality. It has the third highest maintainable road density per area (88 km per 1000 km²) compared with a national average of 65 km per 1000 km². Table 16 shows the breakdown of the road network by road category, surface and condition. Overall 53 per cent of the road network is in bad condition. Since, the whole National road length is assessed to be good or fair, 65 per cent of the Local road length is in bad condition. The proportion of Provincial and District roads in bad condition is about the same with Rural roads being in the worst condition as would be expected. A small proportion of earth roads have been assessed to be in “fair” condition though they are not considered maintainable according to the LRD/LSRSP definition (see section 2.1). According to Table 4, Champasak has a total of 819 km of maintainable Local roads (320 km Provincial, 499 km District and Rural).

The Department of Planning and Cooperation under the Governor’s Office is responsible for the province’s development strategy, planning and statistics and public expenditure. It prepares five year plans and annual plans and budgets which have to be approved by the Central Planning Committee (CPC) at the national level Annual planning and budgeting is a bottom-up process for all departments. For roads and other sectors under its responsibility, the DCTPC starts by assessing conditions at the district level Road condition data are collected by district OCTPCs for preparing maintenance, rehabilitation and improvement proposals. For roads, the budget proposal is separated into different types of work, i.e. construction, rehabilitation, routine maintenance, periodic maintenance and emergency works. DCTPC uses RMMS to assess maintenance requirements.

DPC brings together budget proposals from all departments and submits the provincial budget proposal to GoL. This is followed by negotiations between the provincial authorities and GoL. The budget finally approved by GoL is much lower than the budget requested. The following description of the allocation of resources to the roads sector in Champasak province is based on four different documents with information which is not strictly comparable. The description should therefore be seen as a broad overview rather than a precise statement. The four documents are:

- (a) Champasak Province Department of Planning and Cooperation (DPC) (2003) Summary of Implementation of Social-economic Plan 2002-2003 and Plan for Year 2003-2004, 20th November, Pakse;
- (b) Champasak DCTPC Investment Plan, 2003-4;

Table 16: Champasak Province: Non-urban roads data summary

	Length (km)	Paved road				Laterite road				Earth road				Total Poor (km)	Terrain		
		Length (km)	Good (km)	Fair (km)	Poor (km)	Length (km)	Good (km)	Fair (km)	Poor (km)	Length (km)	Good (km)	Fair (km)	Poor (km)		Flat (km)	Hill (km)	Mountainous (km)
National roads	452	357	357	0	0	95	0	95	0	0	0	0	0	0	248	145	59
Provincial roads	486	68	67	1	0	233	10	151	72	185	0	35	150	222	456	30	0
District roads	343	7	7	0	0	210	49	122	39	126	0	0	126	165	275	68	0
Rural roads	1,420	0	0	0	0	274	12	224	38	1,146	0	141	1,005	1,043	1,224	153	37
Total	2,701	432	431	1	0	812	71	592	150	1,457	0	176	1,281	1,431	2,203	396	96

	Total length (%)	Paved road				Laterite road				Earth road				Bad % in each category	Terrain		
		Length (%)	Good (%)	Fair (%)	Bad (%)	Length (%)	Good (%)	Fair (%)	Bad (%)	Length (%)	Good (%)	Fair (%)	Bad (%)		Flat (%)	Hill (%)	Mountainous (%)
National roads	100	79	79	0	0	21	0	21	0	0	0	0	0	0	55	32	13
Provincial roads	100	14	14	0	0	48	2	31	15	38	0	7	31	46	94	6	0
District roads	100	2	2	0	0	61	14	36	11	37	0	0	37	48	80	20	0
Rural roads	100	0	0	0	0	19	1	16	3	81	0	10	71	73	86	11	3
Total	100	16	16	0	0	30	3	22	6	54	0	7	47	53	82	15	4

Source: Champasak Province DCTPC.

- (c) Champasak DCTPC Construction and Maintenance of Roads, 2003-4, and
- (d) a summary of maintenance expenditure and sources of funds prepared for consultants by Champasak DCTPC.

The total provincial budget for 2003-4 (see Table 17) is about US\$12 million of which about US\$4.4 million is for infrastructure development in all sectors. The DCTPC Investment Plan for the transport sector for 2003-4 shows that the total investment is just over US\$2 million (see Table 18) of which nearly US\$1.6 million are external funds and nearly US\$475,000 are internal (provincial or GoL). Not all the expenditure in the investment plan for roads appears to be on roads (non-road projects include a water supply project and work on office premises) and the plan also includes provision for maintenance. Excluding the non-road projects, the total expenditure on maintenance and construction of roads is US\$1.35 million of which US\$387,500 is on projects funded solely from domestic funds (Table 18).

Table 17: Champasak Province: Planned provincial expenditure, 2003-4

	%	Billion Kip	US\$
Wages and salaries	37.6	48.25	4,552,083
Administration	3.5	4.49	423,731
Adjustments and promotion	21.9	28.10	2,651,346
Governor's contingencies	0.6	0.77	72,640
Infrastructure development	36.4	46.71	4,406,804
Total	100.0	128.33	12,106,604

Source: Champasak Province DPC (2003) Summary of Implementation of Social-economic Plan 2002-2003 and Plan for Year 2003-2004, 20th November, Pakse.

One of the difficulties in assessing availability of funds for maintenance expenditure is that a clear distinction has not been made between the different types of maintenance, rehabilitation, upgrading and construction. The provision specifically for maintenance¹⁹ of all Local roads in the Investment Plan is just over US\$500,000 of which US\$16,400 only is domestic funding, the rest being periodic maintenance under RMP funding. The actual proportion for routine maintenance is not specified but the detailed programme of works indicates that most of the maintenance budget is spent on periodic maintenance and rehabilitation.

The DPC Plan sets out broad priorities which include maintenance of National and Provincial roads and states that 529 km of national roads (including 53 bridges) and 166.3 km of provincial roads will be maintained²⁰ in 2003-4. The plan mentions continuing road projects and additional construction of roads - a small number of short urban roads and between 50 and 100 km of other roads. Further details provided in "*Champasak DCTPC Construction and Maintenance of Roads, 2003-4*" (see Annex 4) show that 182 km of provincial roads are either being regravelled (periodic maintenance under IDA and ADB funding) or being constructed under provincial or RMF funding. Apparently, RMF funds supplemented by revenue from fines are being used to upgrade a provincial road. In addition, some 110 km of District roads are under periodic maintenance with IDA funding and a 9.5 km district road is being constructed to a concrete / DBST level at apparently a very high cost under provincial funding²¹. In addition, 33.4 km of rural roads are undergoing periodic maintenance under IDA funding and work on construction / upgrading of a further 39.5 km of rural roads financed from provincial funds is in progress.

¹⁹ Strictly speaking, maintenance should not be included in the Investment Plan but the overall expenditure plan.

²⁰ Expenditure on maintenance on National roads is not included in Table 12.

²¹ The cost for a 9.5 km long District road (No 7801) appears to be 72,450 million Kip (US\$ 6.83 million or nearly US\$ 720,000 per km). This is an important road linking Junction 8438 (urban) with National roads 13 South and 16 but there appears to be an error. In the absence of more details, calculations and estimates are based on the assumptions that the cost is 7,245 million kip or US\$ 72,000 per km..

Table 18: Expenditure on Local roads in Champasak DCTPC Investment Plan

	Domestic funds	External funds	Total	Domestic funds	External funds	Total
	M Kip	M Kip	M Kip	US\$	US\$	US\$
Total "transport sector" investment	5,025	16,957	21,982	474,057	1,599,717	2,073,774
Total cost of continuation projects	2,008	5,355	7,363	189,434	505,189	694,623
Total cost of proposed projects	3,017	11,602	14,619	284,623	1,094,528	1,379,151
Provision for road maintenance	174	5,355	5,529	16,415	505,189	521,604
Road construction, rehabilitation and maintenance - domestic funds only	4,108	0	4,108	387,547	0	387,547
Road construction, rehabilitation and maintenance - co-financed	348	9,828	10,176	32,830	927,170	960,000
Total road construction, rehabilitation and maintenance	4,456	9,828	14,284	420,377	927,170	1,347,547

Source: Summarised from Champasak DCTPC Investment Plan, 2003-4

Table 18 shows that about US\$387,000 of provincial funds are being spent on road construction and rehabilitation in 2003-4²². These roads include Provincial, District, Rural and Urban roads. Because of limited funds, a number of them are continuing projects with construction stretching over a number of years. This expenditure is adding to the stock of road assets requiring maintenance. With virtually no routine and periodic maintenance for District and Rural roads, the existing stock of maintainable roads and the roads being rehabilitated and improved under RMP and by the province are in danger of becoming a wasting asset.

Data on road maintenance expenditure and sources of funds for financial year (FY) 2003-4 supplied by DCTPC shows that total maintenance expenditure is equivalent to about US\$1.4 million. This is difficult to compare with the data from other sources since it appears to include allocation from RMF for National roads. About 87 per cent of the budget according to this breakdown is being spent on periodic maintenance which may include rehabilitation and upgrading of some roads. Only 4 per cent of the budget is allocated for routine maintenance. This broadly corresponds with the evidence on the Champasak DCTPC Plan roads sector plan (Annex 4).

Table 4 shows that Champasak has a total of 499 km of District and Rural roads in maintainable condition. At annual routine and periodic maintenance costs per km of US\$171 and US\$250, the annual routine and periodic maintenance costs are US\$85,330 and US\$124,750 respectively giving a total maintenance cost of US\$210,080. There is also likely to be scope for reducing maintenance costs by (a) lower level of treatment for low traffic volume roads and (b) excluding the less important roads from the maintenance programme since some maintainable roads may not be parts of core district networks²³. Table 19 shows the estimated routine and periodic maintenance requirements as percentages of (i) the Provincial Infrastructure budget, (ii) the total DCTPC investment plan expenditure for roads, and (iii) rehabilitation and upgrading budget for FY 2003-4.

²² This amount and the total expenditure on roads in Table 18 cannot be compared with expenditure figures in Annex 4 because the latter includes cumulative expenditure since project start for continuing projects.

²³ See sections 7.3 and 8 for further discussion of this aspect.

The evidence shows that if an asset management approach is adopted, there is scope within the available resources for adopting an asset management approach, i.e. reducing expenditure of domestic resources on new investment, rehabilitation and upgrading and using them for maintenance of existing assets.

Table 19: Estimated maintenance requirements and budgets in Champasak

			Maintenance type:	
		Routine	Periodic	Total
		US\$	US\$	US\$
Estimated maintenance cost		85,329	124,750	210,079
			Maintenance requirements as % of budgets	
Province infrastructure budget (US\$)	4,406,804	1.9	2.8	4.8
Total DCTPC Investment Plan (roads) (US\$)	1,347,547	6.3	9.3	15.6
Domestic finance only road projects (US\$)	387,547	22.0	32.2	54.2

Source: Consultants' calculations from the data supplied.

Another important issue is the institutional capacity at provincial and district levels. The Roads and Bridge Division in the DCTPC has 17 persons to manage the whole provincial road network in addition to supervision of National road maintenance. LRD/LSRSP2 technical support and RMP funding has enabled the Champasak DCTPC to gain capability in maintenance planning, procurement of contractors and supervision of implementation, especially for rehabilitation of provincial roads and maintenance of National roads, but their resources are too stretched for them to deal with maintenance on District and Rural roads. For these roads, planning and supervision responsibilities are expected to be at the district level where the staffing and technical and management capacity levels are an even more serious constraint. Each of the district level OCTPCs have an establishment of 5 staff responsible for all MCTPC functions at the district level. All OCTPCs were short of two or three members of staff in April 2004.

The adoption of the VMC model is on a small scale in Champasak. Seven VMCs have been established in the province and three have been carrying out routine maintenance since fiscal year 2002-2003. VMCs were trained in routine maintenance tasks and provided with a set of hand tools and gravel material from DCTPC. Direct supervision of VMCs is provided by the OCTPC under overall charge of the DCTPC. A District road being maintained by a VMC was inspected and appears to be suitable for this arrangement as it is about 3.5 km long and links two villages to a National road. The main activities performed are filling in some potholes but the camber and side drains needed attention. Gravel had not been supplied within reasonable distances of where it was required. The problems may be because the VMC lacks the basic knowledge or because monitoring and supervision by the OCTPC is inadequate.

7.3 Soukhouma district case study

This section looks at one district in Champasak province as a case study to examine:

- (a) the implications of current road conditions and institutional and resource situation for rural access, and
- (b) options for maintenance of District and Rural roads.



Soukhouma District has been chosen for the case study because it is one of the poorest districts in Champasak and therefore targeted for poverty alleviation initiatives²⁴. The district has a population of just over 45,000 persons living in 62 villages with a population density about average for rural Champasak. The district administration has divided the district into three agro-economic zones and prepared a development plan incorporating integrated development schemes. Poor roads are recognised as a major constraint to development. Plans for integrated schemes and road improvement are proposed annually to the provincial authorities but very limited funds are available.

Table 20 shows the breakdown of the road network by road category, surface and condition. There are no National roads in the district. Overall 72 per cent of the road network is in bad condition. The relatively low proportion of bad Provincial and District roads is a result of rehabilitation and periodic maintenance under RMP but virtually the whole of the Rural road network is in bad condition. The maintainable road densities for the district at 19 km per 10,000 persons and 71 km per 1000 km² are below the average for Champasak province but the density by area is not low in comparison with the rest of the country (see Annex 2 for comparison). In early 2004, there were no routine maintenance contracts on the Provincial and District roads which have been rehabilitated under RMP. No VMCs were in operation in the district but the OCTPC chief was in discussion with some villages on District road 7827.

The OCTPC had three permanent staff in April 2004 and one temporary worker. The chief is a bridge engineer who is responsible for the technical and planning aspects of the road network in the district and for monitoring contracts. He has been on a training course on road maintenance planning and procedures. Other fulltime members of staff are a transport administrator (responsible for vehicle licensing and vehicle data for the district), an accountant and a mechanic. In the OCTPC chief's view, more staff were needed, especially to manage the road network. A new office had been constructed for the OCTPC at the district centre and new office equipment and an air conditioner had been supplied but apparently, there were insufficient funds for an electricity connection.

²⁴ 47 poorest districts in Lao PDR have been identified as poor based on the proportion of households with insufficient rice and poor access to basic amenities such as schools, electricity and water supply. Soukhuma is one of only two districts in Champasak belonging to the 47 poorest districts category.

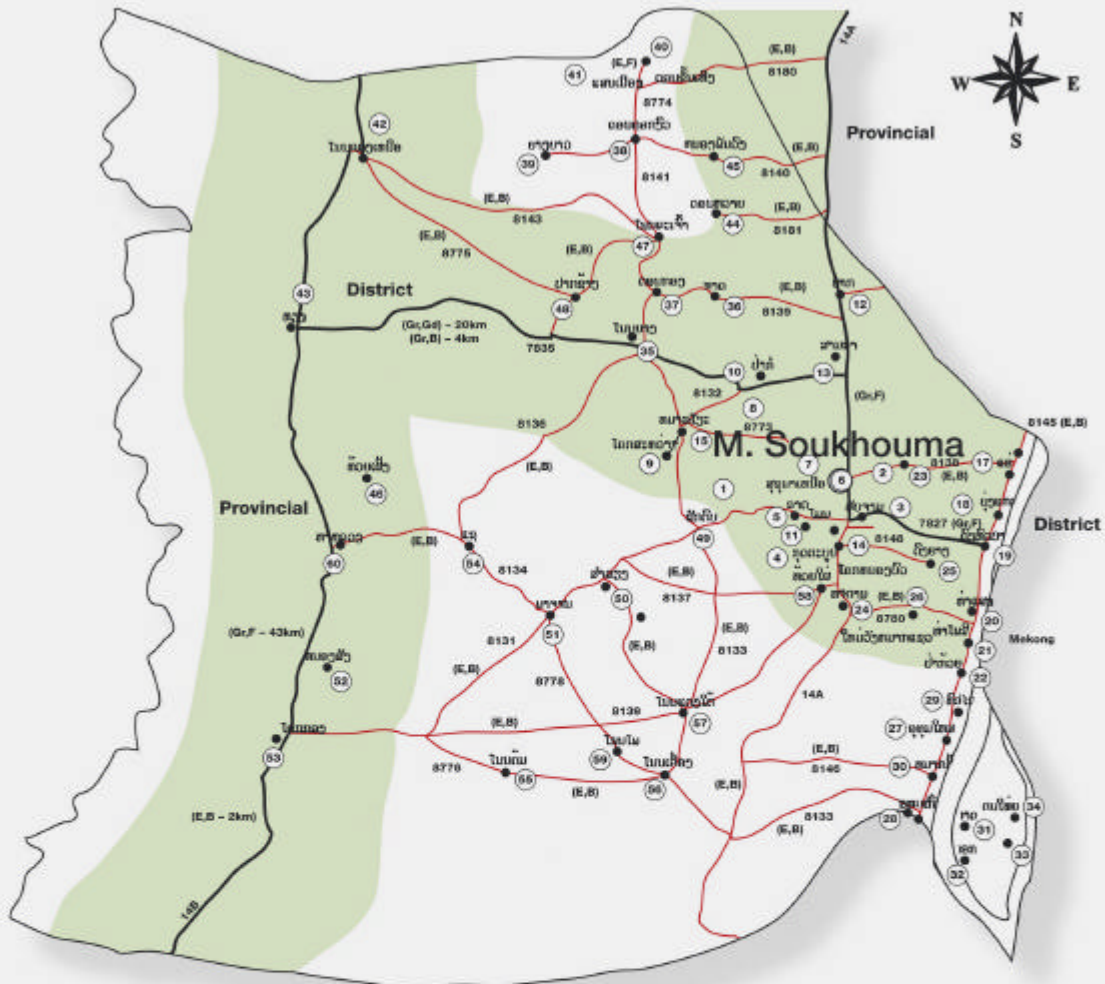
Table 20: Soukhouma District road network summary

Road classes	Length Km	Paved			Gravel				Earth				Total Bad (km)	
		Length km	Good(km)	Fair(km)	Poor(km)	Length km	Good(km)	Fair(km)	Poor(km)	Length km	Good(km)	Fair(km)		Poor(km)
Provincial roads	75	0	0	0	0	55	0	55	0	20	0	0	20	20
District roads	30	0	0	0	0	30	20	6	4	0	0	0	0	4
Rural roads	197	0	0	0	0	0	0	0	0	197	0	3	194	194
All non-urban roads	302	0	0	0	0	85	20	61	4	217	0	3	214	218

Road classes	Total length (%)	Paved road			Laterite road			Earth road			Bad % in each category			
		Length (%)	Good (%)	Fair (%)	Bad (%)	Length (%)	Good (%)	Fair (%)	Bad (%)	Length (%)		Good (%)	Fair (%)	Bad (%)
Provincial roads	100	0	0	0	0	73	0	73	0	27	0	0	27	27
District roads	100	0	0	0	0	100	67	20	13	0	0	0	0	13
Rural roads	100	0	0	0	0	0	0	0	0	100	0	1	99	99
Total	100	0	0	0	0	28	7	20	1	72	0	1	71	72

Source: Champasak Province DCTPC.

Road Network Soukhouma District Champasak Province



	Area within 5km of maintainable road providing 12 month access
	6 Month access (unmaintainable)
	12 Month access (maintainable)
	Village Number
E	Earth
Gr	Gravel
P	Paved
(E,B)	Earth, Bad
Gd	Good
F	Fair
B	Bad

Provincial and District roads identified. All others are rural.



Figure 2

Provincial roads 14A and 14B are the responsibility of the province which will have its own priorities. Coordination between the province and district level planning and a greater orientation of province level strategy towards maintenance of the existing maintainable network are needed to complement the maintenance strategy at the district level. The road network in Soukhouma offers an opportunity to examine the applicability of the proposed VMC model for maintenance. It was noted earlier (section 5.2) that the model can work well if (a) the road is short (usually not exceeding 5 km), (b) specifically serves a village or villages close to each other only, (c) the VMC is highly motivated, well organised and effectively led, and (d) the VMC receives adequate and timely support from the DCTPC and OCTPC in the form of training, guidance, tools and funds.

It is clear that both the District roads 7835 and 7827 do not satisfy criteria (a) and (b). Road 7835 is 24 km long and serves 8 villages with a total population of over 6,100 or about 14 per cent of the total district population. Only 2 of the villages are on the road, the remainder being linked to the road by earth roads in bad condition. Road 7827 is 8 km long and therefore gets closer to the length which could be maintained through VMCs. However, it serves 7 villages with a total population of over 5,700 persons. Only one village (No 19) is on the road. Most of the remaining villages served are along the river but away from the road with possibly less of a commitment to maintaining the road because of their access to river transport. Given the lengths of the roads and the dispersed villages benefiting from the maintained road, it would not be reasonable to expect villagers along the road to contribute labour for maintenance without pay and it is unlikely that they would be willing to make this contribution. Even if VMCs are formed and express their commitment to maintaining the road, they are most unlikely to retain the commitment and operate effectively over time. The lack of OCTPC capacity is a further problem though this will be an issue for effectiveness of maintenance under any system.

The VMC model may be appropriate for short sections of roads. For example, if sections of 8141 and 8142 linking single villages (village numbers 35 and 48 respectively) to District road 7835 were in maintainable condition, the VMC model could be appropriate for them. Villages linked to the core network by such short roads may also choose to take advantage of the VMC and CRM models to apply for maintenance and investment subsidies. However, taking the district wide view, available resources would be better used in maintaining the core road network and, if resources permit, extending the maintainable core network through upgrading or rehabilitation instead of supporting VMCs and CRMs on short village roads. For example, a priority for Soukhouma could be to upgrade Road 8135 to a maintainable standard. In combination with the province level decision to upgrade the short section of Road 14A to link up with Road 8135, 6 more villages 8 per cent more of the population could be brought within about 5 km of a “good” or “fair” maintainable road.

This case study has demonstrated that a strategic approach to the road network at the district level, with the highest priority for maintenance of the core network and a long term investment plan in the context of the provincial strategy is required. This is preferable to a piecemeal approach through VMCs to maintain short sections where conditions are right for VMC contracts. Resources permitting, there is a role for the VMC and CRM models for certain types of roads.

Table 21: Suukhouma District village access data

Village no	Village name	No of households	Population	Road no (1)	Nearest good or fair road	Accessibility status (2)	Notes
001	Soukhouma Nua	371	2,209	14A	14A	1	Provincial, gravel, fair (12 km)
002	Soukhouma Tat	266	1,386	14A	14A	1	Provincial, gravel, fair (12 km)
003	Thap Chan	132	869	14A	14A	1	Provincial, gravel, fair (12 km)
004	Kouta Boun	125	679	14A	14A	1	Provincial, gravel, fair (12 km)
005	Lad	168	992	14A	14A	1	Provincial, gravel, fair (12 km)
006	Phon Pheung	145	932	14A	14A	1	Provincial, gravel, fair (12 km)
007	Bok	126	763	14A	14A	1	Provincial, gravel, fair (12 km)
008	Muang	66	415	14A	14A	1	Provincial, gravel, fair (12 km)
009	Khok Savang	65	386	7835	7835	1	District, gravel, fair (improved under RMP)
010	Pakok	122	724	14A	14A	1	Provincial, gravel, fair (12 km)
011	Phon	41	225	14A	14A	1	Provincial, gravel, fair (12 km)
012	Bak	82	547	14A	14A	1	Provincial, gravel, fair (12 km)
013	Samkha	156	852	14A	14A	1	Provincial, gravel, fair (12 km)
014	Khoknong Boua	37	211	14A	14A	1	Provincial, gravel, fair (12 km)
015	Ma Ngo	62	359	7835	7835	1	District, gravel, fair (improved under RMP)
016	Houay Lek	111	703	7827	7827	1	District, gravel, fair (improved under RMP)
017	Hae	233	1,396	7827	7827	1	District, gravel, fair (improved under RMP)
018	Boung Keo	275	1,692	7827	7827	1	District, gravel, fair (improved under RMP)
019	Dong Houang	82	495	7827	7827	1	District, gravel, fair (improved under RMP)
020	Tha Seng	116	766	7827	7827	1	District, gravel, fair (improved under RMP)
021	Pakuai	43	254	7827	7827	1	District, gravel, fair (improved under RMP)
024	Dong Yang	60	320	14A	14A	1	Provincial, gravel, fair (12 km)
025	Tha Dan	68	432	14A	7827	1	Provincial, gravel, fair (12 km)
026	Dong Yang	200	1,203	14A	14A	1	Provincial, gravel, fair (12 km)
035	None Yang	234	1,425	7835	7835	1	District, gravel, fair (improved under RMP)
036	That (Sam Pang)	265	1,515	7835	7835	1	District, gravel, fair (improved under RMP)
037	Done Kong	72	476	7835	7835	1	District, gravel, fair (improved under RMP)
042	Non Deng Nua	307	1,390	14B	14B	1	Provincial, gravel, fair (3)
043	Hieng	314	1,634	14B	14B	1	Provincial, gravel, fair (3)
044	Done Vuay	92	625	14A	14A	1	Provincial, gravel, fair (12 km)
045	None Phon Vong	86	518	14A	14A	1	Provincial, gravel, fair (12 km)
046	Huay Phueng	68	346	14B	14B	1	Provincial, gravel, fair (3)
048	Pak Xang	127	733	7,835	7,835	1	District, gravel, fair (improved under RMP)
053	Khokkong	170	924	14B	14B	1	Provincial, gravel, fair (3)

058	Huay Phay	209	1,214	14A	14A	1	Provincial, gravel, fair (12 km)
060	Tha Luang	70	369	14B	14B	1	Provincial, gravel, fair (3)
Total (Acc St 1)		5,166	29,979				
	% of total	68	66				
056	Non Ouang	73	426	8,776	14A	2	Rural, earth, poor, Junc 8777. Connected to poor part of 14A
057	Non Deang Tat	143	932	8,135	14A	2	Rural, earth, poor, Junc 8777. Connected to poor part of 14A
Total (Acc St 2)		216	1,358				
	% of total	3	3				
022	Kong Vian	168	1,079	8,145	14A	3	Rural, earth, poor (16 km long along river)
023	Tha Dan	35	297	14A	14A	3	Rural, earth, poor (16 km long along river)
027	Mak Vang Mak Sael	169	1,028	8,145	14A	3	Rural, earth, poor (16 km long along river)
028	Outtoun Kao	143	992	8,145	14A	3	Rural, earth, poor (16 km long along river)
029	Huay Done Xai	114	831	8,145	14A	3	Rural, earth, poor (16 km long along river)
030	Mak Mi	56	452	8,145	14A	3	Rural, earth, poor (16 km long along river)
031	That (Done Xai)	92	626	8,145	14A	3	Rural, earth, poor (16 km long along river) - on island
032	Kok	136	864	8,145	14A	3	Rural, earth, poor (16 km long along river) - on island
033	Toum Noi	57	340	8,145	14A	3	Rural, earth, poor (16 km long along river) - on island
034	Toum Yai	56	341	8,145	14A	3	Rural, earth, poor (16 km long along river) - on island

Table 21: Soukhouma District village access data (continued)

Village no	Village name	No of households	Population	Road no (1)	Nearest good or fair road	Accessibility status (2)	Notes
038	Done Khok Ngua	98	553	8,140	14A	3	Rural, earth, poor (at Junc. with 8774)
039	Yang Sao	58	322	8,140	14A	3	Rural, earth, poor
040	Done Khan Thnang	89	511	8,774	14A	3	8774 is Rural, earth, fair. Connected to 14A through Rural, earth poor roads.
041	Sene Muang	95	449	8,774	14A	3	8774 is Rural, earth, fair. Connected to 14A through Rural, earth poor roads.
047	Non Pha Chao	135	807	8,141	7,835	3	Rural, earth, poor (just outside area of influence of 7835)
049	Phak Tob	78	460	8,131	14A	3	Rural, earth, poor
050	Sam Liang	163	943	8,131	14A	3	Rural, earth, poor
051	Nachan	114	817	8,131	14B	3	Rural, earth, poor
054	Xae	96	552	8,136	14B	3	Rural, earth, poor
055	Non Khoum	61	319	8,776	14B	3	Rural, earth, poor
059	Non Phay	41	248	8,777	14A	3	Rural, earth, poor
Total (Acc St 3)		2,054	12,831				
	% of total	27	28				
052	Senesouk	49	317				Not identified on available map.
061	Non Samphan	83	374				Not identified on available map.
062	Xieng Souvan	47	226				Not identified on available map.
Total villages not identified definitely		179	917				
	% of total	2	2				
Total population		7,615	45,085				-

Source: Champasak DPC database, DCTPC and consultants' assessment.
Village approximately within 5 km of road.

1 - served by good or fair road, 2 - served by provincial road in poor Condition, 3 - served by a poor district or village road
2 km of this 45 km road is earth, poor. It is assumed that all villages are served by the gravel fair section with the poor part being at the south end.

7.4 Roads and road maintenance in Houaphanh province

Houaphanh is a northern province with mountainous terrain. Its population is about average for rural Laos but it has the third lowest maintainable road density per area (39 km per 1000 km²) compared with a national average of 65 km per 1000 km². Only Xekong and Phongsaly have lower densities. Table 22 shows the breakdown of the road network by road category, surface and condition. Overall 47 per cent of the road network is in bad condition. Since, the whole National road length is assessed to be good or fair, 65 per cent of Local roads are in bad condition. District roads appear to be in better condition than provincial roads with village roads being all earth and in the worst state as would be expected. A significant proportion of earth roads have been assessed to be in fair condition though they are not considered maintainable according to the LRD/LSRSP definition. According to Table 4, Houaphanh has a total of 190 km of maintainable Local roads (115 km Provincial, 75 km District and Rural).



All the road maintenance activities currently in progress are on National roads. They were initiated in 2001-2 and are paid for by an allocation from the RMF though in the first year of operation, some resources from the rehabilitation budget were diverted for maintenance. Houaphanh has 446 km of National roads of which 305 km are paved and 141 are gravel. Routine maintenance and some emergency works are the only

activities and include grass cutting, cleaning culverts, de-silting side drains, and removal of land slides. The contracts for maintenance costing 4.5 to 5 million kip per 10 km per year (or about US\$43 to US\$47 per km) have been set up with villages along the road. The villages are provided with a set of hand tools. Table 23 shows, the length of roads being maintained and the expenditure. The cost per km estimates in Table 23 are low when compared with the estimated costs for LSRSP2 and RMP but these estimates must be treated with caution because contracts to cover the whole length of the road may not have been completed. It is also not clear whether the estimates include the cost of the contract payments and tools only or also the costs of supervision and management. In 2003-4, maintenance has been extended to almost the whole National road length in the province.

Field visits were made to National roads 1 and 6 and a District road built under village participation. Maintenance on National roads appears to be working well. The District road built by villagers is in very bad condition and passable with great difficulty in the dry season only. At present, no resources are available for maintenance of Local roads and therefore no maintenance work is currently undertaken on Provincial, District or Rural roads. The DCTPC envisages that funds for purchasing hand tools and gravel for rural road maintenance by village participation may become available in 2005.

On any future programme of maintenance of Local roads, there is scope for adjusting the maintenance works to the available resource. For example, priority should be given to drainage i.e. camber, side drains and cross drainage followed by pothole filling. Grass cutting has a lower priority and can be limited to curved sections and junctions. Financial resources for the roads sector are seriously constrained. Nevertheless, the 2003-4 MCTPC Investment Plan shows that one provincial road of about 43 km length is in the process of

being rehabilitated from a “Bad” earth condition. The work started in 2000 and was expected to be completed in 2004. It was estimated to cost 14.3 billion kip (about US\$1.35 million) giving a cost per km of 333 million kip or US\$31,000. Based on expenditure to date, the project is about 38 per cent complete. The allocation of funds to this project in 2003-4 is 1,450 million kip (about US\$137,000).

Table 22: Houaphanh Province: Non-urban roads data summary

	Total Length (km)	Paved road				Laterite road				Earth road				Total Bad (km)	Terrain		
		Length (km)	Good (km)	Fair (km)	Bad (km)	Length (km)	Good (km)	Fair (km)	Bad (km)	Length (km)	Good (km)	Fair (km)	Bad (km)		Flat (km)	Hill (km)	Mountainous (km)
National roads	446	305	185	120	0	141	26	115	0	0	0	0	0	0	0	0	446
Provincial roads	460	5	0	0	5	110	0	110	0	345	0	49	296	301	0	0	460
District roads	261	0	0	0	0	75	15	60	0	186	0	80	106	106	0	0	261
Rural roads	422	0	0	0	0	0	0	0	0	422	0	84	338	338	0	0	422
Total	1,589	310	185	120	5	326	41	285	0	953	0	213	740	745	0	0	1,589

	Total length (%)	Paved road				Laterite road				Earth road				Bad % in each category	Terrain		
		Length (%)	Good (%)	Fair (%)	Bad (%)	Length (%)	Good (%)	Fair (%)	Bad (%)	Length (%)	Good (%)	Fair (%)	Bad (%)		Flat (%)	Hill (%)	Mountainous (%)
National roads	100	68	41	27	0	32	6	26	0	0	0	0	0	0	0	0	100
Provincial roads	100	1	0	0	1	24	0	24	0	75	0	11	64	65	0	0	100
District roads	100	0	0	0	0	29	6	23	0	71	0	31	41	41	0	0	100
Rural roads	100	0	0	0	0	0	0	0	0	100	0	20	80	80	0	0	100
Total	100	20	12	8	0	21	3	18	0	60	0	13	47	47	0	0	100

Source: Houaphanh Province DCTPC.

Table 23: Routine maintenance expenditure on National roads in Houaphanh

Year	National roads	Length (km)	Expenditure (Kip)	Expenditure (US\$)	Expenditure per km (Kip)	Expenditure per km (US\$)
2001-2	NR1	119.0	76,000,000	7,170	638,655	60
	NR6	92.5	68,000,000	6,415	735,135	69
		81.5	58,000,000	5,472	711,656	67
	Total	293.0	202,000,000	19,057	689,420	65
2002-3	NR1	119.0	82,000,000	7,736	689,076	65
	NR6	179.0	140,000,000	13,208	782,123	74
	Total	298.0	222,000,000	20,943		
2003-4	All roads		548,000,000	51,698		

Source: DCTPC, Houaphanh Province

Houaphanh's provincial road sector budget is much more modest than that of Champasak. Nevertheless, the maintainable network is low at present and there is scope for initiating a maintenance regime within the available resources if the asset management approach is accepted and resources are diverted from upgrading to maintenance. Table 4 shows that Houaphanh has a total of 75 km of District roads but no Rural roads in maintainable condition. At annual routine and periodic maintenance costs per km of US\$171 and US\$250 (section 6 and Table 14), the maintenance costs are US\$12,802 and US\$18,750 respectively and a total maintenance cost of US\$31,552. This is equivalent to 23 per cent of the budget allocated to the upgrading project in 2003-4.

Another major constraint is the institutional weaknesses at the provincial and district levels. The Roads and Bridge Division in the DCTPC has 7 persons to manage the whole provincial road network in addition to the supervision of National road maintenance. The lack of staff is even more serious at the district level. The 8 districts between them have 13 OCTPC staff responsible for all MCTPC functions at the district level. However, the maintainable network of district roads is fairly small and concentrated in two or three districts (one of them being Xamneua). In the first instance, therefore the maintenance programme for District roads could be implemented by the DCTPC with some external support to develop capacity at the district level. A more comprehensive approach to developing a core network for all districts would require upgrading of District roads in the remaining districts.

8. SUMMARY OF FINDINGS AND RURAL ROAD MAINTENANCE MANAGEMENT OPTIONS TO BE INVESTIGATED

This report has reviewed the current situation with respect to the maintenance of the District and Rural road network. This section starts by briefly summarising the main conclusions and resulting recommendations and implications related to maintenance of District and Rural roads. The implications for (a) operations and management, (b) institutional arrangements, (c) funding, and (d) policy derived from the main findings are then set out and finally the next stage in developing a sustainable strategy for rural road maintenance and additional issues to be investigated are outlined.

The main conclusions start with the widely acknowledged premise that District and Rural roads are in a poor state and receive very limited resources for regular maintenance. Some of these roads are being rehabilitated under the LSRSP2 and RMP projects in seven provinces and the VMC model for routine maintenance is being tested for their maintenance but there is limited domestic allocation of funds or implementation capacity for these roads. In examining maintenance options, all District and Rural roads are at present lumped together to be maintained by the voluntary contribution based VMC model with the CRM model proposed for improvement. The most important conclusion of this paper, from which all recommendations and implications follow, is that this treatment for all District and Rural roads is not an adequate strategy for this road network (see sections 5.2 and 7.3).

The possible option outlined here is to adopt a district level core network approach. This approach distinguishes between the core network roads for a district and the remainder. The network approach has been explained and illustrated with the help of the Soukhouma district case study (section 7.3). In brief, it makes a distinction between the usually longer roads which provide access for the rural population to the district centre and the major road network (i.e. Provincial and National roads) and other major transport modes²⁸ and the remaining relatively short roads connecting villages to the core network, other villages and essential local services.

Provincial and National roads may form a part of the core network for a district as the Soukhouma case study shows and some actual or potential core network links may not be in poor condition and unmaintainable. A core network maintenance strategy would:

- (a) assume district level ownership and responsibility for the district roads in the core network²⁹;
- (b) identify the existing core network in maintainable condition providing 12 month access, based on the population served and other relevant criteria (the PRTP process for consultation would be relevant in identifying the core network and priorities for network extension);
- (c) maintain the maintainable part of the core network (not all maintainable roads) by appropriate labour-based contracting, and
- (d) improve access level by extending the core network as resources permit and based on long-term strategic objectives on improving access for the poorly served sections of the population.

²⁸ For example, river transport.

²⁹ Though in view of the low capacity and resources at this level in OCTPCs and the district administration, in most provinces, the strategy would have to be initiated at the province level (see the following discussion, detailed recommendations and implications below).

The strategy and planning role at the district level is consistent with the national decentralisation policy. However, district level capacity for developing a strategy and planning is very weak and the district level strategy has to be devised in the context of the provincial network strategy³⁰. Two possible options are (i) to strengthen capacity at the district level and to ensure consultation and coordination between the district and province levels or (ii) to initially set up a District and Rural roads planning unit within DCTPC initially and build up capacity at the district level over time. In the short-term, option (iii) may be the only viable one.

Strictly speaking, extending the core network is not a part of the maintenance strategy. However, it will be necessary to address it in developing the longer term strategy of improving access as a contribution to NPEP. Within the asset management model, such extensions must balance the benefits against the life cycle costs of the roads to be improved and make a realistic assessment of the resources required for maintenance and whether they would be available.



The core network approach at the district level would make it possible to derive clear objectives and targets with respect to the contribution to NPEP. The objectives could be (a) to retain the current level of access through maintenance (in terms of the population within, for example, 5 km of the maintainable network providing 12 month access), and (b) to increase the proportion of the population with this level access by a given year.

Adoption of the district level core network approach has major implications for policy, institutional and funding aspects and operations and management at the district, province and national levels. These are summarised in Table 24. In the context of the evidence and arguments presented in this paper, most of the points in Table 24 do not need further explanation. Some necessary comments and qualifications are made below.

At the national policy level, the implications in the table are limited to the MCTPC. Some of the changes required (for example, increase in levies to increase RMF revenues and enabling provinces to set up maintenance funds) are not fully within the scope of the

³⁰ In the Soukhouma district (section 7.3), a large part of the maintainable network is made up of Provincial roads. Provincial or National roads are likely to be parts of the core networks for most districts.

MCTPC though it would be able to influence national policies. The table shows that major policy and institutional changes would be required at provincial level. It was noted in section 4.1 that because of the location of DCTPCs in the organisational structure as parts of the MCTPC but also within the planning and implementation structures of provincial administrations, there is lack of clarity in the lines of responsibility and possible conflicts in objectives and policies. An important outcome of the policy and institutional changes required would be to reduce the conflict and bring more clarity and transparency to the allocation of funds for road maintenance through the acceptance by all parties of the asset management principle and an independently managed road maintenance fund.

On adequacy of financial resources, there are a number of uncertainties and contingencies. If funds from RMF increase significantly, the level of additional funding to be raised at the province level will be reduced. However, under the current situation, substantial additional resources may have to be found from a combination of levies and charges at the provincial level and redirection of provincial roads sector expenditure to maintenance. Since provincial budgets are negotiated with GoL and there is MCTPC involvement for the roads sector, there is a role for national level influence on the use of these budgets.

Because of lack of capacity at the district level, the “Policy”, “Institutional”, and “Funding and management of funds” implications and changes have been separated into two types. Those where actions can and should be taken in the short-term and those where this may not be possible. The latter are shown in italics. At the policy level, acceptance of the asset management principle and the core network strategy is important from the outset but setting up district road maintenance funds may be too ambitious and premature and even inappropriate and therefore would need further investigation.

In line with the decentralisation policy, “Planning, management and operations” should be at the district level. Initially because of inadequate district level capacity and capability, the DCTPCs will have to be responsible for most of the planning and operational aspects. Planning also includes consultation with the district authorities on their priorities and plans and coordination of activities with the DCTPCs.

The labour-based approach for construction and maintenance has been applied successfully on a number of projects and is currently being used for routine maintenance on National and Provincial roads. This needs to be extended to the routine maintenance of core district roads. Labour-based methods are also likely to be most appropriate for the periodic maintenance of these roads. Therefore, capacity is needed at district level to implement labour-based work methods by contractor operations. Districts will need a great deal of support and capacity strengthening to be capable to manage these aspects. For effective operation of labour-based methods, it will also be necessary to further develop suitable standards, test alternative maintenance treatments and contracting models.

LRD and DCTPCs will have an important role in this testing and development and supporting the districts in the implementation. As noted above, while district level capacity is being developed, planning and implementation would be undertaken by the DCTPCs. At the DCTPC level, a District and Rural roads planning and strategy unit will be needed, initially to undertake planning, management and operations if there is inadequate capacity at the district level. When district capacity is strengthened, there will still be need for such a unit (i) to support districts, (ii) for coordination of province level strategy, and (iii) for developing and testing new approaches.

Operations and management of the non-core short roads serving specific villages can be delegated to them under the VMC model³¹. Contracts and procedures for these have been developed and tested under LSRPP2. The districts will need the capacity and capability to supervise and monitor these operations.

This paper has identified a number of issues which need further attention. These include:

- (a) whether the policy framework in Lao PDR would enable the policy and institutional changes at the provincial and district levels to implement the required changes;
- (b) the circumstances in other provinces with respect to the infrastructure, resources and capabilities and hence the suitability of the core district network approach;
- (c) traffic volumes and their implications for maintenance treatment;
- (d) the potential for raising adequate revenues at the province and district levels, and
- (e) more detailed examination of evidence on VMCs and other community based maintenance models and the circumstances under which they are appropriate.

Nevertheless, it is clear that in order to develop a maintenance strategy for District and Rural roads, and make a meaningful contribution to alleviation of poverty as a part of the NPEP strategy, fundamental reorientation is needed at a number of different levels as sketched out in this section. The initiation of these changes will require external technical and financial support. In the first instance, the project providing support could focus on two provinces such as Champasak and Houaphanh representing different characteristics with respect to the existing infrastructure, financial resources and management and technical capacity and technical and financial support they have received to date. The aims of the project would be to support LRD and the provinces in :

- (a) developing, refining and applying the district core network strategy model;
- (b) introducing the required institutional changes and developing capacity at the province and district levels;
- (c) adapting the maintenance management systems and procedures to District and Rural roads;
- (d) testing and implementing labour-based routine and periodic maintenance treatments for low traffic volume roads where necessary;
- (e) developing private sector capacity, and
- (f) implementing the maintenance programme.

Initially, the district level studies and implementation may have to be restricted to two districts in each province, one with a relatively well developed core network and one without. The next phases of the World Bank and SIDA support for Local road maintenance (RMP2 and LSRSP3) are currently being developed and could incorporate an initiative to develop a sustainable strategy for the District and Rural roads.

³¹ But note the qualifications made in section 5.2 and 7.3 about the need to separate the contractor role from the management and supervision roles for these contracts and the opportunity cost of the resources required to support VMCs.

Table 24: Overview of policy, institutional, funding and operations and management implications of the core district network maintenance model

	National level	Province level	District
Policy	<p>Asset management principle is fully accepted by MCTPC and LRD.</p> <p>The core district network preservation strategy to be accepted and endorsed by MCTPC and LRD.</p> <p>MCTPC and LRD to enable and support provinces in setting up Provincial Road Maintenance Funds (PRMFs) and Provincial Road Maintenance Boards (PRMBs).</p> <p>MCTPC and LRD to support case for higher funding for Local roads from RMF.</p>	<p>Asset management principle and core district network strategy to be accepted by provincial administrations and DCTPCs.</p> <p>Provincial administrations and DCTPCs to reorientate roads sector expenditure in line with asset management and core district network preservation strategy (see “Funding and management of funds” below).</p> <p>Provincial administrations to initiate policies to raise additional revenue on “user pays” principle for road maintenance (see “Funding and management of funds”).</p> <p>Provincial administrations to make policy decision to direct funds for road maintenance through PRMFs and managed by PRMBs with non-government representation and high degree of independence (see “Institutional” and “Funding and management of funds”).</p>	<p><u>Short-term</u> Asset management principle and core district network strategy to be accepted by district administrations and OCTPCs.</p> <p>District level development strategy to be based on asset management principles and core district network strategy.</p> <p><u>Possible long-term</u> <i>District administrations to initiate policies to raise additional revenue on “user pays” principle for road maintenance (see “Funding and management of funds”).</i></p> <p><i>District administrations to make policy decision to direct funds for road maintenance through DRMFs (District Road Maintenance Funds) and managed by district roads boards with non-government representation and high degree of independence (see “Institutional” and “Funding and management of funds”).</i></p>
Institutional	<p>LRD’s role to be similar to now but with strengthened capacity for support for District and Rural roads maintenance (see “Operations and management”).</p>	<p>DCTPCs to establish a District and Rural Roads Maintenance Planning Unit.</p> <p>Provincial administrations to establish PRMFs and roads boards.</p>	<p><u>Short-term</u> OCTPC capacity for planning, management and operations to be strengthened.</p> <p><u>Possible long-term</u> <i>District administrations to establish DRMFs and district roads boards.</i></p>
Funding and management of funds	<p>MCTPC and LRD to press case for increases in RMF revenues as initially projected and increased allocation for District and Rural roads (based on provisional estimates of requirements in Table 10, 8.6 per cent of RMF funds).</p>	<p>Provincial administrations to press case for increases in RMF revenues as initially projected and increased allocation for District and Rural roads.</p> <p>Provincial administrations to raise additional revenue for road maintenance through levies consistent with the “user pays” principle (for example from licensing of single axle tractors if they are used for transport and market levies).</p> <p>Provincial administrations to rebalance their expenditure on the roads sector to reduce rehabilitation and construction expenditure and increase maintenance expenditure in line with the asset management principle.</p> <p>Road maintenance funds from all sources (RMF, additional levies, provincial budgets, any additional GoL allocations and donor support) to be directed through PRMFs managed by PRMBs.</p>	<p><u>Short-term</u> District administrations to raise additional revenue for road maintenance through levies consistent with the “user pays” principle.</p> <p>District administrations to rebalance their development priorities and expenditure proposals on roads sector to focus on the maintenance of the core district network.</p> <p><u>Possible long-term</u> <i>All road maintenance funds to be directed through DRMFs managed by district roads boards.</i></p>

Table 24: Overview of policy, institutional, funding and operations and management implications of the core district network maintenance model (continued)

	National level	Province level	District
Planning, management and operations	<p>LRD to guide and support the DCTPCs and District and Rural Roads Maintenance Planning Units in DCTPCs.</p> <p>Guidance and support to be provided on:</p> <ul style="list-style-type: none"> (a) core district network planning; (b) specification of road standards and maintenance treatments; (c) training and capacity development in the DCTPCs and OCTPCs; (d) testing and implementing labour-based approaches for routine and periodic maintenance (including, for example, alternatives to grading by equipment); (e) development of appropriate forms of contracts and contractor capacity. 	<p>Initially, in the absence of district level OCTPC capacity, the roles of the District and Rural Roads Maintenance Planning Units within DCTPCs would be to:</p> <ul style="list-style-type: none"> (a) plan, manage and implement maintenance of the core district network (see district column for details); (b) develop capacity of OCTPCs to plan, manage and implement maintenance; (c) experiment with, test and develop new technical, operational and management approaches in collaboration with LRD, and (d) coordinate District and Rural road maintenance strategy and operations with the Provincial road maintenance strategy and operations e.g. in preserving the core network at district levels. <p>When OCTPCs have adequate capacity, the District and Rural Roads Maintenance Planning Unit roles would be to:</p> <ul style="list-style-type: none"> (a) support and guide OCTPCs in planning, managing and implementation; (b) experiment with, test and develop new technical, operational and management approaches in collaboration with LRD, and (c) coordinate District and Rural road maintenance strategy and operations with Provincial road maintenance strategy and operations. 	<p>When OCTPCs have adequate capacity, their roles would be to:</p> <ul style="list-style-type: none"> (a) carry out planning functions related to maintenance (activities include identifying the core district network and collecting information on its condition, prioritising and programming activities in the context of resources available); (b) manage and implement maintenance of the core district network (activities include inspection, procurement and supervision), and (c) management and supervision of VMC and CRM contracts for suitable roads.

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Annex 1

Terms of Reference for a Review of Rural Road Maintenance in Laos

1 General

1.1 Context

The purpose of this assignment is to assist the Government in developing a framework for the effective provision of maintenance to its rural road network.

This initiative forms part of the joint efforts of the Government, the World Bank and the ILO to formulate a National Rural Infrastructure Services Assessment and Preliminary Strategy. The strategy will assess the extent and quality of infrastructure services in rural Laos, estimate service gaps, and what it will take in terms of financial and organizational capacity to fill these gaps given the targets set in the National Poverty Eradication Plan, and the current institutional arrangements for ownership, management, and cost-sharing. The findings will be shared with national and local agencies and concerned stakeholders.

This strategy is envisaged to provide a policy framework and guidance for the detailed implementation strategies in projects and programmes dealing with the development and maintenance of rural roads in Lao PDR. In the short term, this initiative is expected to facilitate the formulation of the World Bank supported Provincial Rural Infrastructure Project and the next Road Maintenance Project.

The strategy will identify a set of recommended actions to be pursued as part of the PRIP and RMP2 projects to ensure all stakeholders in the sector pursue a coherent, sustainable and replicable strategy for improved access to rural infrastructure services. Finally, it will determine the extent to which and how these type of projects can most effectively contribute towards closing the service gaps in the provinces.

The purpose of the services described in these ToR, is to contribute to the above mentioned strategy development through the collection and dissemination of some of the developments already achieved in the sector in relation to rural road maintenance, and discuss their relevance and applicability on a national basis.

1.2 Approach

In recent years, there have been considerable developments in terms of capacity and performance related to maintenance of public roads in Lao PDR. With the recent expansion of the maintainable road network in the country, the Government has acknowledged the demand for a concerted effort in establishing sustainable systems for protecting these investments. These achievements include developments related to maintenance of both highways and the rural road network.

The Government priorities relating to road maintenance have also been well reflected in the support rendered from the donors involved in the road sector. Significant initiatives have been taken in the past and present to provide institutional support for building capacity at central and local level to effectively carry out maintenance of public roads. This support comes from a number of projects, trying out different approaches and implementation modalities with the common goal of extending the lifetime of the established maintainable road network.

With the multitude of maintenance initiatives, there is now a demand to streamline the policies and practices with the ultimate goal of establishing a common approach to road maintenance which covers all the components of the road network. This assignment should be regarded as an input to this common approach goal, relating to the rural roads part of the network. For these reasons, the emphasis of this particular assignment is to

document the current maintenance situation for rural roads, investigate through case studies the current capacity, be it technical, financial and/or financial, and the ongoing practices and arrangements currently carried out in the provinces. Hopefully, this information will facilitate the further discussions related to establishing a nation-wide system for provision of timely and effective maintenance to the rural road network.

1.3 Scope of Work

The effective framework for rural road maintenance involves three key elements, technical, financial and institutional.

The *technical element* relates to defining the type and frequency of maintenance required on rural roads in Laos, how and to what degree this work is efficiently carried out, choice of technology, and the adequacy of current work organisation and management arrangements to cater for current and future performance requirements.

The *institutional element* relates to issues such as identifying the divisions of responsibility for maintenance planning, budgeting and implementation of rural roads and the institutional capacity to carry out such activities. This comprises the responsibility for activities such as the collection of physical data, network planning, budgeting, plan and budget approval, the provision of resources and funds, standard setting, the authority to classify, the implementation of improvement works, the planning and supervision of maintenance, the preparation and award of contracts, works monitoring and accounting. An important part of this component will be to review capacity deficiencies at various parts of the organisations in charge of maintenance, and propose how further capacity development can be organised.

The *financial element* will provide an overview of the current resources available for rural road maintenance in Laos, identify and review the various funding mechanisms and discuss any current and future shortfalls. A central issue relating to this element is the current capacity to fund periodic maintenance of rural roads. As good progress have been achieved in terms of provision of routine maintenance, the financial ability to provide periodic maintenance still needs to be clarified. Currently, there are a number of possible funding sources, however, the extent to which these funds covers the actual demand will be an important part of this component. This of course will need to be reviewed in relation to the actual network which is in a maintainable condition.

2 Technology

2.1 Context

As a starter, the consultants will briefly describe the overall road network of the country, it's current condition, geographical and functional distribution and current use. This will include the following activities:

- Identify the relevant agencies/departments in charge of overall management and statistics for the various parts of the road network,
- Collate already available data on the extent, distribution and condition of the road network,
- Provide a functional definition of rural roads and its relation to the various references applied in the sector,
- Make an assessment of the degree of road access to the rural population in Laos, (number of villages and district centres accessible in dry and rainy seasons),
- Identify the maintainable part of the road network and describe the condition of both the maintainable part of the network and the remaining part,

- Compile a general picture of the traffic patterns on roads in Laos, i.e. average traffic on some representative main roads, provincial, district and village roads.

2.2 Work Methods

Having drawn an overall picture of the road network and thereby its maintenance requirements, the consultants will review the current practices of the Government in terms of how maintenance works is planned and supervised for its rural road network. Although this activity will need to involve all types of roads, the emphasis of this review will be on the practices applied for rural roads.

This exercise will therefore include the review of practices within agencies at central and regional level in order to pick up practices relevant for rural roads. Within this context, the consultants will focus on the maintenance practices applied for roads under the supervision of the provincial and district authorities, and cover issues as follows:

- Describing how current condition surveys are carried out, and any mapping systems applied,
- Describing the process of cost estimating of works required on individual road sections and how this is carried through to annual maintenance plans,
- Reviewing current cost norms for routine and periodic maintenance as a whole and the norms applied to individual work activities,
- Describing current practices on work supervision and the effectiveness of such measures,
- Describe the quality control measures applied to works carried out,
- Reviewing the monitoring and reporting systems applied by the various agencies to document outputs and quality of works,
- Review ongoing and past maintenance initiatives which have received external donor assistance and briefly describe their objectives, outputs, major features and achievements.

2.3 Community Involvement

The use of community contracting and communities also providing some of the resources required to maintain roads, have been a central part of the discussions in Lao PDR as regards to how road maintenance is best carried out. Trials have been carried out by a number of stakeholders, and the consultants will explore the past and current experience of such implementation arrangements. There are currently good examples of community involvement in Luang Namtha, Xayaboury, Houaphanh as well as in the Lao Swedish Road Sector Programme. In detail, this will include:

- Reviewing literature on past experience from projects where community participation has been applied in the context mentioned above,
- Visit on-going schemes and the respective roads covered where such maintenance arrangements are in use or have been applied in the recent past
- Assess the effectiveness of the systems developed, their applicability to the different parts of the road network, its comparative advantages, possible short-comings, demand for external support, scope for replication on a wider scale, and
- Assess the quality and effect of the actual maintenance works carried out at the road sites.

The above information will mainly be collated on the basis of interviews with relevant staff in the DCTPCs in charge of maintenance management, in addition to reviewing available literature covering such topics.

2.4 Field Inspections

This should include visit to ongoing works and reviewing annual work plans, discussions with contractors and other parties involved in executing road maintenance works. The outputs of this exercise will be :

- A description of the most commonly required rural road maintenance activities, how and by whom they are carried out, type and adequacy of tools and equipment used, choice of technology and availability and choice of materials, work organisation, on-site management,
- A review of current technical standards applied for the works, and
- an overall assessment of the quality of the works, actual coverage of network, identifying weaknesses and how these can be rectified.

2.5 Technology Choice

In this context the consultants will assess the feasibility and potential for increasing employment opportunities in on-going road maintenance works through the introduction/increased use of labour-based work methods. This will include addressing issues such as:

- briefly review the current and previous experiences with labour-based methods in Laos and in particular in the field of maintenance,
- assess the policies of the Lao Government regarding labour-based methods and how such technology is integrated in technical guidelines and manuals,
- inventorise the attitude of donors involved in road maintenance towards labour-based methods,
- assess the scope and size of road maintenance works which could be carried using labour-based technology,
- describe the technical, financial and organisational requirements for any increased use of labour-based methods in rural road maintenance,
- the current percentage of road maintenance funding related to labour wages and the scope for increasing this,
- the potential increase of employment through the increased use of labour-based methods for rural road maintenance.

3 Institutional Issues

The starting point for the institutional analysis will be to review the legal context and any other government regulations which defines the divisions of responsibilities and authority for road maintenance. On that basis, the next step will be to study how these regulations have been carried out in practice, at the same time as assessing the effectiveness of the current organisation and the regulations defining it. This exercise will also include the following activities:

- Clearly identify the task and responsibilities of various technical departments at central and local level for the various components of rural road maintenance, (i.e.

- maintaining district and village roads, budgeting, standard setting, quality control, contracts management for the various categories of roads, etc.),
- Describe the consultation process which normally takes place for the development of annual maintenance plans, including timing of events, from initial condition surveys to the completion of the plan and its budgets in time for it to be included into the annual recurrent budgets,
 - Assess to what extent private contracting or force account is applied, and elaborate on the contracts management arrangements applied for works carried out by private contractors,
 - Explore the possibility of increased participation of the domestic private construction industry in road maintenance,
 - Assess whether there are options for improving current contracts management systems for both routine and periodic maintenance works, including reviewing current practice related to packaging of works, contracts announcement and bidding, works supervision, measurement and payments, conditions of contract, qualification of bidders, etc.
 - By comparing the core performance requirements of the maintenance implementation agencies with the resources made available to them, assess any institutional deficiencies (lack of staff, equipment, training, transport, allowances, etc.) and how these can be rectified.

4 Funding of Rural Road Maintenance

Rural road maintenance funding in Lao PDR originates from a number of sources, both from domestic revenues as well as overseas development assistance. Notably, the Government has recently established a Road Maintenance Fund, financed through a dedicated tax on fuel. 10 percent of the funds generated are dedicated to maintaining the rural road network.

For the main roads, funds are sourced from MCTPC through regional maintenance offices.

In addition, the DCTPCs receive funding from MCTPC for maintenance of the public roads.

The DCTPCs are responsible for the maintenance of provincial, district and village roads, which is financed through a number of different sources. While most of the domestic sources origin from the centre, some are from locally generated sources.

In some provinces, also donor funding is available for road maintenance. The main supporters in this respect are the World Bank, Asian Development Bank and the Swedish Government.

During recent years, there have been considerable developments in terms of building up a capacity within government agencies to maintain the public road network. This also includes the maintenance of rural roads, carried out under the supervision of the local government organisations. Despite this, there are still a number of challenges facing the sector and a number of issues have been identified in relation to the capacity required to meet the full demands for maintenance of rural roads.

The consultants will further elaborate on these achievements, current funding requirements, implementation arrangements and funding sources in order to provide an overall picture of the current and future capacity of local government to finance and

execute the maintenance requirements of rural roads which can be classified in a maintainable condition. This will include specific activities such as:

- present a brief overview of the distribution of funding for maintenance of national, provincial, district and village roads,
- collation of overall maintenance budget figures from domestic sources, such as recurrent budgets, local revenues, road fund, as well as donor funding, i.e. SIDA, WB, ADB and others with a particular emphasis on rural roads,
- collect and validate information on the extent and condition of the rural road network for the purpose of estimating the current demand for maintenance funding,
- prepare a comparison between current spending on maintenance of rural roads and actual current and future demands,
- assess the ability of local communities and road users to contribute to the costs of maintaining the road network, and to what extent such contributions can meet the resource demands for maintaining this network,
- describe (if any) applied mechanisms for collecting revenue from local communities and road users,
- review in detail the budgets and budgeting process in three sample provinces, one in the North, one relatively “wealthy” and one less developed province in the Centre/South.

The expected outcome of this assignment will be a comprehensive, but concise overview of current maintenance arrangements in Laos, highlighting crucial issues and challenges which the government is currently facing, and recommendations outlining how these issues can be addressed by the various players in this sector.

Annex 2 Lao PDR road statistics by province

Province	Road length (km)				Maintainable road length (km)				Area (km ²)	Population (2002 est)	Km road per		Km maintainable road per	
	National	Provincial	Others	Total	National	Provincial	District and Rural	Total			1,000 km ²	10,000 persons	1000 km ²	10,000 persons
Attapeu	251	320	532	1,103	358	62	47	467	10,320	107,600	107	126	45	43
Bokeo	94	320	212	626	170	51	59	280	6,169	141,000	101	55	45	20
Borikhamxai	510	371	260	1,141	511	433	338	1,282	14,863	202,300	77	70	86	63
Champassak	472	943	1,046	2,461	452	320	499	1,271	15,415	559,500	160	49	82	23
Houaphan	418	438	382	1,238	446	115	75	636	16,500	303,400	75	51	39	21
Khammouane	416	465	607	1,487	452	311	369	1,132	16,315	337,400	91	55	69	34
Luang Namtha	328	136	232	696	303	401	118	822	9,325	141,300	75	61	88	58
Luang Phabhang	596	357	306	1,260	609	433	338	1,380	16,875	400,400	75	35	82	34
Oudomxai	316	101	603	1,020	314	209	326	849	15,370	259,200	66	49	55	33
Phongsali	477	136	37	650	475	0	74	549	16,270	188,200	40	42	34	29
Saravane	474	591	1,436	2,501	433	72	188	693	10,691	316,900	234	98	65	22
Savannakhet	597	1,160	79	1,836	606	730	188	1,524	21,774	713,800	84	27	70	21
Vientiane	327	284	542	1,153	401	387	395	1,183	15,927	351,900	72	40	74	34
Vientiane Mun	244	270	888	1,402	244	220	673	1,137	3,920	652,400	358	27	290	17
Xainabouli	557	708	397	1,662	540	161	65	766	16,389	359,800	101	57	47	21
Xaisomboun	240	386	282	908	237	10	52	299	7,105	66,500	128	168	42	45
Xekong	203	63	149	415	205	0	27	232	7,665	78,800	54	65	30	29
Xieng Khouang	395	383	871	1,649	385	140	292	817	15,880	246,800	104	82	51	33
Total	6,915	7,432	8,860	23,207	7,141	4,055	4,123	15,319	236,773	5,427,200	98	43	65	28

Annex 3 Labour-based upgrading and maintenance operations: Cost estimates from international experience

	Upgrading / Rehabilitation cost (US\$/km)	Routine maintenance (US\$/km/year)	Periodic maintenance (US\$/km)	Comments
Broad estimate for Lao PDR in 1997 (1)	US\$10,000	US\$100 to US\$200		Costs are for provincial and lower category unpaved roads. Upgrading cost assumes spot improvement including drainage system, replacing missing bridges and regravelling where necessary. Maintenance by labour-based length-person system is assumed.
ILO/GTZ Pilot Project in Oudomxai and Savannakhet (2)	US\$8,000			Labour-based rehabilitation.
Road 2000 Programme, Kenya (3)	US\$2,000	US\$240	US\$280	Rehabilitation cost is for partial rehabilitation and spot improvement of unpaved roads. Labour only routine maintenance on roads with traffic less than 50 vpd is US\$240/km/year. There is an additional cost of US\$280/km for routine towed grading for roads with more than 50 vpd which is not needed every year (frequency not specified). Periodic maintenance costs of regravelling are not included.
LSRSP2 for Local roads in Lao PDR (4)	From US\$1,000			This is based on the observation that many gravel roads can be brought up to a passable, maintainable standard with relatively limited work (clearance of vegetation and drainage system and re-establishment of road camber).
Summary of international estimates (5)	1. From US\$2,000 2. From US\$7000	From US\$250	US\$400 to US\$2,000	1. Rehabilitation of unpaved road – camber and drainage system only. 2. Construction / rehabilitation of a gravel rural road. Estimates assume low labour wage environment. Note that the estimates are “from” and therefore at the low end of the range.
Labour-based, light equipment supported maintenance units in Zimbabwe (6)		1. US\$116 to US\$152 2. US\$198 to US\$317		1. Direct cost only – cost depends on length of roads maintained by unit. 2. Direct cost plus unit and HQ overheads.

Sources:

- (1) World Bank (1997) Lao PDR sector memorandum priorities for rural infrastructure development, February 25, Report No 16047-LA. Agriculture and Environment Operations Division, Country Department I, East Asia and Pacific Regional Office.
- (2) Cited in World Bank (1997).
- (3) Lebo, J and Schelling, D (World Bank) (2001) “Design of rural transport infrastructure” Rural Transport Knowledge Base, Rural Travel and Transport Program 2001
- (4) MCTPC (2003b)
- (5) Petts, R (2002) *Costing of roadworks*, Low Cost Road Surfacing Project Working Paper No 3
- (6) Gongera, K and Petts, R (2003) *A tractor and labour-based routine maintenance system for unpaved and rural roads*, Low Cost Road Surfacing Project Working Paper No 5

Annex 4 Champasak Province Roads Investment Plan, 2003-4

Road Number	Road cat.	Km	Cost (KIP)	Cost (US\$)	Source of Funds	Description	
14a	Provincial	45.5	8,392,000,000	791,698	ADB	Regravelling	Agricultural road
				33	% of total		
7834	District	31.5	1,188,760,000	112,147	IDA	Regravelling	Periodic
7808	Provincial	15.8	482,560,850	45,525	IDA	Regravelling	Periodic
7817	District	8.4	394,316,160	37,200	IDA	Regravelling	Periodic
7824	Provincial	12.5	614,356,420	57,958	IDA	Regravelling	Periodic
7802	Rural	5.4	201,504,000	19,010	IDA	Regravelling	Periodic
7805	Provincial	10.5	223,067,000	21,044	IDA	Regravelling	Periodic
7806	District	20.5	513,376,000	48,432	IDA	Regravelling	Periodic
7812	Provincial	22	791,741,600	74,693	IDA	Regravelling	Periodic
7814	Rural	17.3	638,264,000	60,214	IDA	Regravelling	Periodic
7816	District	12.5	413,329,216	38,993	IDA	Regravelling	Periodic
14a	Provincial	24.2	800,086,000	75,480	IDA	Regravelling	Periodic
7827	District	12.4	384,244,000	36,249	IDA	Regravelling	Periodic
7821	District	7.8	392,056,000	36,986	IDA	Regravelling	Periodic
8091	Rural	5.4	285,929,000	26,974	IDA	Regravelling	Periodic
8002	Rural	2.5	114,785,000	10,829	IDA	Regravelling	Periodic
8016	Rural	2.8	140,380,000	13,243	IDA	Regravelling	Periodic
8017	District	10.4	433,043,000	40,853	IDA	Regravelling	Periodic
7810	District	6.4	246,408,000	23,246	IDA	Regravelling	Periodic
7833	Provincial	32	3,124,104,600	294,727	IDA	Regravelling	Periodic
		260.3	11,382,310,846	1,073,803			
				45	% of total		
8030	Rural	14.5	200,000,000	18,868	Provincial	Cleaning and grubbing	New road
		25	345,000,000	32,547	Provincial	Cleaning and grubbing	New road
7801 (1)	District	9.5	724,500,000	68,349	Provincial	Concrete + DBST	Continuing Construction
7805	Provincial	5	200,000,000	18,868	Provincial	Regravelling	Maintenance
7833	Provincial	8	1,540,000,000	145,283	Provincial	Regravelling	Continuing Construction
		62	3,009,500,000	283,915			
				12	% of total		
7829	Provincial	6.3	2,383,804,500	224,887	RMF + revenue from fines	Regravelling	Construction around Island
				9	% of total		
	Total	374	25,167,615,346	2,374,303			
				100	% of total		

Note (1) Cost of construction of road 7801 shown as 72,450,000,000 kip (equivalent to about US\$720,000 per km). Cost of 724,500,000 kip assumed.