

LAO PEOPLE'S DEMOCRATIC REPUBLIC
INTERNATIONAL LABOUR ORGANISATION

Strategy Document for a Labour-based Road Works Programme in Lao PDR

prepared on behalf of

Project LAO/90/M01/FRG
Labour-based Rural Roads
Construction and Maintenance

by



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Vientiane, December 1996

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ADT	Average Daily Traffic
CPC	Committee of Planning and Cooperation
CTC	Communication Training Centre
DCTPC	Department of Communication, Transport, Post and Construction
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
HFL	Highest flood level
IDA	International Development Association (World Bank)
ILO	International Labour Organisation
IRAP	Integrated Rural Accessibility Planning
JICA	Japanese International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau
Lao PDR	Lao People's Democratic Republic
MCTPC	Ministry of Communications, Transport, Posts and Construction
NEM	New Economic Mechanism
NGO	Non Government Organisation
NPI	National Polytechnic Institute
NTS	National Transport Study
RDC	Rural Development Committee
SIDA	Swedish International Development Cooperation Agency
SCT	School of Communication and Transport
TPU	Transport Planning Unit
UNCDF	United Nations Capital Development Fund
UNDCP	United Nations Drug Control Programme
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNV	United Nations Volunteer
vpd	vehicles per day
WB	World Bank
WHO	World Health Organisation

Current Market Exchange Rate 1 US\$ = 940 Kip

Preface

This report is the result of the work carried out by Bjørn Johannessen and Geoff Edmonds during the period from November to December 1996 in the Lao PDR.

The authors would like to thank all those who have assisted them in the preparation of this report. In particular, special thanks are due to the officials of MCTPC and the ILO project staff in Lao PDR. Their interest and cooperation have made the assignment both easier and a pleasure. In addition, we would express our gratitude to the various development organisations which have also been supportive and helpful to the Consultant.

It is hoped that the production of this document, may facilitate further support to Lao PDR's efforts to develop its rural areas, and that within such programmes the wider use of labour-based technology is achieved.

Executive Summary

Background

The objective of this assignment was to prepare a strategy document for labour-based road works technology in Lao PDR.

This document is intended to assist the Lao Government in its efforts to effectively and efficiently manage and coordinate labour-based initiatives in the rural roads sector. It is an attempt to draw together the main aspects of the application of labour-based methods in Lao PDR. The document provides:

- (i) a review of current as well as previous experience with labour-based works in the road sector,
- (ii) an assessment of the potential for the use of labour-based technology in future rural road works programmes,
- (iii) a discussion of the major aspects of labour-based technology, and
- (iv) an identification of the issues to be addressed in the development of the technology in Lao PDR.

This is an appropriate moment to carry out this assignment, as significant changes are currently taking place in the country with regards to the Government's priorities in relation to rural infrastructure development. The donor community has responded to these changes and are now in the process of shifting their attention from assistance to major highway projects to supporting the development of the rural road network.

In addition, the Government is rightly concerned with the overall socio-economic development of the rural population. The use of labour-based methods could play a part in this development.

Labour-based Methods

An "appropriate" technology is defined as one that is both technically and economically efficient for a defined level of quality. Thus, appropriate construction technology exists over the entire range of methods. In each case, the appropriate mix of labour and machines will be determined by the technical nature of the project, available resources, prevailing prices and the socio-economic environment in which the project is executed.

Labour-based technology can be defined as the construction technology which, while maintaining cost competitiveness and acceptable engineering quality standards, maximises opportunities for the employment of labour (skilled and unskilled) together with the support of light equipment and with the utilisation of locally available materials.

Numerous studies carried out by several agencies including the World Bank and the ILO in many countries including Lao PDR, have demonstrated that when the right conditions are present in a given area, labour-based technology is the most cost-effective approach to rural infrastructure development. These conditions include:

- o sufficient numbers of under- or unemployed persons in the areas where the work is required plus local availability of construction materials;
- o low wage levels (under US\$4.00 per day according to World Bank studies);

- o shortage of conventional construction equipment and high capital costs;
- o Government commitment to the development of employment and generation of income in the rural areas;
- o small contractors skilled in labour-based technology and capable of supervising the work efficiently; and
- o competence of the public sector agencies responsible for rural infrastructure works in the areas of contracting and supervision of contractors' performance.

Lao PDR would generally fall into that group of countries where the use of labour-based methods should be seriously considered.

Labour-based technology is not new to Lao PDR. However, there has been a tendency to view these techniques as methods of necessity and as methods that are only used where no equipment is available. In recent years, however, the programmes implemented by the ILO and the UNDP have demonstrated that they have a role to play in the development of the rural road network of Lao PDR.

The experience from the labour-based projects in the Provinces of Oudomxay and Savannakhet demonstrates that road construction and road maintenance can be implemented using labour-based methods at competitive costs and providing a standard which is totally comparable with the use of equipment.

Policy

To be effective and to be accepted, any technology has to be in line with the policies and needs of the government. Labour-based technology is not stated as an explicit policy of the government. On the other hand neither is the use of imported equipment. What is clear is that the government is concerned to increase income and employment in the rural areas. It is anxious to reduce the dependence on foreign imports and to take measures which lead to import substitution and thereby conserve vital foreign exchange.

On all the above counts a technology which relies to the maximum extent possible on the use of local resources scores highly.

The Government has stated that one of its policies is to improve rural communities' access to the main road network. They intend to do this through the development of a national programme for feeder road construction in the provinces and districts with funds provided through a national programme budget. This will be done by measures designed to:

- o introduce a systematic planning process for feeder roads,
- o increase the allocation of funds for feeder roads and bridges, and
- o promote the development of private sector construction and maintenance capabilities.

The National Transport Study commissioned by the Government made clear recommendations on the use of labour-based methods to improve rural roads and to carry out road maintenance. They concluded that "As the main national roads are successively completed, an increasing share of the future construction work will be concerned with rural road construction, rehabilitation and spot improvements. This will lead to a rapidly expanding role for labour-based methods in the country and at the same time a reduced need

for equipment-based methods. The continued development and application of labour-based methods is therefore strongly recommended."

Given the economic situation of the country and the need to develop and rely on the countries own resources, labour-based methods would seem, a priori, as a logical approach to the development of rural infrastructure.

A major proportion of the budget for infrastructure in the country is provided from external, donor funds. In line with the Government's concentration on rural development, these donors are starting to reorient their emphasis away from major infrastructure programmes to those of rural infrastructure. The World Bank, ADB UNDP, SIDA and several others are in the process of defining programmes of rural infrastructure development.

The Framework

Past efforts to improve the road network in the country have concentrated on upgrading the national road network. The next step is now to improve the secondary and tertiary road network to all-weather standards. Due to the current poor condition of secondary roads and the resulting limited access to the districts, any future road improvement programme in the provinces will first need to address the secondary road network. This implies that the first task will be to provide all-weather access to all of the country's 133 districts.

Of the total provincial road network of nearly 6000 km, less than 35 percent is thought to be passable in the wet season, and only half of the population is estimated to have road or river transport access throughout the year. Only 51 district centres of the total of 133 have all-weather access, and 15 have no road access even in the dry season.

From the above figures it is evident that the need for rural road development are enormous and varied. In the rural road sector, the needs are not just for development of village and district roads, but also of provincial roads. In some provinces, the most immediate need is building roads to connect the isolated provinces to the main road network. As the network of rural roads (provincial, district and village roads) is small and in an unmaintainable state, the needs also include reconstruction of roads to a maintainable state and extension of the network to reach isolated district and major villages particularly in the mountainous regions. Labour-based methods do provide a serious alternative for the rural road sector. Estimates have been made of the likely benefits which would accrue from the use of these methods for the upgrading and maintenance of the rural road network. This suggests that from a cost point of view, labour-based methods would be well within the provision for road expenditure. In addition, the output required to carry out the programme over the next ten years would be feasible. This relates both to the level of production already achieved under existing labour-based programmes and also to the expected level of output of small scale contractors.

In addition, of course a major portion of the \$180 million expected budget for such a 10 year programme would be spent on local labour and local resources, rather than on foreign exchange.

Nevertheless, one should not give the impression that the development of such a programme would not be without its difficulties. In brief it will require a major effort in terms of:

- training at all levels and for the private sector,
- the development of effective management and administrative procedures,
- improved financial procedures at the local level, and

- more participatory processes for the planning and selection of roads.

Technical Aspects

In terms of route identification and selection, the choice of technology does not have a major influence. However, it is necessary to assess the labour availability along the route if labour-based methods are under consideration.

More generally, there should be a concern with community participation and an involvement of the community from the start of the process. This is not so much in relation to the use of labour-based methods, but more in relation to ensuring that the communities needs are being addressed and to enhancing the potential for their involvement in both the implementation and the maintenance of the projects.

The selection of design standards is related to road function, volume of traffic and terrain. The selected design should be justified economically and the optimum choice varies with the construction and road user costs.

MCTPC has recently developed a design manual which has now been officially approved, however, on a provisional basis to be tested out before a final version is established. This manual has been developed for the use of traditional equipment-intensive work methods without major concern to the use of labour-based methods and other locally available resources. It is important that the use of labour-based technology is properly incorporated in the design standards before a final version of this manual is prepared.

In relation to the design standards proposed there are two important issues which should be considered when choosing the exact design of the rural roads viz: (i) the cross-fall gradient of the camber should be increased from 3-4% to 8% and (ii) the MCTPC design guidelines propose relatively wide shoulders with an unprotected sub-base for low-volume roads. An effective way of solving this problem would be to expand the wearing course to also cover the shoulders, and to provide turfing of the side slopes.

Maintenance

Road maintenance, whether periodic or routine, is an activity which lends itself to labour-based methods. There are a whole variety of systems, from the simple lengthman system for routine maintenance to small contractors with simple equipment for periodic maintenance, which can be used. The basic concept, however, is that maintenance is an activity which must involve the local communities to the fullest extent possible. For it is clear that even in the long term the Government is not going to have sufficient financial resources to pursue a policy of equipment-based maintenance.

In general, it is proposed that routine maintenance of low volume laterite surfaced roads is most easily and effectively done by labour-based methods, using hand tools only. This labour component (lengthman) could be fully organised and paid under contract to the DCTPCs. Periodic maintenance would need to be organised under a contract system, the works carried out by small-scale private contractors (with a limited amount of equipment), and supervised and managed by staff of the DCTPCs.

Labour

Whilst Lao PDR is considered a sparsely populated country, there seems to be little problem in recruiting sufficient labour for road work activities. A labour-based programme should therefore have no problem in labour supply if the programme activities are planned such that large numbers of labour are engaged on full time basis only during the dry season, and a smaller full-time work-force during the wet season.

Serious attention will have to be given to the motivation of the labour force. This is ensured by various measures such as appropriate wages, proper supervision, secure working conditions, timely payment of wages and the use of incentive schemes.

Payment can be organised in various forms, depending on the nature of work and type of funding. This would include daily paid, task work, piece rate and payment in kind.

The recruitment and payment procedures would need to be strengthened to ensure both transparency and an understanding by the workers of their rights. This would be particularly important in relation to the use of small contractors where there is more danger of worker exploitation.

Women can be encouraged to be involved in labour-based programmes. In Lao PDR it is culturally acceptable for women to do this work.

Contractors

Experience from other countries would support a move to small contractors taking over the main responsibility for road rehabilitation and maintenance using labour-based methods. Local contractors will not provide an easy solution to road construction and maintenance problems. The development of small-scale contractors entails a series of new support activities such as training in business management, development of user-targeted training material, development of appropriate contract procedures, streamlining of payment procedures, developing banking facilities, and last but not least providing interested contracting firms with attractive market prospects and a conducive environment in which they can operate efficiently.

It is important to provide a framework for the selection, training and certification of these small contractors in order that a professional cadre of contractors is developed in the provinces.

One important issue is the support mechanisms to supply the minimum amount of equipment required to the small contractors. Several options are available, however, it is recommended that a hire purchase arrangement through local banks presents the greatest advantages.

Small contractors will not be able to operate effectively if the environment in which they work is working against them. Attention needs to be paid to the application of tendering procedures and the definition of contract documents which are conducive to the development of the local contracting sector. Certain initiatives have been taken by the World Bank and the ADB. There is still need for reconciliation of the two approaches.

Finally, small contractors cannot grow unless there are good and secure market prospects. In the case of labour-based contractors, this therefore means a defined programme of labour-based works to which the contractors can have access.

Training

Training needs to be provided at several levels to disseminate and sustain labour-based road works technology in Lao PDR.

The most immediate demand will be to provide training to the current actors in the road sector and in particular to the institutions which is expected to be involved in future rural road works programmes, i.e. the provincial road authorities and domestic small-scale contractors. In addition, a more limited training programme is needed for managers, decision makers and planners involved in rural infrastructure development.

If labour-based road works technology will be used on a large scale in the future, the capacity of CTC needs to be expanded. In a large programme, training is a continuous activity, which requires training staff and related resources committed to the programme on a permanent basis.

Secondly, to sustain the technology in the country on a long term basis, labour-based construction and maintenance technology should be integrated into the regular training courses provided by the university, technical colleges, and the in-house training facilities of the MCTPC.

Training and education in labour-based technology at the higher learning institutions in the country is an important aspect. The SCT in Savannakhet provides a three year training programme for road supervisors. The School's interest in including labour-based methods in its regular courses should be supported.

Finally, a larger-scale application of labour-based technology in the country would require an appropriate research capacity, preferably in conjunction with a training institution.

Training is generally accepted as an important component in any capacity building programme. However, for it to become effective, it is important that the training provided, is purpose-oriented and address subjects which are relevant to the duties and responsibilities of the various cadres of staff.

Capacity Building

In terms of the development of the rural areas and the provision of economic opportunities, a rural road works programme can be designed to contribute to the development objectives through a series of interventions:

- o enhancing access to and from the rural areas,
- o providing direct income from the labour-based construction and maintenance of roads,
- o developing the local small-scale contracting industry, and
- o improving the efficiency of local authorities.

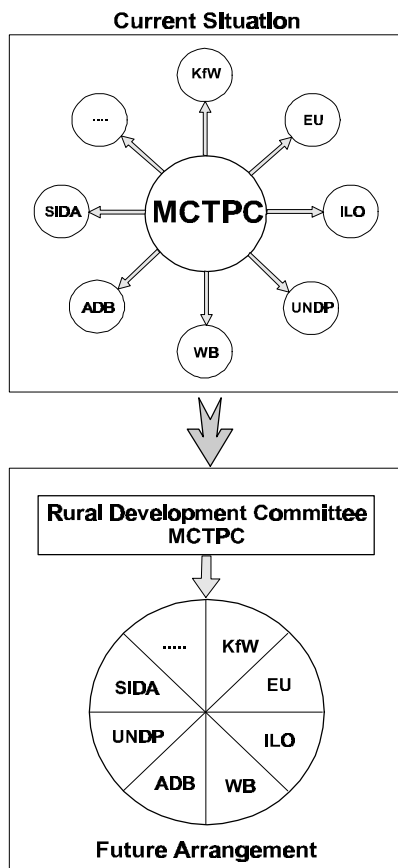
If labour-based methods are to play a major part in the development of the rural road system then the right environment has to be created so that they can effectively achieve their potential. The main responsibility for this will fall on the MCTPC.

The Rural Development Committee of MCTPC will need to set an example in relation to the development of the use of labour-based techniques.

Future rural road works programmes should be designed to develop capacity at headquarters and in the provincial departments by assisting them step by step through the process of the implementation of the interventions mentioned above.

Organisation

There are several rural infrastructure programmes presently being developed in Lao PDR. The government needs a coordinating body which can effectively monitor the performance of various programmes. The government is currently establishing a Rural Development Committee within the MCTPC which, amongst other tasks, will address this issue.



A coordinating body for rural road works in MCTPC will also provide a regular channel for discussions and dialogue with the donor community relating to identification and formulation of future donor funded rural roads projects.

In order to effectively utilise the management resources available to MCTPC, there will be a demand for streamlining and standardising ongoing and future rural road works into one coherent programme. Today, the various projects operate independently with very little coordination and exchange of information. One of the immediate tasks for the Rural Development Committee will be to pull the various projects together, creating *one* national programme consisting of all the various actors. In order to achieve this, the Government needs to establish a set of general standards and procedures relating to rural road works.

These efforts will streamline and improve the efficiency of the overall management and monitoring of rural road works in Lao PDR. It may also streamline project negotiations between the government and donors when a standard mode of implementation has been established. Negotiations with donors can then concentrate on which part of a national rural road works programme they wish to support.

Finance

The rural road construction and rehabilitation works are estimated at an average total cost of US\$ 15,000:- per kilometre. Based on-going labour-based road works, local supervision and administration costs are estimated to be 10% of the total costs. The annual cost of routine maintenance is estimated at US\$ 300:- per kilometre, including supervision and inspection costs.

Funds for rural roads should be directed to and controlled by the provincial authorities as they would be expected to manage and supervise future improvement of the rural roads. This implies that contracts should be managed at provincial level and that funds are at disposal for payment of works through local banks in the provinces. A solution could be to provide an advance transfer of funds from central level to the provinces, based on the agreed annual rural road works programme. Based on progress and expenditure reports from the provinces, the funds could be replenished on a quarterly basis.

At central level, the Rural Development Committee would monitor the physical progress of works, and based on this information advise the finance authorities on the advance disbursement of further funds to the provincial departments of finance, thereby ensuring a healthy cash flow to the provinces and avoiding any disruptions of works progress.

When donors are involved in financing rural road works, separate budget lines and accounts should be established, thereby ensuring that expenditure financed from external assistance can be monitored separately.

Chapter 1 Introduction

1.1 The Assignment

1.1.1 Project Background

Project LAO/90/M01/FRG "Labour-based Rural Road Construction and Maintenance" aims to develop a local capacity within relevant technical ministries to construct, rehabilitate and maintain rural roads using labour-based work methods supported by light construction equipment. Through demonstration sites located in varying topographical conditions, the project has so far constructed and maintained approximately 50 km of all-weather rural roads at maintainable standards in the two provinces, Savannakhet and Oudomxay. The project has chosen to carry out this work through the provincial road authorities by providing required training and direct on-site guidance. Based on the experience gained from the road works, the project aims to develop a strategy for the long term sustainability on rural roads construction and maintenance in Lao PDR.

The project was originally funded for a two year period by the Government of Germany. Technical assistance has been provided by the ILO through a team of four international experts, consisting of a Chief Technical Adviser, an Associate Expert and two United Nations Volunteers.

1.1.2 Scope of Study

This assignment has been commissioned by the ILO to assist the project in formulating a strategy document for labour-based road works in Lao PDR, based on the experience gained from project LAO/90/M01/FRG. More specifically, this exercise attempts to (i) review current as well as previous experience with labour-based works in the road sector, and (ii) assess the potential for the use of labour-based technology in future rural road works programmes, with the final objective of assisting the Lao Government in its efforts to effectively and efficiently manage and coordinate labour-based initiatives in the rural roads sector. Furthermore, this document could be of help in making an assessment of the prospects for a labour-based road works programme and of their commitment to such a programme.

Based on the review of labour-based works in the country, this report provides the rationale for defining the contribution this technology may have in the future development of rural roads in Lao PDR. In addition, this report outlines a medium-term plan for a labour-based road works programme, indicating in broad terms the resources and conditions required to effectively develop the rural road network in the country.

The original terms of reference are attached as Annex 1. The assignment was carried out from 20 November to 30 December 1996 and included travel to Vientiane. The itinerary and work programme and the list of persons consulted are shown in Annexes 2 and 3 respectively.

This is an appropriate moment to carry out this assignment, as significant changes are currently taking place in the country with regards to the Government's priorities in relation to rural infrastructure development. The donor community has responded to these changes and are now in the process of shifting their attention from assistance to major highway projects to supporting the development of the rural road network. In this context, it is worth mentioning that three major foreign actors in the Lao road sector, namely the World Bank, Asian Development Bank and the

Swedish International Development Cooperation Agency are now in the process of preparing major support programmes to improve rural roads in the country.

1.1.3 Plan of the Report

Before commencing on the detailed issues relating to planning and implementing a labour-based road works programme, it is important to clarify the exact meaning and contents of this technology. The remaining part of this chapter, provides a general background to, and definition of, the technology. Furthermore, this chapter presents the general economic situation of Lao PDR, and conditions prevalent in the rural areas as regards to infrastructure demand.

Chapters 2 to 4 presents a brief review of past and current road works where labour-based technology has been applied to improve and maintain rural roads and the current position of the Government and the donor community to the technology and its relevance to the rural road sector.

Labour-based road works technology has so far only been utilised to a limited extent in Lao PDR, mainly in pilot and demonstration projects. However, the general experience from these projects indicate that there is large scope for the expansion of the technology to become an integral part of the national strategy to upgrade the rural network. Chapter 5 provides a general assessment of this potential as related to the overall demands for improvement of the rural road network in Lao PDR.

In order to successfully implement a labour-based road works programme, it is important to design work methods and procedures, carefully taking into consideration local conditions prevalent in the country and the project areas. Based on past experience, Chapters 6 to 10 provides detailed guidelines on technical, financial and organisational issues important for a successful programme in Lao PDR.

1.2 Labour-based Methods - A Definition

1.2.1 History

More than 80 percent of the population in Lao PDR live in the rural areas. Although Lao PDR is presently experiencing a significant economic growth, very little of this contribute to the improvement of the living conditions in the rural areas.

The rural poor are not integrated in the national economy, many are undernourished, illiterate and ill housed, and they are easy victims of floods, famines and epidemics.

Traditionally, policy makers in developing countries have been reluctant to see the potential of making efficient use of the under- and un-employed labour in the provision of rural infrastructure. Notable exceptions were some Asian nations such as India, Pakistan, Indonesia and China, where labour traditionally has been used in all types of construction works. Many developing countries, including Lao PDR, imported construction methods that made extensive use of heavy equipment.

The reliance on equipment-based, high technology, construction methods has evolved for a number of reasons: the desire of politicians and engineers to emulate the more developed countries, the tendency among international consultants and contractors to favour construction methods with which they are familiar, and the biases inherent in the tied-aid stipulations of international and bilateral assistance agencies, the concern of the latter being to help exports of their own countries. A particular important factor has been the educational background of the technical leadership in most developing countries. Often acquired in engineering schools that advocated the latest technology and production methods this background conditioned planners and engineers to favour the use of heavy equipment in all circumstances. Equipment-based methods were perceived to have productivities, costs and

performance that were predictable; they were associated with high quality results; and they were surrounded by an aura of technological progress. Hence, the use of equipment in construction was particularly attractive and in some cases unavoidable, since financing would not otherwise have been forthcoming.

At the same time, the substitution of labour for machines appeared to have negative connotations. Large numbers of labour are needed to approach the output of a single piece of equipment. Doubts were entertained about the ability of unskilled workers to produce high quality work. Labourers were regarded as being undisciplined, unruly, unreliable and consequently, requiring extensive supervision. In sum, the extensive use of labour was judged to increase the risk of higher costs, to bring about longer construction periods, and to produce results of dubious technical quality. These risks tended to make public sectors in most developing countries - the front line of potential users - resist the use of unskilled labour in construction.

Reliance on equipment has shown to have some disadvantages, however. It resulted in a technological dependence on the countries that provided the equipment. Equipment-based operations also entailed heavy expenditures of foreign exchange. Such costs might be an unavoidable burden for urgently needed high technology projects. But for the construction of smaller, more scattered and technically less demanding rural projects, politicians and administrators began to look for ways to put local resources to work. If much of the work could be done by hand, the rural poor would not only receive the benefits of the finished product but would, in addition, secure the much needed income from its construction, considerable employment from its maintenance, and a sense of participation, civic pride and unity.

1.2.2 Definition

There are several categories of construction programmes that use large numbers of unskilled labour:

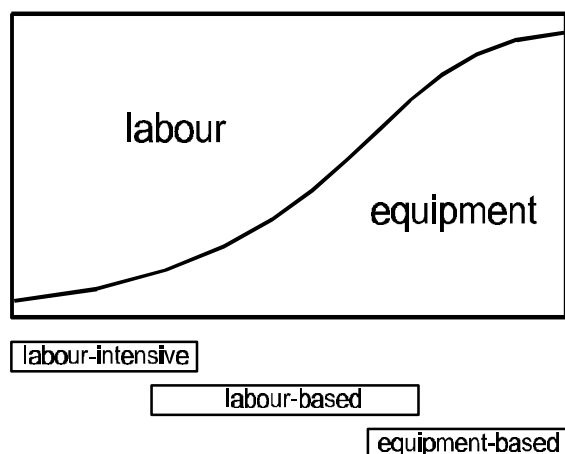
- o Relief Programmes responding to natural or man-made catastrophes, (i.e. droughts, severe floods, war, etc). Their prime objective is to provide food and income to the affected individuals. Although such programmes may also improve infrastructure, this is considered as a by-product.
- o Employment Generation Programmes - These projects give little attention to cost and quality effectiveness. Once more, asset creation is a secondary objective.
- o Asset-Creation Programmes - These attempt to improve infrastructure at the lowest possible cost, maintaining accepted quality levels and applying the most *appropriate* technology. Simultaneously, they supply employment opportunities in the rural areas, providing supplementary cash income to farmers. A sub-category is self-help programmes, which are schemes that do not pay wages to their workers, since the labour is regarded as the ultimate beneficiaries and owners of the created assets, and the project is merely an attempt to assist them in helping themselves.

This document focuses on the planning and implementation of the latter category of programmes, and more specifically, how this type of programmes can be organised in the rural road sector of Lao PDR.

An "appropriate" technology is defined as one that is both technically and economically efficient for a defined level of quality. Thus, appropriate construction technology exists over the entire range of methods. In each case, the appropriate mix of labour and machines will be determined by the technical nature of the project, available resources, prevailing prices and the socio-economic environment in which the project is executed.

The labour-based approach starts from the position that labour is a relatively abundant and cheap local resource during large periods of the year, if not throughout the year, and thereby seeks to

determine the most appropriate work methods.



To avoid a common misconception, it is important to distinguish between labour-based methods and labour-*intensive* methods. In contrast with labour-based technology, the labour-intensive approach seeks to maximise the use of labour with minimum use of mechanised equipment, often at the expense of cost and quality efficiency.

Labour-based technology can be defined as the construction technology which, while maintaining cost competitiveness and acceptable engineering quality standards, maximises opportunities for the employment of labour

(skilled and unskilled) together with the support of light equipment and with the utilisation of locally available materials and resources.

1.3 The Laotian Context

1.3.1 General

Lao PDR is distinguished topographically by a very mountainous area extending north and south throughout most of the country and a small area of lowland on the southern and southwestern borders. The mountainous area, which covers about nine-tenths of the entire country, can be divided into a northern section of heavily forested mountain ranges and plateaus cut by deep, narrow valleys and gorges and a southern section containing more sparsely forested limestone terraces. As a result of this rugged terrain and long distances between settlements, internal and external communications become difficult and costly.

The main climatic features are determined by the monsoons. The wet summer season prevails from about May to October, with rainfall averaging about 1780 mm, and a dry cool season extends from about November to February. The remainder of the year is hot and humid.

Lao PDR is a landlocked country with most of its natural resources unexploited or unsurveyed. The economy remains small and undiversified, with a per capita income estimated at about US\$ 335, making it one of the least developed countries in the world. The economy is dominated by agriculture which accounts for about 60% of GDP and two commodities (timber and electricity), providing about 70% of export earnings. As such, the economy is vulnerable to climatic conditions and external factors beyond the Government's control. This, coupled with a weak human resource base, presents the country with a major challenge to development.

Among Asian countries, Lao PDR has one of the most undeveloped road networks. During the past nine years, Lao PDR has been investing between US\$ 20 and 45 million annually in road rehabilitation. While these investments are sizeable in terms of total capital budget of the Government, the effect on the overall length of the road network has been limited. The past decade's investments have added approximately, 200 km of improved new roads each year, i.e. about 2 % of the national and provincial road network.

With few exceptions, road improvement works has mainly been focusing on establishing a functionable trunk road network in the country. The main emphasis of these investments has been on two major components, (i) Road 13 from Pakse in the south to Pakmong in the north and (ii) in roads

providing access to the rich agricultural and densely populated area on and around the Bolavens Plateau in the south.

Until recently the provincial and district road network has received little attention.

1.3.2 Rural Access

Isolation is a fundamental cause of poverty. Isolation is reflected in the lack of access of the population to goods and services. If the population has no access to basic services such as water supply, health and educational services, they will even be unable to satisfactorily meet their basic needs. In addition, lack of access to, or isolation from, technology, agricultural inputs, markets and outlets for cash crop production means that there is neither the incentive nor the capability to generate economic surplus. Moreover, lack of access to information and to available government services means that the population is cut off from the mainstream of economic and social development in the country.

The important point here is that lack of access is a major factor contributing to the continuing poverty of the rural population. Major efforts are now being undertaken to improve the social and economic situation in the country. Nevertheless, it is vital that the problem of access is tackled in a comprehensive and integrated manner.

Therefore, a shift in emphasis towards improving and maintaining provincial, district and other rural roads is justified. Road infrastructure is limited and where it does exist, it is poorly maintained, causing a serious constraint to economic and social development.

That being said it should be recognised that in the poorer provinces, the immediate potential for economic development is also limited. Most households barely produce enough rice to be self sufficient. Roads cannot, in the first instance, lead to significant increases in income. The immediate benefits are likely to be improved access to health and education. However, without proper roads, it is difficult to provide the basic social services which may in the second round result in increased social and economic development.

Roads therefore are a necessary but not sufficient element in rural development in Lao PDR. These roads could also contribute directly to the benefit of the rural population through the use of labour-based methods.

Chapter 2

Review of Current Practice

2.1 History of Labour-based Road Works in Lao PDR

Labour-based road works technology is not a new technology in Lao PDR. In the 1970s when the country received assistance from the People's Republic of China and Vietnam to construct some 900 km of paved roads in the northern provinces (National Roads 1, 4, 6 and 7), labour-based construction methods were widely used. Despite lack of regular and sufficient maintenance, these roads have stood up to performance requirements and are still passable today. It is also worth mentioning that the Chinese in the neighbouring province to Lao PDR still use labour-based methods to construct and maintain its district road network.

2.1.1 ILO

During the second half of 1980s, two labour-based road projects (LAO/83/001 and LAO/87/003) were carried out in the provinces of Xiengkhuang, Houaphan and Vientiane with financial support from UNDP and technical assistance provided by ILO. These projects served the main purpose of testing the technical and economic feasibility of labour-based road construction and maintenance technology in the country. They showed that labour-based methods were technically feasible and cost-effective as long as supervision and quality control are provided, and payment to the workers are fair and regular. The results suggested that there was a considerable scope for expanding the role of labour-based methods for road works in Lao PDR.

It is worth remembering that these projects were carried out at a time when the rural infrastructure and administration were even less well developed than they are today. This is relevant in the sense that there is often concern that there is limited capacity at the local level to implement what is seen as a supervision intensive technology.

The projects clearly demonstrated the economic advantages of both labour-based construction and maintenance. Moreover, it showed that it was possible to mobilise the necessary capacity at the provincial level to implement labour-based programmes.

2.1.2 SIDA Pilot Road Maintenance Area

In 1991, in the SIDA Pilot Maintenance Area, trials were made to develop suitable methods for routine road maintenance and rural road rehabilitation. The routine maintenance was organised on a lengthman basis to carry out pothole patching, drainage clearing and bush cutting on a gravel road. The road rehabilitation works were carried out on Road No. 207 through Naphok village. An average workforce of 40 workers were recruited from the village to cut bushes, excavate side drains and construct a camber. The results from these trials also confirmed that labour-based methods were competitive to the use of equipment for road maintenance and rural road rehabilitation.

2.1.3 UNDCP Xiengkhuang Highland Development Projects

In the UNDCP Xiengkhuang Highland Development Projects, there was a large component of labour-based road works. During 1992-1994, about 58 km of rural roads were built in hilly and mountainous areas to provide access to hill-tribe villages as part of an anti-opium growing scheme. Large quantities of rock excavation were involved in which rock blasting was required. The rock was thereafter broken manually by labour and used to provide hard surfacing since good quality soil

aggregate was not available in the nearby vicinity. The wage rate adopted was 1.40 US\$/day. Up to 2,300 workers were employed in a month period. Labour were reported to come from villages as far as 10 km away to camps near the road site. The total construction cost was approximately 14,000 US\$/km of which 80% were labour costs.

2.1.4 UNDP Study of Central Region

In 1995, the Government asked the UNDP to carry out a study of the six Provinces of the central region of the country. The study was concerned with defining programmes for rural development. As part of this study, the ILO carried out an assessment of the scope for the application of labour-based methods in rural infrastructure.

The study identified the severe restraints caused by the lack of rural infrastructure in general. In addition, it suggested certain targets for several rural infrastructure sectors including roads. It also suggested that labour-based methods be used to the extent possible and that the private sector should be heavily involved in the implementation.

2.2 On-going Works

Labour-based methods are already experimented with in Lao PDR. Moreover, some initiatives are presently being taken to apply the lessons learned from previous experience.

2.2.1 Routine Maintenance of National Roads

The Government has recently delegated the responsibility for routine maintenance of national roads to the provinces. Starting in 1996, a separate budget item allocates funds to the provincial departments of MCTPC to carry out routine maintenance. Furthermore, it has been decided that this work will be carried out using labour-based methods, recruiting local labour from the areas through which the roads are passing.

This programme is still in its early stage and only a few provinces have so far established a routine maintenance system. In the provinces where works have commenced, it has been organised either as a lengthman system, where individuals have been contracted to carry out maintenance on a one-kilometre section, or on a collective basis where contracts have been entered with the villages to maintain longer sections.

Both methods seem to have advantages and disadvantages, the lengthman system for instance requires extensive supervision on the other hand the community contracts rely on being able to mobilise the community at the appropriate time. It is still too early to conclude which is the better alternative. However, it seems evident already at this stage that for the programme to succeed, there is a demand for training of staff, and to introduce more effective planning, monitoring and reporting procedures.

2.2.2 ADB Rural Feeder Road Maintenance Training Project

The main objective of this technical assistance is to assist the MCTPC and the provincial and district authorities in strengthening the organisation and operation of maintenance of provincial and local roads in rural districts, which are not under the maintenance administration of MCTPC. It is envisaged that the operations for maintenance of such roads of gravel standard will be maintained through labour-intensive methods with the provision of local materials tools and technical guidance from the provincial authorities of MCTPC.

The scope of this project includes (i) providing an overview of the current situation regarding planning, funding and operations of road maintenance for local roads; (ii) formal training of staff of

MCTPC, provincial authorities and local communities in labour-based road maintenance; and (iii) field training in four provinces, Phongsaly, Xayabury, Houaphan and Champasack.

These services are provided by one international expert and one national professional supplied by Royds Consulting. The project duration is one year and will terminate in March 1997.

The project has provided short-courses in road maintenance, focusing on routine maintenance activities, applying labour-based work methods. In relation to this training, the project has prepared a field manual with graphic presentations and minimal text in Lao and English.

2.2.3 KfW Village Based Routine Road Maintenance on RN 6

Under a KfW funded project, which rehabilitates and maintains National Road 6 in Houaphan and Xiengkhuang Provinces, the government has started implementing a labour-based village based routine maintenance system. Similar to the arrangement in the current ILO labour-based project, routine maintenance contracts are awarded to the villages along the road. This project started in late 1996 and receives technical assistance from GITEC Consultants.

2.2.4 Labour-based Rural Roads Construction and Maintenance Project

This project started in November 1994 with financial assistance from the German Government and technical assistance from the ILO, with the aim of building up a capacity in the DCTPCs in two provinces to plan and implement labour-based rural road construction and maintenance. The project was set up in two distinct provinces, in Oudomxay with hilly and mountainous terrain, low population density and mainly shifting agriculture, and in Savannakhet with a relatively high population and with mainly lowland rice production.

The German financial assistance ended in September 1996. Currently, the project receives financial assistance from SIDA to extend project activities until July 1997.

The physical road works have principally served the purposes of (i) providing practical training for DCTPC staff, (ii) assembling data on cost and productivity, (iii) demonstrating that adequate quality can be obtained using labour-based methods, and (iv) developing effective work methods and operational procedures for the use of labour-based technology in Lao PDR.

While the original intention was to give emphasis to spot improvement and maintenance works, the project shifted its focus to new construction and full rehabilitation works due to the poor condition of the existing rural road network in the project areas.

By September 1996, the project has completed some 50 km of all-weather rural access roads to a standard providing a 5.5 metre gravelled carriage width. Average production costs, including the provision of culverts and small bridges, amount to US\$ 9,000:- per kilometre.

Apart from basic hand tools, the project has procured some items of light equipment including single-axle tractors, 1.5 tonne trailers, dead-weight rollers and water bowsers. All tools and equipment, with the exception of supervision vehicles, have been purchased on the local market. While most items originate from China or Thailand, some items have been manufactured locally, according to design specifications given by the project. Such items include ranging rods, profile boards, heavy duty rakes, hand-rammers, wheelbarrows, dead-weight rollers and water bowsers.

The road works are organised as force account operations, directly managed by staff from the DCTPCs. Initially, work was organised as daily work where the labour were paid a fixed daily wage rate (current rate: 1800 Kip/day) for working 7 hours a day, six days a week. Later, when site production rates had been established, the task work system was introduced for most work activities. As expected, the labour productivity increased considerably with the introduction of task rates.

Except for gravel haulage and compaction, the project has applied labour-based methods for the construction and maintenance of the roads.

Local contractors have been involved in the construction of culverts and the provision of gravel. After the first year, the DCTPCs has taken over culvert installations and rehabilitation of small bridges.

Planning, reporting and monitoring systems for the construction activities follow the standard practices on labour-based programmes. For each site, detailed plans are prepared for specific tasks or periods. Daily progress is recorded in terms of quantities executed and labour and equipment inputs for each activity. The daily records are compiled into weekly and monthly progress reports, clearly documenting costs and productivity rates.

The project has introduced a routine maintenance system on all the rehabilitated roads. On most of the completed road sections the lengthman system has been introduced. However, on a trial basis, the project has also awarded maintenance contracts on a collective basis to villages near the roads. Under this system, a village which has participated in the road improvement is contracted to carry out maintenance for a contract sum of 75,000 Kip (approx. US\$ 80:-) per km per year. The project has developed a simple model contract for this purpose. The village committee decides who to participate in the maintenance works and how the funds received should be spent. This village-based system has only been tried out on a limited scale, and it is too early to assess its effectiveness and sustainability.

Labour is recruited from the villages in the vicinity of the road alignment. Female participation has varied from 20 to 40 percent of the total workforce. By September 1996, 78,000 workdays or 250 work years had been generated, giving an average input of 1560 workdays per kilometre.

The seconded provincial and district staff have participated in a comprehensive training programme consisting of practical on-the-job training supplemented with short training courses and study tours. For the delivery of training courses, the project has drawn on the capacity of CTC. Through the involvement of CTC, a labour-based training capacity has been established locally. CTC has also assisted in preparing project training materials and translation into Lao.

The seconded staff have taken an active role in the project activities and have been very motivated for the work. The labour-based road works capacity in the two provinces have gradually been developed, but two years are obviously a too short period to develop and establish an effective organisation to improve and maintain rural roads. The project has to a large extent concentrated its training efforts to site level activities. There is still a demand for more capacity building, emphasising on skills relating to planning and management aspects.

Chapter 3

Policy of the Government

3.1 Rural Roads

The government Public Investment Programme includes the following statements relating to rural roads:

"Policy To improve rural communities' access to the main road network.

Strategies To develop a national programme for feeder road construction in provinces and districts with funds provided through a national programme budget.

*Action Introduce a systematic planning process for feeder roads.
Increase the allocation of funds for feeder roads and bridges.
Promote development of private sector construction and maintenance capabilities"*

The broad tenets of this were confirmed at the Road Sector Donor Coordination Meeting in February 1996.

With the current socio-economic conditions in the rural areas of Lao PDR, as discussed in Chapter 1, it should be rather clear why the government has taken the decisions as mentioned above. However, it is evident that the government at present does not have the resources to pursue these intentions.

The development of the road transport system continues to be a high priority of the government. In the Public Investment Programme 1994-2000, road transport is the major sector receiving funds. As much as US\$ 439 million out of a total of US\$ 1,340 million is set aside for the road sector. Although national roads will absorb the largest share of the investment, it is planned to expand rapidly the rural network in order to improve market access and the delivery of social services such as health and education in the rural areas. The current investment programme further focuses on integrated rural development in order to reduce shifting (slash and burn) farming, a farming practice which is becoming an environmental problem of great concern. The provision of road access in the rural areas concerned is a main component of the rural development programme. Some US\$ 100 million is allocated for rural roads.

It is generally accepted that the existing road network imposes a serious constraint on the economic development and access to basic needs in the rural areas of Lao PDR. Of the total provincial road network of 5,640 km less than 35% is thought to be passable in the wet season and only half of the population is estimated to have road or river transport access throughout the year¹.

Although poverty is due to a variety of factors, one underlying cause is the lack of access of the rural population to basic goods and services. For example:

- o of the 11,795 villages in Lao PDR, only 723 have health centres. According to UNICEF, over 50% of the villages are more than one day's travel to a health centre. This is a major factor in the relatively high infant mortality rate in the country (estimated to be over 100 per 1000 births) and the low life expectancy;

¹ National Transport Study, Final Report and Appendices, UNDP/IBRD LAO/85/020, Report prepared by SWECO on behalf of MCTPC, March 1991.

- o Access to elementary schools is difficult, particularly in the more mountainous regions. It is one of the underlying causes of low primary school enrolment and low rates of completion of primary school. Only 60% of children enrol at a primary school and 30% complete five years of primary school. The average number of years of school attendance is 3 years. In a recent survey, over 60% of parents cited distance to school as a reason for their children dropping out of primary school;
- o Access to agricultural inputs and to markets is difficult because of the lack of roads and the poor state of the existing network of local and provincial roads. The result is that only 10% of the rice produced in the country is marketed. Only one out of every ten farmers use any type of fertiliser or other agricultural input. In addition, even though only a small proportion of the cultivable land is irrigated (3%), it is estimated by FAO that only one in three irrigation schemes is used;
- o Direct access to potable water is a major problem. At a conservative estimate, only 35% of households have access to potable water. One result is high mortality rates due to diarrhoeal diseases.

Of equal importance to the road development works, is the need for comprehensive road maintenance policies and strategies. The ability of Lao PDR to protect its investments in infrastructure will be crucial for its efforts in developing the country.

Roads in the Central Region.

The general level of rural infrastructure in the five Provinces of the central region reflects the situation in the country as a whole. Infrastructure is limited and where it does exist it is poorly maintained. The result is that the level of infrastructure is a serious constraint to economic and social development.

In the roads sector, there has been a natural concentration on ensuring the viability of the national road network, which comes directly under the jurisdiction of the Ministry of Construction, Transport, Communications and Post (MCTPC). This emphasis is not surprising when one recognises that it is almost impossible to have road contact between Vientiane and the provincial capital of Xiengkhuang, Phonsavan. Even now, only 50% of the national road network in the five Provinces is paved. The situation with the provincial roads is much worse. Of the three thousand or more kilometres of provincial roads in the five Provinces only 23% are passable all year round. It is difficult to provide accurate figures for the number and state of the local roads, but the best estimates suggest that there are some 4,600 km of these roads in the five Provinces and very few are passable all year round. Field surveys suggest that some of these "roads" are no more than tracks.

The general lack of road access has its repercussions in the agriculture sector. The government wishes to put a higher proportion of cultivable area under irrigation. At the same time it wants to reduce the use of slash and burn techniques. At present only 3% of the cultivable land is under irrigation. The reason for providing irrigation is both to increase the amount of food crops that are produced in particular rice and to ensure that there is a surplus for cash sales.

To achieve this, however, requires that the farmer can easily transport his produce to the market. Road access therefore becomes crucial to the success of any programme to increase agricultural production.

3.2 Labour-based Road Works Technology

Lao PDR, whilst being a poor country, is surrounded by neighbours whose economies are growing at a very high rate. Lao PDR will definitely benefit from this proximity. However, the difficulty will be for the country to apportion this benefit equitably between its population and in particular between the rural and urban areas. The Government is already focusing on the need to develop the infrastructure in the

rural areas so that the population can have access to goods and services. This provides the *opportunity* for their development. However, for them to take advantage of this they will require an increased cash income. Whilst improved agriculture will be the main source of cash income, it is clear that every opportunity should be taken to provide both income and employment in the rural areas. Labour-based production clearly provides such an opportunity. The evidence suggests that applying these techniques in the construction and maintenance of roads is a viable alternative.

Improving the country's overall road network will be a major component of the Five Years Development Plan. New construction, rehabilitation and maintenance will be involved at all levels of roads: national, provincial and local. Because of the low equipment availability, lack of foreign exchange and relatively low wage levels, adopting labour-based methods in road development work is not only justifiable on employment grounds but would also be cost effective compared with the conventional equipment-based method.

The National Transport Study made clear recommendations on the use of labour-based methods to improve rural roads and to carry out road maintenance (ref. NTS Chapter 55.20):

"As the main national roads are successively completed, an increasing share of the future construction work will be concerned with rural road construction, rehabilitation and spot improvements. This will lead to a rapidly expanding role for labour-based methods in the country and at the same time a reduced need for equipment-based methods. The continued development and application of labour-based methods is therefore strongly recommended."

The NTS also recommended the use of labour-based technology as a means of increasing the involvement of the domestic private construction industry in the Lao road sector (ref. NTS Section 55.25):

"The expected transition from large-scale equipment-based construction to smaller projects - improvements, rehabilitations and rural roads - will also provide opportunities for private contractors. Although such contractors are almost non-existent today in the field of road construction, many have been successful in other construction activities. With smaller projects and labour-based methods, less capital will be required and the private contractors can draw on their management abilities and skills in organising labour. Some existing construction firms may diversify into road construction if there is a market, others may develop, and some provincial enterprises may become viable private companies."

In terms of road maintenance, the NTS proposed a strategy for implementation where labour-based technology would play a central role (Ref. NTS 56.17):

"While almost all maintenance today is undertaken by one of the formally autonomous state or provincial enterprises, it is expected that a wide range of different types of work units will be needed:

- o Equipment-based contractors (private or state-owned), operating across the country for heavy rehabilitation and improvement works, as well as for some periodic maintenance activities such as resealing. As recommended in Section 55, some of the existing state construction enterprises could supplement the existing state maintenance enterprises for these tasks;
- o Smaller, regionally based contractors (private or state-owned) with a mix of labour and equipment, for periodic maintenance and for routine maintenance in some areas;
- o Small provincial force account units for emergency repairs and possibly routine maintenance, or to supervise contracted staff or villages for labour-based maintenance. These may be based on existing provincial enterprises."

It should be noted that this strategy, as described in the NTS, also provides a sound approach to the intentions of the current Public Investment Programme to develop the private sector construction and maintenance capabilities.

Chapter 4 Donors Attitude

4.1 General

The largest external assistance to the road sector in Lao PDR is received from soft loans provided by the Asian Development Bank and the World Bank. The main bilateral donors in the road sector are the Swedish International Development Cooperation Agency (SIDA), Kreditanstalt für Wiederaufbau (KfW), Japanese International Cooperation Agency (JICA) and the Government of Australia.

So far, the thrust of foreign development assistance provided to the road sector has been to develop the main road network in the country, with a bias towards large scale construction projects using international contractors and equipment-based work methods. Technical assistance has focused on improving the management capacity of the roads authorities at central level in Vientiane.

Recently, however, several donors and development banks have started exploring the demands in the rural road sector and are now planning to shift its emphasis from support to the development of the trunk roads towards assistance to rural road development.

A major change of attitude was observed during the Donor Coordination Meeting arranged in Vientiane in February 1996, where most donors stated an interest in supporting the country's intentions to develop the rural road network. In relation to this support, several donors also believed that labour-based technology should play a central part in the strategy for developing and maintaining rural roads.

4.2 Donors Involved in Rural Road Works

4.2.1 SIDA Involvement

The main objectives of the Lao-Swedish development cooperation are to contribute to the alleviation of rural poverty, to strengthen the independence of Lao PDR and to promote democracy and human rights in the country. The Swedish support shall contribute to sustainable economic development, which benefits the whole Lao population.

The present agreement on cooperation in the road sector expires on 30 June 1996. Lao PDR and Sweden have agreed that the road sector should remain one of the main concentration sectors in the future bilateral cooperation also after June 1997. The Annual Review held in Vientiane in February 1996 agreed on an indicative programme for the continued cooperation.

Under SIDA's new road sector programme in Lao PDR (1997 - 2000), the focus will (i) shift to capacity building in the provinces for the development of the rural roads network supplemented by maintenance and rehabilitation activities and (ii) continued strengthening of the Ministry of Communication, Transport, Post and Construction (MCTPC) at the central level.

Swedish assistance provided as grant funds shall have a social dimension, which may be wider than that of the counterpart ministry. It is a concern that the assistance contributes to alleviation of poverty and to increased equality of opportunity between men and women.

SIDA has stated that the use of labour-based methods in road maintenance and construction can provide a means to contribute to these objectives. In the short term, additional sources of income are created for the rural population, through the employment of unskilled labour in the vicinity of the

work sites. In the long term the improved access to the rural areas through an improved road network may facilitate the development of the rural economy as well as social services.

The objective of providing equal opportunities to men and women should also permeate the capacity building process.

Three provinces have been identified for support under the next Swedish road sector support programme, Oudomxay and Luang Prabang in the Northern Region, and Khammouane in the Central Region.

4.2.2 World Bank

Public Expenditure Review

The WB has recently carried out a comprehensive review of public expenditures in Lao PDR, with the aim of, inter alia, assisting the government to prioritise the allocation of scarce public resources across and within sectors. The following analysis is made in relation to the road sector:

"Roads have been the Government's top expenditure priority, and the road system has also attracted the largest share of donor funding. This has reflected the need to upgrade the extremely rudimentary road network in this sparsely populated country, thereby contributing to link dispersed domestic markets and create trade links to neighbouring countries. In the future, the pressing needs for upgrading the country's dilapidated road network will still make transport the priority sector for public investment, but its relative share will shrink to make way for increased efforts in the social sectors. Within the sector, the emphasis should shift from the construction of national highways toward rural roads so as to allow subsistence farmers to market their surplus products."

Furthermore, the review provides the following recommendations relating to the road sector:

- o Due to the funding constraints, the government needs to focus transport expenditure on a "maintainable" core road network. Maintenance is today inefficient due to weak institutions, conflicting roles and mandates concerning central and provincial entities and problems with maintenance funding;
- o It is necessary to improve organisational effectiveness by simplifying and streamlining the decision making process in MCTPC, improving financial and reporting systems, professionalising relationships with contractors and clearly defining the responsibilities and funding of the authorities in charge of road construction and maintenance in the centre and the provinces.

Road Sector

The World Bank has for several years attempted to include labour-based road works technology in its programmes. The road component of the Luang Namtha Provincial Development Project was originally designed to construct two gravel roads (totally 152 km) where labour-based construction methods would be emphasised. As a means of developing a local and sustainable capacity to improve and maintain low-volume roads, labour-based methods would be institutionalised as part of the country's rural roads strategy. Training efforts would be coordinated with the ILO project in Oudomxay from which the WB project would benefit from courses in labour-based techniques¹.

However, due to lack of experience in labour-based road works technology among the project staff and consultants involved, this project has reverted to conventional equipment-intensive methods.

Currently, the World Bank is undertaking two parallel studies relating to the road sector.

¹ Ref: WB Staff Appraisal Report, February 1994.

The first exercise is a study on the "Priorities for Rural Infrastructure Development in Lao PDR", covering the sectors of rural roads, irrigation, water supply and sanitation. A preliminary report on this study was presented to the Government in November 1996. According to this report, the primary beneficiary of this study will be the Government that should find it a useful input into the formulation of its own strategy for guiding investments in rural infrastructure. The summary of this study highlight some important issues concerning the rural road sector:

- o Because rural infrastructure often consist of small, dispersed and localised units, its development is also institutionally demanding during both the investment and operational phases. As Lao PDR shifts gear from the development of the larger national, urban-oriented infrastructure to rural infrastructure, local institutions must be developed to handle the small and dispersed investments;
- o There is a need for reviewing the scope of local government authority over the allocation of budgetary resources especially for rural roads maintenance and to increase it to the level that is consistent with their responsibilities for rural roads development;
- o As the role of the central government agencies has evolved from that of a provider to a facilitator of rural infrastructure, so have the demands of central agencies for professionals that can provide technical support and monitoring. At lower levels of government, the demand for personnel is for those that can undertake community mobilisation and support project implementation.
- o As current capacity building efforts are continued into the future and strengthened, there is a concurrent need for greater involvement and promotion of the private construction industry and for better utilisation of NGOs and TA in order to ease the human resource constraint on implementation capacity;
- o On-the-job training should be provided to local private companies to upgrade their skills, particularly in contract bidding and execution. Training should be accompanied by a strategy to increase access of small contractors to bigger and better equipment and credit;
- o The need to strengthen planning and coordination at central level warrants the establishment of a unit in MCTPC to coordinate and facilitate the development of non-trunk roads;
- o Design standards require changes to increase the content of local materials and labour. Road design manuals need to revised to accommodate the option of using labour-intensive methods of road construction and maintenance in specific areas and situations where they are appropriate.

The second initiative is a plan for an IDA funded 15 million USD project to improve the core rural transport network in two provinces in the North. During preliminary discussions, Oudomxay and Phongsaly Provinces were identified as candidates for this support. However, due to SIDA's current commitment to Oudomxay Province this may be shifted to another province.

4.2.3 Asian Development Bank

ADB has previously been focusing its financial assistance to the road sector in Lao PDR to the national road network, mainly to upgrade National Road 13. However, it should be mentioned that ADB has also been quite active in (i) the privatisation process of the road sector and (ii) developing an effective maintenance system in the country, relying on the private sector.

In terms of future investments by ADB, the next projects will be the rehabilitation of National Road 7 in the North, and through co-financing, the East-west Transport Project, comprising Route 9 from Mukdahan in Thailand to Savannakhet in Lao and on to Dong Ha on the coastal highway in Vietnam. However, in 1999 ADB is planning a loan of US\$ 20 million for Rural Access Roads. ADB's technical assistance operations will be for feeder roads maintenance training to initiate action on institutionalising such maintenance operations, project management of feeder roads, and preparation for loan projects. The operations of trunk links are, thus, together with maintenance support winding

down over 1996 to 1999, and the main emphasis will be on rural access or feeder roads².

4.2.4 KfW

KfW is concerned with the limited capacity of the Government to plan, manage and implement road maintenance in the country. In this context, KfW believes that the following principles may prove helpful in assuring effective maintenance in the future:

- o mechanical routine maintenance should as much as possible be contracted out and privatised, and
- o labour-based techniques should be exploited to the fullest.

It is acknowledged by the Germans that there are great difficulties in local competitive bidding for maintenance due to reasons such as late availability of funds, delayed disbursements and less than satisfactory supervision. These are, however, to a large degree problems of institutional nature and need immediate attention. Finally, KfW believes that there is a great potential for improving routine maintenance by introducing labour-based methods as organised in their village based maintenance project in Xiengkhuang Province.

4.2.5 UNDP

In line with the government's policy, the UNDP is committed to developing the capacity of the provincial and district level administrations. Two particular initiatives are important in this respect. The first is a set of surveys that are being carried out in five provinces to assist them to define appropriate rural development programmes. These surveys involve an assessment with the provincial authorities of the existing proposals and support to the provinces in defining feasible and fundable development programmes.

The second initiative is a project to develop the capacity of the provinces to more effectively plan rural infrastructure. This project, presently operating in three provinces, but about to be expanded to a further two, is based on the concept of accessibility planning. By using a simple planning technique it allows the provinces to prioritise investments in the different rural infrastructure sectors including roads.

The latter project is important in that it links the development of the road network into the overall development of the provinces and emphasises the development of local resources both in the planning and implementation of the programme.

4.2.6 WFP

The World Food Programme is providing emergency food aid to flood damaged areas in Lao PDR. This is often organised as Food for Work Programmes in collaboration with other development organisations and NGOs operating in the rural areas. These projects normally consist of rural infrastructure development such as small irrigation schemes, water supply and village roads.

WFP appears to be quite content with the on-going collaboration with other organisations as a channel for distributing food and at the same time creating real assets in addition to providing emergency relief to flood damaged areas.

² Source: Presentation by Preben Nielsen, ADB to the Road Sector Donor Coordination Meeting, Vientiane 6-7 February 1996

Chapter 5

Scope of Labour-based Technology

5.1 General

In Chapter 1 the issue of the viability of labour-based methods of construction was raised. It was suggested that there were several reasons why these techniques have not been given the attention that they deserve.¹ The overwhelming evidence is that the technology can be successfully employed on both small and large scale projects. The over-riding factor in deciding on their use would be their ability to achieve the required standards at a competitive cost.

Under the right socio-economic conditions, labour-based methods are entirely suitable for rural road works, irrigation canals, river control and land conservation projects. Even on major civil works, such as national highways, the techniques have a role to play for those activities for which they are technically and economically viable.

Labour-based technology should be viewed as an option. There is a danger of approaching these methods as if they were something strange or, worse, backward. The simple fact is that in economies with a low wage level and a shortage of foreign exchange, one would be foolish to ignore consideration of technologies which emphasise the use of the available resource, labour and which limits the use of foreign exchange on equipment. Whether one method or the other is appropriate in particular circumstances or for different types of projects is a question for evaluation. One however has to consider the two alternatives based on the actual prevailing conditions rather than on received "wisdom" from the industrialised countries.

Numerous studies carried out by several agencies including the World Bank and the ILO in many countries including Lao PDR, have demonstrated that when the right conditions are present in a given area, labour-based technology is the most cost-effective approach to rural infrastructure development. These conditions include:

- o sufficient numbers of under- or unemployed persons in the areas where the work is required plus local availability of construction materials;
- o low wage levels (under US\$ 4.00 per day according to World Bank studies);
- o shortage of conventional construction equipment and high capital costs;
- o Government commitment to the development of employment and generation of income in the rural areas;
- o small contractors skilled in labour-based technology and capable of supervising the work efficiently; and
- o competence of the public sector agencies responsible for rural infrastructure works in the areas of contracting and supervision of contractors' performance.

Lao PDR would generally fall into that group of countries where the use of labour-based methods should be seriously considered. The first four criteria are already met and the latter two are being developed, as discussed below.

¹ Not least amongst these is the feeling that "rich countries are rich because they use machinery". In fact they use machinery because they are rich.

Labour Supply

The population density in the rural areas of Lao PDR is relatively low. However, villages tend to be clustered along a road alignment, most sections of road alignments are within walking distance from a village. Taking a low figure of 40 households per village and assuming that 2 persons from each households can be recruited, there will be up to 80 labour from a village available for the 6 months period of the dry season. Significant improvements can be achieved by concentrating effort on rehabilitating or upgrading the already existing roads, particularly the provincial and local roads to a maintainable all-weathered standard. This type of activity can easily be achieved by the level of labour availability previously indicated.

Sufficient labour-supply has always been a key issue in discussions relating to the feasibility of labour-based technology in Lao PDR. However, it is today clearly proven that even in remote areas where population densities are comparably low, it is still possible to recruit sufficient labour.

Being an agricultural based economy, the majority of the work force are in the agricultural sector,

which are normally fully engaged in farming activities less than six months of the year. Most of these farmers need to seek other income generating activities to supplement insufficient farming outputs. Labour-based rural infrastructure programmes are therefore an effective approach to improving both the rural infrastructure and providing additional cash incomes to rural households.

Works in the rice fields start at the beginning of the rainy season in June and finish just before the winter start at the end of November. However, intense works only occur in the first two months during land preparation and planting and in the last month during harvesting.

For the rest of the period, the farmers spend their time partly tending the rice fields and partly with other food gathering activities. A rural employment programme should therefore have no problem in labour supply if the programme activities are planned such that large numbers of labour are engaged on full time basis only during the dry season, and a smaller full-time work-force during the wet season.

Wage Rates

In Lao PDR the opportunity cost of unskilled labour has been found to be about US\$ 1.7 per work day, although there are seasonal variations with labour supply being at a premium during the sowing and harvesting periods of the agricultural cycle.

At the labour wage of 2.00 US\$/day there seems to be no problem of labour supply. In Oudomxay, where the ILO labour-based road project operates in the remote areas, up to 30% of the workers come from more than 10 km away to seek employment. With some assistance from the project, these workers set up camps near the project site. Labour productivity rates is found to be comparable with experience from neighbouring countries.

Equipment Levels

Whilst the Lao economy is certainly growing, it still suffers from a shortage of foreign exchange. The construction equipment that exists in the country is generally brought in by foreign donors or foreign contractors involved in the large infrastructure programmes.

Whilst some small equipment is produced in Lao PDR, most of it is imported from Thailand or China. The equipment that does exist is concentrated in the urban areas or in the vicinity of the large infrastructure programmes such as Road 13.

In the rural areas construction equipment is conspicuous by its absence. Most provincial offices of the MCTPC have very limited equipment and there is relatively little supply from the private sector. In the private sector the demand for equipment is for that which is commensurate with the type of work that local contractors are capable of doing. So they require concrete mixers, compressors and, maybe a small truck.

Government Commitment

This has been discussed elsewhere and, suffice it to say here that, it is clear that the government's policy is towards the development of the rural areas. This policy, however, is not merely to generate agricultural surplus but to improve the lives of the rural dwellers through providing employment and generating income. Labour-based approaches fit squarely within this policy.

Contractor Development and Local Level Capacity

In these two areas there are weaknesses. On the one hand the NEM policy is relatively recent and there has been little time for the development of a viable domestic construction sector. In addition, the process of developing the capacity of the provincial governments has only recently begun in response to the governments concern to improve the delivery capacity of the decentralised governmental system.

These two issues are pursued further in the subsequent chapters.

Appropriateness of Labour based Technology

Before there are any proposals for the expanded use of labour-based methods, one key question needs to be answered. Are labour-based methods appropriate for the development of the secondary and tertiary road network in the provinces? The evidence from the ILO pilot projects and from other projects suggests that labour is available, that it is possible develop effective management and supervisory capacity for labour-based programmes. However, the methods must reach the required technical standard.

When considering the use of labour-based technology in road works projects, it is important to acknowledge its limitations. In some circumstances, traditional equipment-based work methods are more effective and may provide higher quality outputs, such as large excavation works, rock excavation and haulage of materials over long distances. It would be incorrect therefore to take an ideological view of the use of labour-based methods. Where they are not capable of reaching the required standard then equipment should be used. Nevertheless, the experience so far in Lao PDR is that in most cases it is not necessary to resort to the use of heavy equipment.

In general, the priorities for road improvement relate to providing all-year road access to regions where such access today only exists during the dry season and in some cases not at all. In most cases, these roads will improve access to district centres or other larger regions with poor road conditions. The main task will be to upgrade already existing earth roads, following the original road alignments. Considering the purpose of the roads and expected traffic volumes, standard gravel roads of 5-6 metre carriage width, with a 10-15 cm laterite surface and a curvature catering for design speeds of 40 km/h should be appropriate.

Earthworks is mainly expected to involve re-excavation of drainage systems and preparation of camber - activities which are well suited for the use of manual labour. Surface materials will most probably need to be transported using traditional equipment (tipper trucks and loader/excavator) and compacted using vibrating rollers. Levelling works, if properly organised, can be carried out by labour. Bridge and culvert works should follow established work methods which have always relied on a high degree of manual labour.

This method of organising rural road works has proven to be a technically and economically sound solution for the provision of all-weather road access to rural areas both in Lao PDR and in several other developing countries. By choosing an effective balance of labour and equipment, these roads can be effectively constructed/rehabilitated to acceptable quality standards at an average cost of approximately US\$ 15,000 per kilometre.

Finally, by awarding the provision of laterite to larger contractors which possess proper haulage and excavation equipment, the remaining works can be awarded to smaller domestic contracting firms with limited access to equipment.

The use of labour-based methods for routine road maintenance has generally been accepted by the government through the introduction of lengthmen to maintain the national road network. In addition, it is possible to enter into community contracts where the provincial authorities will have a contract with a village or group of villages for the maintenance of the road. This method is useful in areas where the villages are rather scattered and the lengthman system is difficult to operate.

5.2 A National Programme

It is possible to think in terms of a nationwide programme of labour-based rural road works. The on-going ILO assisted labour-based road project has proven that it is possible to carry out rural road works relying on a high degree of locally available resources. Despite operating in some of the more remote areas of the country, this project has managed to deliver desperately needed infrastructure and employment. It has also clearly proved that with proper training programmes provided, it is possible to establish an efficient rural road works programme within and under the management of the existing government technical agencies in the provinces. In addition, if the programme was oriented to the use of small contractors it would at one and the same time develop local capacity, take away the heavy administrative load from the provincial authorities and reduce the supervisory burden from the local government engineers.

Nevertheless one should not give the impression that the development of the programme will not be without its difficulties. This is discussed in detail in later chapters. In brief, it will require a major effort in terms of:

- o training at all levels and for the private sector,
- o the development of effective management and administrative procedures,
- o improved financial procedures at the local level, and
- o more participatory processes for the planning and selection of roads.

Such a programme would need to be seen in relation to the overall condition and status of the road network in Lao PDR.

5.3 Current Condition of Rural Roads

Roads in Lao PDR are classified into four groups according to its function:

National Roads	are of high technical standard, serving the nation's economic, political, and cultural development and national defence, linking the capital with other provinces and linking the country with neighbouring countries and main ports, also serving the most important tourist links;
Provincial Roads	serve economic, social and cultural development, tourism and defence within a province, prefecture or special growth area, linking province to province or district to district;
Local Roads	contribute to economic development and bringing other benefits to towns and villages, linking either district to district, district to village, or village to village;
Special Roads	intend to serve mining, industrial, agricultural or forestry development or required for national defence.

MCTPC is responsible for the construction and periodic maintenance of the national road network, while the provinces are responsible for the provincial and local roads. Recently, the MCTPC also delegated the responsibility for routine maintenance of national roads to the provinces.

Estimates from the Transport Planning Unit (TPU) summarise the existing network and its condition as follows:

	Bitumen	Laterite	Earth	Total
National Roads	1,674	1,646	1,144	4,464
Provincial Roads	360	1,970	3,566	5,896
Local Roads	78	1,073	4,711	5,862

However, this does not fully describe the situation with regard to access to the rural areas. Of the total provincial road network less than 35 percent is thought to be passable in the wet season and only half of the population is estimated to have road or river transport access throughout the year. Only 51 district centres of the total of 133 have all-weather access, and 15 have no road access even in the dry season.

From the above figures it is evident that the need for rural road development are enormous and varied. In the rural road sector, the needs are not just for development of village and district roads, but also of provincial roads. In some provinces, the most immediate need is building roads to connect the isolated provinces to the main road network. As the network of rural roads (provincial, district and village roads) is small and in an unmaintainable state, the needs also include reconstruction of roads to a maintainable state and extension of the network to reach isolated district and major villages particularly in the mountainous regions.

5.4 A Framework for a Labour-based Approach

As mentioned above, past efforts to improve the road network in the country has concentrated on upgrading the national road network. The next step is now to improve the secondary and tertiary road network to all-weather standards. Due to the current poor condition of secondary roads and the resulting limited access to the districts, any future road improvement programme in the provinces will first need to address the secondary road network. This implies that the first task will be to provide all-weather access to all of the country's 133 districts.

From the past labour-based road works programmes it is now possible to develop a good picture of the costs of and timescale for upgrading the rural road network in Lao PDR. Although the existing road network still does not provide access to the entire population, it may provide some cost indications for providing a functional rural road network in the country.

The below table describes the cost of upgrading the existing mapped rural roads using labour-based methods supported with a limited amount of equipment:

Provincial Roads		Length	Unit Cost ¹	Total Cost
Reconstruction	65%	3,832	20,000	76,640,000
Rehabilitation and Spot Improvements	35%	2,064	10,000	20,640,000
Local Roads				
Reconstruction	100%	5,862	14,000	82,068,000
Grand Total/Average		11,758	15,253	179,348,000

1. Includes provision of bridges and other drainage structures

If this work is undertaken during a period of the next 10 years, completing 50% during the first 5 years would correspond well to the government public expenditure programme for 1996-2000.

A key question is whether it is possible to achieve sufficient production rates when applying labour-based work methods. The existing rural road network consists of approximately 11,600 km of provincial and local roads. With the currently planned investment programme it would be possible to finance the improvement of half of this network during the next five year, i.e. 1,160 km per year. This is an average production of 65 kilometres per province per year.

As a comparison with the current force account operations in the ongoing ILO project, the current capacity of the DCTPCs in Oudomxay and Savannakhet should be able to produce 60 km per year provided sufficient funds were made available. Experience from other countries show that trained and equipped small-scale contractors with a labour force of 150 - 200 workers can each complete 15 km per year of gravelled roads to similar standards. With 4-5 trained contracting firms operating in each of the provinces, the required capacity could be achieved.

Clearly, all these figures are illustrative only. Nevertheless, they do suggest that a nationwide programme would be feasible by labour-based methods in relation to the cost per km presently being achieved, the budget allocations for roads and the potential output of the DCTPCs and the domestic construction industry.

5.5 Possible Impact

In the past, little attention was paid to rural infrastructure development as priority was given to developing large scale infrastructure, and as a consequence rural infrastructure has remained largely underdeveloped. Support to this sector is therefore necessary to reduce this enormous backlog. In addition, as there is a strong link between rural infrastructure and rural development, the development of rural infrastructure will address the development needs of the 80 percent of the population who live in the rural areas, 53 percent of whom live below the poverty line.

Labour-based construction programmes are not an end in themselves. They would form part of an overall strategy focusing on use of local resources in the rural areas. For it is self evident that the task facing the government in terms of rural development is enormous. Whilst external funds will of course be necessary, it is obvious that the country will have to depend as much as possible on its own resources.

The government is well aware of this and programmes such as the IRAP local level planning programme are a clear indication of the governments desire to put the responsibility and the authority for local level planning in local hands. Techniques of rural infrastructure which also emphasise the use of local resources will therefore form another part of this strategy.

The government has priority programmes of increasing the access of rural people to goods and services, reducing slash and burn agriculture, enhancing food security and developing ethnic minorities. A programme of labour-based rural infrastructure fits well into this framework.

Immediate Effects

In the labour-based projects currently being executed in the country, labour costs constitute 40 percent of the total construction costs. In terms of employment creation, if the entire rural road network were improved using labour-based methods this would create an additional 58,000 work years of employment over the next 10 years. Perhaps more importantly it would put \$7.2 million into the rural economy every year over the coming 10 year period.

One should also distinguish between short term employment for road improvement works and long term employment for road maintenance. Providing routine maintenance to the entire rural road network using the lengthman system would involve 11,500 workers having full time employment.

Even more significantly, the foreign exchange component of the programme would be reduced from 70 to 20 percent. This would mean a total foreign exchange saving of some US\$ 90 million, most of which would be spent on wages in the rural areas and purchase of local goods, materials and services.

Long-term Effects

The improved roads will contribute to the process of rural development by contributing to agricultural productivity, through expanding access of farm families to markets as well as to health, education and other social services, now severely inhibited by the lack of an adequate and well maintained transport system. This of course would be true whether labour-based or equipment methods were used.

What has been observed in other countries where labour-based projects have operated is the effect on the local economy of the income from the labour-based work. Clearly, some of the money will be used for the purchase of basic items of food, household articles and clothing. However, it will probably also be used for obtaining better health care, education services and farm inputs. In addition, it provides the possibility of the local people making use of the roads through payments for transport services.

Studies on labour-based programmes have shown that it is these secondary benefits of the use of the income derived that is the most important element of these programmes.

Chapter 6 *Technical Aspects*

6.1 *Road Identification and Selection*

6.1.1 *Road Identification*

The system of government in Lao PDR grants a wide degree of autonomy to districts and provinces in the formulation of their rural development programmes. Projects are identified at the local level and forwarded to Vientiane for approval and funding. However, projects are often identified at random, often based on requests from local residents or local political figures. No clear criteria for selecting rural infrastructure projects are available and there is little evidence of planning based on an overall assessment of the demand in the rural areas. In terms of road development, road projects are mostly identified in isolation and do not form part of an integrated strategy to improve living conditions in a selected area.

Also when looking at the road sector in isolation, there is a great demand to improve planning and maximising the effect of the limited funds available to maintain a rural road network. Although there are some recent improvements, there is still a common practice of giving priority to new construction rather than maintaining the existing road network.

An important component of the capacity building at provincial level will therefore be to establish effective management tools for the identification, selection and prioritisation of road construction and maintenance works in the provinces. This planning should not be limited to road network planning but also take into consideration the development programmes of other sectors operating in the rural areas, i.e. agriculture, education, health, etc.

The development of this capacity will involve both the DCTPCs as well as the DPCs and the rural development committees.

The on-going ILO Integrated Rural Accessibility Programme has gathered important experience relating to collecting information on rural infrastructure in the rural areas, and based on this data carry out integrated rural infrastructure planning.

The TPU, with technical assistance from the ILO, is presently applying a local level rural infrastructure planning system in three provinces, Oudomxay, Savannakhet and Luang Namtha. The system, Integrated Rural Accessibility Planning, is proving to be very successful as it has in other countries of the Region where it has been used. The process looks at the access needs of the rural population and prioritises both locations and interventions which directly relate to the needs of the people. Naturally, many of these interventions relate to improving people's mobility - roads, transport services and tracks. In addition, it also identifies the most appropriate siting of services such as schools, health clinics and markets.

One of the important aspects of the IRAP process is that it places the development of road infrastructure in the context of overall rural infrastructure planning, thus maximising the benefits of both.

The IRAP project will in the near future expand its activities to Xayabury, Sekong, Xiengkhuang provinces. It is proposed that future rural road development projects build on this important addition to local level planning. This would have several benefits:

- The provinces would follow the same planning procedures being promoted by the TPU today.

- It would ensure that rural road planning would be placed in the context of overall rural development planning in the provinces.
- It would maximise the potential benefits of the rural road programme.
- It could make use of the capacity that already exists in the TPU and some provinces for effective local level planning.

6.1.2 Road Selection

Once the technical feasibility of proposed road improvement works has been established, the selection and prioritisation of individual projects are subject to two basic criteria:

- (i) economic justification and
- (ii) social considerations.

(i) Criteria for Economic Justification

Various investment models are available to carry out the economic analysis. The benefits normally considered in an economic evaluation are:

- direct savings in the cost of operating vehicles,
- economies in road maintenance costs,
- time savings by travellers and freight,
- reductions in road accidents (although these often *increase* on improved roads), and
- wider effects on the economic development of the region.

Investment models are also available to estimate the total transport costs associated with different road surfaces including vehicle operating costs, maintenance costs and renewal costs under a variety of traffic, climatic and maintenance conditions.

Rural roads, however, represent the grass roots of the road network which feed traffic into the secondary and primary roads opening access to the rural areas. The rural roads have low traffic volumes and are generally constructed with gravel surfaces. For these roads the economic justification for the investment rests mainly on the expected impact on the rural and agricultural development. Both these outputs are time related and have a large element of uncertainty.

The extent to which the local economy adjacent to the proposed road will benefit from the investment is dependent on its economic potential such as unused land, irrigation facilities and labour, transportation facilities and costs. To forecast an increase in agricultural production, producer surplus and assessment of resultant producer benefits is a complex and difficult task.

This effect on the economy is extremely difficult to predict and virtually impossible to model, and any assessment made will have a high element of uncertainty, and relies on a series of external factors.

In terms of maintenance economics, there are, however, clear guidelines which can be followed. A basic rule for any road works programme is to protect previous investments and therefore to allocate available funds according to the following order:

- (i) First, provide routine maintenance to the sections of the network which is in a good and maintainable condition. "Good" condition is regarded as when the road section requires a minimum of routine maintenance, which can be provided through a lengthman system.
- (ii) Secondly, provide spot improvements and periodic maintenance to halt the deterioration of road sections in fair condition, thereby upgrading them to a maintainable condition.

- (iii) Thirdly, rehabilitate existing roads which has fallen into total disrepair.
- (iv) Once the three activities above have been secured, including regular maintenance for the newly upgraded road sections, one should be looking into new construction and expanding the road network. Once again, new projects should only be accepted when sufficient maintenance resources are available or can be secured when the construction of the new roads have been completed.

(ii) Social Criteria

The following are amongst the social criteria that may be used for ranking rural road rehabilitation projects:

- o Present condition of the road. Communities without any access should be given high priority. The better the existing access, the lower the priority.
- o The availability of access year - round. Communities without access only during some parts of the year should have higher priority.
- o The area influenced by the road. The larger the area of influence, higher the priority. The correct determination of the area served is important but is difficult to identify. The limits of the area are generally provided by watersheds, rivers or the proximity of adjacent roads. In the situation of rural roads in Lao PDR, the area within walking distance of two hours from the proposed road can be taken.
- o The inhabitants served. The greater the number of inhabitants to be served, the higher the priority.
- o Present transportation costs per km. Road transport costs are related to the road condition. The higher the present costs, more these costs will decrease by road improvements.
- o The area of cultivable land within the area of influence. A rural road programme should benefit as many farmers as possible. Roads leading to fewer farms and houses should be given lower priority.
- o Increased area of cultivable land. By improving access, the inhabitants may be encouraged to cultivate more land within the area of influence of the road.
- o Orientation of local produce to the market. The greater the volume of marketable produce, higher should be the priority for road improvement.
- o The potential increase in marketable production. Increased production is related to road conditions, because improved access to markets will encourage the inhabitants to produce more goods to sell.
- o The availability of social and economic services. Most of the social and economic services (medical, educational, and agricultural inputs) end where the trafficable road ends and go no further. Improved access can extend these services to isolated communities.

From the above, it is clear that a certain volume of data needs to be collected before a ranking can be established. Furthermore, it is also evident that some of the criteria are in conflict with each other (i.e. maintenance economics versus areas without road access). It is therefore important that the political leadership in the rural areas are fully involved in the final weighting of the criteria and final selection of projects to be included in the provincial road works programmes.

In this respect, the ILO IRAP project has collected some very useful experience, both in terms of an appropriate methodology for data collection as well as establishing road works priorities in the context of an overall rural infrastructure development plan.

6.2 Road Structures and Design

Traffic levels in Lao PDR are low. On the main roads, traffic volumes range between 15 and 336 vpd, though at most traffic count sites average daily traffic is below 150 vpd¹. Information on traffic on provincial or rural roads is scarce since traffic surveys have so far only been carried out on the national roads. However, based on village surveys and evidence some five years ago, the National Transport Survey (NTS) estimated that a population of about 1000 households within 20 km of a passable road could generate a traffic volume of 3 vehicles per day. This could now be an underestimate as there is evidence of substantial increases in traffic volumes on the main roads since 1991 and the requirement for permits to travel outside the province has been removed. The study also estimated that, on the basis of transport cost savings alone, because of the high costs of alternative forms of transport, a rural road costing between US\$ 5,000 and US\$ 10,000 per km could be economically justified with a population of 300 to 400 households within an area of influence which could stretch up to 20 km from the road. The assessment did not take account of the potential for economic development or the benefits of better access to services.

The selection of design standards is related to road function, volume of traffic and terrain. The design process as such deals with the following main steps:

- o Establish road function.
- o Assess the design traffic and its characteristics.
- o Assess other factors which should affect the design (terrain, type of sub-grade, sub-grade strength, availability and cost of construction materials, etc.).
- o Select geometric design standards (road cross-section, design speed and speed related standards).
- o Select appropriate pavement design (total pavement thickness, thickness and type of materials for each component layer).
- o Assess the need for road structures (bridges, culverts, retaining walls, etc)
- o Assess the availability of labour in the vicinity of the road work sites.
- o Assess the availability of local contractors.

The selected design should be justified economically and the optimum choice varies with the construction and road user costs.

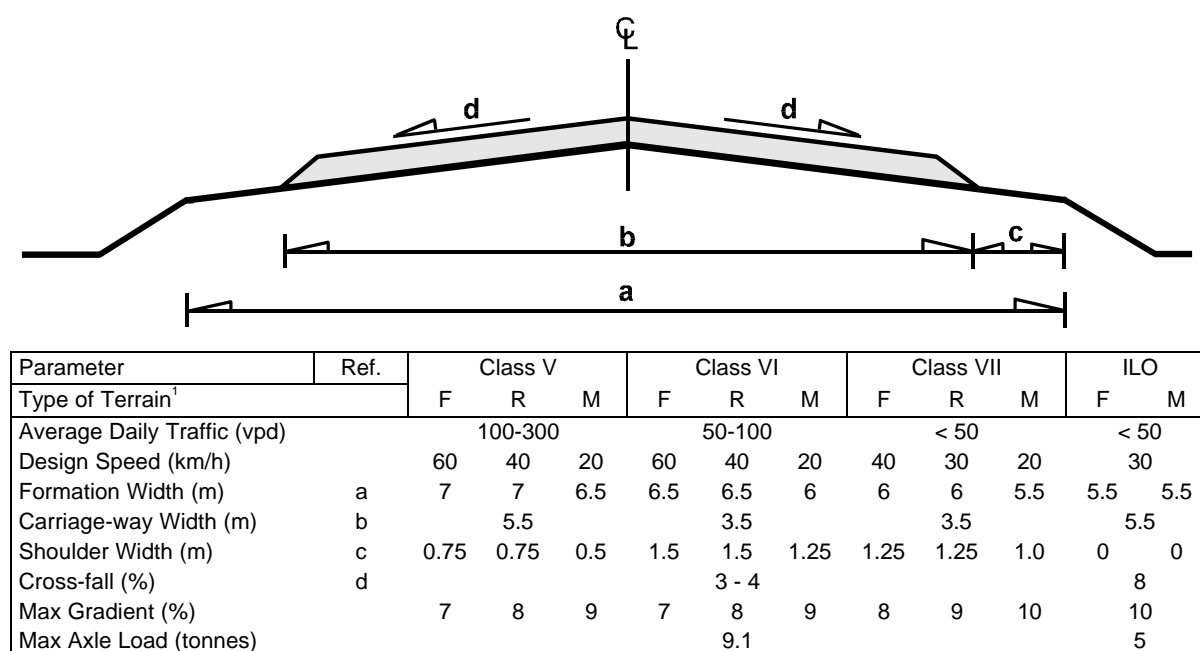
In Lao PDR as elsewhere, any suggested standards must be based on economic and technical considerations. The total rehabilitation needs are huge. Hence, functional standards are recommended. These can always be revised upwards as the traffic increases and more funds become available, in a stage construction process.

The capacity for planning, design, construction and supervision is also a major constraint today and will remain so in the foreseeable future, since the total resources are limited.

MCTPC has recently developed a design manual which has now been officially approved, however, on a provisional basis to be tested out before a final version is established. Unfortunately, this manual has been developed for the use of traditional equipment-intensive work methods without any serious consideration as relating to the use of labour-based methods and other locally available resources. It is therefore important that the use of labour-based technology is properly incorporated in the design standards before a final version of this manual is prepared.

¹ Estimates from the Transport Planning Unit, MCTPC

The MCTPC Design Manual contains guidelines on appropriate geometrical design of roads depending on the expected traffic loads of the roads divided into seven different classes. Of particular interest is the design guidelines prepared for class V, VI and VII roads which are summarised in Figure 6.1.



1 Flat, Rolling and Mountainous terrain

Figure 6.1 Standard Cross Sections

For comparison, this figure also provides the key dimensions for the roads built by the ILO labour-based road project in Oudomxay and Savannakhet.

From past discussions with the provinces regarding the selection of roads to be rehabilitated/constructed, it is evident that the traffic volumes will be in the range of 20 to 50 vehicles per day, maybe with a few exceptions with an average daily traffic of 50 to 100 vpd. Such traffic volumes would prescribe Class VI and VII design standards according to the MCTPC guidelines.

However, there are two important issues which should be considered when choosing the exact design of the rural roads:

- (i) The cross-fall gradient of the camber should be increased from 3-4% to 8%. Experience from other rural road rehabilitation programmes clearly show that a cross-fall of 4% is insufficient. After completion and when traffic starts to wear the surface pavement, this will start at the centre of the carriageway and thereby reduce the cross-fall drainage and lead to an accelerated deterioration of the wearing course. By increasing the cross-fall gradient to 8% this effect can be delayed, reducing and delaying future maintenance requirements.
- (ii) The MCTPC design guidelines propose relatively wide shoulders with an unprotected sub-base for low-volume roads. With the narrow carriage-width on the Class VI and VII roads, meeting traffic will be forced to utilise the shoulders. Without any protection of the shoulders, they will rapidly deteriorate, and if repairs are not carried out immediately, the damage may obstruct the cross-fall drainage. Furthermore, in silty soils it may prove difficult to protect the shoulders from erosion caused by cross-fall drainage. An effective way of solving this problem would be to expand the wearing course to also cover the shoulders, and

to provide turfing of the side slopes. This solution requires higher initial investments during the rehabilitation/construction phase but significantly reduces future maintenance requirements.

As a result of these observations, it is proposed that the design standards as described in Figure 6.2 are utilised for rural roads.

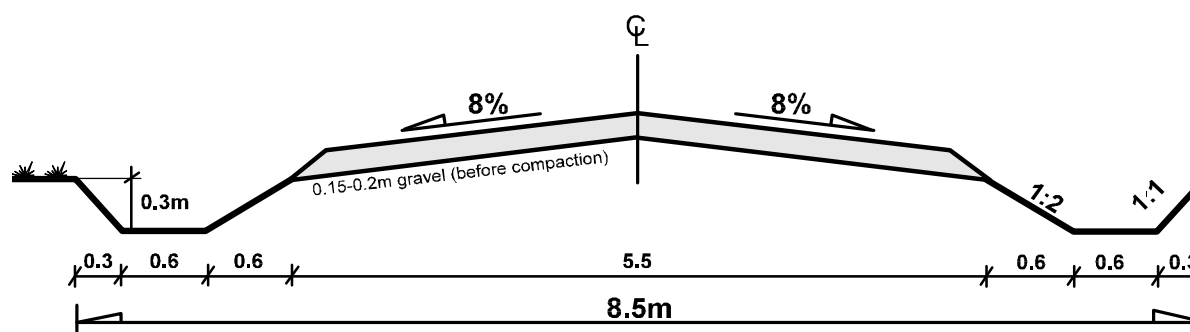


Figure 6.2a Standard Cross-Section

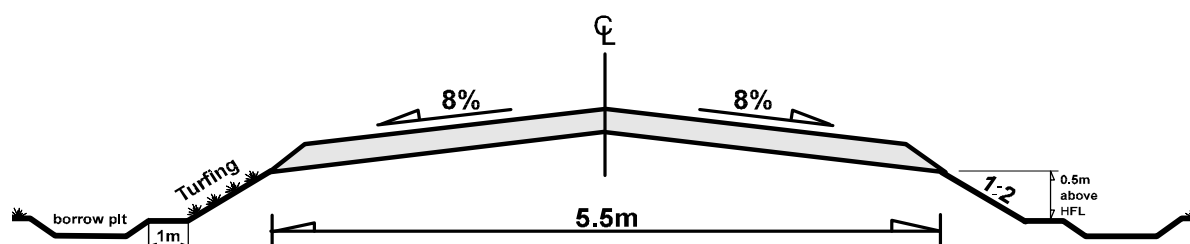


Figure 6.2b Cross-section in Flat and Flood Prone Terrain

Pavement Design

Gravel/laterite surfacing from good quality sources is considered fully adequate for the present volume of traffic and anticipated in the near future. Bituminous paving is not usually justified, till the traffic reaches levels of 150 vehicles per day.

Therefore, it is proposed that gravel is provided to a thickness of 10 to 15 cm after compaction. In exceptional cases with higher traffic volumes (100-150 vpd), it is recommended that the gravel layer is increased to 20 cm (after compaction).

Small Bridges and Structures

For small bridges and other drainage structures, there is a great potential for utilising local industries if the design standards take into consideration locally available skills and materials.

Lao PDR is still blessed with adequate supply of high quality timber which can be used for bridge construction and maintenance. Supply of materials and construction works of this type should be possible to award to local companies.

Culvert pipe production can be organised as a local industry which requires very little equipment and mainly relies on skilled labour. If the local industry receives sufficient advance notice on future requirements, the supply of pipes can be organised through local manufacturers.

Locally available stone should be used for abutments, piers, wing walls and retaining walls. The supply of stone can be awarded to petty contractors and farmers.

6.3 Construction Methods



Before venturing into the detailed work methods, it would be useful to once more repeat the definition of labour-based methods: *the construction technology which, while maintaining cost competitiveness and acceptable engineering quality standards, maximises opportunities for the employment of labour (skilled and unskilled) together with the*

support of light equipment and with the utilisation of locally available materials and resources.

When considering the use of labour-based technology in road works projects, it is important to acknowledge its limitations. In some circumstances, traditional equipment-based work methods are more effective and may provide higher quality outputs, such as large excavation works, rock excavation and haulage of materials over long distances.

Although the technology may be unknown for many of the collaborators in the Lao rural road sector, it has been successfully tested and adapted to the specific conditions in Lao PDR through the ILO labour-based road project in Oudomxay and Savannakhet during the last two years. It is proposed that a future expansion of this project base its work methods on the experience made in these two provinces.

The description below, provides a brief summary of the work methods.

6.3.1 Surveying and Setting Out

Appropriate surveying and setting methods can be easily introduced by using the "Profile Board Method". This method does not require any sophisticated surveying equipment but relies on simple equipment such as ranging rods, profile boards, measuring tapes and line levels which are easy and inexpensive to purchase. Furthermore, this method does not require well developed topographical maps. It is easy to teach, and when properly applied, the road alignment can be established in a manner avoiding heavy earthworks and rather establishing the road line well integrated into the natural topography of the terrain. Finally, when used by site personnel who fully master and use the technique properly, it will provide the accuracy and quality required.

By applying this method, it is also possible to take due consideration of existing farming and other economic activities in the areas through which the road will be passing.

6.3.2 Clearing

The clearing of the road reserve is a work activity which is easily organised by unskilled labour, since this is an operation which is common among farmers in the rural areas. Clearing mainly consists of removing vegetation and topsoil. In rocky areas, it is important to find an alignment which reduces the rock excavation and removal to a minimum. If rock excavation cannot be avoided, it is recommended that regular drilling and blasting methods are applied.

6.3.3 Earthworks

Earthworks can be reduced to the following types of operations depending on the prevalent terrain conditions:

(i) Cut to Fill

In hilly and mountainous terrain where the road pass through sloping terrain, earthworks mainly consist of cut to fill excavations. By carefully designing the road alignment, movement of earth along the road line should be avoided/ minimised. If longitudinal earth movements are avoided, it is normally possible to entirely rely on the use of manual labour.

(ii) Embankment Construction

In the lower lying and flat areas, the roads often pass through rice farming lands which are prone to floods in the rainy season. When constructing embankments through such areas, it is important to first determine the High Flood Level (HFL). The embankment should be constructed to a level 0.5m above the HFL. Normally, it would be possible to borrow soils in close proximity along the road alignment.

The shoulders should have a minimum slope of 1:2, and to avoid erosion, protected by grass turfing and tree planting. Figure 6.3 describes the basic design of an embankment for rural roads.

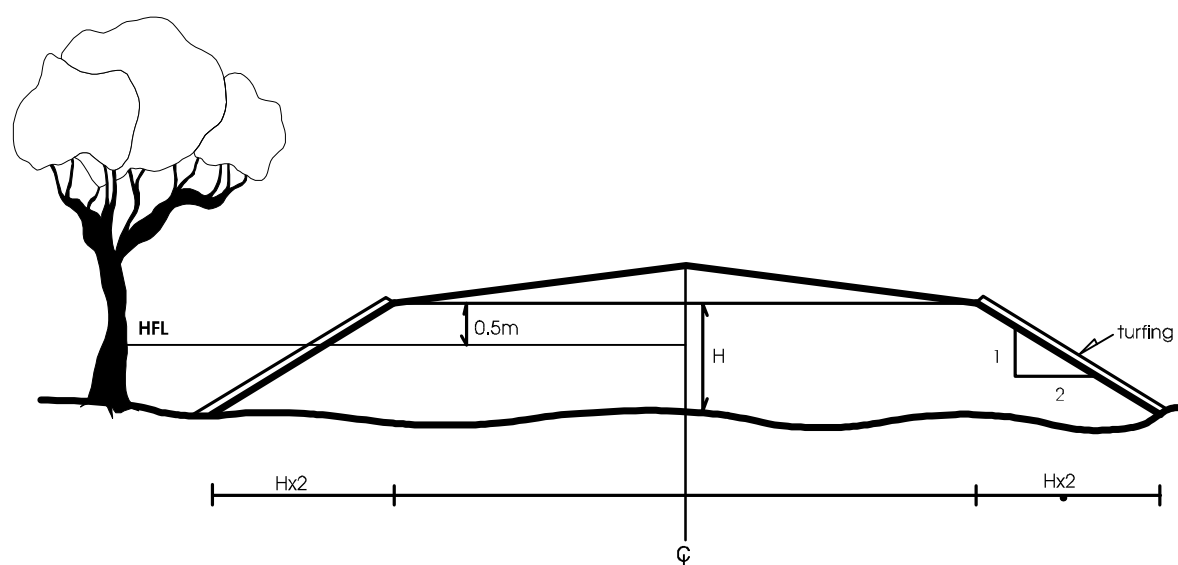


Figure 6.3 Embankment Construction

Soil excavation, transport and filling can be organised through the use of manual labour.

When building embankments, it is important that the cross road drainage is designed in a fashion so that it does not conflict with the irrigation system in the surrounding farming areas.

(iii) Drainage

Side drains are easily excavated by manual labour. To avoid soil erosion and silting of drainage structures, scour checks should be installed at regular intervals.

(iv) Camber Formation

The road camber is normally produced using excavated soils from the side drains. For embankments, the required materials need to be excavated from a borrow pit near the road.

Setting out of side drains, mitre drains and camber can be carried out using the Profile Board Method.

6.3.4 Compaction and Watering

It is extremely important that all fill sections are properly compacted, so that there are no more settlements when the camber and gravel surface is constructed. This implies that the fill sections must

be compacted in layers not thicker than 15-20 cm. For compaction, it is recommended that vibrating 0.6 to 1.0 tonne pedestrian rollers are used.

Optimum moisture content must be ensured during compaction. If necessary, water needs to be added to dry soils, or soils need to be dried during excessively wet periods.

6.3.5 Graveling

Surface materials will most probably need to be transported using traditional equipment (tipper trucks and loader/excavator) and compacted using vibrating rollers. This operation can be sub-contracted to existing local contractors.

Levelling works, if properly organised and with proper supervision, can be carried out by manual labour.

6.3.6 Bridges and Culverts

Bridge and culvert works should follow established work methods which have always relied on a high degree of manual labour. However, with rural roads, where very low traffic volumes are expected, it is important to explore the use of low-cost structures such as drifts and inverted culverts.

Furthermore, the feasibility of using more local building materials such as timber and stone should be explored in future programmes. Manufacturing, supply and installation of culverts, vented fords and drifts could be awarded to local contractors.

6.3.7 Task Work

In order to achieve good production rates, it is recommended that incentive schemes are offered to the workers. The most common solution is to introduce task work on the various site work activities. It is the responsibility of the site supervisor that the workers receive their tasks in the morning immediately when they arrive, and that the amount of work is fair and just. The size of the task must therefore be carefully monitored to ensure that the amount of work given to each worker is neither too little, nor too much. Table 6.1 shows some average task rates, however, they should only be used in an initial phase, before more appropriate quantities have been determined through site trials. Once agreed, the workers should stay on site until their task is completed.

Clearing and Grubbing	50-150 m ³ /wd	Camber Formation	75 m ³ /wd
Levelling	1.5 - 3.0 m ³ /wd	Turfing	10-20 m ³ /wd
Earth Excavation, 20m transport and hand compaction	1.5 - 2.5 m ³ /wd	Graveling (spreading and levelling)	5-10 m ³ /wd
Drain Excavation	1.5 - 3.0 m ³ /wd		

Table 6.1 Task Rates

6.4 Road Maintenance

The work of the ILO and others working over recent years on the problem of road maintenance has demonstrated that it is feasible to involve the local population more extensively in road maintenance works, provided that suitable incentive schemes are introduced and an adequate supervisory and management structure is established. The development and utilisation of small local contractors for road maintenance works is a promising avenue which needs to be explored to the maximum extent possible.

The socio-economic environment and the state of development of a particular area play a determining role. In recent years, however, a great deal has been learnt on the establishment of alternative road maintenance systems. One could categorise those as follows:

- o Direct labour employed as permanent or semi-permanent staff, supported by equipment (classical approach).
- o Individual or collective maintenance responsibility for a road section.
- o Agreements between communities and government.
- o Petty contracts for selected road maintenance activities.
- o Use of the private sector.

Of course, it is possible to combine or modify the above approaches in many ways. It is evident, however, that the classical approach does not currently operate in a satisfactory manner. Moreover, the overall working environment in which road maintenance is carried out continues to be unfavourable.

In applying any of the alternative options the key element to take into account is the motivation of the workers and their supervisors. Incentives at all levels must be incorporated as part of the system in order to make it sustainable in the long term. As concerns the workers at village level such incentives may not necessarily have to be material. If there is a significant local interest in the road (or road section), some assistance in the form of tools, construction materials and supervision could be a sufficient incentive to mobilise adequate numbers of workers.

In these cases, planning and programming assistance may be sufficient to mobilise and direct village labour at specific times throughout the year to bring the road back into a trafficable state. This type of maintenance would therefore be provided not as a continuous low level routine maintenance input, but rather as a scheduled and well-directed community input involving a significant number of workers say two to three times per year.

The purpose of this type of intervention would be to put the road back into trafficable state when it would be most urgently required. The timing of the interventions should be discussed and agreed upon between the villagers and the supervising technical ministry and would depend on technical, economic and social considerations. Naturally, this type of maintenance intervention would primarily apply to access roads with very low traffic levels and where communities are prepared to provide (subsidised) collective inputs to safeguard their level of access to the main road network.

In the majority of cases, however, further inputs in the form of money or food will be necessary to establish a continuous and sustainable maintenance system. The level of such inputs could, however, be kept minimal if agreements with communities and/or village organisations are negotiated. In this way, the beneficiaries of the roads are directly participating in and contributing to its maintenance. Regular and sustained inputs can also be commercially negotiated with individuals or lengthmen (who may be grouped together) or through petty contracts.

Alternatively, systems of financial contributions or local taxes could be negotiated with the local beneficiaries.

Using petty contracts for the execution of different routine maintenance activities has been shown to have the following advantages:

- o Flexibility of contractors (ability to introduce incentive schemes, control of labour force).
- o Less bureaucratic procedures.
- o Government released of direct management responsibilities.
- o Contractual commitment of maintenance funds (difficult to divert funds to other purposes).
- o Political support for well defined activity.
- o Development of skilled local contractors.

On the other hand, the private sector has (as yet) little relevant experience in carrying out routine maintenance contracts. However, small-scale village based petty contractors without previous experience quickly assimilate the necessary skills to organise a number of workers. The crucial issue is to adapt the working environment so that the contractors can perform without constraints and without losing confidence in the employer.

One can argue that in the long term there will not be sufficient funds available to pay the full cost of rural road maintenance. In such a situation, much more thought has to be given to involving the communities in the repair and maintenance of the rural roads.

This is an issue which is often susceptible to simplistic solutions. An argument often heard is that rural roads are built specifically for the benefit of the people and they should therefore shoulder the responsibility for maintaining the road.

One has to remember that roads are built to carry vehicles. Many communities recognise the benefits that will come to the community from the better access to markets, easier access to government services and better connection to the outside. Nevertheless, they do not necessarily recognise the individual benefit that will come to them. After all most of them do not own a vehicle. In Lao PDR, many are subsistence farmers and have no real need of markets. Indeed they may feel that as individuals they cannot see the benefit that will accrue to them. At best, they may be prepared to maintain the road where it runs through the village but, experience suggests that, they will be unwilling to maintain more than that.

This is not to suggest that it is not possible to obtain community support for rural road maintenance. However, it is necessary to put a lot of effort into:

- (i) ensuring that the community fully understands the benefits that will come to them from maintaining the road and
- (ii) providing some form of incentive to the communities.

The lessons to be learned from attempts to involve the local population in the maintenance of rural roads are the following:

- (i) The communities must be involved in the process from the planning stage. Indeed, the road to be built has to be seen by them to be something that they need and not imposed on them from outside.
- (ii) In this respect, it clearly helps if the roads are built using local labour as the community is then involved and benefitting from its construction.
- (iii) Some form of incentive has to be provided. This of course is best if it is cash. However, there are other forms of incentives:
 - (a) If the road is to be used mainly for exporting produce some sort of levy can be made on the those benefitting from the sale of the produce.
 - (b) If the road is of obvious benefit to the communities then some form of maintenance fund can be set up which can be furnished from a small contribution from the communities, if possible augmented by the local authorities. Such a fund can be used to pay the maintenance workers or to pay local contractors. The fund could also be established by a small amount taken from the salaries of the workers involved in the construction.

- (c) If the road specifically results in the possibility to market crops, a small levy could be introduced on those from which funds could be allocated to maintenance.
- (d) The local authority could provide the basic tools such as hoes and wheelbarrows to the maintenance workers. Such tools can be used by the workers for their own activities.
- (e) Food aid can be used either directly or converted into cash as the means to pay for road maintenance.

For the foreseeable future, programmes of rural roads will be funded by foreign assistance. It would be a mistake, however, to use these projects to pay for the maintenance of the roads constructed. Certainly donors should be encouraged to set funds aside to develop sustainable systems. However, it has to be accepted that merely putting money into rural road maintenance is not a sustainable solution. Funds that are available in these projects should be used to test out different forms of maintenance as illustrated above. In this way, it would be possible to arrive at solutions which the Lao PDR Government would be able to sustain.

6.4.1 Current Situation

There is practically no preventive road maintenance on the rural roads in Lao PDR, nor is there any proper maintenance set up in the provincial departments of MCTPC in the provinces. The main reason for this situation is the limited funds available for any type of maintenance activities. As a result, the roads keep deteriorating and the repair needs get more and more desperate. Even roads rehabilitated in the recent past have again deteriorated for want of regular maintenance.

Some development agencies have been involved in maintenance of roads constructed or rehabilitated by these agencies themselves for some time. During the last two years, ILO has been maintaining the roads constructed and rehabilitated by it. Presently, ILO is maintaining 30 km of roads in Oudomxay and 20 km in Savannakhet by the lengthman system and some sections using village-based contracts. In addition, Oudomxay Province has recently established a routine maintenance by the "length-man" system on its national road network.

6.4.2 Routine Maintenance

Routine Maintenance Tasks

- o Repair, fill and compact pot holes and ruts;
- o Erosion control of shoulders and slopes
- o Clear side and mitre drains to allow free passage of water;
- o Clear culverts and other water ways;
- o Cut grass and bushes;
- o Maintain road signs in place;
- o Perform minor repairs to culverts and retaining structures;
- o Repair and replace scour checks.

Routine maintenance of low traffic rural roads is a widely dispersed activity, requiring small resource inputs over a large number of widely separated points. This activity is best suited for manual labour. The amount of work needed to keep a length of road in good condition depends on several factors, such as type of road surface, traffic volume (number, type and size of vehicles), the severity of climatic conditions, especially rain fall, type of soil; the susceptibility of the terrain and road gradients to erosion, and the presence of bush and

vegetation.

Under average conditions, one full time worker should be able to cover the routine maintenance works each year of 1-2 km of single lane gravel road, with traffic of about 25 vehicles per day (ref. Table 6.2). This activity can be most economically performed by persons living along the roads and engaged for road maintenance. Local workers are also under social pressure from their neighbours to do the job well. Former road construction workers are ideal maintenance workers, because they already have some training and experience in the work involved.

6.4.3 Recurrent and Periodic Maintenance

Periodic road maintenance works involve activities such as reshaping of the road surface, re-gravelling and repair or reconstruction of damaged drainage structures. Such works could be organised the same way as rehabilitation and new construction works under a contract system, works carried out by small-scale private contractors (with a limited amount of equipment), and supervised and managed by staff of the DCTPCs.

PRODUCTIVITY GUIDELINES FOR ROUTINE MAINTENANCE						
ACTIVITY	Unit	TASK DIFFICULTY				NOTES
		1	2	3	4	
Clean Culverts + Inlets	As shown	4 Culverts per day	1 Culvert per day	2 Days per Culvert	4 Days per Culvert	Difficulty = Silt depth 1. Up to • 2. • to • 3. • to • 4. Over • Tasks for 600 dia.culverts with 7 rings
Clean Culvert Outfalls	m/day	55	40	25		Difficulty = Silt depth 1. Up to 10cm 2. 10 to 20cm 3. Over 20cm
Repair Culvert Headwalls	No/day	7	4			Difficulty = Type of repair 1. Minor repairs 2. Major repairs
Clean Mitre Drains	m/day	60	45	30		Difficulty = Silt depth 1. Up to 20cm 2. 10 to 15cm 3. Over 15cm
Clean Side Drains	m/day	wet areas 65 dry soft soil 55 dry hard soil 30	45 40 23	30 30 18		Difficulty = Silt depth 1. Up to 20cm 2. 10 to 15cm 3. Over 15cm
Repair Scour Checks	No/day	5	7			Difficulty = Type of scour check 1. Wood 2. Stone
Repair Side Drain Erosion	m/day	wet areas 100 dry areas 100	80 50	60 23		Difficulty = Depth of Erosion 1. Up to 15cm 2. 15 to 30cm 3. Over 30cm
Repair Shoulder Erosion	m/day	100	80	65		Difficulty = Depth of Erosion 1. Up to 10cm 2. 10 to 15cm 3. Over 15cm
Grass Planting	m/day	100	80	65		Difficulty = Planting width 1. Up to 0.5m 2. 0.5 to 1.0m 3. Over 1.0m
Fill Potholes in Carriageway	wheel-brws/day	25	18	13	8	Difficulty = Hauling Distance 1. No haul 2. Up to 100m 3. 100m to 200m 4. Over 200m
Fill Ruts in Carriageway	m/day	wet areas 70 dry areas 50	50 30	35 15	15 7	Difficulty = Hauling Distance 1. No haul 2. Up to 100m 3. 100m to 200m 4. Over 200m
Grub Edge of Carriageway	m/day	wet areas 270 dry areas 190	200 120	130 70		Difficulty = Width of grubbing 1. Up to 0.5m 2. 0.5 to 1.0m 3. Over 1.0m
Reshape Carriageway	m/day	70	50			Difficulty = Type of reshaping 1. Light (Up to 75mm) 2. Heavy (over 75mm)
Cut Grass	Light	m/day	wet areas 425 dry areas 310	260 230	190 170	Difficulty = Width of grass cutting 1. Up to 1.0m 2. 1.0 to 2.0m 3. Over 2.0m
	Dense	m/day	310	240	175	
Clear Bush	Light	m/day	425	260	190	Difficulty = Width of bush 1. Up to 1.0m 2. 1.0 to 2.0m 3. Over 2.0m
	Dense	m/day	275	225	175	

* All tasks except reshaping are measured along one side of the road only.

Source: Minor Roads Programme, Kenya

Table 6.2 Production Rates for Routine Maintenance

6.5 Tools and Equipment

6.5.1 General

By definition, labour-based road construction and maintenance methods consist of an appropriate combination of utilising labour complemented with a limited use of equipment. Equipment for labour-based road works is mainly utilized for operations such as haulage of materials and water, compaction, grading and rock breaking. Well-designed and maintained tools and equipment are important as they determine the productivity as well as the quality of the works carried out. It is therefore important that the tools and equipment used for labour-based construction and maintenance activities are properly designed to stand heavy wear and tear and the normal abuse of a road work site.

The most common scenario is that 20% - 30% of total construction costs are attributed to equipment use. However, 90% of all headaches of project managers are related to the use of equipment. The workers turn up and perform every day, but the equipment breaks down. Malfunctioning equipment is very often the most common item which jeopardizes the progress of a road project.

The optimal choice of tools and equipment also varies from place to place, depending on the site conditions, type of works carried out, type of soils, local skills, etc.

Site supervisory staff are trained in the proper use and maintenance of tools and equipment. Since the labour is temporarily employed, they are not provided with any formal training in the use of tools and equipment. However, the supervisors are responsible for instructing the workers and ensuring that tools are properly used and maintained.

6.5.2 Tools and Employment for Construction Works

The equipment used on site needs to match the number of workers, thereby obtaining an balance between machine and labour operations. Experience has shown that with a labour force of 150-200 workers, the following equipment configuration is appropriate:

2 pedestrian rollers (950 kg)	26,000
1 Etean truck with water bowser	16,000
1 pick-up truck	16,000
1 motorcycle	1,500
2 bicycles	500
1 set of hand tools	4,000
Total	US\$ 64,000

This assumes that provision of gravel is done by traditional equipment-based contractors with tipper-trucks and excavators.

The below table indicates the required hand tools for a project site employing 100 workers or 200 workers.

Item	200 workers	100 workers
Profile Board	100	70
Ranging Rod	100	70
Hoe	150	70
Hoe Handle	150	50
Shovel	75	50
Spade	30	20
Pickaxe	75	25
Pickaxe Handle	75	25
Crowbar	10	5
Bush Knife	10	5
Axe	15	5
Bowsaw	7	4
Grass Slasher	15	10
Heavy Duty Rake	40	30
Hand Rammer	25	20
Wheelbarrow	60	40
Sledge Hammer	3	3
Bucket	10	8
Watering Can	10	8
Fuel pump	1	1
30m Measuring Tape	3	3
3m Measuring Tape	3	3
Line Level	3	3
Nylon String	300 m	300 m

6.5.3 Tools for Maintenance Works

Periodic Maintenance

The main activities defined as periodic maintenance consists of major repairs on drainage systems, rehabilitation of road camber and regravelling. As can be seen, these work activities are quite similar to rehabilitation and new construction works, so, depending on the magnitude of the road deterioration, periodic maintenance works would require the same type of tools as described above.

Routine Maintenance

Required tools and equipment for routine maintenance consist of (i) tools for the lengthman and (ii) inspection transport for the road authorities.

Tools for the lengthman consist of the following items:

- | | | |
|-------------------|---------------|---------------|
| o hoe | o bush knife | o pickaxe |
| o sharpening file | o shovel | o hand rammer |
| o spade | o wheelbarrow | o spreader |

A major item in a routine maintenance setup is the regular inspection and supervision of the lengthmen as well as the timely payment of the works. To carry out these activities successfully the road authorities must possess proper means to travel along the roads and meet with the lengthmen and/or lengthman contractors. Depending on the length of travel, supervision personnel needs to be equipped with bicycles, motorcycles or inspection cars.

6.5.4 Preventive Mechanical Maintenance

Regular mechanical maintenance of the equipment avoids break downs and ensures a long equipment life time and finally avoids disruptions in site works. The supervisors and operators must therefore be

trained in the proper operation of equipment thereby ensuring that preventive maintenance it is carried out at regular intervals. Operator manuals for each piece of equipment should be made available in a language which the site personnel understands, which specifies when and where lubrication and adjustments are required.

When labourers have to work with poorly maintained tools, their output is low. Therefore, effort spent on proper maintenance is amply repaid. The cost of employing a carpenter to make and fix tool handles or employing a blacksmith to sharpen handtools may be repaid many times over by the increased output resulting from better tool condition.

6.6 Labour Recruitment and Employment

6.6.1 Incentive Schemes

The workforce employed to execute labour-based road works are locally recruited within the vicinity of the road sites on a daily basis and are paid only for the days they have worked. They are normally not entitled any social benefits such as paid leave, pensions, sick leave, etc. They can be laid off when their services are no longer required. When the road construction and maintenance activities are moved to a new area, new workers are recruited from this area.

In order to ensure the required level of effectiveness on labour-based projects, serious attention must be given to the motivation of the labour force. This is ensured by various measures such as appropriate wages, proper supervision, secure working conditions, timely payment of wages and the use of incentive schemes.

Payment of works can be organised in various forms, depending on the nature of work and type of funding:

Daily Paid Work: Daily paid workers are paid a fixed sum for each day in return for a fixed number of working hours disregarding achieved work outputs. This system is often used when starting up a new project before an incentive scheme has been established. It is also used as the basis payment when productivities are low and the limits for the receipt of bonuses are not reached.

Task Work: Task bonuses are the most commonly used incentive scheme on labour-based projects. Task work implies that the labourer is given a clearly defined amount work to be completed in one day whereafter he is free to discharge.

Piece Work: On piece work each individual worker is paid per unit of output. The "pieces" are normally equivalent of between one to four times the output expected on daily paid work.

Payment in Kind: In areas where food supply is limited or where the local currency is highly inflated, payment in kind may act as an effective incentive. However, there are certain international standards which should be observed when paying with food for work.

6.6.2 Recruitment and Employment Conditions

Labour-based public works programmes require large numbers of unskilled and semi-skilled labour in a limited period of time. It is important that clear guidelines and procedures are available for the recruitment and employment conditions for casual labour recruited both by public and private sector institutions, including issues such as remuneration, incentive schemes and safety and health.

When expanding into large-scale use of labour-based methods, experience shows that particular attention has to be paid to the procedures for recruiting and paying the casual workforce and their working conditions. Casual workers are rarely aware of their rights under national labour laws and they are vulnerable to exploitation. In most cases, there will be more job seekers than required, and

accusations of corruption and favouritism should be avoided. It is important that the selection process is transparent and is felt to be fair. Apart from human and workers' rights, there are also economic arguments for fair treatment of the workers. Workers who are treated fairly are likely to develop a sense of loyalty with the employer, their motivation and productivity are likely to rise.

The risk of worker exploitation may be higher when private contractors are involved in the execution of the road works. It is therefore essential that labour issues are properly dealt with in contractor training programmes and that the contracts include clauses on relevant labour standards, and that these regulations are monitored by the client.

Liaison with the Ministry of Labour and Social Welfare should be sought during the planning and execution of a labour-based programme, not only for the purpose of controlling the working conditions but also to emphasize its advisory role.

6.6.3 Gender Considerations

Rural women make up 30 - 40 percent of the workforce employed by the current ILO labour-based project, demonstrating that this kind of work is both culturally acceptable and a potential source of income for women and their families.

When the road works are carried out using private contractors, it is important that the representation of women participation in the road works does not diminish. This issue needs to be carefully monitored, and if necessary, proactive measures need to be taken, possibly by introducing quotas included in the special clauses of the road works contracts.

Female participation in the routine maintenance works is easier to control through the actual selection of petty contractors. Here again, the above representation should act as a minimum goal, however, not being regarded as a ceiling.

Finally, women should also be provided equal opportunities, in terms of recruitment for management positions, training and career advancement.

6.7 Environmental Aspects

Most roads needing rehabilitation follow existing tracks and therefore do not cause interference in the economic activities in the rural areas through which they pass. However, it should be acknowledged that the roads will be passing through areas where the farms are small and any encroachment on existing farm lands may have dire consequences for the local farmers. When using labour-based methods, supported by light equipment it is possible to constrict construction works to within the limits of the road width.

A major consideration in roads development is the requirements of existing irrigation systems and associated eco-systems, since it is of prime importance to retain water rather than, as road engineers may prefer, to allow free drainage regimes.

Road works operations, and in particular when using labour-based methods, can be organised so it is locally beneficial in terms of the scale of soil excavation activities. To form embankments, soil is excavated locally at regular intervals in the form of shallow borrow pits. After construction, these naturally fill with water and can become local fishponds. The siting of these pits can be agreed with local communities beforehand in order to gain the best future advantage for them. Laterite excavation is limited to a number of gravel pits where some environmental damage initially results. Borrow-pits can be well shaped and landscaped after excavation operations but many are widely and continuously used and any rehabilitation of the pits would be done at a later date. Eventually, natural vegetation will be very quick to reclaim these areas once they have been worked out.

On embankments, it is recommended that turfing is carried out and that trees are planted on the side slopes for soil protection purposes. The trees can be maintained during their growth period by the routine road maintenance lengthmen, and will improve the overall environmental conditions in the area.

Clearing of landslides comprise a major activity of road maintenance in the hilly and mountainous regions. The cause of the landslides is mainly due to side-cuts excavated to make place for the road width. Local farming activities adjacent to the road (in particular slash and burn activities) often accelerate this soil erosion process. This is a serious maintenance issue which needs to be considered already at the planning and design stage. In order to reduce future maintenance demands, road alignments should be designed in a fashion where side-cuts are reduced to a minimum. When side-cuts cannot be avoided, soil stabilisation measures such as retaining walls, tree planting, etc. must be implemented. These measures will involve increased initial costs during the construction period, but may significantly reduce future maintenance requirements.

Chapter 7 Contractors

7.1 General

The majority of road investments during the last ten years has so far been used to establish a functional trunk road network in Lao PDR. In order to carry out these works one can argue that it has been justified to bring in large-scale international contractors. However, it now seems that the focus is shifting towards (i) upgrading the secondary and tertiary road network in the country and (ii) protecting past investments on the primary roads by establishing an efficient road maintenance system.

In order to carry out these new tasks effectively it will also be necessary to develop a new and different approach to implementation of works. Future works, such as maintenance of existing roads and construction of low traffic rural roads, will be more dispersed geographically and each of the road projects will be of considerably smaller magnitude than previous projects.

To continue relying on foreign construction companies to carry out these type of works will not be a cost-efficient approach to the new challenges in the road sector. For this type of works it would be more effective to rely on local forces and institutions already present in the country.

During the past, the domestic private construction industry has played a secondary role in the road sector. Local contractors still struggle with lack of and old equipment, lack of experienced staff, insufficient quality on completed works and uncertain market prospects.

With the imminent shift in the nature of road projects and type of works, the time has come to focus more on strengthening the in-country capacity to manage and implement the future challenges in the road sector in Lao PDR.

With the current work requirements to upgrade the secondary and tertiary road network in the rural areas and the future road maintenance requirements on the primary network, it is evident that the market prospects for the local construction industry could be secured for the foreseeable future. To accelerate the participation of domestic contractors in the future road works programme of Lao PDR, it is important to look at current limitations and try to develop a conducive environment in which they are able to more effectively compete and operate.

In order to improve the conditions and effectiveness of the domestic construction industry there are certain critical issues which needs to be addressed in future road works programmes:

- (i) Smaller companies are more vulnerable to cash flow distortions. This implies that they need more regular and timely payment of works executed than large construction firms. For small-scale contractors to survive payments will be necessary on a monthly basis.
- (ii) Small companies often struggle with mobilising capital for equipment investment and replacement. A common feature among Lao contractors are that their equipment fleet is often old and in many cases they lack the specific equipment required.
- (iii) A general problem in the domestic construction industry is the lack of qualified and experienced personnel, ranging from plant operators, mechanics, artisans to management staff such as technicians and engineers.

- (iv) Due to the above factors, several companies are not eligible to participate in the pre-qualification process and therefore do not have access to works.

If Lao PDR wishes to increase the involvement of their domestic industry in the road sector, these issues will need serious consideration when designing future road works programmes. It is also natural that the donor community address these issues when preparing new road sector support programmes in the country, if they wish to achieve any sustainable results from their assistance.

Most labour-based road works, including the projects in Lao PDR, have previously been public works schemes carried out by force account. In recent years, there has been a move towards increasing the involvement of the domestic private sector in the execution of road works in the country.

When involving the domestic private sector in the execution of labour-based road works, there are several institutional issues which need proper attention during programme design and implementation. Local contractors will not provide an easy solution to road construction and maintenance problems. The development of small-scale contractors entails a series of new support activities such as training in business management, development of user-targeted training material, development of appropriate contract procedures, streamlining of payment procedures, developing banking facilities, and last but not least providing interested contracting firms with attractive market prospects and a conducive environment in which they can operate efficiently.

7.2 Identification and Selection

7.2.1 Types of Contractors

The size of the contracting firms is important when identifying and selecting appropriate contractors to participate in labour-based road works. The optimal solution is to target contractors who would use labour-based methods as a main source of livelihood. Large contractors are normally not interested in labour-based works contracts since the contracts are considered to be too small.

Common selection criteria used for contractors are:

- o ownership of equipment,
- o supervisory capacity,
- o access to capital,
- o background of company, i.e., track record,
- o size of company, and
- o residence.

Since most small-scale contractors have limited experience from the road sector, most of the contractors selected in other programmes have been recruited from the building industry, others were transport contractors.

Before a programme involving the domestic contracting industry is formulated, it is important to identify the various types of contracting firms which operate in the country. Table 7.1 describes the different types of contractors, categorised according to their size and the type of works they could carry out in a rural road works programme.

Type	Description	Type of Works
Petty Contractors	<ul style="list-style-type: none"> • single person • labour only • not registered • basic skills 	<ul style="list-style-type: none"> • routine road maintenance, • labour only sub-contracts
Small-scale Contractors	<ul style="list-style-type: none"> • registered • possess basic equipment • capital security low • entrepreneurial skills • technical and managerial skills 	<ul style="list-style-type: none"> • periodic road maintenance, • rehabilitation works, • small bridge and culvert works
Large-scale contractors - normally not interested		

Table 7.1 *Types of Contractors*

(i) **Petty Contractors**

The petty contractor is generally referred to as a one-man contractor. This category of contractors usually consists of one man firms, sometimes assisted by a limited amount of unskilled workers. They may be labour contractors, usually consisting of a businessman sub-contracted to carry out specific work, relying mainly on unskilled casual labour.

Organised local community groups such as farmers associations and village welfare groups can also be classified as petty contractors.

A common feature for this group is that they are not formally registered and do not possess any capital and are therefore extremely vulnerable to cash-flow problems such as mobilisation capital and late payments. The petty contractors normally do not possess any equipment, and lack any means of transport. Due to their lack of mobility, they should be recruited from the vicinity of the work sites.

These contractors are mainly used for maintenance works or simple, clearly defined sub-contracts requiring a minimum of skilled labour and equipment. A lengthman system, securing the routine maintenance of rural roads, may be a potential market for petty contractors. In addition, such firms can be utilised for contracting out masonry works for small bridges and culverts.

(ii) **Small-scale contractors**

Most domestic small-scale contractors are found in the building construction industry and the transport sector, and are normally registered companies. Often limited, they still possess certain technical and managerial skills. However, experience shows that their organisation requires further training in business management, accounting, mechanical maintenance, road and concrete technology, as well as in labour-based work methods.

Their equipment fleet is sparse and often old and poorly standardised. Before they can be awarded road rehabilitation works, it is usually necessary to assist them in the acquisition of additional light construction equipment (i.e., hauling and compaction equipment).

Similar to the petty contractors, the small-scale contractors are often under-financed and vulnerable to cash-flow distortions. Often, these contractors do not operate their accounts through a bank. In many cases, the local banks do not consider these firms as attractive clients and therefore do not provide them any services.

The main advantage of involving existing small-scale contractors is that this group can provide evidence of entrepreneurial skills through the works they are currently involved in. Although some of these firms are mainly involved in building works, they can provide a business entity, and an

established organisation with administrative, financial and technical staff which could be further trained and developed to cater for the requirements of a rural road works programme.

After receiving appropriate training and development assistance, these contractors prove to be highly efficient in carrying out both road construction and maintenance works. In other countries, they have shown good entrepreneurial drive, and given favourable conditions for their operation, such as a steady supply of work and regular and timely payment, they can survive as sound construction firms and constitute an important component of the domestic construction industry.

(iii) Large-scale contractors are often subsidiaries of large foreign multi-national companies which have good access to capital, equipment and skilled labour. These contractors participate in international competitive bidding and are often only present in the country while they are carrying out a works contract. Once their assignment has been completed, they leave the country, including evacuating equipment and skilled personnel. Due to this, their involvement provides a minimal technology transfer to the recipient country, resulting in a low sustainability and little institutionalisation of skills and experience. In most cases, they regard the size of labour-based road contracts as too small for their interest. For these reasons, this category of contractors is not regarded the appropriate beneficiary target group for training and development assistance.

7.2.2 Selection

From previous surveys carried out in Lao PDR by the consultant, the general impression is that the local contracting industry in the provinces is very much interested in this type of work, and based on their past experience and some additional training, they should be capable of undertaking the envisaged road works.

One of the initial activities when involving the private sector will therefore be to carry out a comprehensive survey of the local private sector in the provinces. The outputs of this activity will provide the basis for the final selection of contractors and design of a subsequent training programme.

When selecting and inviting a group of firms to participate in a training and development programme, it is important that this process is carried out in a fair and transparent manner. Therefore, any future contractor development programmes should be thoroughly announced in the local press and through the regular channels which are used when inviting contractors to tender for works.

The interested firms should then be invited to an information seminar where the intentions of the programme and the future role of the contractors are explained. Based on more thorough interviews with key staff from the firms, an officially appointed selection committee should decide on which firms should participate in the future training and development programme.

7.3 Training and Certification

Training of contractors should involve all cadres of staff in the contracting firms covering both technical and administrative personnel. In this respect, it is important that the staff members of the firms possess the formal education required for their respective positions. Therefore, certain minimum levels of education should be demanded from the contractors' staff before they are qualified to participate in a training programme.

A training programme should concentrate on practical skills learning in a real environment, specifically focusing on the envisaged works expected to be carried out by the contractors. This can best be provided by demonstration and "learning-by doing". The proposed training package for the small-scale contractors can be described as three phases:

Phase 1: Demonstration Phase

The government has during the last two years established the efficient use of labour-based methods to rehabilitate and maintain rural roads. During the initial phase, this capacity should be transferred in a structured manner to a selected number of contracting firms through a training programme provided to all cadres of their staff.

During the demonstration phase the government will still be in charge of the road works, and a road works site should be used for on-the-job teaching purposes where the contractors' staff is seconded to the various operations under close guidance of experienced government provincial staff acting as instructors.

Phase 2: First Trial Contract

After the demonstration phase, each contracting firm should be given an initial trial contract consisting of approximately 4 km of road rehabilitation works which is executed under close guidance of trainers and local instructors. At this stage, the responsibility for the work sites are transferred to the contractors, however, in a safe environment where instructors still closely monitor and advise the contractors, thereby avoiding errors and sub-standard works at an early stage.

Phase 3: Second Trial Contract

When the contractors have successfully completed the first trial contract, they are awarded negotiated contracts of 10 - 15 km road rehabilitation or new construction. This is the final show-piece for the contractors. During this phase, the contracting firms do not have access to the close technical support rendered during the first trial contract, and the government will act in the normal manner as the client. The time schedule for the above described training and development programme depends on the capacity and performance of each of the contractors. However, it is expected that the first trial contracts is completed in 5 to 6 months and that the second trial contract requires a period of 1• years.

The final result of the training should provide the contracting firms with a special certification which qualifies them exclusively to tender to labour-based road works. This enables the government to streamline its activities in this sector and provide a uniformity to all projects wishing to use this approach to rural road rehabilitation and maintenance. Furthermore, it will enhance the contracting firms' future market prospects and thereby maintain this capacity in the private sector.

7.4 Acquisition of Equipment

Lack of and old and inappropriate equipment is often the reason why domestic contractors are barred from works contracts in the road sector. It is therefore important that support mechanisms are provided to supply the domestic small-scale contractors with the minimum of equipment required to carry out the road works.

Once the participating firms and their respective equipment fleets have been identified, it is possible to determine their exact requirements for additional equipment. For a small-scale contractor, which is expected to carry out road rehabilitation and construction works, the following set of equipment would be appropriate in combination with a team of 150 workers:

2 pedestrian rollers (950 kg)	26,000
1 Etean with water bowser	16,000
1 pick-up	16,000
1 set of hand tools	4,000
1 Motorcycle	1,500
2 Bicycles	500
Total	US\$ 64,000

The following options can be considered for providing the contractors with the necessary equipment:

(i) Direct Sales

The government could enter into direct agreements with the contractors. On conclusion of the agreements, the equipment would be released to the contractors. Recovery of the equipment costs could be achieved through reductions from the payment certificates.

This arrangement is simple. However, the draw-back is if the contractor defaults and the plant needs to be recuperated.

(ii) Hire from Government

If the contractors hire the equipment from the government, this will imply that the contractors would not need to involve them self in any great capital investments. The equipment rent could be recuperated through reductions from the payment certificates.

The disadvantage of this arrangement is that it leads to messy relations between the contractor and the client. In this arrangement, it is difficult to split the responsibility for the maintenance of the equipment. When break-downs occur, government would need to act promptly and ensure that the equipment is repaired, leaving a responsibility, which is best carried by the private firms, in the hands of government. This will also limit the degree of flexibility of the contractors and finally be a source of conflict when determining the blame when implementation delays occur.

(iii) Hire from Private Owned Plant Pools

Under this arrangement, the government could transfer equipment to a private plant pool who would be responsible for maintenance and operation of the equipment.

The main disadvantage of this arrangement is that the contractors would then be perpetually tied to a third party, thereby limiting their flexibility, profit potentials and in the long run their possibility for growth and development. The involvement of a third party also increases the risks of delays since there are more actors involved in the implementation of the programme.

Finally, it is important to assess the availability of such services, especially whether plant pools are operating in the provinces and their interest and financial ability to acquire the specific types of equipment required.

(iv) Hire-Purchase through a Local Bank

This option entails that the government establishes a separate agreement with a local bank or financing institution and transfers the equipment to this bank which then provides the plant to the contractors on a hire-purchase basis. Agreements between the bank and the contractors are then established following normal bank procedures for screening customers (past bank records, securities, interest rates, etc.).

The main advantage of this option is that the contractors are then the owners of the equipment and must take full responsibility of operation and maintenance of the plant. This results in clear divisions of responsibility between the contractor and the client, as well as provides the contractor with the degree of flexibility which they need to efficiently carry out the work activities which rely on the use of equipment.

Considering the size of the contracts for rehabilitation works, it is evident that the financial relations between the client and the contractors should be carried out through the services of a local bank. It would then seem logical that a bank who possess past experience in this type of hire-purchase

agreements are involved. This will relieve the government from a responsibility which are best taken care of by a professional institution for such financing arrangements.

By combining the bank services for payment of works certificates and the financing of equipment, a further security can be introduced into the programme. By issuing the cheques for completed works in the joint name of the contractor and the bank, no other bank has access to the cheque. When the cheque is cashed, the bank can gradually recover the loan by securing an agreed portion of the amount as a repayment of the equipment loan.

If the government can provide good market prospects on a long term basis, this is certainly the contractors' preferred way of acquiring the necessary equipment. However, when conducting future interviews with the small-scale contractors, it is important to make an initial assessment of their credit worthiness and discuss with them how they envisage the ideal solution.

It should be acknowledged that a private contractor is a private business concern and therefore its development must be allowed to follow that of a business entity. It should also be noted that the hire-purchase solution is not a new concept developed for Lao PDR. These equipment related issues have been raised in several labour-based small-scale contractor development projects, and experience has shown that the preferred solution by the contractors, and the most sustainable alternative, has been to hand the ownership and full responsibility for the equipment over to the contractors. As a reference, the small-scale contractors in Ghana acquired equipment for a total of US\$ 160 000:- to be paid back in four years, and in Sierra Leone US\$ 99,000:- over four years.

7.5 Tendering Procedures

During the development phase, covering both the first and second trial contracts, the works awarded to the small-scale contractors need to be exempted from regular government tender procedures. During the trial contracts, unit rates set by the government should be the basis for payment of works carried out by the contractors.

Normally, government tender procedures prescribe that works of the size expected to be awarded to the small-scale contractors after the initial demonstration phase, are awarded after local competitive bidding and the involvement of a government tender board. In order to allow the contracting firms a chance to consolidate themselves in the market, it is recommended to obtain a waiver from the standard tender procedures in the initial phase. It is of vital importance that this exemption is approved before a training programme commences.

Since the number of contractors initially trained and qualified to carry out labour-based road works will be limited, it will take some time to establish a fully competitive environment. In order to maintain progress in terms of physical work outputs, it is in the interest of the government to retain all the firms and ensure that they are awarded a steady supply of works. Experience from other programmes have shown that during the first tenders, the contractors will "cooperate" amongst each other when bidding for the works. It is therefore not in the interest of the client to allow the unit rates to be determined freely by the contractors.

Once the contractors have successfully completed training, including the completion of the two trial contracts, it is recommended that further works is still awarded based on unit rates fixed by the government. This system could eventually be adjusted to allow variations on unit rates thereby gradually introducing a competitive environment. However, still wanting to secure work to all contractors, the competition aspect could be introduced in the form of awarding the biggest contracts to the lowest bidders.

This also emphasises the importance of the government's role in monitoring the productivity rates on site in order to establish real performance and productivity rates as a basis for the calculation of the real costs involved in labour-based road works.

7.6 Contracts Documents

Contracts management procedures and documents for major works such as road rehabilitation and new construction should follow to the extent possible the existing procedures of the government. For routine maintenance works involving petty contractors, a complete set of simplified contracts documents and procedures are required.

For rehabilitation and new construction works, there are at present two standard types of contracts available in Lao PDR which seem to meet the requirements of clarity and simplicity. One has already been used on a number of IDA funded road maintenance projects and the second standard contract is still being prepared within an ADB financed project, developing a Management Information System in MCTPC.

Before contracts are awarded to small-scale contractors to carry out rural road works, it will be necessary to review the new standard contract being developed by the ADB project to ensure that it is appropriate also when using labour-based methods. Furthermore, design standards and full works specifications for all site activities needs to be developed, which should be attached to the works contracts.

For routine maintenance works, simple contracts have already been designed and are currently in use by the government. These will need to be reviewed in line with further development of the routine road maintenance system.

7.7 Market Prospects

When developing small-scale contractors to implement labour-based road works, it is important to ensure that the authorities are able to supply a steady amount of works to the construction firms. In order to defend their investments in terms of staff training and equipment, a firm government commitment on future work prospects is required. It is therefore important to limit the number of firms involved in a future programme to the exact demand set out in the physical works programme.

When the contractors are well established, they will also look for assignments in other sectors, thereby reducing the dependency on the roads authorities. Secondly, it is envisaged that the labour-based contractors should eventually be able to bid successfully on works which are not necessarily earmarked for labour-based methods, competing with firms using traditional equipment-intensive technology.

Chapter 8

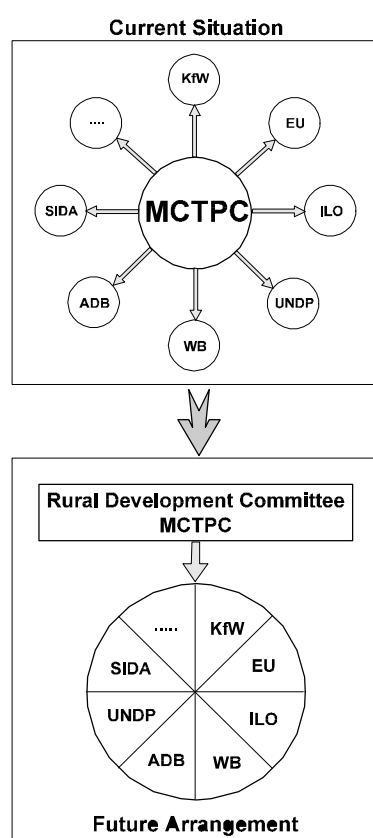
Organisational and Financial Aspects

8.1 Organisation

There are numerous components in the overall development activities, ongoing or proposed, in the rural areas of the country. Clearly, the only link between all the activities is the Government of Lao PDR represented by its institutions at central and provincial level. Although acknowledging that these organisations need building up and strengthening, the priority principle should be one of very close coordination at all stages of various rural development projects. To achieve the most effective utilisation of the resources to be provided by capital funds and technical assistance, it is important that all parties agree on a common strategy related to coordination and cooperation to achieve common and individual objectives.

8.1.1 Central Level

An important component of a future rural road works programme will be to assist the government in its efforts to coordinate, manage and standardise such a programme, including various donor inputs and project activities. There are a number of organisations (ADB, WB, UNDP, KfW, SIDA and others) which are currently or planning to support the rural road sector in Lao PDR. It is in the interest of the government, that the various programmes follow certain standardised work methods, procedures and regulations.



The government also needs a coordinating body which can effectively monitor the performance of various programmes. Furthermore, there is a demand for exchange of information and experience from the various on-going and future rural road projects.

For this purpose, the government has recently established a Rural Development Committee within the MCTPC which, amongst other tasks, will address this issue. A coordinating body for rural road works in MCTPC will also provide a regular channel for discussions and dialogue with the donor community relating to identification and formulation of future donor funded rural roads projects.

In order to effectively utilise the management resources available to MCTPC, there will be a demand for streamlining and standardising ongoing and future rural road works into one coherent programme. Today, the various projects operate independently with very little coordination and exchange of information. One of the immediate tasks for the Rural Development Committee will be to pull the various projects together, creating *one* national programme consisting of all the various actors. In order to achieve this, the Government needs to establish a set of general standards and procedures relating to rural road works.

This includes uniform procedures for contracts management, employment conditions, planning, budgeting, funds allocation and transfers, auditing, monitoring and reporting. It will also require the use of standardised technical

specifications and work methods. Good solutions to most of these issues can already be found in the country. The challenge today, is rather to ensure that all actors are applying the very best work methods in their respective projects.

A standardised system will also allow the government to coordinate all training carried out within the framework of rural road construction and maintenance. With a programme with standardised procedures and work methods, it will be possible to provide a uniform training programme which can service the demands of all projects.

Finally, it should be mentioned that these efforts will streamline and improve the efficiency of the overall management and monitoring of rural road works in Lao PDR. It may also streamline project negotiations between the government and donors when a standard mode of implementation has been established. Negotiations with donors can then concentrate on which part of a national rural road works programme they wish to support (geographical area or activity, i.e. training, technical assistance, equipment, physical works, etc.).

The Government has now decided to establish a coordinating body in MCTPC, the Rural Development Committee, covering all rural development activities which fall under the responsibility of this ministry. Although, the details of this organisation remains still to be formulated, the main features are currently being formulated. It will have a status equivalent to a Department in MCTPC, and its Director will report directly to the Minister. At this stage, its organisation will feature the sections and functions as described in Figure 8.1.

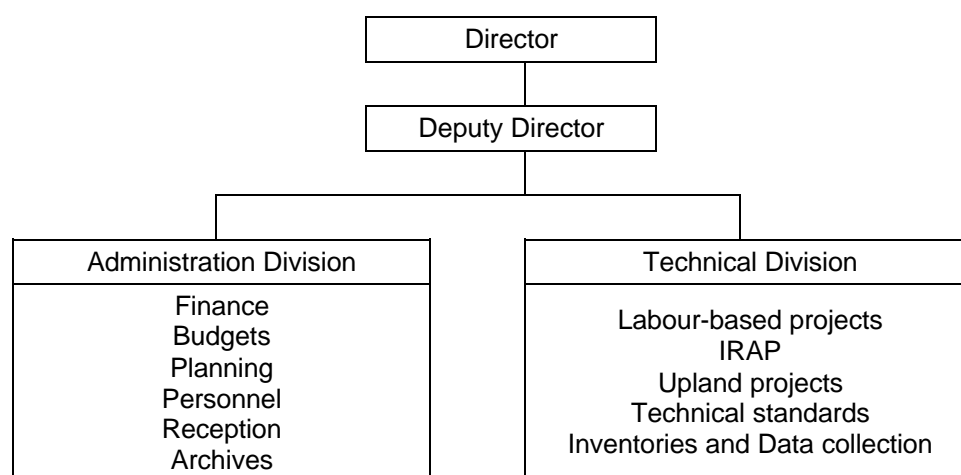


Figure 8.1 Rural Development Committee, MCTPC

8.1.2 Province Organisations

Rural road works, including construction and maintenance of both provincial and local roads is the responsibility of the provincial departments of MCTPC. At provincial level it is important to clearly identify the various actors and their respective roles and responsibilities. Once the local institutions which will be involved have been identified, it is possible to make a detailed assessment of their current capacity and prepare a detailed staffing and training needs assessment (ref. Chapter 9) which will form the basis for future training programmes, thereby ensuring that each of the local parties will fulfil its operational responsibilities. In this context, the following major players can be identified:

- (i) The client, i.e. the owner/provider of the infrastructure - in the case of rural roads, the client has been identified as the Government, represented by the provincial authorities and its representatives, with the MCTPC provincial technical departments providing engineering and

supervision services.

- (ii) The private construction industry through local small-scale and petty contractors who should play a major role in the execution of works.

The three above mentioned players are responsible for carrying out four major activities:

- o planning and estimating of works,
- o supervision of works,
- o execution of works, and
- o certification and payment of works.

(i) The Client

An important role of the client will be to prepare road network plans which includes clear linkages to the existing road network showing the physical connections to the various classes of roads existing in the area which are in a passable condition.

Another important task of the client will be the management of contractors and to ensure timely payment of executed works. In the case of small-scale contractors relying on a large labour-force it will be vital for their success participation that they are paid regularly and on time. This implies that the client will need efficient financial procedures which enable them to process payments for works in a regular and prompt manner.

The DCTPC staff requirements *in each province*, for taking care of the clients interest and obligations when contracts are awarded to the contractors, are described in Figure 8.2. This organisation caters for the management and supervision of both road rehabilitation and maintenance contracts.

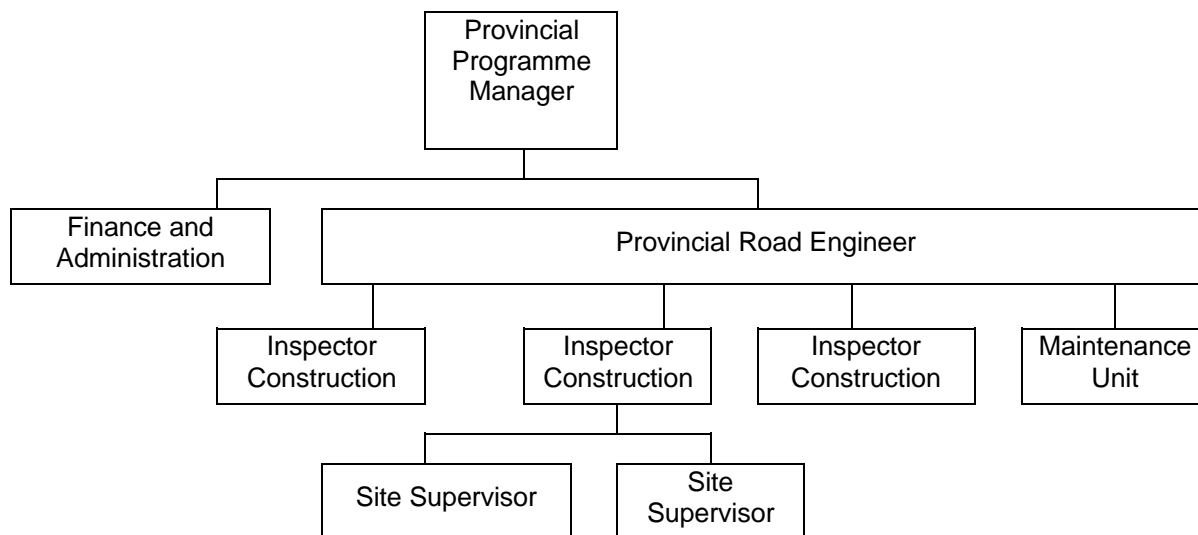


Figure 8.2 Organisation for DCTPC Road Sections

Considering the magnitude of the envisaged work programmes, it is important that the management positions described in the above organigram are filled with existing staff from the provincial government which have sufficient authority as well as experience. In this respect, it is recommended that the position of Provincial Road Engineer is filled by the DCTPC Director or Deputy Director. This would imply that the Programme Manager position should be held by one of the Deputy Governors. Finally, it is important that the Inspector positions are filled by experienced engineers

who are sufficiently competent to carry out the daily supervision of private contractors executing the road works.

(ii) Private Sector

The type of road works envisaged to be carried out can be grouped into two main categories according to the size of works, requiring contractors with two different profiles:

- (a) small-scale contractors carrying out new construction and periodic maintenance of rural roads, and
- (b) petty contractors providing routine maintenance organised as a lengthman system.

It is proposed that the envisaged labour-based road rehabilitation contractors are equipped adequately to execute a monthly production of 1.5 - 2.0 km of completed gravelled roads. This would require an average labour-force of approximately 200 unskilled casual workers. In order to manage an operation of this magnitude, it is estimated that the firms will need the management staff as described in Figure 8.3.

Each contractor should ideally possess the services of a graduate engineer in his management team for the overall technical supervision and management of contracts. This may be the contractor himself or a person employed by him. The on-site manager should at least be a person with a formal training to technician level. For the direct supervision of works, the contractor will need a minimum of three foremen. Furthermore, the contractors should be required to employ a qualified mechanic and book-keeper for his support services.

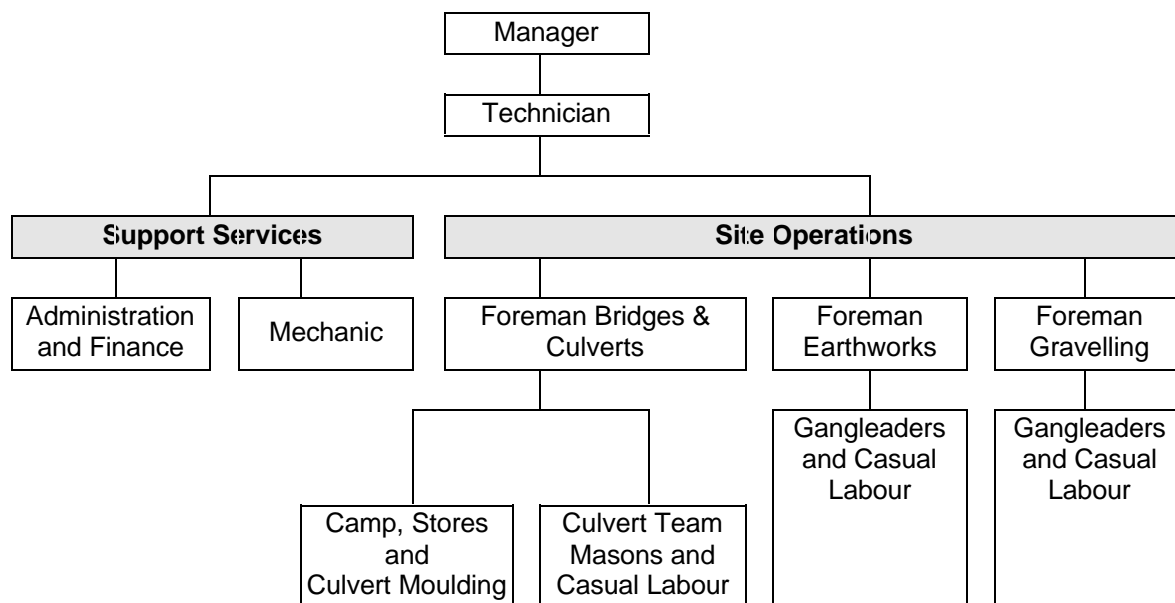


Figure 8.3 Organisation for a Road Construction and Rehabilitation Contractor

Figure 8.3 shows the minimum staff requirements which the contractors need to provide before they can qualify as a labour-based road rehabilitation contractor. If the firms wish to appoint staff with higher qualifications, this should be regarded as an advantage during the selection of the initial batch of contractors. It should be noted that the qualified contracting firms should be required to recruit this staff before commencement of a training programme since this staff will be part of the core target for the training.

8.1.3 Rural Road Maintenance

As mentioned in Chapter 6, very little consideration has so far been given to maintenance of the rural road network. Considering the poor state of the rural roads, it may be argued that this is not the most critical issue, and that the current demand is rather to upgrade and expand the network so it effectively serves the majority of the rural areas throughout the year. However, this being acknowledged, it is important that an effective organisation is in place to cater for increased road maintenance demands when the rural road network is expanded and upgraded.

The often suggested strategy for maintenance of rural roads is to involve the beneficiaries in the maintenance of assets. The economic condition of the populace in the provinces is such that voluntary labour input will be difficult to mobilise. In any case, it is not a sustainable solution and is generally not recommended.

It is also not practical to collect any road user fees nor does the vehicular traffic justify such a levy. It is unlikely that the vehicular traffic on rural roads will ever reach a level in the foreseeable future as to warrant such a levy. Studies have shown that the cost of collection of tolls breaks even at average daily traffic of 250 - 300 vehicles only, and to have any significant revenue, the traffic required is of the order of 500 vehicles per day. The concept of road user fees is not applicable to rural roads except indirectly through increased gasoline prices or from other sources. Hence, the total maintenance costs would initially need to be borne by the recurrent budgetary allocations catered for accordingly.

A whole new system therefore needs to be established at the DCTPCs equipped with management, skills, staff, equipment and operating funds to carry out regular and effective maintenance of the rehabilitated assets. To develop such a system, and to make it operational on a sustained basis, will need time, training and most important adequate, regular and assured allocation of maintenance funding.

For this purpose, funds for maintenance of the rural roads rehabilitated under a donor funded programme, should be considered already during the planning stage. This will ensure that the created assets are adequately preserved and serve the purpose that was meant to be served, both in terms of economic and social benefits, and that the assets created are not allowed to deteriorate by default.

Regular supervision of a dispersed operation like road maintenance is feasible only if a supervisor is mobile. Contracts should specify the stretch of road to be maintained, activities to be performed, the inspection and payment frequency and the payment. The payment must be linked with satisfactory completion of all the maintenance tasks involved. Labour only (petty) contractors could be developed to take responsibility for several lengthmen, thus reducing the administrative burden.

Responsible supervisors would need to be appointed to supervise the conduct of road maintenance works. Their duties would be to instruct the contractors, to issue and account for tools and materials, to inspect all roads in their jurisdiction at regular intervals to ensure that maintenance works are done properly, to keep pay rolls and accounts, and pay the contractors.

Maintenance Management

Accordingly, at the DCTPCs, road maintenance units would need to be organised to carry out the following functions:

- (i) Regular inspection of the road sections and effective supervision of routine maintenance contracts by lengthmen, their output and quality.
- (ii) Arrange procurement and supply of adequate quantities of repair materials, where and when required.
- (iii) Regular inspection (condition survey), maintenance planning, and immediate response to any emergency and unforeseen work requirement.

- (iv) Conduct of regular recurrent and periodic maintenance activities, necessary budgeting, funds allocation and financial management.
- (v) Preparation of contract documents, bill of quantities and cost estimation, inviting bids and award of maintenance contracts.
- (vi) Construction supervision and management of contracts for recurrent and periodic maintenance works done through private small-scale contractors.

The maintenance units would need to be organised and staffed accordingly. The staff concerned would need to be trained to organise, conduct, control and monitor the above stated maintenance works and activities accordingly.

Maintenance Organisation

The provincial government is currently not organised, staffed, trained or has the necessary resources to carry out maintenance of roads, nor is maintenance being done.

The suggested maintenance set up, for rural roads should be on the following lines:

- (i) DCTPC is responsible for prioritisation planning, information systems and overall monitoring.
- (ii) DCTPC is responsible for general planning, procurement of services, regular inspection and reporting (which is the basis of a maintenance system), and detailed supervision and monitoring of the maintenance activities.
- (iii) Private contractors (after their training and development) should handle the routine and periodic maintenance activities.
- (iv) A labour-based lengthman system is used through petty contractors for the routine maintenance activities.
- (v) Establishment of a suitable maintenance unit at the DCTPC, with an engineer charged with the exclusive responsibility of maintenance of all rural roads in the province.
- (vi) Use of labour-based methods for maintenance of rural roads is a must. It is a means to encourage community participation through the petty contractor development.

It is important to organise preventive maintenance starting as soon as rehabilitation works on a particular road section have been completed.

However, to ensure a sustainable maintenance system, adequate financial resources will have to be provided to the provinces exclusively for maintenance, to enable the maintenance unit to effectively operate in the future.

Maintenance Unit

In each of the DCTPCs, a maintenance unit would need to be established. This unit would be responsible for maintenance management of all roads in the province. The staff in this unit will need to be trained in road maintenance management functions and respective responsibilities.

However, regular, adequate and timely availability of funds is a pre-requisite for the maintenance unit to function. The process of budgeting and appropriate financial procedures and controls would need to be introduced.

To carry out all the above stipulated functions and responsibilities, the proposed *Maintenance Unit* would need to have the following staff:

- o Maintenance Supervisors - to check the work of the contractors and ensure correct conduct of the maintenance works, regular inspection, checking and reporting on road condition for planning of new maintenance activities.

- o Contracts Manager - to prepare cost estimates, contract documents and process award of contracts for special, recurrent and periodic maintenance activities.
- o Finance Officer - to process all payments, keep proper accounts, process budgetary allocation and exercise financial control on behalf of the Provincial Government.
- o Administrative staff - necessary administrative and support staff is allotted to the unit for its efficient functioning.

Tasks of the Maintenance Unit

Inventory: recording the list of roads and basic characteristics of each section of the road network.

Inspection: examining the road section and measuring and recording its condition.

Determination of maintenance requirements: analysing effects, their causes; and specifying what maintenance activities are needed to rectify them and delay any further deterioration.

Resource estimation: costing the needed maintenance activities in order to define an overall budget.

Identification of priorities: deciding the work that has to take precedence if resources are limited.

Work scheduling and implementation: timing and controlling the work implementation.

Monitoring: checking the quality, its progress and effectiveness of the work.

The key to the management of maintenance activities is the competence of its technical staff to carry out the assigned duties. A number of trained work supervisors will be needed.

Technical assistance would be needed in different areas both in order to (i) provide the selected staff with sufficient competence to carry out the functions expected from them in the maintenance set up, and (ii) assist the DCTPCs in the mean time in carrying out those functions and provide on-the-job training.

8.2 Budgeting and Cash Flow

8.2.1 The Current Budgeting Process

The total annual budget for the MCTPC including the provinces is prepared and compiled by the Planning Division of the General Administration Department. The main steps of the process are as follows:

1 January	Follow-up of previous year's budget and start preparation of directives for next annual budget.
1 March	MCTPC sends out directives to its departments and provincial DCTPCs for the preparation of the long term plan and the annual budget.
1 June	MCTPC departments and provincial DCTPCs submits proposals for short and long term planning to the Ministry.
1 July	MCTPC submits the draft budget for the coming year to the State Planning Committee (SPC).
1 August	SPC provides comments to the MCTPC draft budget proposal, including expected ceiling amounts for the coming year.
1 September	MCTPC submits the final draft annual budget to SPC.

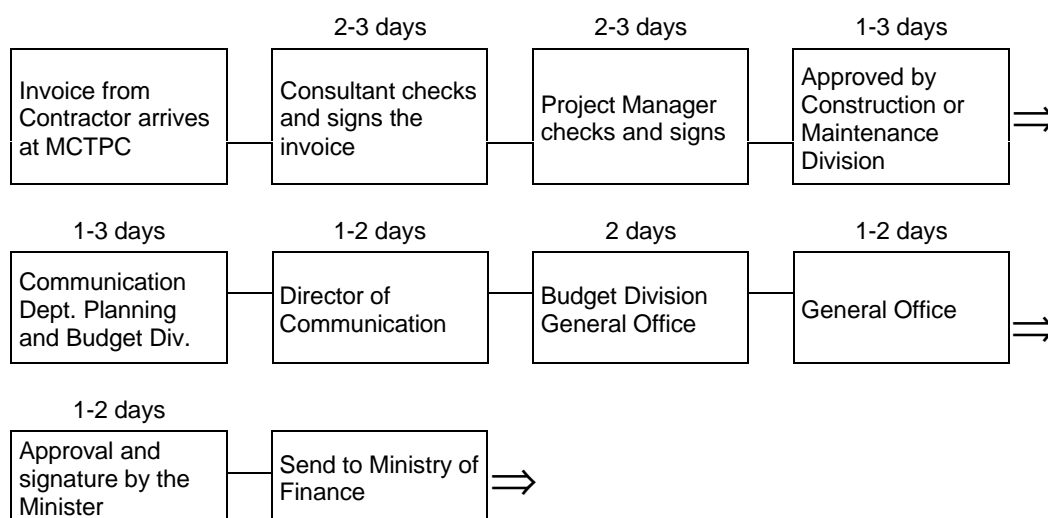
During June, there is a budget dialogue, chaired by the Minister of MCTPC and involving all the heads of departments and DCTPCs, in which the government directives are elaborated and the budget proposals are discussed. At the same time, SPC arranges similar activities in the provinces in order to co-ordinate the budget proposals for different sectors of the economy.

A decision on the budget is made by the National Assembly before the beginning of the new fiscal year, 1 October. Shortly thereafter, the decision is submitted in writing to the concerned ministries.

8.2.2 Finance and Cash Flow

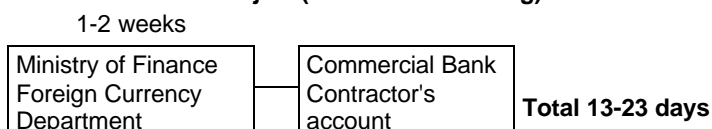
Once the annual budget has been decided upon, the corresponding finance procedures and cash flow concerning provincial road projects run directly between the Ministry of Finance, and the provincial DCTPCs. Thus, the MCTPC headquarters are not involved in the payment process.

The general principle for financing road sector activities is payment from a Treasury account (local funds) or a foreign account (owned by a donor agency or development bank) according to an invoice which must be approved by the appropriate authorities in MCTPC and Ministry of Finance (MoF).

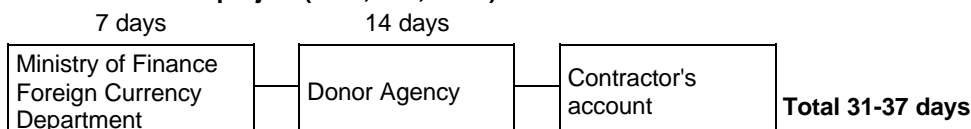


Alternative A: Foreign Currency Fund

A1: Maintenance Project (ADB or IDA funding)



A2: Construction project (ADB, IDA, SIDA)



Alternative B: Local funds

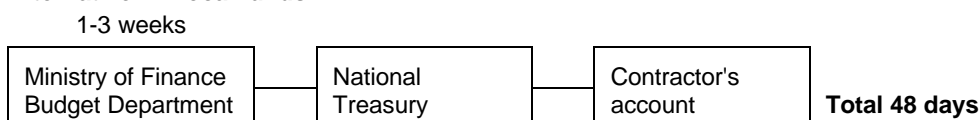


Figure 8.4 Schedule for handling of invoices for road works contracts

Figure 8.4 shows the normal procedure for handling an invoice up to payment, including lead times concerning road works within the responsibility of MCTPC. Payment delays concerning works done

by international contractors are normally penalised through an extra fee on top of the unpaid invoice amount (% of the amount). The use of penalties has resulted in more timely payments than during previous years, but local contracts do not follow such practice. Therefore, payments of invoices in local currency are still delayed or paid only in part.

Payments to local contractors on externally funded projects are made through the BCEL (Banque Commercial Extérieur du Laos) in Vientiane to the contractor's account in a local bank. When the projects are funded entirely by local revenue, the invoices from the contractor are paid out directly from the Finance Division of the DCTPC.

It is admitted that payment delays are quite frequent and that local contractors often call to demand more timely payments. Waiting for many days to get signatures by some of the staff responsible for different steps of the invoice handling process (ref. Figure 8.4) is quite common. If some detail is wrong in the set of documents, and this is detected at a late stage during the checking and signing process, the whole file is returned to the project manager who has to contact the Contractor and ask for a new invoice. Previously, corrections of minor errors with a red pen were allowed but this is no longer permitted. As a result of the present strict rules, contractors sometimes have to wait up to three months before receiving payment.

8.2.3 Development Needs

The average total rehabilitation and construction costs have been estimated at US\$ 15,000:- per kilometre (ref. Section 5.4). If this work is bundled into contracts of 5 to 10 km, it is evident that efficient and transparent contracts management and reporting procedures are required. Furthermore, due to the increased work load, the DCTPCs needs to increase their general supervision budgets (to cover costs such as transport, travel allowances, administration, etc.). Based on the ILO labour-based project, this is estimated at 10% of the overall construction costs.

The contracts management procedures described in Figure 8.4 have been developed mainly for larger road works contracts with a selected few large size construction firms carrying out rehabilitation works on the trunk road network. For a rural road works programme, involving smaller contracting firms and smaller but more numerous and scattered contracts, the requirements of a contracts management system will be different and therefore new procedures will need to be developed and introduced into the system.

The ultimate situation should be for the funds for rural road works to be channelled in advance from central level through to the provinces. This arrangement already exists to some extent for maintenance funds. As a principle, initial systems and procedures should therefore attempt to respond to this and build on what already exists (however rudimentary).

Funds should be directed to and controlled by the provincial authorities as they would be expected to manage and supervise future improvement of the rural roads. This implies that contracts should be managed at provincial level and that funds are at disposal for payment of works through local banks in the provinces. A solution could be to provide an advance transfer of funds from central level to the provinces, based on the agreed annual rural road works programme. Based on progress and expenditure reports from the provinces, the funds could be replenished on a quarterly basis. At central level, the Rural Development Committee would monitor the physical progress of works, and based on this information advise the finance authorities on the advance disbursement of further funds to the provincial departments of finance, thereby ensuring a healthy cash flow to the provinces and avoiding any disruptions of works progress.

When donors are involved in financing rural road works, separate budget lines and accounts should be established, thereby ensuring that expenditure financed from external assistance can be monitored separately.

For this situation to be realised efficiently, there is a demand for strengthening the capacity of the provincial departments of both the Ministry of Finance as well as the DCTPCs in order for them to take on this increased responsibility.

8.3 Reporting and Monitoring

8.3.1 Current Situation

At the moment there are no standard reporting formats for project monitoring in MCTPC. Each project manager makes his own standard report every week, month, etc. For projects assisted by foreign consultants, the normal procedure is just to translate the consultants' reports to the donor agency into Lao. Since the donors all have different reporting formats, the result is that a variety of formats are currently being used in MCTPC.

This creates one fundamental problem, which is that it makes comparison of project productivities impossible. A uniform reporting system should be developed and established in all the provinces as a Lao standard reporting system for rural road works.

The reporting formats should meet the requirements of the donors but also fit into the longer term reporting needs of the Ministry. In a brief and concise manner the reports should present feed-back and work results in measurable terms, providing information in terms of km of road works completed, expenditure, and number of labour employed.

It appears quite sufficient for central level to receive monthly reports, whereas weekly reports is justified at provincial level from the work sites to the DCTPCs.

8.3.2 Outline of a Reporting System

Weekly reports

Brief weekly reports on the physical work progress, use of labour, materials, tools and equipment and costs from the construction sites and any outstanding problems are needed from the site management to the provincial office of DCTPC. These reports should form an important part of the management system in the DCTPCs.

Monthly reports

Each sub-project, separate contract activity or training component should be reported on a monthly basis. The information should be compiled into one report from each province, which should be prepared by the provincial programme managers, assisted by technical assistance staff. The reports should be delivered to the Rural Development Committee in MCTPC, the provincial administration and the DPC not later than the 10th. of each month. The Rural Development Committee in MCTPC should then compile a summary report on the same main issues including an executive summary to be submitted to the Director of the Communication Department. The reports should cover the following areas:

(i) Programme Organisation

- o Establishment (local staff, end of previous month)
- o Technical assistance staff

(ii) Road Works

- o Volumes/amounts of new road, spot improvement, rehabilitation and maintenance works completed last month and accumulated
- o Major problems (technical, managerial, environmental, etc.) encountered and suggested action
- o Plan for the following month

(iii) Training

- o Completed, ongoing and planned courses, study visits, etc.
- o Number of staff in training and completed

(iv) Rural Road Planning

- o Completed, ongoing and planned activities

(v) Staff

- o Staff recruitment, discharges, transfers, promotions, etc.
- o Disciplinary problems (confidential)
- o Workers' safety (accidents, protection measures, etc.)
- o Gender issues

(vi) Equipment & Other Facilities

- o Achievements last month
- o Availability

(vii) Finance

- o Expenditure last month and accumulated, as compared to budget
- o Status of cash flow, etc.

(viii) Management systems and procedures

- o Achievements compared to plans

Quarterly Reports

Quarterly reports should be based on the format of the monthly reports, using aggregated data from previous quarter.

8.3.3 Auditing

There is a Control Division in the General Office which carries out auditing of project management and enterprises in the communication and transport sectors.

They focus on activities financed by Government funds in all the departments of MCTPC as well as in the DCTPCs. The auditing is legal, fiscal and contractual. The staff seems to be qualified and experienced in their field, and have sometimes been quite successful in revealing inaccuracies. Their capacity should be utilised for instance during the selection of contractors for the rural road construction and maintenance projects (pre-auditing), as well as performing normal auditing according to current regulations.

Chapter 9 Training

9.1 Overview

Training in labour-based technology needs to be provided at several levels to disseminate and sustain labour-based road works technology in Lao PDR. The most immediate demand will be to provide training to the current actors in the road sector and in particular to the institutions which is expected to be involved in future rural road works programmes, i.e. the provincial road authorities and domestic small-scale contractors. In addition, a more limited training programme is needed for managers, decision makers and planners involved in rural infrastructure development.

To sustain the technology in the country on a long term basis, labour-based construction and maintenance technology should be integrated into the regular training courses provided by the university, technical colleges, and the in-house training facilities of the MCTPC.

A larger-scale application of labour-based technology in the country would also require an appropriate research capacity, preferably in conjunction with a training institution.

The CTC currently runs long-term courses in road construction and maintenance for the supervisory staff and short-term courses on various topics, including training of trainers courses. The Centre is well equipped in terms of teachers and teaching aids. Through its cooperation with labour-based projects, such as the ILO and ADB projects, the CTC has built up a considerable capacity in the field of labour-based road works technology.

However, if labour-based road works technology will be used on a large scale in the future, the capacity of CTC needs to be expanded. In a large programme, training is a continuous activity, which requires training staff and related resources committed to the programme on a permanent basis.

Furthermore, if the local contracting industry is to be involved in a future programme, there will be a demand for training in additional subjects such as contracts management for government staff and business management for contractors.

Training and education in labour-based technology at the higher learning institutions in the country is also an important aspect. The School of Communication and Transport (SCT) in Savannakhet provides a three year training programme for road supervisors. The ILO project has given students and teachers at the branch of the SCT in Savannakhet some training and initial exposure to the technology. The School has recently expressed an interest in including labour-based methods in its regular courses.

The ILO has started discussions with SCT in Vientiane and the National Polytechnic Institute on the integration of new elements covering labour-based road works technology in their courses. Through an inter-regional project funded by SIDA, the ILO is in a position to support training institutions which are interested in incorporating labour-based technology in their course curricula.

9.2 Training for a Nation-wide Programme

The training programme described in this section defines a general model which has been successfully applied in other rural infrastructure development programmes where domestic small-scale contractors have been involved, using labour-based works technology.

Training is generally accepted as an important component in any capacity building programme. However, for it to become effective, it is important that the training provided, is purpose-oriented and address subjects which are relevant to the duties and responsibilities of the various cadres of staff. This training programme focuses on practical skill training in the expected work environment of all

the involved parties, covering both staff from the private contractors as well as from the government agencies at both provincial and central level.

9.2.1 Training Needs Assessment

Before commencing a training programme, it is important to first establish the organisation required in the public and private sector to carry out a rural road works programme. The next step, will then be to physically identify this staff and study their current capacity and compare it with the future performance requirements as defined in the programme organisation.

When private contractors are involved, a similar exercise needs to be carried out among the candidate firms, expected to participate in the programme. In this respect, the first step will be to carry out a detailed survey of contractors available and preferably operating in the programme areas. Chapter 8 describes the organisation and staff requirements, necessary to implement a rural road works programme in the provinces using labour-based methods.

Through interviews with the contractors' and government staff can their past experience as well as formal training background be identified. The detailed content and extent of a training programme will therefore only be finalised once the final screening and selection of participating contracting firms have been carried out. However, at this stage it is possible to identify the main topics which needs to be included in a future training programme (see Tables 9.2 and 9.3).

9.2.1 Training Strategy

The training should concentrate on skills development specially required for the planning, execution and supervision of the envisaged road rehabilitation and maintenance works. Training would therefore include both government staff and personnel from the contracting firms, ranging from general management to plant operators, mechanics, store keepers and site supervisory staff.

The objectives of a training programme would be to:

- o Create a capacity within the government to plan, manage and supervise road works carried out by local contractors using labour-based methods;
- o Establish a cadre of domestic small-scale contractors capable of undertaking road rehabilitation and maintenance works using labour-based methods. This implies that the firms are fully conversant with the technology, contract management, business administration and supervision of labour, machines and materials;
- o Establish a local capacity for training government and private sector staff in the use of labour-based rural infrastructure rehabilitation and maintenance technology.

In order to achieve the above objectives training should be provided to:

- (a) DCTPC technical staff including engineers, planners, technicians, supervisors and contracts administrative staff,
- (b) DCTPC and DPC management staff including senior engineers, planners and coordinators,
- (c) contractors' staff from managers, engineers, supervisors, clerks, mechanics to plant operators, and
- (d) representatives of the local communities, policy makers, planners and administrators.

The training should be target oriented and meet the performance requirements of each category of staff. Table 6.1 provides a brief summary of the training needs, describing the formal education required, skills to be acquired and necessary training for some of the key personnel participating in a future rural road works programme.

Position	Duties and Background Education	Skill Requirements	Training
Provincial Engineer Contractor Engineer Technicians	Duties: Responsible for planning and implementation of major road works Background Education: NPI or High Level SCT	Be able to effectively plan, manage and monitor large scale road works programmes, and provide on-the-job training and instruction to subordinates	<ul style="list-style-type: none"> ◦ Labour-based road works technology ◦ Contracts Management ◦ English ◦ Training of Trainers Course ◦ On-the-job training through TA ◦ Computer training
Supervisors	Duties: Responsible for road works sites Background Education: Medium or High Level SCT	Be able to independently plan and manage a road works site and to provide instruction and supervision to local contractors	<ul style="list-style-type: none"> ◦ Labour-based road works technology ◦ Equipment Operation and Maintenance ◦ Contracts Management ◦ English ◦ On-the-job training through TA
Foremen	Duties: Responsible for a group of workers carrying out a certain site operation. Background Education: Medium Level SCT or Secondary School	Be able to manage the various work operations on a road site and command a group of 50 workers	<ul style="list-style-type: none"> ◦ Labour-based road works technology ◦ Equipment Operation and Maintenance ◦ English ◦ On-the-job training through TA and supervisors

Table 6.1 Skills and Training Requirements

The training for the various categories of staff should be carried out with varying durations and through different approaches, such as on-site and classroom training, workshops, seminars and study tours.

9.2.2 Training Methods

(i) On the Job Training

It has been proved over the years in a number of countries that on-the-job training is the most effective tool for training most categories of government and contractor's staff. Training of technical staff should therefore be carried out through demonstration and practice at full-size training sites. This approach can be used for managers, engineers, inspectors, supervisors, foremen and machine operators with the on-site training being supported by classroom components tailored for the various categories of staff.

(ii) Short Courses

Intensive refresher courses for periods of one to two weeks should be organised to supplement on-the-job training for some of the technical staff. The training programme should also include independent courses for other staff categories such as storekeepers, accountants, pay clerks and administrative staff.

(iii) Seminars

Seminars is an efficient method for dissemination of data and information, in particular to senior government officials at central and provincial level, as well as representatives for other government agencies, donors and the private sector. Thus, seminars are a useful platform for policy makers, planners and administrators to review the implications of using labour-based methods and to enhance the domestic private sector participation in rural road rehabilitation and maintenance works. The physical work outputs may also have implications for other parts of the road network as well as other sectors.

(iv) Study Tours

Visits to similar but more advanced programmes in other countries can be very stimulating and inspiring for managers, engineers and trainers. It is therefore proposed to organise study trips to ongoing rural road construction and maintenance programmes in the region (i.e. Cambodia and China) as well as to Africa where domestic contractors have been trained in the use of labour-based methods (e.g. Ghana and Lesotho).

(v) International Courses

To strengthen the capacity as well as to motivate the provincial engineers and technicians, it is recommended that selected government staff are sent for further training in the management of labour-based road construction and maintenance at Kisii Training School in Kenya. These courses, organised and supported by the ILO and the Swiss Development Cooperation in collaboration with the Ministry of Public Works in Kenya, are aimed at improving the efficiency of the management of labour-based road projects, introducing the participants to latest information and techniques for the effective use of labour and other local resources, drawing upon the experience from ongoing projects worldwide.

9.3 Curricula

The training package should consist of the following four major elements:

(i) Labour-based Road Construction and Maintenance Technology

This topic would constitute the major part of a training programme. Labour-based methods will be a complete new topic for the majority of the trainees, however, during this training it will also be necessary to review basic road works technology which does not necessarily relate to any specific work method.

This training should be provided to both government and contractors' staff. It is equally important that planners, supervisors and the management staff in Government are fully conversant with the technology. The curricula on labour-based road rehabilitation works would cover the subjects as outlined in Table 9.2.

(ii) Business and Contracts Management

One of the objectives of a future programme should be to further develop the contractors to enable them to manage contracts, which may be of a larger size than the works they have previously carried out. In order to achieve this goal, the contractors will not only require training in road works technology, but also in general management subject related to the daily running of a construction company.

It is therefore proposed that the small-scale contractors are offered short-courses in essential aspects of management such as pricing and bidding, book-keeping, accounting, marketing, office work and planning. This training component will be offered to the various cadres of staff as outlined in Table 9.3.

Equally, government staff needs further training in contracts preparation and management in order to effectively fulfil its obligations responsibilities.

(iii) Operation and Maintenance of Equipment

The small-scale contractors needs to acquire a certain amount of light construction equipment and hand tools to effectively carry out works to established standards. To ensure that the equipment is not misused and quickly fall into disrepair, their mechanics and operators will require proper training in preventive maintenance and correct use of the equipment, and the managers will need instruction in efficient equipment utilisation and economics.

(iv) English

To facilitate collaboration between foreign technical assistance teams and local staff, English language training should be provided to government counterpart staff as well as key staff from the contractor firms. This training can be sub-contracted to local institutions/capacities.

Subject	Contents	Trainees
Planning	how a labour-based road works programme is planned at different levels, discusses the planning responsibilities of the various levels of staff, work plans, organising site camps, planning of tools and equipment, and the hiring and organisation of casual labour	Contractor Managers, Technicians and Supervisors, Provincial Engineers and Site Inspectors
Reporting and Control	administrative control of a work site, production control and quality control	Contractor Engineers, Technicians and Supervisors, Provincial Engineers and Site Inspectors
Work Organisation	sequence of labour-based work activities, gang balancing, instruction and motivation of labourers	Contractor Engineers, Technicians and Supervisors and Site Inspectors
Tools and Equipment	selecting appropriate tools and equipment, how it is handled, its use and maintenance and the role of the store-keeper	Contractor Engineers, Technicians and Supervisors, Plant Operators, Storekeepers Provincial Engineers and Inspectors
Survey and Setting Out	setting out horizontal and vertical alignments, cross sections, curves and how to use various setting out equipment such as profile boards, templates, string line levels etc.	Contractor Engineers, Technicians and Supervisors, Provincial Engineers and Inspectors
Clearing	clearing the alignment of vegetation and boulders	Contractor Engineers, Technicians and Supervisors Provincial Engineers and Inspectors
Drainage	the vital importance of a well functioning drainage, how to construct side and mitre drains, camber, catchwater drains, scour checks, and culverts	Contractor Engineers, Technicians and Supervisors, Provincial Engineers and Inspectors
Earthworks	how to measure and estimate earth works done by labour, the organisation of excavation, levelling, hauling, loading, unloading, filling and spreading, compaction and erosion control	Contractor Engineers, Technicians and Supervisors, Provincial Engineers and Inspectors
Compaction	presents simple soil mechanics, optimum moisture content, indirect compaction, direct compaction and the use of hand rammers, deadweight and vibrating compaction	Contractor Engineers, Technicians and Supervisors, Provincial Engineers and Inspectors
Gravelling	how to organise gravelling operations, and testing of gravel quality	Contractor Engineers, Technicians and Supervisors, Provincial Engineers and Inspectors
Maintenance	the organisation and implementation of the various activities on labour-based routine, periodic and emergency road maintenance, and the required tools and equipment	Contractor Engineers, Technicians and Supervisors, Provincial Engineers and Inspectors
Structures	construction and maintenance of small bridges, drifts, causeways, culverts and box culverts	Contractor Engineers, Technicians and Supervisors, Provincial Engineers and Inspectors

Table 9.2 Labour-based Road Works Technology

Subject	Contents	Trainees
Business Management	bookkeeping, profits, budgeting, cost control, cash flow planning, material purchase, personnel management, banking, taxes, labour regulations	Contractor Managers and clerks
Contract Management	bidding and submission, unit rates, estimating, tender preparation, contract documents, contract variations, claims, payments	Contractor Managers, Technicians and clerks
Contract Supervision	contract conditions, submission and tendering, contract variations, claims, payments, work inspection, contract administration	Provincial Engineers and Inspectors

Table 9.3 Business and Contracts Management

9.4 Training Facilities

Training should be executed through a combination of class-room and on-site training. For this purpose, it is important to establish class-room training facilities and a demonstration site in close proximity to each other. The training location will require easy access to catering and accommodation facilities for trainees, lecturers, instructors as well as for visitors. The training centre together with the demonstration site would also be an essential asset for promoting the programme and its technology and approach amongst donors as well as other government institutions.

The demonstration site should be fully equipped with the same type of hand tools and light equipment with which the envisaged road works is carried out. In addition, the classroom facilities needs to be equipped with training aids such as overhead projectors, slide projectors, video equipment, training manuals, flip charts, black boards, etc. For the development and production of training materials the training centre requires personal computers with good printing facilities, a photocopier and a stenciller.

9.5 Training Materials

The technical/training manuals covering labour-based road works technology in Lao PDR have been developed to cover the essential needs of past and currently on-going projects. It is important that in a future training programme that these documents are upgraded and adopted to the further development of work methods and organisation.

An important source of information, in this respect, is all the training materials developed under similar contractor development programmes in other countries (e.g. Cambodia, Lesotho, Ghana and Uganda). The Technical Enquiry Service of the ILO in Nairobi, Kenya can provide a vast collection of additional literature already developed by these programmes.

9.6 Collaboration with Local Training Institutions

In order to achieve a sustainable programme, it is crucial that the training capacity for this type of programme is fully institutionalised in the country. To achieve this goal, there is a demand for a structured plan for the involvement of local trainers.

From the onset of training, a number of government engineers, technicians and supervisors should be permanently attached to the training site. They should be trained to gradually take over responsibility for the training from foreign training specialists, and cater for a future expansion of labour-based road

works technology. This will ensure that, once the training material and the first training programme has been conducted, it should be possible for the government, with minor external assistance, to take the lead in conducting further courses.

There are three training institutions in the country which currently provide training related to road works technology, namely the Communication Training Centre in MCTPC, the School of Communication and Transport and the National Polytechnic Institute.

With a shift of road works activities from the national to rural roads, it is important that these institutions respond the new type of works and consecutive training requirements.

Communication Training Centre

For the immediate training demands it is logical that MCTPC's own training resources are involved.

During previous labour-based training courses arranged in collaboration with ILO and other projects, the Communication Training Centre (CTC) has provided valuable assistance in terms of preparing and conducting courses. Through this involvement, CTC and its trainers have established a considerable experience in organising and conducting training in labour-based road construction and maintenance technology as well as developing training materials and courses. It is therefore proposed that CTC is fully involved in all the training activities in a future programme. By doing so, the training capacity can be fully institutionalised and sustained within a local organisation.

The business management training could be carried out together with a local capacity within this field (i.e. local consultant, bank, university, etc.). Possible collaborators in this field still needs to be further explored before a large scale programme commences.

9.7 Long-term Training

Labour-based methods is a technology which should not be regarded in isolation and only applied in special programmes to satisfy special social concerns or specific interests of the donor community. The task of determining the most appropriate technology to carry out certain civil construction works has always been an important task of technicians and engineers. As described in this report, in many cases the most appropriate technology may prove to be the use of labour-based methods. For this, it is important that the new generation of engineers and technicians in Lao PDR also learn about this technology at the same time as they are exposed to more traditional equipment-intensive work methods.

SCT and NPI are currently in the process of establishing a collaboration with ILO with the objective of creating an awareness among road and bridge engineering graduates of the principles, methods and benefits of labour-based technology as an alternative to conventional approaches. This will be carried out by (i) strengthening the capacity within SCT and NPI to provide training in labour-based road engineering and (ii) developing course materials and conducting training in labour-based technology in the existing road and bridge engineering courses.

Although this is a good first initiative in terms of introducing the technology in the higher training institutions of the country, it should be noted that the resources available are very limited and will probably be insufficient to fully achieve the stated objectives. It is therefore recommended that, when designing future training programmes for this sector, further assistance is provided to SCT and NPI in its efforts to incorporate labour-based technology in its engineering courses.

Chapter 10 Capacity Building

10.1 Objectives

Labour-based methods seem to provide a cost effective means to create assets whilst at the same time generating income and employment in the rural areas. The Government could therefore use the need for roads in the rural areas as a means to solve the problems of lack of disposable income. The income derived from such programmes could be used to stimulate the economy in the rural areas.

The overall objective of the Government is to improve the living conditions and economic opportunities of the people in the rural areas. Within the framework of this overall goal, however, more distinct and specific objectives can be derived for the actors in the road sector.

One is to effectively implement a set of road works interventions which will contribute to the improvement of the conditions of the people in the rural areas. The other is to develop the capacity in the MCTPC and the provincial government agencies to be able to effectively plan, design, manage and evaluate rural infrastructure works.

In terms of the development of the rural areas and the provision of economic opportunities, a rural road works programme can be designed to contribute to this objective through a series of interventions:

- o enhancing access to and from the rural areas,
- o providing direct income from the labour-based construction and maintenance of roads,
- o developing the local small-scale contracting industry, and
- o improving the efficiency of the Provincial government.

10.2 Programme Approach

If labour-based methods are to play a major part in the development of the rural road system then a framework has to be developed so that they can be used effectively. Clearly, the responsibility for this will fall on the MCTPC.

MCTPC has already set the basis for this by setting up a coordinating unit, the Rural Development Committee, whose mandate is to look at all aspects of rural road development. It will be necessary for this unit to set the example in relation to the development of the use of labour-based techniques. This would take the shape of preparing and disseminating guidelines on their application based primarily on the work in Lao PDR. Introductory workshops would need to be arranged for all the DCTPC and DPC to introduce them to the concepts and practice of the technology.

MCTPC could spell out in some detail which tasks and activities labour-based is appropriate for. It could draw together the existing knowledge on productivity and costs to provide a basis for informed choices on the appropriate technology.

In developing this capacity, the MCTPC would be building up its own capacity to define its own programmes. In this way it can present programmes to the donor community rather than having them proposed to it by external sources. The road programmes would then begin to be fully Lao, driven by demand rather than by the supply of funds.

Future rural road works programmes should be designed to develop capacity at headquarters and in the provincial departments by assisting them step by step through the process of the implementation of the interventions mentioned above. Experience from past programmes clearly show that this hands on approach is the most effective and sustainable way to develop capacity.

The key concept is that the local staff should learn by a combination of formal and on-the-job training. Technical assistance should be made available to provide advice, guidance and training to the local staff in all aspects of the implementation of the programme in order that they will be fully conversant with and capable of supervising and administering the programme in the future. In so doing, they will also actively participate in identifying constraints in the system in order that effective measures can be taken to rectify and improve the situation.

Improving access will provide the opportunity to improve the living conditions and economic situation in the rural areas. Developing the capacity of the government and the private sector will ensure that such programmes can be sustained in Lao PDR. The work of ILO and others, relating to labour-based road works technology, has mirrored that from other parts of the world. When sufficient attention is paid to managerial and organisational aspects, labour-based methods do produce roads which are of good quality and are inexpensive. The ILO has developed a basic system of training, organisation and administration which ensures that the potential of labour-based methods can be achieved. This, coupled with the results from the work in Lao PDR can be used to develop capacity in the MCTPC and the provinces.

10.3 The Development of Small Contractors

In future programmes, a significant proportion of the roads can be rehabilitated and maintained, using local small-scale contractors. This is very much in line with government policy and also is logical, given the limited capacity of the government agencies. The use of the private sector takes away some of the burden of responsibility for implementation. The experience of the ILO should be used to develop in each province, through on-the-job training, a cadre of contractors capable of effectively implementing the road works using labour-based technology. The focus of a future programme should be to continue with similar support as ILO has provided to the provinces, however, with the involvement of the private sector by developing small-scale contractors to execute works, while simultaneously building capacity within local government to manage contract works rather than operating force account units.

This will demand new skills being acquired by both groups since contractors can only survive by making profits and need to learn how to manage efficient construction in order to do so. For the government staff, the commercial world is one of legal contractual obligations, deadlines and work schedules and contractors looking for ways to maximise income and profit which may not always be compatible with proper construction standards.

For contractors, labour-based construction can only be really profitable if well organised and managed in terms of labour input and productivity, and for supervisors generally a higher level of inspection is required than for equipment-based work. For contracts managers, labour-based contracts are usually smaller and more numerous than those using equipment and thus the administrative workload is increased.

10.4 Strategy

The overall strategy for the capacity building should be one of process management, in the sense that assistance should be provided from within the Ministry to support and further develop the capacity and experience that already exists and assist their efforts in ensuring that works are carried out effectively by the provincial departments, thereby developing their capacity to replicate and maintain such programmes.

This approach is one in which foreign consultants and advisers would work with the agencies concerned. Solutions are derived through a process of both implementation and learning from that experience and from thorough discussion of each step of the process. The approach is concerned with developing a feeling of ownership of the techniques, methodologies and, eventually, the product that is being developed. This ownership applies not only to the government agencies involved in the

planning and design of the programme but also to the beneficiaries who will be involved in the production of the rural roads and will benefit from it.

Future consultants and advisers therefore need to adopt an approach of teamwork with the intended beneficiaries in order that the solutions relate to the needs of the beneficiaries and that there is a feeling of ownership for whatever solutions emerge from this participatory approach. Only in this way will the solutions become sustainable.

10.5 Need for Technical Assistance

Whilst the need for rural roads is dire, the capacity to plan, design, monitor and supervise construction and maintain the roads is limited in the provinces.

Key Elements to Capacity Building

- o build on existing capacity and experience
- o a flexible team-based approach to programme implementation
- o discussion and consensus rather than advice and instruction
- o use implementation to develop skills
- o defining and taking ownership of the responsibilities at all levels

It is therefore crucial that any rural road works programme place at least equal emphasis on the development of this capacity as compared with actual construction and rehabilitation works. Only in this way will (i) the investments made be sustainable and (ii) the provinces be able to further develop and maintain the road network. The strategy adopted by a future programme should therefore be one of developing capacity through implementation - learning by doing.

In the case of the development of the small contractors, technical assistance is initially required at a relatively concentrated level since there is a large component of training involved. Technical assistance to a future rural road works programme can thus be summarised as follows:

- o to assist and advise the government departments in the implementation of the road rehabilitation and maintenance programme,
- o to provide on-the-job training to provincial government staff on design, planning, contract management and daily supervision of the road rehabilitation and maintenance works using labour-based methods and utilising private sector contractors,
- o to train and develop local small-scale and petty contractors in road construction, rehabilitation and maintenance using labour-based technology, and
- o to ensure proper implementation of administrative and financial procedures to allow small-scale contractors to compete for and execute contracts effectively.

These major operations can be divided into activities which are required at central level and other activities which are more effectively carried out at local level.

10.5.1 Central Level

The main tasks at central level will be to coordinate, support and monitor the road work activities carried out in the provinces. This will mainly be the task of the Rural Development Committee. The support of technical assistance will be necessary to assist the Committee to:

- (a) Establish a capacity within the MCTPC and its provincial departments to plan, implement, and monitor rural road rehabilitation and maintenance works executed by domestic small-scale contractors using labour-based work methods.
- (b) Define the detailed organisational and administrative framework in which the programme is implemented.
- (c) Participate in the development, establishment and presentation of training courses and seminars on labour-based road construction and maintenance works.

- (d) Assist in the management and coordination of all programme inputs provided by the Government, donors and others, ensuring that the inputs are effectively used.
- (e) Liaise with donor agencies (e.g. ILO, SIDA, ADB, WB, KfW, etc.) and other technical assistance staff who may become involved with the programme to ensure a smooth and effective implementation of works.
- (f) Prepare work plans, implementation and material schedules and other programmes.
- (g) Prepare the technical specifications for all procurement of plant and equipment, tools, materials, both local and overseas.
- (h) Negotiate with local banking institutions appropriate arrangements for the contractors' acquisition of tools and equipment.
- (i) Liaise with relevant government departments (i.e. the various MCTPC divisions, Ministries of Planning, Finance, etc.) concerned with the programme, particularly with respect to the development of appropriate administrative and financial procedures facilitating the integration of the programme activities into the administrative system and procedures of the government.
- (j) Monitor and adjust as appropriate systems, procedures and regulations with a view to optimising the prospects of expanding the application of labour-based technology and involvement of domestic contractors for rural road construction and maintenance.
- (k) Participate in the further development/adaptation of standard documentation, guidelines and procedures related to the implementation of labour-based works including technical design standards, work methods, organisation, contract documents, bill of quantities, tendering documents, procedures for contract award, etc. based on initial field trials where the newly developed procedures are tested.
- (l) Monitor the work on contract supervision and quality assurance.
- (m) Monitor payment procedures to contractors with specific reference to the requirements of regular (monthly) payments.
- (n) Assist in the development of an appropriate cost accounting system for contracts.
- (o) Assist in establishing appropriate unit rates for the various categories of work activities executed by the contractors.
- (p) Assist in the effective presentation of the programme to visitors, in a planned manner which ensures that suitable on-site facilities and relevant data are available at all times.
- (q) Assist other relevant provincial departments in identifying the possibilities for labour-based infrastructure works.
- (r) Assist in formulating and preparing new proposals for labour-based road works projects and discuss these with the government and donors.

10.5.2 Provincial Level

Implementation of road works should be entrusted to the provincial departments of MCTPC. Assistance should therefore focus on these institutions. Training and advisory support should be strongest to the DCTPCs. Assistance will be required to:

- (a) Identify the rural road network in the provinces and classify it according to its purpose and overall condition.
- (b) Survey and inventorise the roads and tracks, resulting in a detailed database which describe the condition and location of all road components.
- (c) Identify and collate all programmed road upgrading and rehabilitation works envisaged in the programme area including interventions from on-going projects.
- (d) Develop appropriate levels and quality norms and procedures for rural road construction and maintenance works.
- (e) Prepare detailed road priority plans for rehabilitation and maintenance funding.
- (f) Determine available local resources for road maintenance, including donor support (funds, staff, equipment, materials, petty contractors, etc.).
- (g) Prepare rural road maintenance implementation plans.
- (h) Determine required inputs in terms of funding, training, tools and equipment, consultancy inputs, etc.
- (i) Identify and select small-scale and petty contractors for the road construction and maintenance works.
- (j) Present training courses for government staff and contractors.
- (k) Define the detailed organisational and administrative framework in which the road works will be implemented.
- (l) Integrate the newly developed technology and procedures within relevant provincial departments.
- (m) Implement the road works.

- (n) Monitor and adjust as appropriate systems, procedures and regulations with a view to optimising the prospects of expanding the involvement of small-scale and petty contractors for rural road works.
- (o) Further develop/adapt standard documentation, guidelines and procedures related to the implementation of labour-based road works including technical design standards, work methods, organisation, contract documents, procedures for contract awarding, etc. based on initial field trials where the newly developed procedures are tested.
- (p) Monitor and report work progress in the area of contract supervision, administration and quality assurance.
- (q) Monitor payment procedures to the contractors with specific reference to the requirements of regular (monthly) and timely payments.
- (r) Develop an appropriate cost accounting system for road works contracts.
- (s) Establish appropriate unit rates for the various road works activities.
- (t) Carry out inspections of delivered equipment, set up stores and a stores management system for all spare parts.
- (u) Set up a system for maintenance of equipment and supervise the implementation of the maintenance and repairs.
- (v) Plan and monitor equipment utilisation.
- (w) Conduct training of plant and auto mechanics, store-keepers and other associate staff from the provincial authorities as well as the contracting firms.

10.5.3 Level of Technical Assistance

A future labour-based road works programme needs to be developed gradually, first establishing efficient systems and procedures before it is expanded to cover the entire country.

Based on experience from similar programmes in other countries, it is evident that the road works programme will be limited during the initial period, during which focus will be on development of efficient systems and procedures and staff training. However, it is strongly recommended that a significant road works programme is established in order to gear the capacity building efforts to a reasonable activity level. The staff training will only be efficient if a proper job environment is provided through a significant road works programme.

Considering the weak capacity in the provinces today, there will initially be a relatively high demand for technical assistance. This assistance should provide assistance in both programme development as well as implementation. Gradually, when the government builds up its capacity, the level of assistance is reduced, finally arriving at a nationally implemented programme.

In order to meet the requirements of the above tasks, the following projections of technical assistance is made:

Central Level: 1 Programme Adviser
 1 Contracts Engineer
 1 Training Adviser
 1 Training Assistant (locally recruited)

Province level: 1 Senior Road Engineer (in each province)
 1 Junior Road Engineer (each prov.)
 1 National Engineer (each prov.)
 1 Infrastructure Planner (each prov.)
 1 Mechanical Engineer (covering two prov.)

10.5.4 Logistics

A major problem in the provinces is a uniform lack of resources required to carry out the daily work activities. A future road works programme will need to rehabilitate office facilities, invest in adequate transport for the provincial and district staff and provide sufficient budgets for sundries and field allowances.