



International  
Labour Organization

# Rural Road Maintenance

## Sustaining the Benefits of Improved Access



Chris Donnges  
Geoff Edmonds  
Bjorn Johannessen

Copyright © International Labour Organization 2007  
First published 2007

Publications of the International Labour Office enjoy copyright under Protocol 2 of the Universal Copyright Convention. Nevertheless, short excerpts from them may be reproduced without authorization, on condition that the source is indicated. For rights of reproduction or translation, application should be made to the ILO Publications (Rights and Permissions), International Labour Office, CH-1211 Geneva 22, Switzerland, or by email: [pubdroit@ilo.org](mailto:pubdroit@ilo.org). The International Labour Office welcomes such applications.

Libraries, institutions and other users registered in the United Kingdom with the Copyright Licensing Agency, 90 Tottenham Court Road, London W1T 4LP [Fax: (+44) (0)20 7631 5500; email: [cla@cla.co.uk](mailto:cla@cla.co.uk)], in the United States with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923 [Fax: (+1) (978) 750 4470; email: [info@copyright.com](mailto:info@copyright.com)] or in other countries with associated Reproduction Rights Organizations, may make photocopies in accordance with the licences issued to them for this purpose.

Donnges, Ch.; Edmonds, G.; Johannessen, B.

*Rural Road Maintenance - Sustaining the Benefits of Improved Access (SETP 19)*

Bangkok, International Labour Office, 2007

Poverty alleviation rural infrastructure planning, road maintenance, labour-based works technology, decentralisation, local government capacity, institutional capacity development, employment, contractor development

ISBN 978-92-2-119723-2 (print)

ISBN 978-92-2-119724-9 (web pdf)

ILO Cataloguing in Publication Date

The designations employed in ILO publications, which are in conformity with United Nations practice, and the presentation of material therein do not imply the expression of any opinion whatsoever on the part of the International Labour Office concerning the legal status of any country, area or territory or of its authorities, or concerning the delimitation of its frontiers.

The responsibility for opinions expressed in signed articles, studies and other contributions rests solely with their authors, and publication does not constitute an endorsement by the International Labour Office of the opinions expressed in them.

Reference to names of firms and commercial products and processes does not imply their endorsement by the International Labour Office, and any failure to mention a particular firm, commercial product or process is not a sign of disapproval.

ILO publications can be obtained through major booksellers or ILO local offices in many countries, or direct from ILO Publications, International Labour Office, CH-1211 Geneva 22, Switzerland. Catalogues or lists of new publications are available free of charge from the above address, or by email: [pubvente@ilo.org](mailto:pubvente@ilo.org)

Visit our website: [www.ilo.org/publns](http://www.ilo.org/publns)

Printed in Thailand

# Rural Road Maintenance

## Sustaining the Benefits of Improved Access





## Preface


Access is a key determinant of poverty. Without physical access rural communities face much greater obstacles in obtaining health, education and other social services. In addition their ability to take advantage of surplus crop production and of employment opportunities is severely constrained. Roads are a key element in the provision of physical access. Although physical access is not a Millennium Development Goal in itself, it plays a vital role in determining the chances for reaching a number of the MDGs. The benefits of improved access however are short lived if the rural roads are not maintained.

Rural roads are often treated as the last link of the transport network. Despite this, they often form the most important link in terms of providing access for the rural population. Their permanent or seasonal absence will act as a crucial factor in terms of the access of rural communities to basic services such as education, primary health care, water supply, local markets and economic opportunities.

Road deterioration due to lack of maintenance has become a growing issue in a number of developing countries. The problem has been discussed at length and the results of a lack of maintenance have been well defined and quantified. Nevertheless, the extent of the problem is not fully appreciated and the solutions are still not commonly understood. Equally, the measures required to rectify the shortcomings are under-estimated. These include the scale of support and capacity development required, and the time-scale necessary for establishing an effective road management system. Such a system should halt road network deterioration and ensure that financial, material and human investments are made in a manner which maintains the quality and value of the assets and, in addition, improves the network in relation to the demands and priorities of the users.

The basic objective of road maintenance is implicit in the word itself. It is done to ensure that the road that has been constructed, or improved, is maintained in its original condition. It is accepted that over the life of the road it will deteriorate due to factors with which maintenance activities cannot deal. Nevertheless maintenance is intended to slow down this deterioration and should begin on the first day after the road improvement works are completed.

In practice the effect of regular and timely maintenance is to increase the life of the road by putting off the date at which it needs to be reconstructed. This has several benefits, the prominent being that it stretches the period over which the benefits of the investment made are available and therefore provides a higher rate of return on



the initial investment. Maintenance puts off the date when large investments have to be made to reconstruct the road. As the yearly cost of maintaining a road is a small fraction of the investment cost, the economic logic for effective preventative maintenance is undeniable. It can be argued that the construction of roads, whilst consuming large amounts of money, is of limited importance if there is no effective maintenance system.

The situation is particularly critical with unsealed roads, which is the case for the majority of rural roads in the Asia and Pacific region.

Whilst the cost of rural road maintenance is small relative to the asset value, it is crucial that maintenance is carried out on a timely and regular basis. Consequently it is a recurrent activity and needs to be financed as such. The funds allocated to it should relate to a maintenance plan which defines those roads in a maintainable condition and defines a recurrent cost for the network. Unfortunately, road maintenance is often viewed as a set of projects to be carried out on roads which, because of lack of maintenance, have deteriorated to a state where they need re-construction.

The problems of rural road maintenance are not uniquely related to finance. There are technical issues related to the lack of planning and the lack of information on the state of the road network. There are also major institutional factors relating to the lack of clear responsibility at different decentralised levels for maintenance planning, budgeting and implementation.

The ASIST AP programme of the ILO has been involved with rural road maintenance as part of its overall programme of work on local resource based approaches to rural infrastructure development. The work has been both in the assessment and evaluation of rural road maintenance systems and in the practical application of sustainable maintenance systems in the Asian region.

In this document it is argued that the emphasis on the rehabilitation of rural roads, as one of the key elements of improving access and thereby reducing poverty, is justified only if equal attention is paid to the maintenance of these roads and, hence, the sustainability of physical access.

The role of rural roads in providing the opportunity for alleviating poverty is receiving renewed attention. It is therefore appropriate and timely that ASIST AP has prepared this document. It provides both an evidence based assessment of the situation in the Asian region and the implications of the present limitations. It also provides proposals on how the situation can be improved and identifies good practices from the region.



## Foreword


Investments in rural roads have significant potential for the use of local resources, create decent jobs, support the local economy and strengthen local commerce and have therefore important implications for poverty reduction and local economic and social development. The direct consequence of investing in rural roads is the generation of jobs, incomes and business opportunities, particularly if the development and maintenance of these rural roads is targeted in favour of local resource-based methods. Longer lasting impacts such as improved access to goods and services and production and productivity enhancing impacts further contribute to sustainable poverty reduction and local economic and social development. Impacts however will only be sustainable if the roads are maintained.

The ILO is committed to the achievement of the MDGs. The ASIST AP programme aims to mainstream poverty reduction strategies through local resource-based infrastructure development. Over the years ASIST AP has developed an integrated strategy which covers the entire cycle of infrastructure development from planning and design to implementation and maintenance. ASIST AP works with governments, the private sector and community associations in orienting infrastructure investments towards the creation of higher levels of productive employment and towards the improvement of access to basic goods and services for the poor. The ASIST AP approach is in harmony with the general move to the decentralisation of government services including the provision and maintenance of rural roads.

Much of the renewed emphasis on rural roads in recent years has been concerned with the need for the provision of a larger network of roads. Large investments were made in extending the road networks in the region and provide access to formerly isolated areas. However when these roads are not maintained any initial benefits of a larger network are soon eradicated.

The report is intended to serve two purposes. The first is to provide a more considered assessment of the rural road maintenance problem. Most people involved in the road sector are aware that there is a problem, however without a more reasoned analysis of the situation it is difficult to propose solutions.

The second is to provide some suggestions on how the situation can be improved. This draws on published work on the subject but also from the practical experience of the ILO in the region and the detailed studies carried out by the ILO ASIST AP



on rural road maintenance in Lao PDR, the Philippines, Indonesia, India and Cambodia.

Chapter 1 provides an overall framework for the paper. It shows how rural road maintenance has been dealt with over the years and places maintenance in the context of poverty reduction.

In Chapter 2, an attempt is made to bring together the available data on the technical, financial and institutional aspects of maintenance in order to provide an assessment of the status of rural road maintenance in the Asia region.

The social and economic impact of the current lack of maintenance of rural roads is analysed and described in Chapter 3. It highlights not only the economic but also the human cost of the lack of maintenance.

One of the key issues in the manner in which rural roads are administered has been the process of decentralisation of government which has been almost universal in the region. Chapter 4 investigates the issues raised for rural road maintenance by the process of decentralization.

In Chapter 5, an attempt is made to draw together the lessons that have been learned from recent experience and studies in the region.

Finally in Chapter 6 some practical solutions are proposed based on experience and good practice in the region.

## Table of Contents

Preface	4
Foreword	6
Chapter 1 Introduction	10
Definitions and Understanding of Maintenance	17
Classification of Maintenance	18
Timing of Maintenance Inputs	19
Maintenance Priorities	21
Chapter 2 Situation Analysis	22
The Road Network	22
Condition	24
Road Maintenance	29
Institutional Arrangement	29
Financing Maintenance	31
Levels of funding	32
Some general indicators	33
Source of Funds	35
Finding the Funding	36
Asset Value	39
Budgeting maintenance as repair projects	41
Chapter 3 Lack of Maintenance: Economic and Social Impacts	42
Overall Implications from Lack of Road Maintenance	42
The Direct Implications	44
Depreciation of the Value of the Road Network	45
Asset Management	46
Increasing Transport Costs	48
Declining Rural Access	50
Lost Employment Opportunities	52
Maintenance and Economic Analysis	53
Maintenance and Poverty	55
Chapter 4 Decentralisation	58
Introduction	58
Attitude and Perception	59
Finance	61
Institutions	63
Political Influence	65
Implementation	66
Technical	67
Summary	69
Chapter 5 Lessons Learned	72
Introduction	72
The Network	73
Attitude and Perception	75
Financing	76
Funding Sources	77
Subventions from central government	77

Road Maintenance Funds	78
Locally Generated Revenues	79
Road Tolls	79
External Agency Support	80
Community Contributions	80
Financial Constraints	83
Lack of Capacity	84
Network Planning	86
The Appropriate Institutional Level	88
Chapter 6 Key Issues for Sustainability	90
Rural Road Maintenance - A 21st Century Crisis	90
Funding Issues	91
Paying for the Real Stuff	91
Funding Sources	92
Centrally Run Rural Infrastructure Development Programmes	92
Funding Confidence	93
Funding Priorities	94
Institutional Home	95
Implementation Authority	96
Centrally Organised Road Works Agency	97
Local Government Authority	98
Works Implementation Arrangements	99
Technology	103
Work Contents	103
Technical Planning and Supervision	104
Technology Choice	105
Bibliography	108
Box 1.1: Road Maintenance: Why and who benefits?	10
Box 1.2: The Result of a Lack of Access	15
Box 1.3: Bhutan Rural Access Project	16
Box 3.1: Problems of Poor Access	52
Box 4.1: Local Capacity Building in Cambodia	68
Box 4.2: Rural Road Maintenance in Uttar Pradesh	71
Table 2.1: Road Lengths by Country in Asia	23
Table 2.2: Size of Road Networks	24
Table 2.3: Density of Road Networks	24
Table 2.4: Paved Roads in the Region	25
Table 2.5: Condition of Rural Roads	26
Table 2.6: Institutional Arrangements in the Region	31
Table 2.7: The Maintenance Gap	33
Table 2.8: Maintenance Budgets as Percentage of GNP	33
Table 2.9: Costs and Actual Expenditure for the Road Network	35
Table 2.10: Length of Rural Roads	39
Figure 3.1: Effects of Neglecting Maintenance	43
Figure 3.2: Road Investments - Socio-economic Benefits	51
Figure 3.3: Socio-economic and Transport Cost Impacts	52
Figure 3.4: Costs and Benefits of Maintenance Foregone	54
Figure 3.5: Cost Implications of Maintenance	55
Figure 4.1: Options for the Implementation of Rural Road Maintenance	64
Figure 4.2: Devolution of Responsibilities	67

# Chapter 1

## Introduction

This document is concerned with rural road maintenance in the Asia region. The term “rural roads” is often used imprecisely. Some countries use it to define all roads which are not national or secondary roads. Others put tertiary roads, which are part of the publicly owned network, together with other local roads which are not included under the responsibility of the government. In this report rural roads have been defined as *all publicly owned roads whose primary purpose is to provide rural villages and communities with direct access to economic and social services.*

### Box 1.1: Road Maintenance: Why and who benefits?

The purpose of maintenance is to ensure that the road remains serviceable throughout its design life. Maintenance is important because it:

- ◆ prolongs the life of the road by reducing the rate of deterioration, thereby safeguarding previous investments in construction and rehabilitation,
- ◆ lowers the cost of operating vehicles on the road by providing a smooth running surface
- ◆ keeps the road open for traffic and contributes to more reliable transport services
- ◆ sustains social and economic benefits of improved road access.

The first purpose is primarily in the interest of the responsible government authorities. The last three are of more general interest to the inhabitants of the area traversed by the road and to the vehicle operators.

Since the early 1980s major investments have been made in rural roads. There were several reasons for this. In the first place it was a natural extension of investment into the lower parts of the road networks given the major investments that had been made in the national highways of most of the countries of the region. It was therefore a logical step to develop the whole of the road network.

Underlying this was a belief that rural roads and the vehicles that traveled on them would provide the catalyst for increased economic activity in the rural areas. It also responded to the change in development thinking towards a belief in the necessity to develop the rural areas so that agricultural production is stimulated and to ensure that jobs and livelihoods are created locally to limit the urban drift. The development of the rural road network was seen as, if not the prime mover in this, certainly an important facilitator. Indeed the justification for rural road investments was, and to some extent still is, based on their effect on the rural economy.

With the emphasis on rural development came a major investigation of the dynamics of the rural areas. This included an assessment of the role of rural transport in the economic and social activities of the rural population. It became clear from this work that rural transport involved much more than roads and motorised vehicles and that it had a major part to play in the social activities of the rural population.

The investments made in rural roads therefore seemed to be justified not only in purely transport planning terms but also in both economic and social returns that could be expected from these investments.

This new investment in rural roads was almost totally concentrated on new construction and improvement works. The fact that the expansion of the road network would require additional funds for its maintenance was, if not ignored, considered a separate issue that could be dealt with at a later stage. Unfortunately this coincided with several other factors which contributed to a lack of concern for maintenance.

Firstly, the funds for road construction came from the capital development budget whilst funds for maintenance were expected to be sourced from government recurrent budgets. Often the investments for road building were financed by bilateral donors or from loans from the international development banks. Whilst the funding agencies often insisted that conditions were included in the agreements regarding the Governments' commitment to maintenance, limited efforts were made to enforce such commitments. If the maintenance dimension was raised in relation to these programmes, it was commonly referred to as a government commitment without any further concerns to either funding or to the capacity to ensure that maintenance actually took place.



Secondly, the introduction of maintenance on these roads was not considered a serious problem, in the sense that there was very little money involved and it was often assumed that the authorities would automatically take on this responsibility. Politicians however were more interested in opening new roads than maintaining existing ones. Public road building agencies were largely not accountable for the problems caused by the lack of maintenance. In addition, rural road maintenance did not provide an interesting career path for engineers.

Finally, there was little understanding that effective maintenance required a certain level of technical and administrative capacity. In general, this did not exist to any significant degree as maintenance was considered as a secondary issue.

It should be added that, often, maintenance is not considered as a recurrent, preventive activity but a curative measure when the road has significantly deteriorated.

The dilemma posed by the major investments in rural roads came to a head in the early 1990s. It became clear that the investments that had been made were not providing the benefits that had been predicted. Several reasons were postulated for this amongst which was the lack of understanding that benefits would not accrue if complimentary activities to the road investments were not implemented in parallel with the road improvements. However, it was also becoming apparent that the burden that the increased network had placed on the recurrent budgets was too much for it to bear. Consequently, roads were deteriorating at such a rate that benefits were being lost.

Other issues also played a part. Decentralisation was becoming the order of the day in many countries in the region. This process was often carried out by transferring responsibilities for centrally based agencies to local authorities without at the same time transferring the required financial resources. The technical and managerial capacity at the local level to provide road maintenance was insufficient. The limited funds available for road maintenance were often used for other activities as, in a cash deficient situation, local authorities commonly placed greater emphasis on road building activities. The basic problem however was that the road network was growing at a greater rate than the recurrent budget could deal with.

It would be simple to say that the problems of lack of maintenance are caused by a lack of understanding of the need for maintenance. However, there are many examples of effective maintenance systems being put into place prior to the growth of the rural road networks in the 1980s and early 1990s. A considerable body of knowledge existed on the benefits of effective maintenance. As early as 1988, the World Bank asserted that one dollar spent on maintenance will save four spent on rehabilitation.<sup>1</sup>

The road maintenance crisis for the major road network was therefore highlighted already in the late 1980s.<sup>2</sup> In Africa this led to a major programme called the Road



Maintenance Initiative which was primarily concerned with raising awareness of the issue and providing support to national programmes.

In Asia the issue has not received such intense attention. This is not to say that the problem is any less apparent or real. In many of the countries of the region, rural road maintenance is conspicuous by its absence. Insufficient funds are allocated and even where funds are available they are generally not applied within a planned maintenance framework. Rather, the funds are used to correct major defects which have been caused by the absence of preventive maintenance. This is evident not only in the statistics on the condition of rural roads but also for anyone who has traveled on rural roads in the region.

The implications of this lack of maintenance are severe. In the first place it means that the enormous investments in capital assets that a country has placed in its rural road network are often deteriorating faster than roads are being rehabilitated. In the Philippines for example it is estimated that the annual loss in national capital assets is twice the budget that is required to maintain these assets.

Second, rural roads play an important role in supporting the livelihood of the population in the rural areas. If they are not maintained then the number of people who benefit reduces rapidly over time and the economic and social benefits of proper access are lost.

Third, rural roads are generally funded based on an economic analysis of both the reduction in transport costs and increases in production. Moreover the analysis assumes a design life of the road based on an effective maintenance regime. If the latter is not in place then the analysis is meaningless.

---

<sup>1</sup> World Bank. Road Deterioration in Developing Countries. Washington 1988.  
<sup>2</sup> Ibid.

Rural road maintenance is therefore a major challenge for the countries of the Asia region. To be able to address the challenge there is a need to access the scale of the problem and its effects, to identify the causes and finally to present some suggestions on how these issues may be addressed by drawing on experience from within the region and elsewhere.

The rationale for road maintenance is clear. The basic objective is implicit in the word itself. It is done to ensure that the road that has been constructed, or improved, is kept in its original condition. It is accepted that over the life of the road it will deteriorate due to factors which maintenance activities will need to address. Maintenance is organised as a preventive measure and for this reason starts from the day the road improvement works are completed.

The effect of regular and timely maintenance is to ensure that the road remains serviceable or at least sustains the life of the road by delaying the date at which it needs to be reconstructed. This has several benefits, the most important being that it stretches the period over which the benefits of the investment made are available and therefore provides a higher rate of return on the initial investment. In addition, it puts off the date when large investments are required for reconstructing the road.

The yearly cost of maintaining a road is a small fraction of the investment cost, usually some 2-3% for a major paved road and 5-6% for an unpaved rural road. The economic logic for effective preventative maintenance is undeniable. It can indeed be argued that the construction of roads, whilst consuming large amounts of money, is of limited importance if there is no effective maintenance.

In 1988 the World Bank produced a seminal work on road maintenance.<sup>3</sup> The publication drew on detailed research and data from 85 countries. The publication was more focused on the major highways and the paved road network than on rural roads. However its conclusions were quite devastating. They noted that in the 85 countries that received World Bank assistance for roads, a quarter of the paved roads outside the urban areas needed reconstruction as did a third of the unpaved roads. Such reconstruction would cost US\$40 to 45 billion which could have been avoided if less than US\$12 billion had been spent on preventive maintenance. They identified a series of technical, institutional and financial issues that had contributed to this parlous state of affairs. Since the publication of that document much more attention has been paid to road maintenance. However, a current assessment of the situation in many of the countries of the Asia region suggests that little has changed in practice since the 1980s (see Chapter 2).

In one respect the situation has become worse. The investments in major highways are generally justified on pure economic grounds based on the reduction of the vehicle operating costs and thereby the cost to both the transporter and the end users of the goods being transported. Rural roads have a much wider benefit audience. Poor maintenance of rural roads leads to loss of access with the results illustrated in Box 1.2. Access is a major element in poverty reduction. The loss of

access therefore results not only in economic loss but also in lower enrolment in schools, higher rates of infant, child and maternal mortality and a general isolation from the mainstream of national development.<sup>4</sup>

Lack of maintenance, is a major issue in financial terms given the loss of investment and the loss of benefits. Of equal importance, in the case of rural roads, is the resulting lack of access and the implications for rural people. If rural roads are not maintained then access will be reduced.

Lack of access has its effect at the most basic level of living. If there is poor access to health services, people will remain unhealthy, children will die, and any epidemic will be likely to have catastrophic results. If there is poor access to clean water, again health will suffer. If there is poor access to basic information the household will be unaware of ideas and technology that might help them to lift their level of living. And if there is poor access to education, children will in the future share the limitations confronting their parents today. In addition, lack of access to markets ensures that whatever potential that exists for marketing crops will be limited.

In general terms, a lack of maintenance is often a major impediment to the achievement of a country's poverty reduction goals.

In the region as a whole, the majority of the population still lives in the rural areas -

Box 1.2: The Result of a Lack of Access<sup>5</sup>

- Many farmers are reluctant to grow a marketable surplus second crop because it cannot be sold or due to the difficulty and expense of transport significantly reduces the returns to labour.
- Agricultural productivity is low and there is a lack of innovation because extension information and inputs do not reach the farmers.
- School enrolment is low and absenteeism is high (often among teachers as well as children).
- Standards of health care are low because clinics are hard to reach and health workers cannot travel easily.
- Women's working days are long and arduous, largely owing to the time and effort required to reach water and fuel sources.

<sup>3</sup> Ibid.

<sup>4</sup> Howe, Transport for the Poor or Poor Transport. ILO 1997. Geoff Edmonds, Wasted Time the Price of Poor Access. ILO 1998

<sup>5</sup> Rural Transport and the Village. World Bank 1992

in Lao PDR as much as 90% of the population and in India, 975 million! Their primary means of transport would be through the use of an access road, linking into feeder roads and other minor roads before connecting to the main roads and highways. Isolation is a fundamental characteristic of poverty and access provides the way to reduce that isolation.

Currently, a large portion of rural communities do not have this access facility and despite the fact that numerous rural development programmes are involved in building local roads, the combined effect of an insufficient network and the lack of maintenance is keeping the rural population isolated from the rest of society.

Any development plan which has poverty reduction objectives needs to have within it the appreciation of the fundamental value of effective rural road maintenance for the achievement of those objectives. Rural road maintenance is not therefore just a financial and economic issue. It is also a humanitarian priority.

#### Box 1.3: Bhutan Rural Access Project

Poor road access means poor market access, poor health access and poor school access: (i) several areas are located 2-3 days' walking distance from the nearest road; mule transport costs about US\$3 per ton-km compared to US\$0.1 per ton-km by motorized vehicle on a road. This distance prevents crop-diversification and growing of marketable cash crops, causes damage to perishable crops taken to market and poor availability of extension services, etc., impeding farming output and income; (ii) poor road access reduces access to medical facilities, resulting in more deaths and more sick days out of work; (iii) poor access reduces school facilities available to rural children, with many social and economic consequences. The results of poor road access (or long walking distance) to schools are: (a) lower enrollment rates in Junior High School and above in less accessible areas due to distance and due to many young people being fully occupied by portering of goods (b) much lower girls' enrollment rates as parents are reluctant to send young girls away to boarding schools and (c) high cost incurred by Government for building and operating free boarding facilities at distant Junior High Schools to accommodate children from inaccessible rural areas.

Source: Bhutan Rural Access Project, Project Appraisal Document, World Bank

This report is intended to serve two purposes. The first is to provide a more considered assessment of the problem. Most people involved in the road sector are aware that there is a problem, however without a more reasoned analysis of the situation it is difficult to propose solutions.

The second is to provide some suggestions on how the situation can be improved. This draws on published work on the subject but also from the experience of the ILO in the region and the detailed studies on rural road maintenance carried out by the ILO ASIST Asia Pacific Programme in several countries of the region.

In Chapter 2, an attempt is made to assess the status of rural road maintenance in

the Asia region. The impact of limited maintenance of rural roads is analysed and described in Chapter 3 which highlights both the economic and social cost of the lack of maintenance. Previous studies have identified a variety of reasons why maintenance is not carried out and these are addressed in Chapters 4 and 5. This is done, first in Chapter 4, by looking at the institutional issues, particularly in relation to decentralisation. Then, in Chapter 5, an attempt is made to draw together the lessons that have been learned from recent experience and studies in the region. Finally in Chapter 6 some practical solutions are proposed based on experience and good practice in the region.

#### Definitions and Understanding of Maintenance

The basic objective of road maintenance is implicit in the word itself. It is done to ensure that the road that has been constructed, or improved, is maintained to the extent possible in its original condition. All roads require maintenance as they are subjected to traffic and the forces of weather. Even with the highest possible quality of construction, maintenance is essential to provide optimum service from the road structure during its life period. By applying preventive maintenance, the deterioration of the road and all its components can be slowed down and thus postpone the need for costly investments in rehabilitation.

Maintenance requirements depend upon a number of external factors such as traffic, terrain, soil types and climate. The need for maintenance is also very much determined by the original technical designs applied during the construction of the road, and the quality of the works carried out during the construction works. Depending on these parameters, it is possible to devise maintenance solutions and corresponding management systems which optimize maintenance costs and efforts.

Rural roads constitute the majority of roads in the national network in most countries. They normally cater for a limited volume of traffic, and therefore



require relatively unsophisticated technical designs. However, due to their large numbers and wide geographical distribution, they create very distinct challenges to their management and operation.

No matter what technical designs are chosen, all roads, from major highways to local gravel roads, require regular and timely maintenance in order to secure a reasonable lifetime on the construction investment. Maintenance-free technical designs are an illusion and in the long run only prove that lack of maintenance leads to accelerated rates of deterioration.

It is important to make a clear distinction between maintenance and repair works. Proper maintenance is clearly time linked, and to be efficient is carried out before major damage takes place. This involves activities relating to supervision and monitoring of the road assets even while they are still in good condition. It also requires that road authorities are sufficiently responsive and capable of taking action when it is required - as opposed to a response in terms of repairing the road when access has finally been cut off.

Timely and regular maintenance requires securing sufficient funding before repairs and maintenance become an urgent issue. The most effective form of maintenance is achieved when an organisation is capable and prepared to carry out appropriate interventions at an early stage of deterioration and thus limit the extent of damages. This implies that the responsible authority is furnished with the necessary human and financial resources to effectively manage all facets of the maintenance works.

#### Classification of Maintenance

The effective organisation of maintenance is based upon the concept of damage control. With timely interventions based on regular inspection of the road network, works are planned and carried out at an early stage to counter the detrimental effects of traffic and weather.

A central part of road maintenance works is to move the water away from the road structure as quickly and efficiently as possible. Effective measures need to be installed at an early stage during the original design and construction of the road. With a well-designed road, a major function of the maintenance works is to ensure that the drainage system continues to operate effectively.

Maintenance activities are commonly categorized in two distinct groups, depending on the location of the actual works. Off-carriageway works are mostly related to maintaining the drainage system, and halting any damages to the road components outside the road surface. This means that the side slopes, all drains and cross drainage structures are kept in a good condition permitting the free but controlled run-off of water away from the road.



The second group of maintenance activities relate to road surface repairs. This work mainly consists of maintaining a good running surface on the road, free from any obstructions and damage and with the necessary cross-fall to secure proper drainage of the surface.

In terms of securing a long life for rural roads, the most important type of maintenance is related to protecting the drainage system - most of which is found outside the carriageway. On highways, where traffic volumes are more intense, a substantial amount of resources are also used to maintain the roadway surface. Compared to highways, rural roads receive low levels of traffic and road surface works constitute a smaller proportion of the maintenance required. For rural roads, the maintenance priorities are clearly linked to the provision and upkeep of the drainage system.

#### Timing of Maintenance Inputs

Routine maintenance is a recurrent activity. Careful timing of work inputs forms an important part of an efficient maintenance programme. The prime objective when scheduling maintenance works is to ensure that the works are carried out as preventive measures, at an early stage when the road deterioration and damage are still limited. The works are therefore scheduled at strategic intervals when it is expected that the need for action is essential. For this reason, the timing of regular, or routine maintenance works are often related to the time of the year when rainfalls occur.

The most common work activities are:

- ◇ Erosion control on shoulders and slopes;
- ◇ Clear drains to allow free passage of water;
- ◇ Clear culverts and other waterways;

- ◇ Minor repairs to culverts and retaining structures;
- ◇ Repair and replace scour checks;
- ◇ Repair, fill and compact potholes and ruts;
- ◇ Grass and bush clearing;
- ◇ Repair road signs.

Routine maintenance of rural roads is a widely dispersed activity, requiring small resource inputs over a large number of geographically spread locations. For this reason, this operation is very well suited for labour-based work methods thereby relying to a high extent only on locally available resources.

In addition to the routine maintenance carried out each year, the road will need a more extensive overhaul after a certain number of years. Such periodic maintenance involves more comprehensive and costly activities such as reshaping of the road surface, re-surfacing and major repair or reconstruction of cross-drainage structures. Depending on the quality of the road, and the level of wear and tear, the periodic maintenance works would be scheduled at intervals of 3 to 7 years. Periodic maintenance includes activities such as:

- ◇ Major repairs to structures;
- ◇ Reshaping prior to resurfacing;
- ◇ Regraveling/resurfacing of entire road;
- ◇ Spot improvement/rehabilitation of failing sections;
- ◇ Installation of new culverts;
- ◇ Stockpiling gravel for use during routine maintenance.

Besides scheduled maintenance activities, road works agencies need to make provisions for the occurrence of unforeseen damage to the road network. This could be caused by excessive floods or rains, landslides, or other freak conditions. By definition, emergency maintenance cannot be forecast and therefore does not figure in annual work programmes. It is, however, possible to reserve a certain amount of funds for this purpose. Equally, the road authorities need to establish contingency plans for such incidences, thus allowing them to react in a timely fashion, in order to reopen access on the road and limit the extent of the damages.

Emergency maintenance involves activities such as:

- ◇ repair or reconstruction of damaged cross-drainage structures due to floods or over-weight vehicles,
- ◇ repair or reconstruction of damaged road sections due to wash-outs, erosion, or floods,
- ◇ repair or reconstruction of damages to erosion protection, resulting from excessive flows of water or landslides,
- ◇ clearing of landslides, trees or rocks from the road carriageway.

## Maintenance Priorities

All road works agencies need to factor in budgetary limitations when planning their maintenance programmes. Every engineer responsible for road maintenance faces the additional challenge that available funds are never sufficient. It is therefore necessary to assess the importance of the various work interventions to ensure that available resources are utilized in the most effective manner.

Among the three types of maintenance, obviously emergency maintenance is the most important as it relates directly to keeping the roads open to traffic. In terms of non-emergency related works, experience clearly show that it is regular or routine maintenance activities related to preserving the drainage system which have the most significant effect in terms of extending the lifetime of a road. These works do not involve any sophisticated technology or skills. They can be carried out using manual labour and simple hand tools and are inexpensive. Despite this, they still require a sound management organisation to ensure that works are carried out at the right place and time.

## Chapter 2

### Situation Analysis

Rural roads are a fundamental element in the provision of access in the rural areas. However, such access has to be sustained otherwise the benefits will be lost. To be able to make meaningful suggestions regarding the provision of effective maintenance it is necessary to have an understanding of the current situation. This chapter looks at the physical, institutional and financial issues related to rural road maintenance in the region.

#### The Road Network

Roads are considered to be crucial to economic and social development. It is surprising therefore that the data on roads in the region are not only difficult to find but also questionable regarding their veracity. Data on the national highways is relatively abundant, however the further one progresses down the network the more difficult it is to find reliable statistics.

Rural roads form part of an overall network and they are dependent on the higher order roads to serve their purpose and vice versa. In the first place it is useful therefore to see rural roads in the overall context of the road networks of the region.

“Rural roads” is generally an ill defined phrase. Road classification varies across the region depending on whether roads are described by type or by function. However there is rarely a full definition of rural roads. Indeed they are generally put together as those that are not primary or secondary roads. In this report we have defined rural roads as all publicly owned roads whose primary purpose is to provide rural villages and communities with direct access for the rural villages and communities to economic and social services.



Table 2.1 Road Lengths by Country in Asia

	Kilometres of roads	Km per 1,000 population	Km per 100 Sq km	Percentage rural roads
China	1,809,828	1.4	18.9	76
Mongolia	49,250	17.6	3.0	77
Indonesia	368,263	1.5	19.2	79
Philippines	202,205	2.3	67.4	86
PNG	27,000	4.9	5.8	75
Cambodia	38,257	2.8	21.1	73
Lao PDR	31,210	5.0	13.2	70
Thailand	233,096	3.6	45.3	77
Vietnam	215,525	2.6	64.9	92
Afghanistan	23,700	0.8	3.6	75
Bangladesh	140,000	1.0	97.2	82
Bhutan	3,375	1.5	7.2	51
India	2,550,000	2.4	77.6	78
Nepal	27,000	1.0	19.1	83
Pakistan	280,000	1.7	34.8	52
Sri Lanka	108,000	5.4	163.6	60

Whilst there are some variations, Table 2.1 shows that rural roads represent between 70 and 80% of the total length of public road networks. It should be recognized that they only account for some 15-20% of the traffic volumes on the network.

Over the last 20 years the road networks of the region have increased significantly. Over the period 1988 to 2004 the South Asian and East Asian regions showed an overall increase in road network size of 88% and 83% respectively. In East Asia, China accounted for the major part of this increase. However, even in the other countries of the sub region the increase was over 50%. Whilst initially this increase was concentrated on the main road network, over the period the increase has been evenly distributed between the main and rural roads.

Figures reflecting the size of the road network in the region are given in Table 2.2. Overall the figures show a major growth of the road network in both East Asia and South Asia. The growth of the networks suggests 3 to 4% annual growth. Clearly this has been necessary for the development of the economy and for providing access in the rural areas. However it should imply also a similar rate of growth of maintenance funding. In general this has not been the case for rural roads.

Table 2.2 Size of Road Networks

	Kms of road		
	1988	2004	Percentage Increase
South Asia	1,655,323	3,105,000	88
East Asia	1,440,614	2,640,392	83
East Asia excl. China	525,514	830,564	58

Road density rose with the major increase in the length of the networks. This was particularly apparent in China.

Table 2.3 Density of Road Networks

	Km per 1000 population		Km per 100 Sq. Km	
	2004	1988	2004	1988
East Asia	1.6	1.1	19.6	11.7
E. A excl. China	2.3	1.9	20.7	17.2
South Asia	2.1	1.7	55.9	32.9
S.A Excl India	1.5	0.7	25.1	10.0

A word of caution is necessary here. Figures for road length are usually based on the statistics on the classified road network. However significant parts of the network are in an unmaintainable condition and are therefore effectively unusable by vehicles. A better indication is given by using only the roads considered as maintainable, generally those classified as being in good or fair condition. In the case of rural roads this is particularly important given the poor state of most rural road networks. The relevance of this has been demonstrated recently by research which shows that poverty levels are directly correlated with the length of rural roads that are in good or fair condition.<sup>6</sup>

In the following sections an attempt is made to provide an overview of the situation in the region in order to demonstrate that, in general, rural road maintenance receives far too little attention, certainly too little to make any effective impact.

### Condition

Information on the existence, condition and use of rural roads is limited. There are various reasons for this. Due to the decentralization process in recent years, new

<sup>6</sup> Howe, Transport and Poverty Reduction. Paper presented at the annual DFID Engineers meeting in 2005

<sup>7</sup> Edmonds and Johannessen, Building Local Government Capacity for Rural Infrastructure Works, ILO ASIST AP 2003

institutions have been created to take charge of maintenance of rural roads. These institutions are still weak and need further capacity development before they can effectively take on the responsibilities of managing the rural road networks.<sup>7</sup> Engineers at the local level often do not have the resources to be able to carry out condition surveys and therefore rely on old and outdated statistics. Consequently, the information on the state of rural roads is based on outdated estimates of the road network size. Moreover roads that have been constructed since the most recent survey are often merely added to the list of roads in the network, thus giving an inflated size of the network. Many roads no longer serve any trafficable purpose because of lack of maintenance. Nevertheless they are still included in the network of roads for which the local authority is responsible.

Condition data for rural roads in the region is limited. However some indications can be drawn from the available evidence.

Table 2.4 Paved Roads in the Region

	Percentage roads paved	Main roads as a percent of total
Cambodia	4	27
Indonesia	54	21
Lao PDR	14	30
Mongolia	3.5	23
Philippines	20	14
Vietnam	18	8
Afghanistan	25	25
Bangladesh	14	18
Bhutan	60	49
India	49	22
Nepal	17	17
Pakistan	60	37



Table 2.4 provides a comparison between the percentage of paved roads and the percentage of the total network that are national highways. In some countries - Cambodia, Lao PDR and Mongolia - the figures show that even major parts of the national highways are not paved. In others - Afghanistan, Bangladesh, Nepal and Pakistan - the paved network is similar in size to the national highways network, suggesting that most of the latter is paved. In other countries - Indonesia, the Philippines, Bhutan and India - the paved network is bigger than the national highway network suggesting that at least part of the rural road network is also paved.

In the Philippines, there has been no condition inventory of rural roads since the decentralization of Government in 1991. Whilst the rural road network has grown by some 4,000 km per annum since 1991, there is no indication of the condition of these roads or of the rest of the network. Consequently, even if sufficient funds were available and capacity existed, the planning of rural road maintenance is difficult given the fact that there is little understanding of either the true size or the condition of the rural road network. The Philippines has major poverty reduction programmes many of which rely on road access to achieve their objectives. The lack of proper management of the rural road network is therefore a major impediment to the

Source: Maintenance of Rural Roads: The case of the Philippines. ILO ASIST Bangkok 2005

As regards to the condition of the networks, Table 2.5 shows a dismal figure for the range of countries for which data is available.<sup>8</sup> In only one of the countries (Vietnam) are more than 50% of the rural roads in a maintainable condition. This compounds the problem illustrated in the second column. Most of the countries have difficulty in providing road access to significant numbers of the rural population. Moreover when it is provided it is poorly maintained.

Table 2.5 Condition of rural roads

	Percentage of villages having no road access	Percentage of rural roads in poor condition
India	50	60
Madhya Pradesh	62	80
Uttar Pradesh	50	80
Jharkhand		81
Himachal Pradesh	52	55
Philippines		65
Lao PDR	38	73
Bhutan	40% of the population have no road access	53% of district and 86% of feeder roads
Pakistan	34% of the population have no access to a road	>50
Indonesia	10% of the population have no road access	50
Sri Lanka		>70
Vietnam		35

A general overview of the road networks in the region is shown below.

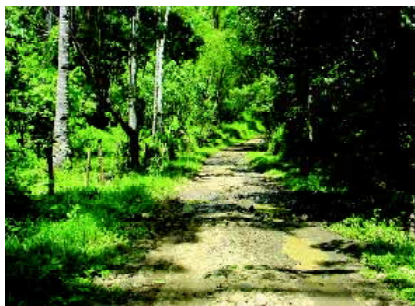
Afghanistan	<p>The road network comprises about 3,300 km of regional highways, 4,900 km of national highways, 9,700 km of provincial roads, and between 17,000 and 23,000 km of rural roads. More than 90% of national highways and provincial roads are either earth or gravel, and over 60% are in poor condition.</p> <p>The expected road revenue will be able to finance about 30%-50% of the road maintenance requirement.</p>
Bangladesh	<p>The primary road network has 8,555 km. The secondary has 13,823 km. Tertiary roads (the rural road network) comprise 36,166 km of sub-district, 42,329 km of union roads and the 171,335 km of village roads. Of the sub-district roads, about 50% are paved, only 20% of union roads are paved.</p>
Bhutan	<p>There are 4,153 km of motorable roads, including 1,577 km of national highways, 459 km of district roads, 1,205 km of feeder roads, 117 km of urban roads, 251 km of farm roads and 543 km of forest roads. All national highways and nearly half of the district and feeder roads are paved; however, 20% of national highways, 53% of district roads, and 86% of feeder roads are in poor condition.</p>
Cambodia	<p>It is estimated that of the approximately 24,000 km of rural roads in Cambodia, some 84% are considered to be in poor or bad condition.</p>
China	<p>Of the 2.9 million km of rural roads only 20% of 480,000 km of county, 15% of 950,000, and 9% of 1,500,000 km of village roads are paved. 72% of rural roads are unsealed (earth).</p>
Indonesia	<p>Of the classified roads, 27,668 km (8.5%) are national roads, 51,638 km (15.9%) provincial roads and 244,844 km (75.5%) district and municipal roads. Some 50% of the provincial and district roads are in good condition. About 54% of the rural villages are not connected through asphalt roads, and about one third of these lack any form of year round access. 57% of the district roads are in poor condition.</p>
Lao PDR	<p>The Lao PDR has a road network of about 32,600 km, national roads comprise 22%, provincial roads 28%, urban roads 4% and district or community roads 46%. Only 14% of the road network is paved, including about 50% of the national road system.</p>
Mongolia	<p>The road network of about 49,250 km comprises 11,063 km of state roads and 38,187 km of local roads. Only 12% of the roads (1,670 km) are paved, 13% (1,800 km) are gravel, and 75% are earth roads.</p> <p>Funding for road maintenance amounts to some 25% of the amount required.</p>
Nepal	<p>The national road network had a total of 16,834 km of roads, comprising 4,861 km (29%) of strategic roads (national and feeder), 2,198 km (13%) of urban roads, and 9,775 km (58%) of district roads. Feeder roads totaled 2,034 km in length. Two thirds of feeder roads and most district roads remain unpaved and many are impassable during the wet season. 15 out of 75 district headquarters are not connected by road at all and 40 district headquarters are not connected by all-weather roads.</p>

<sup>8</sup> Source: World Bank and ADB loan project appraisals and other country reports

Pakistan	Half of the national highway network and a large proportion of the provincial road networks are in poor condition.
Philippines	Paved roads represent 20 percent of provincial roads and only 7 percent of barangay (tertiary) roads. About 33 percent of tertiary roads have an earth surface. As much as half of the barangays (villages) in the country lack all-weather roads, and about half of the existing tertiary rural roads are in such poor condition that they cannot be maintained any longer.
PNG	Almost half of the 7,800 km of national roads and two thirds of the 5,350 km of provincial roads need rehabilitation or reconstruction before they can be properly maintained. 35% of the population lives more than 10 km from a national road and 17% from any road at all. The majority of the rural network is not in a maintainable condition.
Sri Lanka	The road network of about 108,000 km comprises some 11,700 km of national highways, 15,500 km of provincial roads, 64,700 km of local authority roads, and 16,300 km of roads under the ownership or control of irrigation, wildlife and land development authorities. Only 40% of national roads, 50% of provincial roads and 35% of rural roads are in a maintainable condition.  Current allocations for maintenance of national, provincial and rural roads represent 42%, 12% and 18% of the requirement.
Vietnam	The rural road network comprises 175,000 km. 76% of the population has access to an all-weather road and the network serves 90 percent of the nations poor who live in rural areas. 84% of all hamlets now have access to all weather roads. 54% of provincial and 21% of district roads are paved.  Maintenance is generally insufficient in most provinces, particularly at lower levels of the network (commune and district roads).

Source: World Bank and ADB reports

The overall picture is rather dismal indicating the low level of accessibility of the rural population to a maintainable road. It also demonstrates the insufficiency of funding to deal with the problem.



## Road Maintenance

### Institutional Arrangements

Even before the decentralisation process in the region, the administration and management of rural roads was often unclear and somewhat disorganised. If they were dealt with by the mainline road agency they were often treated as the poor relation of the road sector.

More often the responsibility for rural roads was placed with non technical ministries such as Local Government or Rural Development who had limited technical capacity. Moreover, rural roads were often constructed by several different agencies such as Agriculture, Mining, Tourism and Defence. The net result was that, without proper coordination, it was difficult to set proper standards let alone have a coherent and standard policy pertaining to rural roads.<sup>9</sup>

With the introduction of decentralised government the situation has improved in the sense that rural road management and administration is more clearly defined as the responsibility of specific local government units. The problem of course is that the lower orders of roads are often managed by the lower levels of government administration which have the least resources.

The decentralisation process in the Philippines has led to a situation where political imperatives have resulted in a breakdown in rural road maintenance. The country has a large network serving the rural areas. Since 1991 responsibility for rural roads was decentralized to the local government units. The responsibility for rural roads was given to the barangays, the lowest level of government administration. It is estimated that there are some 160,000 kilometres of rural roads serving the needs of 41,969 barangays. Thus on average each barangay deals with about 4 km of rural roads. There is no technical capacity at the barangay level and in any case such capacity would be inappropriate for such a small length of road. However small the length, maintenance would put a major strain on the extremely limited budget of the barangay. The result is that very little maintenance is implemented.

Source: Maintenance of Rural Roads: The case of the Philippines. ILO ASIST Bangkok 2005

A recent ILO study in Madhya Pradesh also illustrated the ambiguity caused by a lack of foresight in devolving road maintenance responsibilities.<sup>10</sup> The study pointed out that the spread of responsibilities for rural road maintenance within the various levels of government has led to a situation where no one agency feels responsible for sustaining the rural road network.

<sup>9</sup> Eleven states of India have between them 24 agencies managing rural roads; two of them have four each

<sup>10</sup> Situational Analysis of Rural Road Maintenance in Madhya Pradesh. ILO ASIST AP Bangkok 2006

The study showed that very little road maintenance has been possible due to lack of funds and a lack of proper policy and institutional framework. However, weaknesses in the implementation capacity coupled with the lack of clarity of the institutional responsibilities are hidden as the emphasis has been placed on the inadequacy of funds. While the need for adequate funds is evident it is the more critical institutional issues which require attention.

Lao PDR is an example of a unified system in the sense that the mainline technical ministry - the Ministry of Communications, Transport, Posts and Construction - is responsible for all roads in the country. It has offices at the provincial and the district levels. The sub-national agencies are responsible to the main technical line agency. Plans for the district roads are channeled through the provincial level to the central ministry for approval. Funds for maintenance from the established road fund are provided to the provinces and districts also from the Ministry.

Cambodia presents the other common approach. The road network is divided into a primary and secondary network which is the responsibility of the Ministry of Public Works and Transport. Tertiary roads are the responsibility of the Ministry of Rural Development. In both cases the central ministry has provincial offices. However the provincial offices are responsible to the governor of the province.

These two systems are replicated with some modifications throughout the region. The differences are related to the levels and lines of responsibility at the local level. In some cases the road agency still retains authority over the local agency dealing with rural roads, as in Laos. At the other end of the scale are the barangays in the Philippines who are the sole authority for the rural roads under their jurisdiction

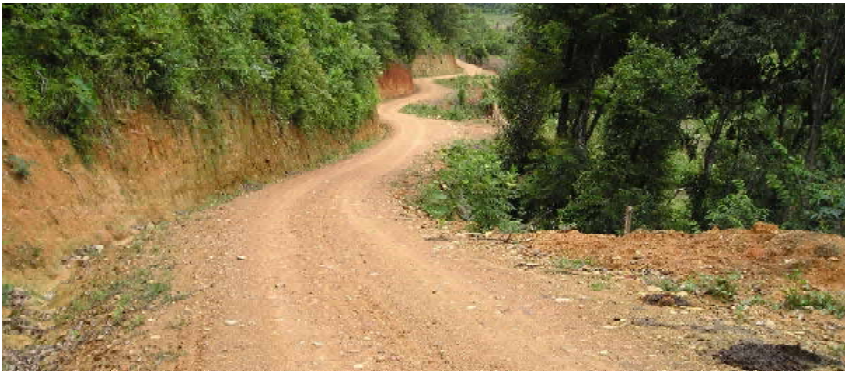


Table 2.6 Institutional Arrangements in the Region

	Institutional arrangements for roads	
	Main Roads	Rural Roads
Philippines	Department of Public Works and Highways	Provincial Government (provincial roads) Barangays (tertiary roads)
Indonesia	Ministry of Public Works (MPW), through its Directorate General of Highway	Ministry of Home Affairs Implementation devolved to local government
Cambodia	Ministry of Public Works and Transport	Ministry of Rural Development
Lao PDR	Ministry of Communications, Transport, Posts and Construction	
Thailand	Department of Highways	Ministry of the Interior Implementation devolved to local government
Vietnam	Vietnam Roads Authority and Ministry of Transport	Provincial and District Departments of Transport responsible to provincial authorities
Bangladesh	Roads and Highways Department (RHD) within the Ministry of Communications	Local Government Engineering Department (LGED), Ministry of Local Government, Rural Development, and Cooperatives
India(States)	State Ministry of Public Works	State Ministry of Rural Development and local government (village roads)
Pakistan	The National Highway Authority (NHA) under the Ministry of Communications	Provincial authorities, with implementation decentralized to the districts
Nepal	Ministry of Physical Planning and Works, Department of Roads	Department of Local Infrastructure Development and Agricultural Roads under the Ministry of Local Development Implementation devolved to district government authorities
Sri Lanka	The Ministry of Highways - The Road Development Authority	Ministry of Home Affairs, Provincial Councils and Local Government Implementation devolved to local government

### Financing Maintenance

Maintenance funding is a major problem in the road sector. There are several reasons for this. The result is that major parts of the road networks of the countries in the region receive little or no maintenance from one year to the next. The further down the network one goes, the lower the amount of funds available.

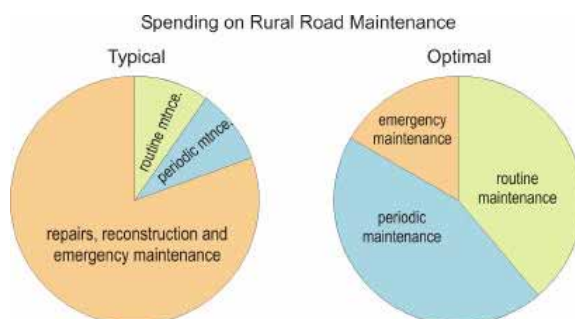
The funding of road maintenance is concentrated on the top tier of the network. Thus the national highways receive the majority of any maintenance funding that is available, with the amount of available funds reduced at each level down to local village roads. The introduction of road funds in some countries of the region has ensured that funds are available for maintenance on a predictable basis. However

the scale of the funds is generally only sufficient to provide effective maintenance to the national highways.

### Levels of funding

Figures for overall fund allocation and expenditure on road maintenance are notoriously difficult to come by. Maintenance is often not classified as a separate item in the budget or it is listed under the capital investment budget rather than the recurrent budget; budgets for maintenance are often used for improvement; funds may be earmarked for projects which in fact are periodic maintenance activities; different agencies are responsible for different classes of roads; often recurrent budgets do not differentiate between road maintenance and other recurrent activities. Allocations, particularly at the local level, are more difficult to identify. Road maintenance allocations, being part of the recurrent budget, are easily commandeered for other more pressing activities.

Even where there is a budget for rural road maintenance often little is spent on maintenance activities as such. The roads are in such a parlous state that the money is spent to keep some key links open. Thus the budget that exists for maintenance is often spent on what can be described as repairs, reconstruction and emergency works.<sup>11</sup>



Very few countries in the region have sufficient maintenance budgets to provide effective maintenance for the whole of the network. Most countries have insufficient funds for the maintenance of even the national network. To illustrate the disparity between maintenance funding needs and funding availability, Table 2.7 provides estimates of the gap for 9 countries (including one state of India) for which data is available on maintenance expenditure.

Table 2.7 The Maintenance Gap

	National km	Maintenance cost	Rural km	Maintenance cost	Total Cost \$million	Budget \$million	Percentage cost covered
Cambodia	4,757	17	27,800	42	58	7.7	13
Indonesia	26,300	92	291,841	438	530	45	8
Lao PDR	6,420	22	21,710	33	55	19	35
Mongolia	11,063	39	37,923	57	96	1	1
Philippines	29,900	105	164,719	247	352	140	40
Thailand	52,960	185	179,484	269	455	258	57
Vietnam	15,284	53	198,230	297	351	87	25
Jarkhand	7,883	28	104,727	157	185	21	11

The figures should be viewed as orders of magnitude only. However what is clear is that in only a few cases is there sufficient money to maintain the main roads and in no case are there sufficient funds to maintain the entire road network.

#### Some general indicators

An indication of either the importance attached to maintenance, or the ability of a country to pay for it, is the proportion of the national budget that is allocated to it.

The figures in Table 2.8 suggest a median figure for maintenance expenditure of between 0.1 and 0.2% of GNP. This should be compared with annual capital investments in roads in general of the order of 2% of GNP. The World Bank has indicated that whilst a developed country such as New Zealand spends some 45% of the total road sector budget on maintenance, the figures for developing countries are much lower. Bangladesh for example spends 22%, Indonesia 31%.

A reasonable indication of the financial burden of rural road maintenance is the ratio of the length of rural roads to the overall

Gross National Product. In the region this ratio ranges from 1 kilometre per million dollars of GNP for China to 3.5 for India to 31 for Mongolia. This means that China needs to spend much less of its national budget on rural road maintenance than India, both of whom need to spend much less than Lao PDR and Mongolia.

Table 2.8 Maintenance budgets as percentage of GNP

Country	Maintenance as a percent of GNP
Indonesia	0.03
PNG	0.04
Mongolia	0.08
China	0.10
Philippines	0.16
Lao PDR	0.17
Cambodia	0.19
Thailand	0.19
Vietnam	0.22
Bhutan	0.38

<sup>11</sup> Charts based on data collected by the Authors from several countries of the region

Country	Ratio Km Rural Road to GNP
China	1.0
Thailand	1.3
Indonesia	1.7
Philippines	1.9
Pakistan	2.1
Bhutan	3.1
Vietnam	3.4
India	3.5
Bangladesh	3.7
Nepal	3.8
Afghanistan	3.9
Sri Lanka	4.1
PNG	5.4
Cambodia	6.8
Lao PDR	11.2
Mongolia	31.9

Thus, even with good management countries with high ratios would have major problems in financing maintenance.

Often the fact that maintenance is carried out by the public sector can also limit the funds spent on physical works. In many states in India as much as 60% of the recurrent budget of the public works departments is spent on gang labour. This is permanently employed workers, the overall number of which is excessive and vastly exceeds the need. On the other hand, in Vietnam the maintenance budget is generally under-valued due to the use of the obligatory labour system whereby each member of society has to provide 10 work days to the commune. Much of the work done under this system is the repair and maintenance of rural roads. This provision of labour is not included in the resources allocated to rural road maintenance.

Figures that are available suggest that most countries in the region are spending considerably less than US\$1,000 per km on the maintenance of the total road network including national highways. In general, the poorer the country is the less the expenditure per km. This is despite the fact that the actual cost of maintenance does not vary a great deal across the region.

The poorer a country, the greater the significance of the value of the rural road network. Lao PDR for example has a GNP per capita of US\$340, the Philippines US\$1,080. The cost of maintenance of rural roads in Lao PDR represents 2% of the GNP, in the Philippines 0.3%. Poorer countries therefore are asked to look for alternative funding to bridge the gap between the cost of maintenance and what the government can afford. However this implies raising local taxes from a tax base which is already very low.

The overall wealth of a country is, of course, important. Perhaps of equal importance is the land area and the population. Vietnam for example has something over four times the length of road than Mongolia. However the coverage of those roads is more than 20 times in terms of km per surface area. Large countries with dispersed populations, such as Mongolia and Afghanistan, require significant lengths of rural roads. They therefore need to spend more on maintenance.

The evidence suggests that sufficient funds are available in most of the countries to maintain the major part of the national road network based on realistic costs per kilometre of maintenance. However there would be little or nothing remaining for rural roads. Nevertheless, several countries do manage to provide limited funds for at least some rural road maintenance.

## Source of Funds

Maintenance, by definition, is a recurrent activity and should therefore be funded from the recurrent budget. This would help to ensure that its role as a preventative rather than a curative measure was appreciated. For rural roads, which are often under the responsibility of decentralized authorities, funds for maintenance are rarely allocated as part of the recurrent budget. Rather funds are provided from the capital budget according to perceived need, in particular in relation to ensuring that certain roads remain passable. There seems to be little acceptance that constant care of a road would result in prolonging the time when a major input of funds is required to solve the problem caused by the lack of recurrent maintenance.

The data available supports the general theory that insufficient funds are allocated to rural roads. Nevertheless it is perhaps unrealistic to expect that government funds will be able to cover the totality of the network. With pressure from the other sectors for funding it is unlikely that the road sector will be treated any better than, say, health or education.

It seems highly unlikely that most countries in the region will have the funds to be able to properly maintain the totality of their network. Estimates for the nine countries in Table 2.9 indicate that the cost of maintaining all the roads is orders of magnitude greater than the present expenditure.

Table 2.9 Costs and Actual Expenditure for the Road Network

Country	GNP per capita	Cost of full maintenance as a percentage of GNP	Maintenance expenditure as a percentage of GNP
Cambodia	300	2.1	0.19
Lao PDR	340	3.7	0.17
Vietnam	480	1.1	0.22
Mongolia	480	9.1	0.08
Bhutan	630	1.6	0.38
Indonesia	810	0.5	0.03
Philippines	1080	0.5	0.16
China	1100	0.3	0.1
Thailand	2190	0.4	0.19

Even if all the available funds for maintenance were spent on rural roads this would not be sufficient, by a wide margin, to cover the actual costs of maintaining the rural road network.

The theoretical figures for the cost are of course open to criticism. It is assumed that funds need to be available for the whole identified rural road network. In the first place we know that large parts of the rural road networks are not in a main-

tainable state. In addition the figures for the length of rural roads are likely to be overestimates, often based on old inventories which have merely been added to without any regard for their condition. Also, there is often no clear definition of which roads are included under the responsibility of the government for maintenance. Many village roads have been built under self-help schemes or through relief programmes or agriculture development programmes, not to mention food for work and employment generation schemes. Often these roads once completed are left without maintenance.

Nevertheless the scale of the gap between current indications of demands and actual expenditure suggests that there is a need for some radical changes to current practice in order to change current trends.

### Finding the Funding

The solution to this problem from an economic point of view is to treat roads as a commercial proposition. Roads serve transporters and the users should therefore pay for this service in relation to the use they make of the service. This is the basis of the Road Funds which have been set up in several countries of the region - India, Laos, Mongolia, Nepal, Pakistan, Philippines, PNG and Sri Lanka.

Whilst the actual organization of the road funds may vary from one country to another the basic principles apply to all. The fuel levy is used to maintain the road network. The money is placed in a dedicated account and administered by an independent body which has representation from both the public and private sector. The amount of the levy utilised varies although it is estimated that 7 to 8 cents a litre would be enough to cover the full maintenance of the national highways networks of most countries.<sup>12</sup>

If the money was allocated strictly on the basis of the user pays then rural roads which, though the more extensive in terms of length and carrying a much smaller percentage of the traffic, would receive very little funding. In most countries however funds have been allocated to rural roads in recognition of the socio-economic benefits that they provide. In Laos for example 20% of the road fund is allocated for provincial and district roads. In the Philippines some 5% of the total is allocated to a Special Local Road Fund.

It is however understood that the road funds are not expected to finance the maintenance of the whole of the rural road network and other means need to be found.

Much has been said regarding the willingness of rural communities to pay for maintenance. The argument is that if local people are prepared to use their own resources to maintain certain roads then support should be given to ensure that these roads remains in a maintainable condition. Regardless of the fact that this is a form

of regressive taxation, the important question is whether local communities would be able to afford and also willing to contribute to the maintenance of the roads.

Clearly it has to be in the interests of the rural people to see that the roads are maintained, however, rural incomes are generally very low and there is little available to pay for maintenance. If the benefits are considerable it is argued that the villagers may then be persuaded to contribute. In Laos for example, rural household consumption, excluding subsistence production, is an average of US\$53 per month for villages with road access and US\$28 where this is no road access.<sup>13</sup> It can be argued that if the difference is actually attributable to road access then villagers may be willing to make cash contributions to improvement and maintenance of road access. Then again, even with an average monthly household of US\$53, there will be very little surplus income which the villagers are prepared to allocate to maintenance of public roads.

It is fair to point out that self-help schemes for maintenance of public roads have been distinguished by their lack of success. Despite major efforts in pilot projects to mobilize communities for this purpose, experience has shown that it is difficult to sustain such arrangements in the long term without relying on external assistance. However this may be that the approach to the villagers has been couched in terms of patriotic duty or of there being no alternative. If the appeal was to the generation of higher incomes, the chances of success may be improved.



<sup>12</sup> Kumar. Assessment of Selected Road Funds in Africa. World Bank 2001

<sup>13</sup> LangXang International for the MCTPC Lao PDR. Development of Rural Transport Infrastructure Policy. January 2006

Recent work has shown the benefits of road access. In Vietnam, the prevailing price of goods was seen to reduce, motorcycles were purchased and children could attend school more regularly.<sup>14</sup> In Indonesia, incidence of poverty was shown to decline more rapidly in provinces with good roads than in those with poor roads. This also mirrors recent impact studies carried out by the ILO in Laos.<sup>15</sup>

The problem that remains is that poor communities which most need access are the least likely to be able to pay for sustained access.<sup>16</sup>

Indeed a better way of approaching the problem would be to start with what is affordable both at national and local level. Naturally this depends on a host of factors including tax revenues, levies and competing demands from other sectors. Rather than looking at the financing from the point of view of what in theory needs maintaining, one should first look at what is maintainable. The next step would then be to look at the most effective use of available funds and finally assess whether the funding discrepancy can be covered by the various sources already identified and in use - before looking for new funding mechanisms. This should include the possible redirection of funds away from capital investment to maintenance. This seems a much more pragmatic approach which may actually result in funds being spent on a reliable and known road network.

The above discussion raises the whole issue of what proportion of the national budget should be allocated to the maintenance of rural roads. Many would, and have, argued that the financing of road maintenance should be based on the user pays concept. On the other hand often the same proponents of this concept propose that rural roads should be used more effectively to provide access and be more integrated with investments in health and education thus supporting poverty reduction goals.

In the case of national highways the link between investment and economic return is clear. Moreover the concept of user pays is relevant because those using the roads reduce their transport costs and thereby increase their welfare.

Rural roads, though, present a different set of issues. What proportion of fuel taxes, levies etc should go to rural roads; and on what basis, on the asset value, on return on investment, on traffic levels? What is it that the government is getting in return for spending on roads which have little economic return? On purely economic grounds, if national highways carry 80% of the traffic and/or represent 80% of the capital assets in roads then they should receive 80% of the funds available.

Rural roads are not principally an economic investment. They are more socio-economic in nature. Whilst they do obviously have economic return in terms of the evacuation of cash crops, they play a major role in facilitating access to social services including health and education, the latter benefits being difficult to quantify in economic terms.<sup>17</sup>

There is a strong case therefore for treating the maintenance of rural roads in a different manner to that of national highways.

### Asset Value

For the 16 countries for which reliable data is available, there are over four and a half million kilometres of rural roads. This is a huge regional and national asset.

It is estimated that of the overall rural road network only 15% is paved. Based on the available figures from the countries in the region, an estimate has been made of the replacement value of the rural road networks. Based on current maintenance costs, it is estimated that to adequately maintain these networks would involve spending some 6% of the replacement value per year.

Most countries in the region, however, are spending much less than is necessary to adequately maintain the rural road network. Many of the rural roads in the region are already in an unmaintainable condition. Consequently the road assets are deteriorating at an alarming rate. This merely reinforces the argument that money spent on maintenance would have major economic significance in retaining assets which could provide huge economic and social benefits.

Table 2.10 Length of rural roads

Country	Length of rural roads km
Cambodia	27,800
China	1,371,235
Indonesia	291,841
Lao PDR	21,710
Mongolia	37,923
Philippines	164,719
PNG	15,000
Thailand	179,484
Vietnam	130,000
Afghanistan	17,775
Bangladesh	205,101
Bhutan	1,721
India	1,985,000
Nepal	22,410
Pakistan	145,600
Sri Lanka	64,700
Total	4,682,019

The asset management approach tries to move the debate over road maintenance away from the purely technocratic and even political to concentrate on "the inherent value of the network expressed in money terms".<sup>18</sup>

The idea is relatively simple. It is possible to estimate reasonably accurately the asset value of the existing road network. Lack of maintenance will mean that roads will deteriorate over a relatively short period of time. Investment in rehabilitation

<sup>14</sup> Songco. World Bank working paper 2796. 2002

<sup>15</sup> Lao Houaphan Household Survey, Chloe Pearse, ILO ASIST AP 2006

<sup>16</sup> Stiedl and I. T. Transport Ltd. Rural Road Maintenance. Report prepared for the Rural Infrastructure Improvement Project of the Ministry of Rural Development Cambodia. 1998

<sup>17</sup> OECD Guiding Principles on Using Infrastructure to Reduce Poverty. November 2005. Produced by the DAC task team on Infrastructure and Poverty Reduction

<sup>18</sup> Howe. Sustaining Africa's rural road networks: The Asset Management Approach

and/or new construction will increase the asset value but this is likely to be more than offset by the deterioration of the network due to lack of maintenance. It is therefore possible to compare in money terms a strategy which gives low priority to maintenance and higher priority to rehabilitation and construction with one which places higher priority on preserving the existing network. These calculations are not complicated and local decision makers can make them. This means that they themselves can see the financial consequences of their decisions whether to invest in maintenance or rehabilitation.

An assessment of rural roads in Battambang Province in Cambodia showed that between 1998 and 2000 US\$1.5 million per year had been invested in rural roads. However over that period no maintenance had been carried out. Consequently the asset value of the rural roads which in 1998 had been US\$2.5 million had fallen to US\$1.7 million. The cost over the period of keeping the network in its existing condition would have been some US\$800,000, 20% of what had been invested.

The Asset Value approach can be exemplified using figures from Laos. The network has 15,222 km of District and Rural roads representing 48% of the total network length. Of these 4,123 km are estimated to be in a maintainable condition. A reasonable figure for the replacement value of the maintainable roads would be US\$15,000 per km. The unmaintainable roads still have some residual value estimated at 40% of the replacement value. The total replacement value would then be US\$128 million. If, as often is the case, it was decided to put the funds which should be allocated to maintenance into rehabilitating the unmaintainable roads over a five year period, the net result would be a total loss of asset value of US\$28.5 million (128.5 million less 100 million).

			Replacement value per km in US\$	Replacement value maintainable roads in US\$*	Replacement value non maintainable roads in US\$	Total replacement value in US\$	Annual maintenance requirement	
	Length	Maintainable					percentage of asset	US\$ per annum
Year 1	15,222	4,123	15,000	61,845,000	66,594,000	128,439,000	5	3,092
Five years nominal maintenance money is spent on rehabilitating unmaintainable roads at US\$8,000 per km. Annual maintenance money is 5% of replacement value of maintainable roads i.e. US\$3,092 m per year. Total roads rehabilitated 1,932 km								
Year 5	15,222	1,932	15,000	20,317,500	79,740,000	100,057,500		
					Asset Loss	28,381,500		

\*Assumed that the reconstructed roads will deteriorate from 100% of their value in Year 1 to 40% in Year 5.

This example may appear theoretical, however by emphasizing rehabilitation over maintenance this is exactly what many countries are doing.

### Budgeting maintenance as repair projects

In several countries in the region, the description of road maintenance in the budget reflects the curative rather than preventive approach to maintenance. Funds for maintenance are instead allocated to “small”, “medium” and “big” repair works. There is therefore a major effort required not only to develop an effective and realistic rural road maintenance system but also to create a planned maintenance culture.

Because funds are allocated for projects, the money tends to be spent on rehabilitation of unmaintainable links. Because the funds are not spent in general on the continuous maintenance of maintainable links these links become unmaintainable. In addition, the rate of deterioration of the maintainable network is faster than the improvements brought about by rehabilitation. Consequently the overall maintainable network becomes smaller.

Thus, the allocation of funds to road repair on a project basis is unlikely to lead to an increase in the stock of roads in a maintainable condition. On the other hand a planned maintenance procedure would lead to more roads being in a maintainable condition and consequently a yearly addition to the number of people who has road access.

## Chapter 3

# Lack of Maintenance: Economic and Social Impacts

### Overall Implications from Lack of Road Maintenance

The social and economic impacts of rural roads are well established. Communities and local governments often attach a high priority to rural road improvements. Rural roads improve rural access, which facilitates marketing, schooling and health services. Better access provides the opportunity for increased income and employment opportunities and can also contribute to the alleviation of poverty. Still, maintenance of rural roads is seriously neglected in many countries. This chapter focuses on the economic and social implications of such neglect.

Although the link between rural roads and poverty alleviation is mostly indirect, experience clearly shows that areas with poor road access are generally more disadvantaged than areas which are better served. Investments in rural roads can therefore often be justified from both a socio-economic and a poverty reduction point of view. Nevertheless whatever benefits they provide are short lived if they are not maintained.

The principle objectives of road maintenance is to keep roads open, reduce rates of deterioration and extend the life of the road network, reduce vehicle operating costs and improve the speed, frequency, safety and convenience of private and public transport. When maintenance is provided it also generates employment opportunities and additional market prospects for the local construction industry. These are the benefits of maintenance, which will be benefits foregone if no maintenance takes place.

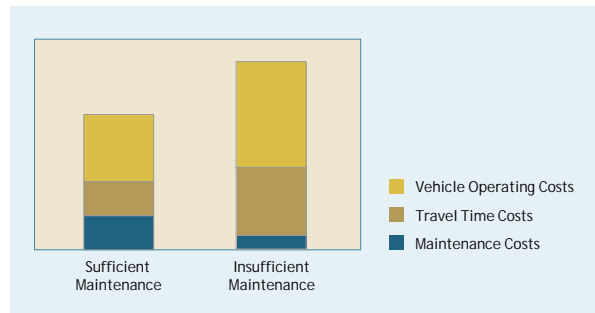
It was demonstrated in Chapter 2 that in most countries in the region there is an imbalance between fund allocations for road construction and for maintenance. Capital expenditures for new construction and rehabilitation works receive a higher priority in fund allocation, thereby increasing the number of roads requiring maintenance. The end result of this imbalance is a growing maintenance deficiency. This could be avoided, if a more balanced allocation would take place.

Cutting back on maintenance accelerates the loss of national assets, increases the overall costs of operating the road network for the owners of the network, increases road transport costs for the users and raises the cost of transport to the economy as a whole.

Good roads are roads that are in a maintainable condition, providing year round access. Well-designed roads can last more than 20 years if adequate maintenance is provided on a regular basis. For a variety of reasons, roads are often left with insufficient maintenance, then reconstructed after they fall into total disrepair. This is not because roads are seen as unimportant. The fact that roads are rebuilt actually demonstrates the importance of these roads, as institutions are willing to re-invest in their reconstruction.

Maintenance costs are generally small compared to other direct costs of road travel. The impact of maintenance on vehicle operating cost and travel time cost can be considerable. Figure 3.1 illustrates the effect on direct transport costs (VOC and travel time) of neglecting maintenance. In addition, with insufficient maintenance, the road will deteriorate and the operation costs for the road will also increase. It should be noted that this example does not consider the costs of any negative socio-economic impacts due to a lack of maintenance and a possible negative impact on accident level.

Figure 3.1: Effects of Neglecting Maintenance



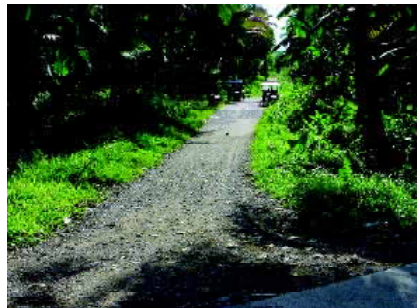
Maintenance costs money, but in pure economic terms it is money well invested. When using economic models emphasising the savings in transport costs, experience shows that maintenance of rural roads often provide an economic rate of return in the range of 30 to 40 percent. This clearly reflects the value of the reduction in road operating costs as a result of improved maintenance.

Roads facilitate the movement of people and goods. Those affected by poor road maintenance include:

- ◇ owners of private vehicles (increased vehicle operation costs and faster depreciation of cars, motorcycles, bicycles)<sup>19</sup>
- ◇ owners and operators of transport services (increased vehicle operating costs)<sup>20</sup>
- ◇ passengers (increased travel times, higher fares, lower frequency, less comfort)
- ◇ farmers, entrepreneurs and traders (higher transport costs of inputs and raw materials and higher prices of hauling produce to the market)
- ◇ local governments (an accelerated depreciation of assets, additional expenditures in terms of rehabilitation costs)
- ◇ people requiring access to health services
- ◇ children travelling to school
- ◇ local people in their efforts to reach locations for employment or partaking in economic activities located outside their communities
- ◇ people wishing to avail of government services
- ◇ government agencies in their efforts to reach local communities providing outreach services such as health, education and agricultural extension services
- ◇ communities' ability to maintain social contacts.

#### The Direct Implications

If not maintained, rural roads rapidly become impassable to motorised traffic until a point that they are no longer trafficable. The pace of deterioration largely depends on the quality of initial construction, surface materials, drainage measures, levels of traffic and weather conditions. Gravel roads deteriorate more quickly than sealed roads and their value can often be assumed to be worthless after five years without maintenance. Sealed-top roads may have a marginally longer life without maintenance but are far more expensive to rebuild. It should also be noted that for rural roads where traffic is more limited, the critical maintenance interventions are often related to maintaining the drainage system. Contrary to common perceptions, the maintenance priorities on rural roads are often related to off-road (and cross-road) structures and not to road surfaces as such.



As a result, the preventive action required as part of an effective maintenance system often consists of minor repairs to the drainage system before water causes any major damage to the road assets. If this is not carried out in a timely manner, the pace of deterioration increases, leading to and accelerating increases in rehabilitation costs.

The direct implications of poor maintenance are fourfold:

1. Depreciation of the value of the road network;
2. Increasing transport costs;
3. Declining rural access; and
4. Loss of economic development and employment opportunities

#### Depreciation of the Value of the Road Network

For many countries in Asia roads are their largest assets.<sup>21</sup> The replacement costs, in case these assets are lost, amount to a significant percentage of GDP. Rural roads constitute a major part of the assets in a public road network. Overall for 15 countries in the region, the asset value of rural roads alone represents 27% of the overall GNP.

In many of these countries, maintenance expenditures have been so low that a substantial percentage of the initial capital investment in roads has been and continues to be eroded. This is a huge cost to society as it bears important opportunity costs. Instead, the money eroded could have been used for alternative investment opportunities.

According to a 1988 World Bank study,<sup>22</sup> allocations for road maintenance over a twenty year period had been so low that nearly 15% of the capital invested in main roads - roughly US\$43 billion equivalent to 2 percent of these countries GNP - had eroded due to lack of maintenance. The same study demonstrated that reconstructing these roads - costing US\$40 to US\$45 billion worldwide - could have been avoided by spending US\$12 billion on maintenance. This is a ratio of about 3.5 to 1, not taking into consideration the time value of money.

---

<sup>19</sup> In the context of rural roads, it is often the case that a lack of maintenance not only increases VOC but will often prescribe the use of more expensive types or modes of transport. This may take place in the form of having to use 4x4 vehicles instead of standard 2-wheel drives. In extreme cases, when vehicular passage is no longer possible, the transport may have to revert to animal or human transport.

<sup>20</sup> On rural roads the amount of goods and people transported is far less than on the main roads. Levels of transport services are therefore more limited and more sensitive to the quality of the roads.

<sup>21</sup> Assets are defined here as durable items of relatively long life that are used for production of goods and services (in this case transport services).

<sup>22</sup> Road Deterioration in Developing Countries, Harral and Faiz, 1988

## Asset Management

Local authorities often underestimate the importance of road maintenance and consequently budgets for maintenance are usually severely constrained. Introducing an asset management approach to local decision-makers may generate more political and local support for road maintenance activities.

The basic ideas behind asset management which has been introduced in Chapter 2 are very simple:

- ◇ A local road network has a certain value, which is estimated in money terms;
- ◇ Investments in rehabilitation and construction of roads increase the value of the network. On the other hand, road deterioration due to lack of maintenance decreases the value of the network;
- ◇ Local agencies should aim at increasing the total value of the network (and thereby maximizing access). Available investment funds should therefore be efficiently balanced between the demand for maintenance on the one hand and construction of new roads (and the rehabilitation of roads in total disrepair) on the other;
- ◇ Local decision makers themselves should be involved in assessing the results of different allocations in terms of value (and quality) of the total road network.

The asset management approach is likely to give first priority to maintenance tasks and lesser priority to investments in rehabilitation and new construction.

The data presented in the table below is an example from the Philippines, illustrating in a simplified manner the principle of asset management.



Assumption	Effect
Assume that a Local Government Unit (LGU) owns 200 km of roads in maintainable condition. Total construction cost per km is estimated at Peso 1 million per km.	Asset value of the maintainable road network is 200 million Peso
Assume the annual maintenance cost is 50,000 Peso per km per year (5% of the construction cost). If this amount was spent on maintenance, the network would remain in good condition (and the asset value would remain the same)	Total maintenance requirements are 10 million Peso. The LGU will have to spend 10 million Peso annually to keep the existing road network in good condition
Assume that a road deteriorates to an impassable condition in 5 years time if no maintenance takes place and that the cost of rehabilitation is 60% of the new construction cost or Peso 600,000 per km	If no maintenance takes place, the road value is reduced by 120,000 Peso every year.
Assume that the LGU has an annual budget for road works (maintenance and new construction) of 20 million Peso.	
Assume that the LGU gives first priority to all maintenance works and use the remaining funds for new construction	The value of the road network will be 245.2 million Peso at the end of year 5 (beginning of year 6)
Assume that the LGU spends all funds on new construction and no maintenance takes place	The value of the road network will be 184.3 million Peso at the end of year 5

	at the beginning of year					
	1	2	3	4	5	6
Option 1 Maintenance first, remaining budget used for construction						
Length of Road Network	200.0	210.0	219.5	228.5	237.1	245.2
Total LGU Budget	20.0	20.0	20.0	20.0	20.0	
Maintenance Budget	10.0	10.5	11.0	11.4	11.9	
Available for Construction	10.0	9.5	9.0	8.6	8.1	
Kms of new road	10	19.5	28.5	37.1	45.2	45.2
Deterioration Road Network Value	0.0	0.0	0.0	0.0	0.0	
Option 2: Construction Only	Year 1	Year 2	Year 3	Year 4	Year 5	Year6
Length Road Network	200.0	196.0	192.5	189.4	186.7	184.3
Total LGU Budget	20.0	20.0	20.0	20.0	20.0	
Maintenance Budget	0.0	0.0	0.0	0.0	0.0	
Available for Construction	20.0	20.0	20.0	20.0	20.0	
Kms of new road	20	40	60	80	100	100
Deterioration Road Network Value	24.0	23.5	23.1	22.7	22.4	

The conclusion of the example above is that if the local government prioritizes maintenance, the total value of the road network after 5 years will be 25% higher compared to a situation in which the local government allocates a similar level of resources for new construction while neglecting maintenance. It is worth noting that the more prevalent conclusion often taken by local leaders is that 100 km of road have been constructed under Option 2 against Option 1 where there are only 45 km of new roads. The fact that the asset value and the part of the network in good condition has decreased from 245 km to 184 km is often ignored.

The costs of lack of maintenance should also be looked at from a network perspective. A lack of maintaining critical links may have an impact beyond the immediate area of influence. Not being able to maintain critical links in a network may generate a wide range of problems felt elsewhere. For example maintenance of village access roads is of little value if the feeder roads to which they connect are not maintained.

#### Increasing Transport Costs

With improved roads, transport cost savings occur both through lower costs of existing traffic and lower costs of generated and attracted traffic. The assumption is that traffic will grow as a result of road improvements. A deterioration of the road network on the other hand will gradually reduce traffic levels. Moreover the unit transport cost will increase.

Poor roads impose higher costs on transporters as operating costs are higher. Eventually, when the roads become impassable, there will be a shift to less-effective modes of transport, replacing motorized transport by more costly non-motorized transport. In addition, the move to non-motorised transport often implies that a lot of transport simply ceases to take place. If motorised transport is not available, bulky goods can only be transported for short sections.

The increased costs due to poor maintenance are borne primarily by users of the transport system in terms of higher fares for passengers and freight. They are not borne directly by the provider of the road, the government.

After a number of years, roads without maintenance become impassable to year round traffic. Initially, the deterioration of the roads only leads to increasing transport costs marginally. At some point however, traffic conditions, traffic composition and traffic patterns change as the road becomes increasingly impassable and the cost of transportation rises drastically.

The extent to which the savings in transport costs are passed on to the farmer as a result of adequate road improvements depends upon several factors including the degree of competition between traders and haulers. A more competitive environment increases the likelihood that VOC savings will be passed on to the farmers.<sup>23</sup> A deteriorating road network on the other hand reduces competition because VOC

increases. Obviously, farmers are likely to bear the brunt of this increase. A World Bank report shows that if a road is allowed to deteriorate, each dollar deferred on road maintenance increases VOCs by about US\$2 to US\$3, a direct cost borne by the road users.<sup>24</sup>

Deteriorating roads increase the duration of the journey. A recent study estimated travel time savings for rural travellers at US\$0.06 per hour in Bangladesh and US\$0.18 per hour in Ghana and Tanzania.<sup>25</sup> The same figures could be used in valuing the cost of increasingly long journeys. In general, a poor network decreases personal mobility which also bears social costs in addition to the economic costs of travel times.

It is safe to assume that if a rural road deteriorates due to lack of maintenance,

- ◇ traffic levels go down while transport costs and transport time increase,
- ◇ there will be a negative impact on (agricultural) production,
- ◇ average annual household income will decrease.

This is exacerbated by the reduction in competition in the transport sector due to lower traffic levels. As a result, the increased cost of transport is passed to the farming households. On the other hand, a well maintained road network keeps input and transport prices down and, hence, production costs lower and can lead to improved livelihoods through higher incomes.

The quality and density of the rural road network makes a significant difference in the cost of agricultural inputs, the quality and value of outputs as well as the delivery of extension services.<sup>26,27</sup> A World Bank report on rural poverty in the Philippines estimated that the provision of all-weather roads could reduce the costs of marketing agricultural products by 15-20 percent.<sup>28</sup> The major issue here is not the need for more roads but ensuring that the existing network is in good condition. Poor roads increase the cost of haulage, reducing the profit margins of farm enterprises. The current lack of maintenance is a prime reason for the poor productivity and low profitability of agriculture in many countries in Asia.

---

<sup>23</sup> Hooke and Howe. Transport and the Millennium Development Goals. A background paper for the Millennium Project

<sup>24</sup> World Bank, Commercial Management and Financing of Roads, 1998

<sup>25</sup> Valuation of Travel Time Savings: Empirical studies in Bangladesh, Ghana and Tanzania, IT Transport, 2005

<sup>26</sup> Recent research by Howe in Zambia suggests that there is a close correlation between the density of maintainable roads and poverty levels

<sup>27</sup> Lan Xang International for the MCTPC in Lao PDR. Development of a Rural Infrastructure Policy. 2006

<sup>28</sup> World Bank, Philippines 1996: A Strategy to Fight Poverty

## Declining Rural Access

Rural roads are important to realise the productive potentials of agricultural land, facilitate schooling, health services and marketing and satisfy other social and economic needs. If rural roads are not maintained properly, access will deteriorate and these activities will be negatively affected.

### Increase in Rural Traffic

The impact of improved road access in rural areas is clearly demonstrated when a new road is constructed or an old road is rehabilitated. A common scenario in many developing countries is that rural communities do not have any road access at all or at best the village is connected with a track which is open for 4x4 vehicles only during the dry season. As a result of this dire access situation, any transport of goods and people is essentially by foot or at best with the occasional animal drawn cart.

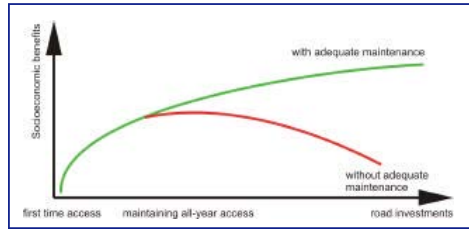
When these communities are connected with all-weather roads, it is common to see a significant increase in traffic to and from the communities. Although farming and other economic activities normally need some time to adjust to the improved access situation, there is an immediate increase in the number of trips carried out by the villagers served by the road. In the Asian region, the majority of local traffic often consists of an array of intermediate means of transport often powered by motorbikes, rickshaws and power tillers.

What is important to note is the significance of the rural road connecting these communities. Very often, the only access to these communities and the only reasonable mode of transport is provided through a single access road. If this link is not maintained, there is no alternative means of communication. When these connections fall into disrepair, they therefore have an enormous social and economic impact.

Most benefits emerge when a region receives first time access. The first roads open up the area to markets, health facilities, schools, government services etc. This can bring about substantial economic and social benefits. Goods, services and facilities become increasingly accessible. Communities enjoy the benefits of better access and become increasingly frustrated if access deteriorates and improvements in their living standards are compromised.

Figure 3.2 shows the relationship between investments in road development and socio-economic benefits. It indicates that the initial investments in providing first time access generate the fastest increase in socio-economic benefits, followed by investments that provide all year access (in areas that only have seasonal access). The smallest increase in socio-economic benefits results from further road improvement and upgrading. Maintenance works sustain and compound the benefits generated, while lack of maintenance results in a significant decrease in socio-economic benefits over time.

Figure 3.2: Road Investments - Socio-economic Benefits



A lack of maintenance also affects people's life in social terms. Once roads become impassable, people can no longer access schools, health centres or other service centres. It also becomes more difficult for service providers to reach communities, schools and health centres. As a result, the level and quality of certain services deteriorate. Teachers may well be absent more often as schools become more difficult to reach, mobile health teams visit areas less often and the distribution of medicines declines. These negative social impacts have significant long-term economic consequences.

Accessibility and transport services are linked and an important correlation is the one between rural roads and rural transport services. Rural people often are too poor to own their own motorized vehicles and depend on public transport to gain access to locations outside their communities. When rural roads deteriorate public transport becomes more expensive and transport operators eventually decide to stop their business. This translates into declining public transport services in rural areas. Transport is a facilitating mechanism and as a result access to social and economic goods and services declines.

#### Health and Education

Numerous studies have identified the connection between quality of health services and literacy levels in rural communities and the proximity to all-weather road access. With poor roads travel time obviously increases to health centres and schools. When the travel becomes too arduous, many people choose not to use such facilities. Poor access also has a significant impact on the quality of schools and health services. It is a common feature that schools and health clinics located in areas with poor access are badly equipped as compared with similar facilities in central locations. The reasons are very simple. Firstly, with poor access, it becomes more difficult to maintain and re-supply these facilities. More critical is the fact that qualified teachers and health workers are often not prepared to live and work in such areas with limited or poor access.

Figure 3.3 depicts the impact of lack of maintenance on both the level of socio-economic benefits and transport costs.

Box 3.1: Problems of Poor Access

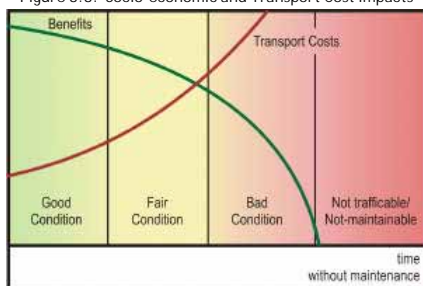
Many farmers are reluctant to grow a marketable surplus second crop because it cannot be sold or because the difficulty and expense of transport significantly reduces the returns to labour.

Agricultural productivity is low and there is a lack of innovation because extension information and inputs do not reach the farmers.

School enrolment is low and absenteeism is high (often among teachers as well as children).

Standards of health care are low because clinics are hard to reach and health workers cannot travel easily.

Figure 3.3: Socio-economic and Transport Cost Impacts



Lost Employment Opportunities

Maintenance of rural roads offers an excellent and sustainable opportunity for local job creation. Routine maintenance is by its nature labour intensive. There are also several periodic maintenance activities that can be efficiently carried out by manual labour. Using labour-based methods provides long-term employment and income as maintenance is a continuing activity. The Philippines, for example, has a rural road network of about 172,000 kilometres.

A lack of maintenance is a critical problem in the country severely constraining growth of the local economy. If the country would adopt a length-man system, with on average 1 person responsible for the routine maintenance of 3 kilometre of rural road, it could create 57,000 permanent jobs. In addition, another 35,000 short-term jobs could be created through periodic maintenance. Greater investment in maintenance therefore would not only preserve the road network but also contribute to employment creation and income generation in the rural areas thus

having a positive impact on local development and poverty reduction.

Funds invested in cash or food for work schemes are often wasted because the works are poorly constructed and rarely maintained. A more effective use of the funds would be to invest them in rural road maintenance thus creating longer term jobs and sustaining the rural road asset.

Regular transfers of cash through labour-based road maintenance schemes can have a major impact as the Bangladesh experience shows. The Local Government Engineering Department (LGED) is involving poor rural people, particularly destitute women, in road maintenance programmes to make roads useable throughout the year and at the same time creating employment opportunities for local people. LGED employs about 1,000 destitute women at any specific time to protect and maintain slopes and plant trees alongside 550 kilometres of rural roads. These women receive a monthly salary for a period of 26 months and also participate in the benefits of the trees when they are harvested. Female workers are selected from among the very poor households in a community and live close to the road. The cash injection is enough for these women to invest in other opportunities to lift themselves and their families out of extreme poverty.<sup>29</sup>

An ILO rural road project in Cambodia<sup>30</sup> showed that over 70% of the costs of its maintenance activities represented local wages for labourers and local materials. The project also demonstrated that maintenance offered viable market prospects for local contractors.

### Maintenance and Economic Analysis

The appraisal of investments in rural roads needs to include the costs of maintenance. The social and economic importance of rural roads has been described by many authors. There is little disagreement that rural roads facilitate major social and economic benefits and that a lack of maintenance therefore has both economic and social consequences. The lack of maintenance affects the stream of future benefits and reduces the economic returns. In reality, in many developing countries, maintenance activities are indeed rarely carried out in a sufficient and proper manner and the stream of future benefits is affected.

Rural roads are often selected by comparing their costs and benefits. Sometimes this is done based on cost-effectiveness criteria. Occasionally however this takes place through a more detailed socio-economic cost-benefit analysis resulting in the calculation of a road's IRR or NPV. The stream of benefits and costs is usually calculated over a longer period (up to 20 years). This period will exceed the actual

---

<sup>29</sup> "Rural Road Maintenance and Implementation Procedures in Bangladesh", P. K. Choudhury, LGED 2003

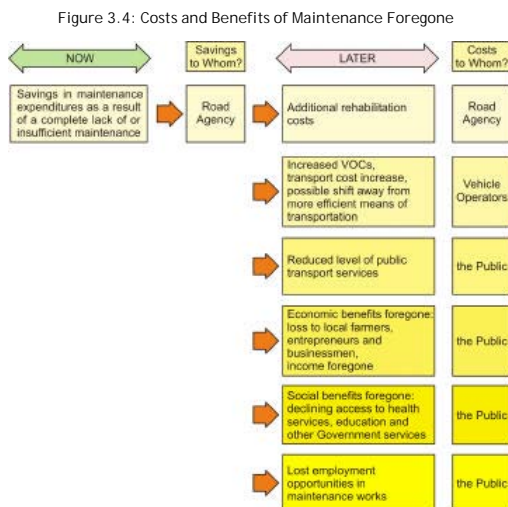
<sup>30</sup> "Rural Road Maintenance Initiative - Inception Report", Upstream Project, 2000

life of a road in the case where no maintenance takes place. Implicit in the economic and financial analysis is therefore the assumption that the roads will be properly maintained and that the stream of benefits will continue. Adequate routine maintenance and a regular cycle of periodic maintenance are assumed to ensure this long life of the road. This assumption contradicts reality. One could argue that if a country has a poor track record of maintenance, the assumption with regard to the life of the road may have to be reduced, which will in all likelihood reduce the value of the IRR and NPV below the threshold levels.

The World Bank and ADB usually use 12% as the opportunity cost of capital. Road projects should show a minimum IRR of 12% to be eligible for funding. The models used for economic analysis are often based on a 20-year life span of the road and assume that freight volumes increase and VOCs remain constant after road construction has been completed. Obviously, this will not be the case if the road is allowed to deteriorate due to poor maintenance.

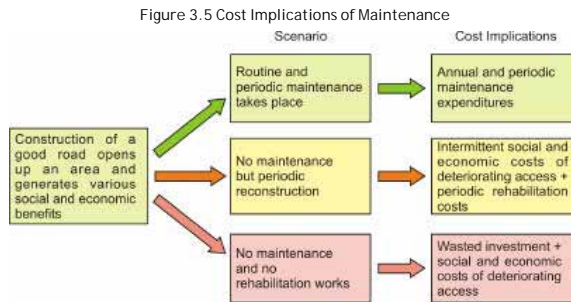
Not maintaining roads saves maintenance expenditures. These savings however are only a fraction of the benefits foregone. In addition, savings in maintenance expenditures now lead to increased rehabilitation and transportation cost in the future. The costs of the latter outweigh the maintenance savings by far.

The following figure illustrates the above.



For the road agency the choice is between providing maintenance funds and delaying the point at which significant funds are required for rehabilitation or using the available funds to build more roads. The general public doesn't have a choice however. Poor access due to a lack of maintenance will result in reduced health services, increased mortality rates, less school enrolment, lower literacy levels and lower income levels. Figure 3.4 indicates that most of the benefits foregone do not directly affect the road agency but the transport operators and the general public. For the road agency the argument is purely between maintenance and rehabilitation. For the users it is a choice between investments in maintenance or the loss of a range of benefits which do not impact on the road agency but on the public in general.

The opportunity costs of lack of maintenance are substantial. These costs relate to lost social and economic benefits and an increase in transport costs and effort. Figure 3.5 summarizes the cost implications of the three main scenarios.



### Maintenance and Poverty

Access is accepted as being of prime importance to the achievement of the MDGs. There is also solid evidence that rural roads provide much of the access needs of the rural population. However it is not the construction of roads that ensure the access. If they become impassable after the first rains then their access value is lost. It is maintenance which provides the sustained access and contributes to the achievement of the MGDs.

Improving a rural road provides the opportunity for a reduction in the price of consumption goods; for ensuring that cash crops can be exported to the local market in a timely fashion; that children can attend school on a regular basis; and that decent medical attention can be obtained when necessary. However it is

maintenance which ensures that the opportunity which is provided is not only taken but can be sustained.

Much has been written recently on the poverty reduction potential of good rural roads. This is generally seen as a plea for more investment in rural road rehabilitation. However it is the maintenance of rural roads which is going to ensure continued access and facilitate sustained results of other development efforts.

In discussing the importance of maintenance in relation to poverty reduction it is important to recognise the facilitating role of rural roads. It is generally recognised that rural roads by themselves do not have a major impact on poverty. However by the same token it would be difficult to imagine how poverty can be reduced without the provision of rural roads. Roads provide the potential for access and access is a major catalyst for poverty reduction.

Nevertheless, rather than spending energy on justifying the poverty reduction aspects of rural roads construction, proponents of the road sector should be lobbying for more and better maintenance. This would ensure that any poverty reduction potential that rural roads have can be achieved and sustained.

Whilst rural roads are not mentioned specifically in the MDGs, it is clear that they contribute directly through the provision of access. Of the eight MDGs,<sup>31</sup> viz,

- Goal 1. Eradicate extreme poverty and hunger
- Goal 2. Achieve universal primary education
- Goal 3. Promote gender equality and empower women
- Goal 4. Reduce child mortality
- Goal 5. Improve maternal health
- Goal 6. Combat HIV/AIDS, malaria and other diseases
- Goal 7. Ensure environmental sustainability
- Goal 8. Develop a global partnership for development

It is clear that access is a significant factor to the achievement of Goals 1, 2, 4, 5 and 6.

However, as has been made clear, it is not merely the construction of a road which provides access but the sustainability of that access through effective maintenance. A formerly isolated area will first enjoy the benefits of improved road access once the road network has been improved. Maintenance provides the sustainability. It ensures that the benefits that are generated with the improvement of the road network are continued. Prices for basic necessities remain stable because transport costs do not rise, government services continue to be provided, traders continue to travel to the villages to buy produce and the improvements in personal mobility are sustained ensuring continued access to health services, schools and income and employment opportunities.

Maintenance of rural roads needs to be an integral part of poverty reduction strategies if we are to succeed in reaching the MDGs. Many rural roads will not have sufficient economic justification for investing in improvements as the traffic numbers often do not support the costs of providing all-weather road access. Proper access is however required in the rural areas in order to deal with the MDGs in an effective manner. Large parts of the poor population live in remote and sparsely populated areas where traffic numbers will remain low. If the aim is to improve livelihoods in such places, we need to go beyond the economic calculations and include road access as part of the social goods (similar to health, clean water, education, etc) which we generally consider as a right of all people. In order to sustain the social development efforts, we need to include rural road maintenance into this picture.

Rural road users experience benefits from improvements to the rural road network. These benefits will be lost over time if roads are not adequately maintained. The following quotes are taken from a socio-economic impact study of labour-based rural infrastructure rehabilitation and maintenance in Cambodia (Sakko, ILO 1999).

**Rides and frequency**

Respondents report to have doubled their rides as compared to before the road was built. This counts for half of all motorcycle drivers, most of the motor trailers, ox-carts, bicycles and pedestrians.

**Reduced travel time**

All road users, pedestrians and vehicle drivers, reduce their travel time by at least one third to half the travel time after the road was rehabilitated.

**Fares**

Transport fares clearly drop after the road has been rehabilitated. For motorcycle and trailer transport, fares drop by one fourth to one third. For etans (light truck) and pickups, fares drop by one third.

**Load**

Motorcycles now carry double the number of passengers than before the road was built. Their load carriage has at least doubled, and is in some cases increased by 500 per cent. Bicycles now often carry an extra passenger, although not meant for public transport. Bicycles now carry double or triple the load before the road was built. Ox-cart, etan and pick-up drivers almost double their load.

**Number of vendors and stands**

Markets and shops expand at many places within the influence zone of the road. Some market places have grown out of a few plots before the road was built up to 200 stands now, within two years. Along the rehabilitated road, small shops have doubled or are five to six times the number before the road was built. Although other factors and interventions may also influence economic growth, shopkeepers see a clear relation between the rehabilitated roads, more customers and expansion of markets.

**Prices of goods**

In general prices of basic goods drop. More vendors increase competition. Vendors report that the rehabilitated roads contribute to better and larger supply of goods, which cuts costs and forces prices down.

<sup>31</sup> Willoughby, Infrastructure and the Millennium Development Goals Prepared for the DAC Task Team on Infrastructure and Poverty Reduction meeting in Berlin in October 2004

## Chapter 4

# Decentralisation

### Introduction

Rural road maintenance is a local activity, affecting local people. It is therefore reasonable to expect that the decentralisation of the responsibility for implementing maintenance of rural roads would be beneficial to all concerned. There is a better understanding of the condition of the network at local level both by the local population and those responsible for its upkeep. There is the chance that local people could be involved in the monitoring of overall performance and the delivery of maintenance. The importance of maintaining local roads are important to local communities and if funds are available to local bodies, the maintenance can be made more responsive to the actual requirements of the local road network. Perhaps above all local people have a much greater vested interest in keeping roads trafficable than does a centralised organisation.

Decentralisation, in its various forms, is now in place in most of the countries of the region. Decentralisation transfers important aspects of public service delivery from the central agencies to sub national agencies. In most developing countries it is of fairly recent origin and as such has attracted a vast array of literature. This has dealt with financing, management, governance and institutional issues to name but a few. Amongst this wealth of research, there have been a few that have dealt with the road sector, either specifically or as part of discussions on the delivery of public services.

It is not the intention in this chapter to discuss in detail the general advantages and disadvantages of decentralisation. The issue here is in what way does, or can, decentralisation affect rural road maintenance.





Strengths	Weaknesses
<ul style="list-style-type: none"><li>◆ Decisions taken at the local level</li><li>◆ Funds used for locally defined needs</li><li>◆ Increased opportunity for community involvement</li><li>◆ Decentralised supervision allowing for regular inspection of work sites and improved progress monitoring</li><li>◆ User Involvement in monitoring of performance</li></ul>	<ul style="list-style-type: none"><li>◆ Lack of clarity of decentralisation often leading to related central agencies attempting to retain authority</li><li>◆ Vested interest from local politicians</li><li>◆ Lack of capacity in terms of technical and managerial skills</li><li>◆ Lack of qualified staff for work design and supervision, accounting, overall planning and management</li><li>◆ Lack of funding due to poor local tax base and limited funds being allocated by central authorities</li></ul>

In Chapter 2 the parlous state of the rural road networks in the region was illustrated. There is little in the literature that indicates whether local authorities are any better at maintaining the network than more centralised ones.<sup>32</sup> In theory however they should be. Rural road maintenance is one of the public services that could be more effectively delivered at the local level. However, as in any management configuration, there are financial, political, attitudinal, institutional and technical reasons that need to be considered.

#### Attitude and Perception

Maintenance has always been the poor relation of the road sector. It is viewed as important only by its absence, when roads deteriorate to the point that they are no longer serving their intended purpose. It is seen this way because it is not perceived as being in the interest of any of the stakeholders involved. The fact that those responsible are closer to the users in a decentralised system does not necessarily mean that sustaining the road network will be taken any more seriously than under a centralised system.

Elected representatives of local bodies often see little political capital from promoting maintenance. Because of their limited tenure in office their interest is best served by using the funds for roads for construction or rehabilitation. Through this they can show that they are bringing the services to their electorate. Preserving the network has no glamour and maintaining the status quo does not generate votes.

For politicians there is little interest in proclaiming that they have managed to preserve the investments that were made by their predecessors.

<sup>32</sup> Robinson and Stiedl. Decentralisation of Road Administration: Review of Experience. DFID 2000

#### Breaking a Vicious Circle

Without an organised approach to preserving the rural road network, it is often seen that local road works agencies are forced into a system of consistently dealing with the effects of the lack of maintenance, i.e. having to repair and reconstruct road sections which have failed since timely and adequate maintenance interventions were not carried out.

For obvious reasons, the first priority of the local road agencies is to keep road passage to local communities open throughout the year, or through most of the year (accepting the roads not being passable during extreme weather conditions). Without any preventive maintenance system in place, the efforts to keep roads open very much consists of carrying out repairs after the damage has been done. This type of interventions is often much more costly than preventive maintenance. Due to the extent of damages each year to the network, the remedial works often drain the entire road works budgets, leaving no resources left for preventive measures.

With the damages caused during the next rainy season, the local authorities are left with no alternative than to use the subsequent budgets to once again carry out repairs to damaged roads. Although it can be argued that the repairs are necessary, this way of managing the road network is costly and ineffective, and the only way of breaking these bad habits is to introduce the concept of preventive maintenance, thus reducing the extent to which the roads will require costly repairs. The cost savings in repair works can then be brought forward to the next maintenance season and utilised for further preventive activities which may preserve the road assets.

Those in the technical units at both decentralised and central level also have a tendency to favour new construction rather than placing importance on maintenance. This may not be their fault. Often the budget for maintenance is not clearly defined and in many cases is included in the development budget and not as a recurrent item. Thus funds for maintenance are used to repair or rehabilitate roads that are unmaintainable. In addition the attitude of politicians pressures the technical staff to give low priority to maintenance. Equally, the majority of funds allocated to roads works in externally funded rural development programmes emphasise construction works, often with no strategy for the ensuing maintenance requirements.

In addition, the technical capacity at the decentralised level is often limited. In the first place this results in a lack of information on the state of the network. Even the size of the network may not be known with any accuracy. Condition inventories are notable by their absence. In default of this information, it is difficult for those responsible to present reasonable arguments to spend the limited funds available at the local level to preserve important links in the rural road network. Sometimes, as in the Philippines, the administrative unit to which responsibility is decentralised is very small and is responsible for only a few kilometres of roads. Equally the revenue of such units is very small and road maintenance is not seen as a priority.

People are of course pleased that roads are provided for them. However they will generally not complain about the lack of maintenance but about the lack of trafficability once the road has become unmaintainable. Moreover they are not generally aware that the road has deteriorated because of lack of maintenance. Thus, even though they have the possibility of bringing complaints to the local authority, they would not usually point to the lack of maintenance.

Because maintenance is not seen as being important, little attention is paid to setting maintenance performance targets and standards. Thus it is very difficult to judge the performance of a local authority.

The general theme running through all these attitudes is the lack of accountability. If budgets are not allocated specifically for maintenance then there is no monitoring of maintenance expenditure. If politicians are not accountable for the assets that they assume responsibility for, then it is not their concern that those assets deteriorate. If technical staff do not have the capacity to assess the state of the road network and do not have the tools and procedures to be able to effectively plan the use of what little money is available, they cannot either be held responsible for the lack of maintenance.

In general the old adage that “if it is not broken don’t mend it” could be slightly amended for the common attitude to rural roads into “if it is not broken don’t maintain it”.

#### Finance

In their comprehensive review of experience of decentralisation of road administration,<sup>33</sup> Robinson and Stiedl suggest that “it appears that most attempts to decentralise responsibility for rural transport infrastructure have done little to address the funding problem”. There appears to be several reasons for this in relation to maintenance.

In many countries the fact is, as illustrated in Chapter 2, that there are simply insufficient funds available for the maintenance of rural roads. Moreover, the poorer the country is, the smaller the amount of money available. In addition, in a decentralised system it is often the case that the funds transferred to the decentralised agency is considerably less than required.

Whilst taking the responsibility to local levels might encourage more concern for maintenance, dividing the funding cake into smaller pieces does not make the cake any bigger. Indeed the lack of clarity of whether maintenance is included in the development or recurrent budget actually exacerbates the problem.

Decentralisation usually allows local authorities to utilise their own resources as well as the subvention they receive from central government. However in many cases, particularly in rural administrations, the potential for raising local funds is limited. Local taxes can provide some income but this is generally limited as the tax base is also small. Road user charges can be applied and, of course, are on the

---

<sup>33</sup> Robinson and Stiedl. Decentralisation of Road Administration: Review of Experience. DFID 2000

major roads of the network. Applying them to rural roads is more difficult. Given the traffic levels involved, the collection of these charges involve a disparate relationship between the cost of collection and the revenue achieved. Road funds have also been seen as an effective way to provide funds for road maintenance. However the proportion of the funds that go to rural road maintenance has in general been very small. Attempts have also been made to generate interest in local communities to provide at least some of the cost of maintenance whether in cash or in kind. However, there has been only a few examples of communities being willing to contribute to the maintenance of rural roads on a longer term basis.

Another factor which complicates the financing issue is the lack of control that local authorities have over the construction or rehabilitation of roads under their responsibility. Large, centrally managed programmes requiring the provision of rural roads, such as agriculture development projects, are often designed and implemented with only limited involvement of the local authority. The implications for the maintenance budget of the local authority of these improvements are rarely discussed. Even if they are it would be difficult for a local authority to reject the offer of improved roads in their area. Local authorities are often obliged under the terms of these programmes to maintain the roads constructed by the programme. This may seem logical but ensures that the limited budget that they may have is allocated for roads which may not necessarily be priorities for the local administration.

The massive and extremely well organised rural road programme in India, the PMGSY, has taken the innovative step of ensuring maintenance of the roads rehabilitated under the programme by including maintenance in the rehabilitation contract for a period of 5 years after completion. After that date their maintenance is passed to the local administrations. Efforts are now under way as part of this programme to ensure that the PMGSY roads are indeed part of the core rural road network of the states. Thus their future maintenance accords with the priorities of the local administration.

It is also worth noting that even when funds are allocated for maintenance this does not imply that funds are expended. In Madhya Pradesh, for example, actual expenditure on rural roads never exceeded 50% of the allocation in the period from 1998 to 2003. This, and the fact that even the funds that are actually provided often arrive in irregular apportionments, further limits their usefulness.

Some authors have suggested that the solution to this dire financing problem is to state the obvious that one shouldn't build what one cannot maintain. However this ignores the fact that in the poorer countries rural road networks are vital to the development of agricultural production which would allow them to increase their national wealth. Limiting the rural road network to that which the country can afford to maintain would mean restricting the potential for economic growth.

Nevertheless it is clear that certain basic measures could be applied at the decentralised level to ensure that

- ❖ at least a basic minimum of funds are allocated to maintenance and
- ❖ that there is sufficient local technical capacity to spend it more effectively.

In a paper for the World Bank, Humplink and Moini-Araghi argue that “there are initial costs of decentralisation which relate to losses in economies of scale. However these losses can be outweighed by increases in efficiency”<sup>34</sup> This of course is a general conclusion. Particularly in the roads sector there needs to be a capacity at the local level to create this greater efficiency. An acceptance that funding for maintenance will always be a problem does not mean that effective maintenance cannot be done with the funds available. The improvement of capacity at the local level has to be a major focus of any road administration if the limited funds that are available are to be spent effectively.

The World Bank has pointed that out that every dollar spent on maintenance saves US\$4 in rehabilitation costs. It seems therefore that there is also room for money to be spent on increasing capacity so that the life of the road is prolonged.

#### Institutions

The most important institutional issue is that of capacity. This has been poorly dealt with in the devolution process. Even if sufficient funds are available, if there is no capacity at the local level then the efficiency gains referred to above will not materialise. In the roads sector relatively little has been put in place during the decentralisation process to ensure that local authorities possess the knowledge and skills to effectively deal with road maintenance.



<sup>34</sup> Humplink and Moini-Araghi. Decentralised Structures for Providing Roads: A cross country comparison. World Bank

Institutional capacity to perform efficient and timely maintenance involves the capacity to plan and carry out the works at the right time, preserving investments with solutions which are cost-effective and thereby utilising available funding resources in the most efficient manner. This requires:

- ❖ technical staff
- ❖ a thorough knowledge of road network
- ❖ sound procedures for road condition inventories
- ❖ efficient planning procedures
- ❖ effective procurement systems
- ❖ good supervision
- ❖ adequate logistical support
- ❖ transparent and up-to-date reporting
- ❖ reliable financial management

Figure 4.1  
Options for the Implementation of  
rural road maintenance

Implementation Arrangements	
1	Paid permanent staff supported by equipment
2	Paid casual workers for defined tasks
3	Direct contracts with individuals or groups (payment by result)
4	Contracts with petty, medium or large scale contractors
5	Agreements with communities
6	Agreements with defined village level organisations
7	Self-help: (i) voluntary (ii) collect funds and hire people or contractors (iii) collect funds and combine self help with rented equipment inputs

There has been a tendency in recent years to move away from public sector provision of infrastructure services towards the involvement of the private sector. This has obvious benefits in that the private sector is usually perceived as more effective in delivering services. However contracting out maintenance at the local level may not follow conventional procedures (see Figure 4.1). Certainly for routine maintenance it has been possible in several countries to contract out the work to lengthmen or petty contractors. This still requires both planning and contracts management capacity at the local level and adequate supervision to ensure that the work is carried out effectively. In this regard the experience is such that several basic guidelines and training materials exist to support the local administration.<sup>35</sup>

The issue of capacity is related to the level to which decentralisation takes place. This often has more to do with political considerations than with either economic or functional efficiency. Unfortunately, the result may be that the level to which the responsibility for rural roads is devolved is not optimal. In the Philippines for example the Barangays are responsible for the maintenance of the 160,000 km of

Barangay (tertiary) roads. Each Barangay is responsible for no more than 4 km of road. Whilst this should result in those roads being maintained, in practice it means that they are ignored. Not for any willful disregard but because the funds available at Barangay level are so limited and there is no technical capacity to deal with roads. In India, responsibility for rural roads is devolved to the Panchyati Raj Institutions. However they, in common with most decentralised agencies in the region, rarely have sufficient funds and often have no technical expertise.

There is also the additional problem that by having units responsible for such small portions of road the concept of a functioning network is partly lost.

Rural road maintenance is not complex in implementation. However it does require some basic minimum of technical expertise. Hiring a grader for a few days to maintain the roads often does more damage than good. However developing a system of continuous routine maintenance requires an organization in charge of planning and supervision and with a measure of administrative and financial management procedures.

With funds for maintenance being so scarce it is vital to maintain those roads which provide the most benefit both to the communities and to the local economy. This can only be done by looking at the network in a broader sense. Hard decisions need to be taken regarding the allocation of the limited budget that is available.

This is where local autonomy is in conflict with the general good. For a local government unit serving a small population to decide that it wishes to have a health centre or extra classrooms is well within both their competence to arrange and their ability to ensure that they are maintained. On the other hand the use of funds to maintain roads of minimal economic value or which serve only a handful of people has to be seen in a broader sense of the rural road network and the effective allocation of limited resources.

#### Political Influence

It is often argued that decentralisation increases the risk of political interference. However true this is, self serving interference is reduced if there is an effective planning and budgeting and accounting system in place. In that case, rather than regarding political involvement as a negative factor, politicians can be brought into the process so that not only do they understand the logic of the proposals made but they can also see the political benefit to themselves. Moreover they will then be more willing to use their influence to lobby for further funding and support for maintenance.

---

<sup>35</sup> Ministry of Rural Development, Cambodia: Rural Road Maintenance Management. 1999

An example from local level planning procedures in the Philippines illustrates the point. IRAP is a local level infrastructure planning tool.<sup>36</sup> When introduced many of the municipal mayors saw it as something which would restrict their control over how the budget was spent. However attitudes changed when it was pointed out that the IRAP process identifies where facilities should be placed to benefit the maximum number of people. Some of the politicians recognised that this could translate into votes. The same argument can be applied to maintenance planning in that funds should be allocated on the basis of benefiting the maximum number of people.

Another factor which can demonstrate to politicians that investment in maintenance is worthwhile is the fact that it creates employment for the rural people. Maintenance is a largely labour intensive activity, which, because it is continuous, provides long term employment. Asset management and employment issues can be used to persuade politicians that maintenance is a worthy investment.

### Implementation

In many countries the perception of maintenance as an unimportant issue, the extremely limited level of funding and the lack of capacity at the decentralised levels are identified as the reasons for the lack of maintenance. However implementation of maintenance is also dependent on a set of procedures and systems which need to be in place.

In the first place, there needs to be some form of organisation which deals with the analysis of needs for maintenance. Maintenance is planned on the basis of its demand on each road section in a network. Based on updated condition inventories, it is then possible to effectively plan and implement maintenance works. The size of this unit varies depending on the size of the network to be dealt with and therefore on the level to which responsibility is devolved. Moreover not all functions should be devolved to the one level (see Figure 4.2). What is important here is that the responsibilities of each level are defined clearly.

---

<sup>36</sup> See "Improving Access in Rural Areas - Guidelines for Integrated Rural Accessibility Planning. Chris Donnges. ILO ASIST AP 2003

Figure 4.2 Devolution of Responsibilities

Level	National	Provincial	District	Commune
Data Collection			✓	✓
Planning	✓	✓	✓	✓
Budgeting	✓	✓	✓	
Plan approval	✓	✓	✓	
Budget approval	✓	✓	✓	
Source of funds	✓	✓	✓	
Standard setting	✓			
Authority to classify	✓	✓	✓	
Improvement		✓	✓	
Maintenance			✓	
Supervision		✓	✓	
Award contracts		✓	✓	
Monitoring	✓	✓	✓	✓
Accounting		✓	✓	

As far as the actual implementation of works is concerned, procedures and systems need to be in place for planning, budget preparation, payment, monitoring and accounting.

For the planning of maintenance the first prerequisite is information. This basically implies data on the size of the network and its condition. Budget preparation requires information on the cost of routine and periodic maintenance. This is usually available from the technical agencies dealing with road works. Accounting procedures need to define the various types of work carried out and meet the reporting requirements of the various funding sources. Procurement procedures obviously vary according to whether the works are carried out by force account or by the private sector. The latter involves a significant reduction in the number of financial transactions for the local accountants. Monitoring is important as it provides information on the effective utilisation of the resources allocated and also on the effect of the interventions.

#### Technical

Devolving responsibility to the decentralised level provides the opportunity to make more effective use of the resources made available at the local level. A more centralised system is not attuned to the potential that exists at the local level. Rural road maintenance lends itself to the use of local resources.

Routine maintenance is most appropriately carried out by labour based methods as it involves simple activities such as ditch clearing, slope protection, culvert clearing which ensure that water is taken away from the road without causing damage to the structure of the road. There is no call for the use of equipment as the activities are able to be carried out, and are better carried out, by labour. The clear benefit here is not only that the activities can be organised through the local people but also that the funds used also provide local long term employment and cash injections into local communities.

Clearly relying on local labour does require some level of supervision from the local administration. However the ILO's work in several countries has shown that a programme of routine maintenance can be organised so as to minimise the inputs required from the local administration.

Periodic maintenance in most cases requires the use of some equipment. The work of the ILO over many years has shown that this can also be restricted to a few activities such as compaction and haulage of materials where equipment is combined with the use of manual labour.

The important issue here is that, from a technical point of view, decentralisation can provide a major opportunity for providing effective maintenance. The operations are simple, local people and contractors can be engaged and good examples of how this may be organised exist from several countries including some from the region.

#### Box 4.1 Local Capacity Building in Cambodia

In the mid 1990s the Ministry of Rural Development implemented a Rural Infrastructure Improvement Project with assistance from the Asian Development Bank.

Through this project, the Ministry had two very distinct and specific objectives, (i) to effectively implement a set of rural infrastructure interventions contributing to the improvement of the conditions of the people in the provinces, and (ii) to develop the capacity both in the MRD and its provincial offices to be able to effectively plan, design, manage and implement rural infrastructure improvement and maintenance works.

An important feature of this project was the involvement of the domestic construction industry in a structured manner with the development of a complete contracts management package tailor-made for the works carried out, combined with a comprehensive training programme for both government staff and contractors.

The various types of contracting firms already operating in each of the project provinces were involved. Local builders were engaged on simple culvert works, building contractors were engaged for bridge works and smaller petty contractors were utilised for routine maintenance of the improved roads. Construction firms with some experience in carrying out minor civil works were trained and engaged in road works construction utilising labour-based methods.

## Summary

The single most important issue related to the provision of rural road maintenance is the lack of capacity at the decentralised levels. Only in rare cases has the devolution of responsibility been accompanied by the requisite capacity to shoulder that responsibility. Even if there was a political will, even if attitudes towards maintenance changed and even if finance was available, the implementation of effective maintenance would not be done unless the appropriate capacity existed.

There is a desperate demand to strengthen local government capacity to carry out maintenance. The capacity needs to be matched with resources and clear targets and performance standards against which the local technical agencies are evaluated.

There is a general perception that maintenance is an activity that needs to be done when things go wrong. This may be in part cultural. You go to the Doctor when you are sick; you mend your car when it breaks down. To change this attitude as regards to rural road maintenance at the local level requires more than exhortations and instruction. Vested interest plays a major part and if the key people involved do not see the benefit to themselves they are unlikely to respond to these pleas.

For politicians the benefit may be in demonstrating that not only are they preserving assets but employing local people by doing so - and this at a very low cost. However it would be wrong to place the blame only on the politicians. The roads fraternity has to embrace the concept that maintenance expenditure, though relatively small, is more important to the nation than expenditure on new construction. This not only places maintenance in a more acceptable light but also provides the basis for lobbying for additional funds for maintenance. After all it is a national tragedy that a major national asset, the rural road network is deteriorating at such a rate.

The road users also need to find a voice. In decentralised systems the local people may be more directly involved with government but often they have little voice either in terms of defining what their needs are or in bringing complaints to the local authority.

The lack of finance is of course a major problem. There are however two elements here. First, as illustrated in Chapter 2, the overall level of spending of the countries of the region is insufficient to cover the whole of the road network. Nevertheless the situation is worse for the poorer countries of the region. Not only is there less money to spend, but the level of capacity to deal with roads is lower. The work of the ILO in Sri Lanka, Cambodia, Indonesia, Lao PDR and Madhya Pradesh, for example, has indicated that the capacity at the level to which rural road administration has been devolved is insufficient to deal with the responsibility that they have been given.

Improvements in the financing of rural road maintenance at the local level are of course dependent on the importance that the local officials place on maintenance. Innovative means of raising and ring fencing budgets for maintenance need to be found. Work in Bangladesh,<sup>37</sup> Lao PDR and Cambodia are providing some alternatives.

Another element of the financing problem is making better use of the resources available. Because there is lack of capacity at the local level the limited funds that are available are not spent in any planned or organised fashion. "Maintenance" is often merely solving a problem caused by the lack of proper maintenance. There is no capacity to be able to make rational decisions on how to secure preventive maintenance of core elements of the rural road network.

The devolution of responsibility for rural road maintenance is rarely based on assessments of the appropriate level at which the responsibility should be placed. Moreover different levels of local and national government have a role to play. The road sector is extremely important to the national economy: Some 25% of public investment goes to the sector. Figures from the region suggest that between 20 and 30% of the total investment in the road sectors goes to rural roads. It is therefore necessary to recognise economies of scale and the capacity that will exist at the level to which it is proposed to decentralise for the preservation of the rural road network.

As an example of the range of issues that face the transport sector in relation to the rural roads sector, the following is a compilation of the challenges facing the authorities in the state of Uttar Pradesh in India.



Box 4.2: Rural Road Maintenance in Uttar Pradesh. The Challenges

A. Policy Framework

Effective road sector strategy  
Lack of proper integration of rural roads being undertaken by several agencies in the state.  
Lack of proper legal title for rural road assets

B. Maintenance Funding

Inadequate funding for maintenance  
Effective management of funds for maintenance  
Lack of funds to address backlog of deferred maintenance  
Poor integration of resources

C. Institutional Aspects

Poor career management and prospects for Public Works Department and Rural Engineering Services staff  
Inadequate quality and quantity of training for agency and contractor staff  
Ownership of non core rural roads not yet transferred to Panchayat Raj Institutions

D. Maintenance Planning

Weak data collection system for road inventory, surface condition and traffic  
Incomplete and out of date asset database  
Inadequate reporting on maintenance planning and implementation  
Absence of rational planning for ensuring complete routine works and prioritizing periodic maintenance works

E. Execution of Maintenance Works

Inadequate implementation of routine and periodic maintenance works on core and non core networks  
Low productivity of gang labour  
Poor quality at time of original design and construction increasing future maintenance requirements.  
System procedures and documentation are inadequate.  
Inadequate quality audit procedures  
Continued use of out of date techniques for maintenance

Source: D.P. Gupta. Maintenance of Rural Roads: Developing Policy and Implementation Plan for Uttar Pradesh. July 2003

<sup>37</sup> See 1. Care International 2005 annual report for Bangladesh, 2. Lao PDR MCTPC draft Rural Transport Infrastructure Policy 2006, 3. ADB Mainstreaming Labour Based Road Maintenance to the National Roads Network. Project Document, Cambodia

## Chapter 5

### Lessons Learned

#### Introduction


In most countries of the region the primary roads of the national network are in place. Attention is more and more being focussed on developing rural roads. Whilst the primary network provides the main arteries of the transport network, without rural roads the potential for social and economic development in the rural areas will not be achieved. The emphasis on the achievement of the MDGs and on poverty reduction in general contains an implicit assumption of an improvement in rural access. Without such access the ability to provide improved health, water supply and educational facilities is compromised.

The importance of rural access is certainly recognised, at least in terms of the provision of rural roads.<sup>38</sup> Governments, financing institutions and donor agencies have made major investments over recent years in developing the rural road network. This has not only been through mainline road agencies but also as significant components of agriculture development programmes, where rural roads are seen as crucial to the exploitation of agricultural potential. Moreover the provision of rural roads has contributed to bringing large numbers of rural people into the mainstream of both national social and economic development and also of national identity.

The emphasis on rural road development has been recognised as providing a significant contribution to the economic and social development of the countries. The perception that rural roads serve not only to extend the road network but also to respond to socio-economic objectives has ensured that they have been seen as effectively contributing to objectives in the health and education sector and in general to poverty reduction. Without effective access, health centres and improved schools are unlikely to serve the rural population; lack of access prevents communities from marketing surplus crops thus leaving them as subsistence areas. Research shows that areas without road access tend to be poorer than those which do have access.<sup>39</sup>

Whilst there is still debate on whether rural roads provide benefits equally between the poor and less poor, there is general consensus that rural roads can be an effective facilitator in economic and social development.<sup>40</sup>

Roads, like any other infrastructure facility, need to be properly constructed and maintained if they are to adequately produce the benefits expected from them. This



is a truism which appears obvious. Nevertheless, for a variety of reasons, the maintenance of rural roads still receives limited practical attention.

The reasons for this are several: attitude, financial constraints, lack of capacity, unclear agency responsibilities, technical deficiencies, to mention the most important. What is clear is that, in many countries rural roads are deteriorating faster than they are being constructed or improved. This is a major crisis as not only are investments being wasted but the benefits of an improved rural road network are being lost. In this chapter some of the reasons for this are explored in order to be able to suggest how these trends can be reversed.

### The Network

The State is responsible for the maintenance of the public road network. Roads are publicly owned assets and it is often a legal requirement that they should be maintained from public funds. Despite this, the actual size of the rural road network is not known with any degree of certainty. Condition inventories are conspicuous by their absence throughout the region.

Usually one agency is responsible for setting standards and guidelines for the whole road network. Most countries distinguish between the gazetted road networks and the rural roads. Although the rural roads remain a part of the public roads network they are often dealt with by separate legislation - often linked to the local government acts. They would provide standards and guidelines for all aspects of the road network. They may however delegate responsibility for parts of the network to other agencies. Most commonly the technical agency will delegate responsibility for rural roads either to another Ministry or to the decentralised local government units.

In addition, there is a range of government agencies which construct or improve rural roads. Ministries of Agriculture, Defense, Mining and Tourism build or improve rural roads. Unfortunately this may be done without reference to the Ministry responsible for the road network. Moreover, decentralisation, as illustrated in Chapter 3, devolved responsibility for rural roads to a range of local government agencies.

---

<sup>38</sup> Rural access is not merely the provision of rural roads. Many rural transport activities take place off road and without the benefit of motorised vehicles. (See G. Edmonds. Wasted Time: the Price of poor access. ILO 1998.)

<sup>39</sup> Hettige. When do rural roads benefit the poor and how? ADB 2006 Willoughby. Infrastructure and the Millennium Development Goals. Paper for the DAC InfraPoor Task Team. 2004

<sup>40</sup> Hettige. Op cit.

Add to this that often rural roads form part of individual employment or income generating programmes executed through non technical agencies and the lack of clear understanding of the size of the network is perhaps not surprising.

Whilst the overall size and condition of the network may not be known with any accuracy, the function of the hierarchy of roads in the network is understood. Rural roads connect into secondary roads which in turn feed into national roads. Rural roads, those acting as collector or feeder roads for a series of villages into the district centre or into the secondary network, have been generally seen as the end of the network.

In recent years, however, there has been a concentration of development efforts at the village level and this has also applied in the road sector. This emphasis reflects a more community based approach to development exemplified by, for example, the sustainable livelihood approach. The rationale behind this is that at the local level where there is limited external support, the people should define their needs within the constraints of their identified assets.

Local people see access correctly as being important. Not surprisingly many donor supported programmes at the community level have resulted in small community roads being built. These typically would connect the village to the rural road or to the local community centres. These roads are short and carry very little traffic. Under these community based programmes, the promoters have again correctly set up community based maintenance systems for the short stretches of roads. Indeed this has often followed from some form of community contract to actually build the small roads. The basis for this is that the more the local people are involved, the more likely that they will feel ownership for the programme outputs.

Whilst in development terms this initiative is very laudable, it is not very constructive for sustainable rural roads. A community needs road access in order to evacuate its crops to the market, to be able to reach the clinic and the school and for the inflow of agricultural inputs. These village roads connect into the rural road network. If the rural roads are not in trafficable condition, all the defined access needs of the community will not be achieved. It is clear that the majority of rural roads are not being maintained and large parts of the network are not in a trafficable condition. To provide resources therefore, as many donors are doing, to the lowest element of the network, when the rural roads are in dire need of support seems illogical. The money invested in these community roads provides employment in the construction and maintenance of the community roads. Such investment would be better used to maintain the rural roads whilst at the same time providing the same income and employment at the community level.

There is also a danger that part of the reason for involving local communities in rural road maintenance is to absolve the relevant agency from responsibility. Certainly the argument of willingness to pay, whether in cash or in kind, has been used to justify placing responsibility for maintenance on local communities.

## Attitude and Perception

The attitude to rural road maintenance has been discussed in relation to decentralisation in Chapter 4. In this section a broader assessment is made of the way that the maintenance of rural roads is considered, if at all.

The general points made in Chapter 4 are still relevant. Politicians want to build new roads - there are more votes in spending money on new roads than in maintaining existing ones; the general public see the remedy for poor roads as rebuilding not maintenance; engineers do not generally see maintenance as a major element of their work.

More generally governments have not been persuaded to invest funds in maintenance because they see that, despite the lack of funds, the road system still functions, albeit poorly.

For major roads, the attitudes of the road agency, the provider, and the road users are paramount. As regards to maintenance, there may be a major divergence of views. The road agency may not necessarily see the benefit of investing fewer funds in construction and more in maintenance. There is an argument that the money saved on maintenance, in particular periodic maintenance, can be used later to pay for reconstruction. The road user on the other hand is aware of the disbenefit of the lack of maintenance in terms of increased transport costs. In this context, it is important to acknowledge the difference between main roads and rural roads in terms of maintenance. Although maintenance is often non-existent on rural roads, there is often a functioning system for the major roads and highways.



For rural roads the situation is similar for the provider of roads, whether this be a centralised agency or the local authority. It is even compounded at the local level by the desire of politicians to show how they are effectively spending money. Corruption is also an issue given that capital investment provides greater opportunities than does maintenance. However the attitude changes when it comes to the beneficiaries of rural roads. Certainly there are still the road users whose transport costs are reduced by effective maintenance. However traffic volumes are low and the transporter may not be the major beneficiary. The major benefits of greater access accrue to the people living along the road. In general these people do not have the same organised “voice” as a group of private transporters. Consequently there is no effective pressure group for rural road maintenance.

In the final analysis the pressure should come from the Treasury, given that every year, for lack of allocation of funds, the national asset of rural roads is deteriorating faster than it is being improved. Ministries dealing with local development should also play an important role in this respect.

### Financing

Financing has repeatedly been suggested as the major constraint to effective rural road maintenance. Indeed the lack of it is often used as the main excuse for the absence of maintenance. The situation analysis presented in Chapter 2 showed that most countries in the region have major difficulties in providing sufficient funds for maintenance of the road network and that the rural roads receive far less than is required.

Looked at from a purely theoretical point of view, therefore, it is hard to see how most of the countries could provide sufficient funds. As long as government continue to spend most of the road budget on construction and/or rehabilitation, the gap between what is required, based on the size of the network and realistic costs for both routine and periodic maintenance, and what could be available from public funds is too large to be bridged. However, it is clear that in practice rural roads are receiving some attention although not to the degree required.

In general the conventional economic wisdom is that roads should receive funding for maintenance in direct proportion to their asset value and the level of traffic that they support.<sup>41</sup> This reflects the approach to major roads whereby the investment in their construction is repaid in the economic benefits that they produce in terms of reduced vehicle operating costs and travel time. Major roads are seen as economic entities which depend on the volume of traffic to justify their investment cost. Assessing the amount of maintenance funding in relation to the value of the road therefore makes sense at this level.

Rural roads however are generally not justified in economic terms. In the first place the level of traffic on these roads is generally low so the economic returns are low. More important, these roads serve both economic and social needs and consequently give rise to social and economic benefits. This of course is where things become difficult. How do you measure the social benefits of rural road improvements? This has two aspects. What is the monetary value of improved education and health care facilitated by the improved road access? A corollary to this is the uncertainty regarding the proportion of the social benefits that can be ascribed to the road.<sup>42 43</sup> Are reduced drop out rates at schools due to better access or to a major campaign by the government to keep children in school? Unlike major roads therefore, one cannot clearly isolate the benefits of the road and thereby identify the need for maintenance. As is illustrated later this has implications in relation to central government allocations for rural roads. It also raises the issue of whether the maintenance of rural roads should be treated differently - both in terms of the source of funding and in terms of the institutional approach.<sup>44</sup>

What is clear is that most rural road investments cannot be justified on purely economic grounds. Consequently the idea that only the users should be required to pay for their maintenance is not valid. Considering the importance of access for social and economic development in the rural areas, it therefore seems more logical to justify investments in rural roads using a rationale similar to when justifying expenditures for health, education and rural water supply.

### Funding Sources

Funds for rural road maintenance come from a number of potential sources:

- ❖ Subventions from central government,
- ❖ Road maintenance funds,
- ❖ Locally raised revenues,
- ❖ External agency support,
- ❖ Community contributions.

### Subventions from central government

In most countries the subvention from central government for rural roads to decentralised agencies is the major source of funding available for rural road maintenance. This may come in very precise terms, as in Uttar Pradesh, as a fixed amount per kilometre for different types of roads. Or be part of an overall block grant to the local government units, as in the Philippines and Nepal.

---

<sup>41</sup> Metschies, adapted from Connerly and Schroder

<sup>42</sup> Hine. Are Social Benefits the Missing Component of Road Appraisal? Ethiopian Road Authority. 2004

<sup>43</sup> TRL research on social benefits of rural roads.

<sup>44</sup> ADB. Road Funds and Road Maintenance: An Asian Perspective. 2003

If a budget allocation for rural maintenance is not clearly identified, the greater the possibility that it can be moved to other activities.

Theoretically it is better if maintenance funds are allocated to the recurrent rather than the capital or development budget. However it is often included in the development budget. This results in maintenance funds being spent on "projects" - rehabilitating a broken bridge or a failed road - rather than on preventive maintenance. Conversely, however, where maintenance is placed under the recurrent budget there is a risk that it will not be disbursed owing to the extremely limited level of the recurrent budget, the vast majority of which is spent on staff salaries. In several countries of the region more than 60% of the recurrent budget is spent on salaries and wages.

A further problem is that the funds actually made available either as sector specific grants or as part of an overall block grant rarely match those requested.

The net result is that the major component of funds for rural road maintenance is often not ring fenced. Funds that are required and requested for maintenance are not provided. In addition the funds often do not arrive in a timely fashion. This ensures that funding is not predictable thus making maintenance planning difficult.

#### Road Maintenance Funds

Several countries in the region have set up road maintenance funds. These are based on the principal of the user pays. The funds rely on road user charges, usually collected centrally and include fuel levies - usually the largest component, vehicle license fees, international transit fees and road tolls.

The distribution of the funds between different types of roads, the various administrative levels in the country and the split at the local level is a major and often difficult task. A solid amount of experience exists today in relation to the setting up and operation of road funds.<sup>45</sup> The important issue here is how they have assisted or could assist in the maintenance of rural roads.

The users of course are mainly those who use the major highway network. Not surprisingly therefore it is argued that the bulk of the funds should go to the primary roads. However correct this may be it is hard for rural road agencies to argue for a greater share when they have no information on the traffic levels on the rural roads with which to justify an increased allocation. In Lao PDR for example 90% of the road fund is allocated to the national roads, the remainder for provincial and district roads. In the Philippines 5% of the revenue is to be allocated to a special local road fund for provincial and city roads. In Nepal funds are allocated to the districts on a cost-sharing basis.<sup>46</sup>

## Locally Generated Revenues

Most local governments can mobilise a limited amount from local revenue. The Philippines provides a fairly typical example where the ratio of central government transfers to total municipal revenues is 80%. Of the 20% of locally raised revenue only a small portion is allocated to roads.

The main sources of revenue are market and business taxes. Others include property tax and levies on agricultural production. The latter are relatively easy to collect and their use for road maintenance can be justified in the terms of the access that the roads provide. In Madhya Pradesh proposals have been made by the state government for the agricultural market levy (cess) to be used for the maintenance of rural roads.

The problem is that the funds collected from such levies and taxes are relatively small and that they are inconsistent and irregular in their size and collection.

## Road Tolls

It has been suggested that it would be possible to collect road tolls for rural roads as is often done for major highways. It is, however, 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.<sup>47</sup> The concept of road user fees is not applicable to rural roads except indirectly through increased fuel prices or from other sources. Hence, the total maintenance cost would need to be borne by the recurrent budgetary allocations.



<sup>45</sup> Heggie et al.

<sup>46</sup> ADB Road Funds and Road Maintenance op cit

<sup>47</sup> Malmberg Calvo op. cit

## External Agency Support

In recent years many donors and financing agencies have recognised that maintenance should be treated as part of the life cycle cost of a road. Currently, external sector support programmes often include funding for maintenance albeit with conditions and restrictions. This support can take various forms. The most obvious is to provide a financial contribution over a defined period of time for the maintenance of roads. This is usually accompanied by capacity building support to the agency responsible for maintenance. Often the financial support is provided on a declining basis on the assumption that the improved capacity will allow the agency to build or obtain sufficient of its own funds to replace those provided by the external agency.

It is a welcome move that donors and financing agencies recognise both the need and their own responsibility in relation to the sustainability of the roads for which they are providing the capital funds. This has proved particularly effective where the external agency has provided general support to the maintenance of the rural road network as a whole and not only to the specific roads for which their programme has provided the investment funds. In the latter case there is a danger that the limited funds that are available will only be used for the programme roads leaving the rest of the core network with no funds at all.

Under the massive PMGSY programme in India another mode has been found to ensure maintenance at least in the initial period. In this programme the Federal Government acts as the external financier whilst the State Government is responsible for implementation. The works are carried out by contract and the contractor is obliged under the contract to maintain the roads constructed for a period of 5 years. This is not the optimum solution as after the 5 years the maintenance responsibility returns to the state. However it not only draws attention to the need for continuous maintenance but provides a lead time in which the local governments could develop a capacity to maintain their defined rural road network.

More generally external funding for maintenance can be seen as a way of leveraging additional funds from local and central governments, initially on a cost sharing basis. Equally it provides the opportunity to develop awareness and capacity for maintenance and to develop effective and realistic plans for its execution.

## Community Contributions

The Government is responsible for maintenance of the public road network of the country. The network is defined in terms of its function and size. In general the network can be split into three - national highways, secondary roads and rural roads. The network is defined by law and despite the limitations of the information available, the extent of the public road network is known to some degree of accuracy. There are of course other, privately owned rural roads for which the

Government is not responsible. These include roads built by plantation companies, mining companies, tourist resort operators and local communities.

This discussion on community contributions relates solely to publicly owned rural roads. It is perhaps natural when resources for maintenance are extremely limited to suggest that local communities should be held responsible for the maintenance of roads which serve them. The rural roads in question are of course public roads which are the responsibility of the Government. Passing that responsibility to local communities therefore has to include some form of incentive to the people to take on the job of the Government.

It is often suggested that because the state has insufficient resources it is the obligation of the local people to come to the aid of the nation. However patriotic local people are it is unlikely that they will be prepared to rise to this call unless they can see some direct benefit to themselves. Indeed, an analysis of experience of community involvement in the maintenance of rural public roads shows little evidence of any success.<sup>48</sup> Malmberg-Calvo<sup>49</sup> states that "reliance on unpaid labour for regular maintenance of local government roads is not sustainable and leads to confusion".<sup>50</sup> Miller highlighted this issue several years ago in his assessment of the ILO's employment intensive programmes.<sup>51</sup>

A programme in Lao PDR, funded by SIDA, is attempting to overcome the inherent problems described above. It is as yet too soon to judge the success of the programme.<sup>52</sup>

In the process of defining the core rural road network and the planning of maintenance activities one can, and should, involve local people. This is not, as sometimes is suggested, so that the people can take ownership of the roads. It is because these roads, whilst financed by the state, have an impact on their lives and they are key stakeholders in defining their access needs.

---

<sup>48</sup> Wattam et al. Community participation in the maintenance of rural roads

<sup>49</sup> Malmberg-Calvo. Options for Managing and Financing Rural Transport Infrastructure. World Bank Technical Working Paper NO. 411

<sup>50</sup> One exception is found in Vietnam where communities are obliged to provide 10 working days for community work most of which is spent on infrastructure works including road maintenance

<sup>51</sup> Miller, Remuneration systems for labour-intensive investments. Lessons for equity and growth, International Labour Review 1992

<sup>52</sup> Local Road Division, Department of Roads, Ministry of Communication, Transport, Post and Construction, Lao PDR. Managing and financing local roads in Lao PDR: The introduction of a community-owned - and managed - rural access road network 2003

In addition there is a role for local people to play in the execution of routine maintenance. It has been demonstrated in several countries that employing local people as lengthpersons or petty contractors, responsible for sections of the road, can be very effective. This has the benefit that the people employed come from and know the area. In turn this means that the local people know who is responsible for routine maintenance. Not only therefore does money go into the local economy but local skills are developed. Moreover, local people can directly channel their concerns regarding the condition on of the road. Thus they have voice which otherwise they lack.

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 from spending their own time and resources to fully finance the upkeep of an all-weather road open to the public. After all, most of them do not own a vehicle. Many are subsistence farmers and have limited 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. The lessons to be learned from attempts to involve the local population in the maintenance of rural roads are:

1. 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.
2. In this respect, it clearly helps if the roads are built using local labour as the community is then involved and benefiting from its construction.
3. 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 those benefiting 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, augmented by the local authorities. Such a fund can be used to pay the maintenance workers or to pay local contractors.

- (c) If the road specifically results in the possibility to market crops, a small levy could be introduced which 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.

It should not be forgotten, however, in the discussion on generating local enthusiasm for executing unpaid maintenance works, that the local people certainly appreciate the improved access. However, contributing their labour freely for the maintenance of roads is an opportunity cost for them for which there is limited perceived benefit.

Schemes which generate contribution from and entail the involvement of local communities have had some limited success. However they have relied on intensive external technical assistance inputs in the form of social mobilisers and technical support. It is unlikely that local governments can provide such inputs on a sustainable basis.

#### Financial Constraints

The general problem of fiscal management at the local government level has been covered both in Chapter 4 and in other publications.<sup>53</sup> In summary they are:

- ❖ Lack of clarity on devolved financing
- ❖ Lack of technical and managerial capacity at the local level
- ❖ Limited financial procedures
- ❖ III-defined organisational responsibilities and arrangements

There are however specific problems in relation to maintenance. The fundamental problem is that funding for maintenance is rarely properly identified. If maintenance funding is understood to be part of the recurrent budget, which it should be, it is rarely identified as a separate item. Consequently if it is not given priority, funds will not be allocated to it. To be able to identify such an item implies that it is accepted as a recurrent item and that it has been planned and budgeted for. Unfortunately this is rarely the case.

---

<sup>53</sup> Edmonds and Johannessen, *Building Local Government Capacity for Rural Infrastructure Works*. ILO ASIST AP 2003

If, as is more common, “maintenance” is seen as a series of projects and not part of a planned set of recurrent activities then the funds which are allocated will be spent on emergency repairs or the rehabilitation of already failed roads.

In addition, in many countries, the allocation of funding at the local level is at the whim of local politicians. As we have suggested the prevailing attitude to maintenance is not likely to ensure that funds are allocated to it.

Consequently in many countries we have the situation that either funds are theoretically included in the recurrent budget but are spent on other activities, mainly salaries, or maintenance is included under projects in the development budget and the work carried out is not maintenance.

This state of affairs however is not only the fault of the financial system or procedures. It is also due to the lack of planning and budgeting for rural road maintenance which accepts that maintenance is a preventive recurrent activity that has to be planned for every year.

#### Lack of Capacity

Perhaps the major constraint to effective decentralisation has been the lack of capacity at the decentralised levels. This lack of capacity is not only cited as an excuse for lack of performance but also used by centralised agencies to argue that they should retain responsibility for activities at the local level in their sector.

Rural road maintenance however, being the difficult and poor relation in the roads sector, does not suffer from the desire of centralised agencies to retain responsibility for them. Indeed they are only too happy to divest themselves of this responsibility.

It is therefore not surprising that the capacity to plan and implement rural road maintenance is particularly limited at the local level.

To be able to even begin to plan road maintenance, engineers and technicians need to have an understanding of the road network. This implies that key data on the length, traffic levels and condition of the roads is known with some degree of confidence. Without this it is simply not possible for engineers to develop and effectively argue for providing funds for the roads. Local officials are aware that funding is limited. To make a case for maintenance funds engineers must show that they have identified the key links in the network, understood what is required to maintain them and provide a coherent budget and plans to implement the work.

Whilst road maintenance is not a complicated technical issue it still requires some basic technical activities to be carried out. These are:

1. Regular inspection (condition survey), maintenance planning, and immediate response to any emergency and unforeseen work requirement.
2. Regular inspection of the road sections and effective supervision of routine maintenance contracts and the resulting outputs and quality.
3. Arrange procurement and supply of adequate quantities of repair materials, where and when required.
4. Preparation of contract documents, bill of quantities and cost estimates, inviting bids and award of maintenance contracts.
5. Supervision of contracts for recurrent and periodic maintenance works done through local contractors.
6. Conduct of regular recurrent and periodic maintenance programming activities, necessary budgeting, funds allocation and financial management.

These activities do require technical expertise. The agency given the responsibility must have this competence.

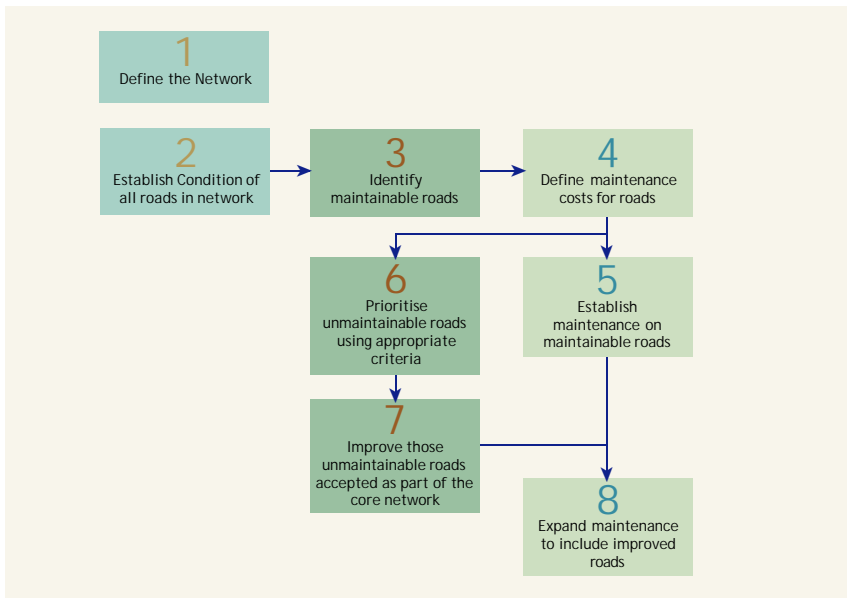
The lack of capacity is also closely linked with the issue of the appropriate level of devolution of responsibility. In some countries the administrative unit to which responsibility has been devolved is dealing with only a few kilometres of road. In others the central ministry is still responsible for the whole of the rural road network. In the first case it does not make sense to develop the capacity to deal with 2-3 km of road and in the second case the central agency is far too removed from the object of their responsibility.

If capacity does not exist it must be developed at the most appropriate level with efficiency and economies of scale in mind.



## Network Planning

One of the major problems at the local level is that the roads are not seen as part of a network but as a series of road links to which funds are applied when there are problems. To ensure that the limited funds available are spent in an efficient manner a simple road planning system is required. This will ensure that the roads serve their purpose of providing access to the greatest number of people. Maintenance is at the heart of local road network planning. There is little point in defining a network without consideration of the resources that would be required to maintain the network. The following flow chart illustrates the point.



### **1. Define the core road network**

The definition of the core rural roads should be done through a process of consultation. This consultation should however be based on an understanding of the existing situation of the roads. Clearly certain road linkages have to be in place. For example, the connection of villages to the district centre provides political and administrative cohesion as well as access to the facilities that exist at the district centre. Other linkages may also be important, such as roads which link to river transport landing stages, roads to particular markets, roads which may provide access to tourist locations and to particular agriculturally productive areas.

### **2. Establish condition of all roads in the network**

The condition of the roads in this network needs to be established by conducting a detailed condition survey. Often they are defined only in terms of whether they are trafficable or not. To be able to assess the costs of maintenance for the roads, a condition inventory needs to be prepared for each road.

### **3. Define the maintenance costs of the roads**

The core network that is defined needs to be maintained in its entirety. In the initial stages only the maintainable sections can be maintained. However over a period of time the full core network should be put in maintainable condition. To be able to plan effectively the cost of maintaining the whole network needs to be known.

Generally, the funds available for maintenance will be less than what is required. In this case hard choices need to be made regarding the size of the core network or, alternatively, a major effort has to be made to identify additional sources of funds.

### **4. Establish maintenance on maintainable roads**

Having identified the funds required, they need to be applied effectively. A planned system for the routine maintenance of the roads coupled with a plan for their periodic maintenance needs to be drawn up. In general the maintenance plan will define responsibilities for providing the resources, and be the basis for preparing the annual maintenance plan and budget and for implementing the works.

### **5. Prioritise unmaintainable roads using appropriate criteria**

Having put the maintainable roads under maintenance, the next step is to identify a programme for the improvement of the rest of the network. Simple criteria exist which can be used to prioritise the unmaintainable roads. These generally use the cost of the road improvement compared with the population served by the road as the main criteria. Other criteria related to economic and social benefits can also be included.

## 6. Improve unmaintainable roads

Clear decisions would need to be taken on the technology to be used, whether using labour based work methods or equipment, whether the works are to be carried out by force account or by contractors and what can be expected in terms of local contributions.

## 7. Expand maintenance to the entire core network

As roads of the core network are improved these need to be put under maintenance. Assuming that the level of funding remains stable, as the network of maintainable roads increases over time, more of the available budget will be used for maintenance.

### The Appropriate Institutional Level

As mentioned before, responsibility for rural road maintenance often has little to do with a realistic assessment of the most appropriate location for it. Responsibility is given along with a whole range of functions for which the particular level of government or agency is responsible. Thus the responsibility for rural roads including their maintenance is given to local governments. This follows a common trend from the 1980s whereby the main technical ministry often devolved the responsibility for rural infrastructure to the ministry responsible for local government. In general the national highways are the responsibility of the technical highway agency, secondary roads come under the next level of government administration, whether that be Regional or Provincial and rural roads come under the government administrative units at the lower levels. It is also common for certain maintenance activities to be dealt with at a level lower than the improvement or construction of roads. Thus whilst rural roads may be constructed by a district authority it may be the commune or village that is responsible for recurrent maintenance activities.

In Madhya Pradesh, the responsibility for state highways and secondary roads rests with the Public Works Ministry. The responsibility for rural roads, however, is delegated to the local governments, the Panchyati Raj Institutions. In addition the rural roads development agency has been placed in the State Ministry of Rural Development. At this point no clear definition of responsibility exists for maintenance. There is also very limited funding for rural road maintenance. All these factors combine to give a situation where little maintenance is carried out on rural roads other than those that come under major centrally funded programmes.

Rural roads are recognised as being crucial to the economic and social development of the rural areas. In addition they represent a major national asset. It is

wrong therefore to ascribe the responsibility for their maintenance on the basis of the overall administrative and political decentralisation of the country as a whole without securing the required capacity and resources to carry out this mandate. Responsibility for such an important task should be devolved to the level where there is, or there is the potential to develop, the capacity to be able to implement. Moreover, maintenance involves a series of activities not all of which should necessarily take place at the same level.

The funding for maintenance, for example, should be held at the level where there is the capacity to deal with it. This does not mean merely looking after the funds but also a financial management system which is accountable and can be monitored. Moreover, maintenance funds can then be identified for the task rather than being part of an overall recurrent or capital budget.

Planning is best done as a joint exercise between the beneficiaries, who can define their needs, the local administration, which can assess the need in relation to the access requirements in their area and the technical unit at a higher level which can place the plans in the context of the overall rural road network in the area.

The actual implementation of works may be supervised at the very local level. However the technical inputs to ensure that the work is effectively done should rest with the level where such technical capacity exists.

The common situation where the complete responsibility for rural road maintenance is given to the lowest administrative level almost ensures that maintenance will not be done.



### Key Issues for Sustainability


#### Rural Road Maintenance - A 21st Century Crisis

Road deterioration due to lack of maintenance has become a growing issue in a number of developing countries. The problem has been well defined and quantified - yet the solutions are still not commonly understood and the extent of the problems is not fully appreciated. Equally, the measures required in terms of rectifying these shortcomings are under-estimated in terms of the scale of support and capacity development required, and the time-scale for establishing a sustainable system. Financial, material and human resource investments will need to be made in a manner which not only maintains the quality and value of the assets, but also improves it according to the demands and priorities of the users.

Rural roads are often treated as the last links in transport networks. Despite this, they often form the most important link in terms of providing access for the rural population. Their permanent or seasonal absence will act as a crucial factor in terms of denying rural communities access to basic services and economic opportunities. Lack of access is one of the basic constraints to poverty reduction and although transport access is not a Millennium Development Goal in itself, it plays a vital role in determining the chances of reaching a number of the MDGs.

Rural roads form an integral part of national road networks. It can be argued that during the past 30 years, the capacity to maintain such roads has been lost in a number of developing countries due to the institutional changes which have taken place. In the past, road maintenance, including rural roads, was carried out by centrally organised force-account operations. With the structural adjustments carried out in these countries, such operations have been privatised, leaving the government only with a managerial responsibility. This process has arguably been successful in terms of transferring implementation capacity to the private sector for main roads. Central road works organisations have developed effective systems and procedures for managing private construction firms executing highway maintenance and improvement works. However, in parallel to this process, the responsibility for rural infrastructure has been transferred to local authorities, and in this process there have been very limited attempts in rebuilding implementation and management capacity.

The result is that rural road networks are facing a crisis in terms of maintenance and operation. Whilst the technology already exists, is simple and inexpensive, local capacity and funding for managing and implementing such works are missing or lacking in a number of developing countries.



The most important criteria for an effective rural road maintenance system is to ensure all weather access and protect the investments carried out during the construction phase. In order to meet these overarching goals, there are a number of secondary issues which needs to be dealt with in a sustainable manner. For road maintenance to be effective, it is commonly recognised that there are three vital issues which need to be properly addressed:

- adequate funding,
- institutional capacity and
- appropriate technology and work methods.

#### Funding Issues

##### **Paying for the Real Stuff**

Finance, or the lack of it, has traditionally been the main excuse or reason for roads not being maintained. Lack of funds is certainly a major obstacle. However, it would be more correct to say that the misallocation of funds is the main reason why funds are not available for maintenance. Rather than giving maintenance its due recognition and prioritising funding for maintenance of existing roads, the general trend is often to spend available funds on new construction or on rebuilding roads which have fallen into total disrepair.

The discussion on how to mobilise sufficient resources for road maintenance has been ongoing since modern road works technology was developed. Already in the 19th century it was acknowledged that effective maintenance required skilled supervision and proper remuneration of the workers carrying out the works. Until then governments had, to a large extent, relied on various forms of obligatory labour contributions as a means of mobilising resources for road maintenance works.

##### Addressing All Demands

The costs of maintaining rural roads are well known. Equally, it is evident that there are no short cuts past this funding issue. The cost of maintaining a rural road network is directly proportional to its size. With the shortage of funds, it is often suggested that one should limit the size of the road network, normally implying that the number and extent of the rural road network should be reduced. With the continued demand for access in the rural areas, local authorities therefore are left with the tough choice of either providing new road connections (which eventually fall apart) or maintaining already existing roads. In countries such as Cambodia, Laos and Nepal, all-year rural road access is still only provided to a limited portion of the rural population. Unless sufficient funds are mobilised for a sustainable expansion of the network in which there is sufficient funding for both new development and maintenance, the practice of diverting maintenance funds to new construction will continue.

## Funding Sources

Although funding for maintenance is often insufficient, most governments do actually set aside funds for this purpose. Funding for rural road maintenance can and is sourced from various funding mechanisms.

The traditional source of maintenance funding in most countries has been the recurrent budget allocations to maintain and operate government services, similar to the operation of health, education and other social services provided by the government.

In recent years, it has been acknowledged that the funds made available for road maintenance in the recurrent government budget are insufficient to cover the costs of adequate maintenance of the entire road network. As a remedy to this, a number of countries have established special road or fuel taxes from which the proceeds have been specifically dedicated to road maintenance. These special taxation arrangements are often referred to as road funds, and are managed by special arrangements separate from mainstream government budget procedures.

Local government administrations essentially have two sources of funding, either based on local taxation or through funds transfers from central government. Central government funding often consist of funding support allocated to particular sectors, i.e. health, education, water supply, roads, etc. It may also be general budgetary support which it is then up to local government to decide how to allocate.

## Centrally Run Rural Infrastructure Development Programmes

To draw a full picture of the funding situation for rural roads, it is also important to mention large-scale rural infrastructure development programmes. Although these programmes do not provide much sustainable sources of maintenance funding, they have a major impact on the sector as a whole. Through their rural road improvement components, they often significantly increase the maintenance burden due to the resulting rapid expansion of the local road network.

Their exit strategy is often to hand over the maintenance responsibility to local authorities, and therefore such programmes have a major impact on the same authorities' ability to deal with its network. In recent years, it should however be acknowledged that these type of programmes have to an increasing extent also incorporated a maintenance component in the project design, with the objective of (i) building up a local maintenance capacity and (ii) gradually handing the funding responsibility over to the concerned government authorities.

#### Funding for Rural Road Maintenance in Nepal

The district authorities in Nepal have a number of sources for funding maintenance of rural roads, some originating from centrally allocated funds as well as from local sources. From the centre, the districts receive annual block allocations for infrastructure works, some of which are specifically dedicated to road maintenance. In addition, loan and grant projects by international development banks have allocated part of the proceeds to rural road maintenance. The districts also have access to locally sourced funding that can be used for this purpose. Some districts allocate some of their revenue from local taxes to maintaining local roads. In addition, districts have awarded road toll concessions to road user committees or local contractors, under which parts of the concession fees are returned to the roads to finance maintenance works.

All these funding mechanisms for rural road maintenance actually prove that the funding situation is not as hopeless as it is often perceived. However, a lack of capacity at local level, combined with no established maintenance procedures have so far resulted in very limited rural maintenance taking place, and where it is done, it has not been very effective.

#### Funding Confidence

Road maintenance has a poor record of transparency, appearing as a seemingly bottomless pit of funding. Despite the resources allocated to maintenance, the roads seem to fall apart while the road agencies are asking for more funds. As opposed to construction works, the funds allocated to maintenance do not create any new assets - it only preserves what is already out there.

It is therefore understandable that funding authorities have some reservations against allocating money to this activity. The combination of institutionally weak recipient organisations and a complete lack of reporting on the use of maintenance funds does not instill any particular confidence among the decision makers who are requested to allocate funds for this purpose. Also, due to the lack of institutional capacity among the organisations charged with rural road maintenance, there is often very limited documentation supporting the need for increased maintenance allocations.

Very few maintenance programmes have good reporting systems, which actually report the specific needs for maintenance, in terms of defined activities at identified locations along the road alignment. Equally, for the funds made available, there is seldom any detailed reporting on how road defects have been rectified and how available funds have been spent.

On this basis, it is not difficult to understand that finance ministries and treasuries, have certain reservations against putting money into maintenance, and in particular rural road maintenance. It is, however, possible to carry out this work in a transparent and well-documented manner. With proper road condition inventories, it is possible to draw up comprehensive and detailed work programmes clearly defining the work activities against which budgets are allocated. During works

#### Management of Rural Road Maintenance in Cambodia

Appropriate systems and procedures have been developed for assessing maintenance needs and documenting how resources have been utilised. In an ADB funded rural road works programme in Cambodia simple procedures were developed to quantify maintenance requirements based on regular road condition surveys. The identified volumes of work were then packaged into small civil works contracts awarded to community based "contractors". Payments against the contracts were based on quantities of work so all maintenance expenditure could be traced back to actually completed works. Not only did the system provide a transparent system for use of maintenance funds, it also provided the districts with an efficient road maintenance management set-up, requiring a limited amount of technical supervision staff. With adequate training, institutional development and sufficient funding it was possible to establish an effective maintenance system in a short period of time, largely relying on in-country resources and expertise.

implementation, it is possible to specify contracts to the level of detail which clearly documents where and what work is carried out forming the basis of payments. With sound inspection procedures and payment based on performed outputs, the progress of work can be properly verified and expenditure related to specific work outputs. Without this, it will be hard to instill any funding confidence within the relevant financing authorities.

This type of programming and supervision arrangements does, however, require a professional organisation in which such procedures are institutionalised. It will need a team of professional staff with the relevant technical, financial and administrative skills and the logistical means to carry out the works.

This will achieve the level of transparency and good governance which is today expected by the funding authorities. Without this capacity within the executing agencies, releasing the required funds for maintenance runs the risk of the funds not being spent for its intended purpose.

#### Funding Priorities

For obvious reasons, most governments give more priority to developing and maintaining the national road network. The trunk roads provide the skeleton of any national road network into which the rural roads provide the access to the rural communities. However, a road network is not complete without an extensive and well functioning rural road network. For the national road network to effectively serve its economic and social purposes, there is a demand for a well functioning trunk road network supplemented by a comprehensive network of feeder roads which links the rural communities with the main transport systems of the country.

It is important to see the rural road network as an integral part of the country's communication network. In order to achieve this in practice, there is a need to secure the necessary funding and develop the institutional capacity to (i) create the necessary levels of access to the rural areas, and (ii) maintain and operate the rural

road network. Rural roads and their maintenance needs to be seen as an essential part of the investments in the transport sector, and not as an afterthought only considered when the demands for trunk roads have been taken care of.

### Institutional Home

A wide number of implementation arrangements have been devised for executing rural road maintenance, ranging from mobile force account units, use of local contractors and community contracting with various elements of voluntary inputs. It can be argued that any or all of these arrangements can be effective in terms of maintaining the road network. The solution chosen is very much dependent on prevalent government and donor policies on how the provision of public works are to be executed.

The effective execution of any of these implementation arrangements requires an efficient management organisation. Without it, any efforts in carrying out maintenance works will be ineffective and short-lived no matter which of the above work arrangements are pursued.

In a number of countries today, it is evident that there is simply no institutional home for rural road maintenance - or at best it exists on paper but not in practice.

#### Finding the Appropriate Local Government Authority

Through the Prime Minister's Rural Road Programme (PMGSY), the Government of India has launched a major rural road programme whose ultimate goal is to connect all villages in India having a population of more 500 inhabitants. Annual investments of the order of US\$ 1 billion are currently being allocated to the programme. Maintenance of the road assets being created has emerged as a key issue for sustaining these investments. The current trend seems to be that state authorities are giving considerable emphasis to road construction, while maintenance activities remain at nominal levels.

Although Panchayati Raj Institutions are expected to maintain the rural roads, there are still a number of unresolved issues with respect to how future maintenance will be funded and organised. A recent study carried out by the ILO in Madhya Pradesh revealed that maintenance of roads and in particular rural roads is generally not carried out to any substantial or effective degree. Currently the maintenance requirements for the PMGSY roads have only been dealt with for the first five years after construction by extending the defects liability periods of the construction contracts.

The study concluded that maintenance of rural roads still does not have a clear institutional home and therefore it has been difficult to build up the necessary capacity for this purpose. In order to establish a sound and effective system for maintenance of rural roads, capacity needs to be developed at the appropriate level of local government for planning and programming of maintenance works, procurement of maintenance works, supervision and monitoring, quality control as well as adequate financial and administrative services supporting such civil works activities.

The reasons for this are often home grown and differ from one country to another. A general trend, however, which is found in several countries, is that when the responsibility for the provision of rural infrastructure was decentralised to local government authorities, the responsibility for rural road maintenance was moved to institutions with no history or capacity in relation to rural road maintenance.

#### Implementation Authority

The provision and maintenance of public roads are in most countries governed by a legal framework in which the responsibilities for various parts of the road network are clearly set out. A Road Act or similar legislation will normally form the legal basis for how road works are organised. Other legislation will cover the division of responsibilities between central and local authorities including directions on how rural infrastructure services are provided. Finally, there will be a regulating framework detailing how work should be implemented, such as regulations on financing of road works, procurement, safety and environmental concerns.

The maintenance and operation of roads are closely linked to the ownership of such assets. Road Acts and other legislation would normally define who is the legal owner of roads and the assets surrounding the road network. This legislation also often provides direction on who is allowed to manage and carry out maintenance and improvement of the assets. Furthermore, such regulations provide the necessary mechanisms for the acquisition of land, for the improvement of the road network, identifying who is in charge, setting out the procedures to be followed, providing guidelines on valuation, voluntary acquisition, etc. A very general conclusion which can be drawn from this legal framework is that the government, at central and local level, through its specialised agencies, holds the ownership of and responsibility for the maintenance and operation of the public road network.

In most countries - if not all - the government also assumes responsibility for planning and management of rural roads. The overall responsibility for the provision of such services is with the government. However, the actual planning, design and works implementation can be outsourced to other players such as private consultants, contracting firms and community groups.

There are essentially three potential solutions to finding an institutional home for the provision and maintenance of rural roads:

- (i) Centrally based authority or works department which devolves responsibility to province and district offices;
- (ii) Decentralised to local government authorities - with a technical unit in the local government administration;
- (iii) Communities responsible for rural road maintenance.

### Centrally Organised Road Works Agency

The classical approach to maintenance of public roads has been through a central government works department in charge of all civil works under government authority. Public works departments in a number of countries still have large road works sections, organised with satellite offices at strategic locations around the country. In several countries, the choice has been to rely on one single road works agency for the provision and maintenance of the entire road network, ranging from highways to rural roads.

The strength of this arrangement is that scarce resources for management and operation of public roads are consolidated into one organisation. With budgets, staff and logistical resources earmarked for rural road maintenance, this arrangement can prove feasible if the authority has established local offices close to the network and is able to respond in a timely manner when inputs are required.

Central ministries which have devolved authority for rural road maintenance to its provincial and district offices can actually provide a viable solution for the delivery of such services at local level. However there has to be an appropriate mechanism established for the involvement of local political bodies. In Laos, the responsibility for the provision and maintenance of rural roads lies with the provincial department of the ministry of communication, transport, post and construction (DCTPC). Despite the fact that this is a centrally managed government organisation, there seems to be sufficient dialogue with local political bodies to ensure that transport priorities are reflected in the works programme of the road and bridge units in the provincial and district offices.

Essentially, the DCTPCs are providers of the technical services required to plan, design and manage the rural infrastructure works in the provinces. Works implementation is carried out using the private construction industry, relying on technical staff from the DCTPCs to provide supervision and inspection of works. Funding of maintenance on the local roads come from both central government sources as well as taxes collected by local authorities.



## Local Government Authority

With recent trends to decentralise authority to local government, the responsibility for the provision and maintenance of rural infrastructure, including rural roads, have in many countries been transferred to local government administrations. In such arrangements, a road works section is often established within the relevant technical unit in the local administration.

There is a growing understanding among governments and key players in this sector of the importance of giving the authority and responsibility to local authorities. However, the change required to develop the required capacity is a major challenge. Nevertheless, experience has clearly shown that if the local institutions are provided with the means to handle new responsibilities, they are perfectly capable of assuming them.

When rural infrastructure is planned as part of a central government programme, it is too often done in relation to the development of the sub-sector alone. The decentralisation of authority to the local level (i) allows all types of infrastructure such as roads, clinics, schools, irrigation to be planned in relation to implementation of other infrastructure, and (ii) may achieve a better reflection of the real demands of the local communities. Building proper ownership already at the construction stage may increase the pressure from local communities to secure adequate maintenance of the improved roads.

Genuine decentralisation enables local organisations to “exert pressure” and therefore to defend their projects better because, at that level, the negotiating partners and the needs of the population are better known. The main issue here is that local authorities are held responsible to the users for their actions. When works are managed by personnel who reports to some central agency, this pressure from the local population is diluted, since central agencies and their staff take their orders from superiors situated in the capital or provincial headquarters.

### **Community Maintenance**

For the past 30 years, there has been a series of attempts to transfer the maintenance burden of rural roads to the local communities. Most of these initiatives have been on a project basis with some mixed results. What is evident is that in order for this to take place with a minimum of success, there will always be a demand for considerable support from a technically competent agency.

Equally, most of these initiatives have proven that it is difficult for most rural communities to shoulder the entire costs of the required maintenance. Finally, it can so far be concluded that none of the models developed, in which the communities take the lead role in providing road maintenance, have been possible to mainstream on a national basis as a solution to the lack of maintenance of rural roads.

## Works Implementation Arrangements

There are essentially three mechanisms for providing road maintenance.

- (i) Force Account, implying that the resource inputs such as labour, equipment and materials are directly managed and supervised by a government agency;
- (ii) Private Sector Involvement, in which private contracting firms are relied on to actually implement the physical works. This arrangement may also to a certain extent involve the private sector in managing the works.
- (iii) Community contracting of rural road maintenance with various implementation arrangements with the objective of securing a closer involvement of the road users in the effective operation of the road assets.

### **Force Account**

Traditionally, road maintenance was organised through force account operations under the responsibility of government public works organisations or a centrally based road agency. These institutions would have strategically located road depots at various locations around the country in charge of maintaining the road network in their neighbourhood.

In a number of countries, the use of force account has been phased out to the preference of contracting out works to the private construction industry. In addition, the ownership and management of the rural roads has been delegated to local government institutions as part of recent policies to decentralise public services. The remaining force account operations still in existence today are mainly related to highways and national roads.

A common feature of many force account units has been their tendency to employ a large labour force which has been difficult to sustain in the long term. Equally, experience from several countries showed that it has been difficult for government organisations to maintain and renew their equipment fleets necessary for the effective implementation of works.

Despite the fact that this implementation arrangement is no longer “in fashion”, it is important to note that some of these institutions at one stage did actually contain all the prerequisites for a successful road maintenance programme, i.e. clear mandate, available financial and human resources, technical and administrative procedures, planning and resource management systems, work procedures and technical standards and cost and quality monitoring.

**Private Sector Involvement**

The use of private contractors has proven to be equally successful for rural road maintenance as for any other works carried out in the construction industry. When designing the contracting arrangements, it is however important to take note of the specific characteristics of rural road maintenance, often consisting of small amounts of works dispersed over a large geographical area. In addition, both routine and periodic maintenance of rural works in most cases involve smaller contracts as compared with maintenance works on highways. This often has the result that large contracting firms are not interested in getting involved in works on rural roads or at best, prefer to sub-contract such works to smaller firms. This certainly applies to routine maintenance, which involves very limited equipment and material inputs.

For these reasons, it is important that rural road maintenance works is targeted towards the appropriate part of the private construction industry. With the works packaged into appropriate size contracts, experience has shown that maintenance of rural roads can provide attractive work prospects to the local construction industry.

Periodic maintenance works can be organized into civil works contracts which in size and type of works match the capacity and interest of small and medium size contracting firms based in the provinces not far from where the works are located. Equally, routine maintenance can be organized through contracts with local community groups or petty contractors.

Organizing the maintenance works through the involvement of the private sector does however require a sound local government capacity in planning and supervision of works and contracts management. Besides allocating adequate budgets for this purpose, the local authority in charge of providing and maintaining these roads need to be equipped with the technical and managerial skills and adequate procedures to perform these duties in an efficient and transparent manner.

#### Lengthmen versus Petty Contractors

The lengthman system has been in existence since the 1800s when road authorities abandoned old systems of statutory labour and similar arrangements in which residents along the road were made responsible for maintenance without any form of compensation for their contributions. Today, the lengthman system is widely used for road maintenance of both highways and rural roads in a number of developing countries.

Although the lengthman system can provide effective routine maintenance, it does however have certain shortcomings. The system is essentially based on assigning one worker to a specific stretch of road, on average consisting of a distance of 3km. The workers are supervised by a maintenance overseer from the government authority in charge of this particular class of roads. This agency is also in charge of the recruitment and payment of each individual lengthman (or lengthwoman). With an extensive road network dispersed over a large geographical area, this management arrangement poses a rather large logistical challenge. Each lengthperson needs to receive individual work instructions and his/her outputs need to be inspected and finally paid for. These logistical challenges have proven to be difficult to cover in an adequate manner with the result that work supervision is often lacking and payment is often based on the contractual obligations of the employer rather than on actually completed works.

An alternative to the lengthman system has been to contract out larger road sections to a group of workers or a petty contractor, thereby delegating the supervision of the individual workers to the contractor. With a petty contractor in charge of a larger quantity of works, the preparation of contracts and work instructions can also be more streamlined. As a result, each maintenance overseer in charge of work supervision can cover a larger part of the road network, thereby reducing the demand for supervisors and logistical support. An added advantage with the petty contracting system is that it is based on detailed quantities of work with payments linked to completed measured work outputs. This feature not only improves the efficiency of the investments made in maintenance, but also allows for improved monitoring of the actual maintenance requirements and its related cost.

Alternatively, supervision can be carried out by a larger contractor, engaged on a performance-based contract. In this case, the outputs of the maintenance workers and sub-contracted petty contractors are primarily the responsibility of the main contractor. The works still need to be inspected and verified by the government at the time of payment, however the indicators of satisfactory completion of works are based on performance standards rather than completed quantities of work. The use of performance contracts does however require a good contracts management capacity within the concerned government authorities, as well as a good knowledge of the amount of works normally required to maintain the network in a good condition. As this is often not the case, in particular when dealing with local government administrations, it is recommended that contracts management experience is first developed using the petty contracting model.

#### Community Contracting

This concept encompasses a wide variety of implementation arrangements. In its simplest form, it consists of a road agency contracting a community or a community group to carry out a specific amount of works on a particular road section. In many ways, this arrangement is comparable to the use of petty contractors for routine maintenance works. It applies the same basic principles of contracting in which works are specified in detailed quantities of works and payments made on

the basis of measured and inspected works. This arrangement provides the level of effectiveness and transparency required in a government public works programme. This also leaves the ownership and overall implementation authority for the road services with the technical authority which has been identified through the laws of the country.

Other arrangements which have been tried include systems in which the community acts as the client and owner of the road assets and contracts local individuals or firms to carry out the required maintenance. Although this sounds good in theory, such arrangements have been faced with several problems some of which have yet to be resolved. Experience from a number of such pilot projects has been that for such a system to operate effectively requires a substantial amount of technical and administrative support. Not only do the communities require continuous assistance in technical aspects relating to the physical works, there is also a clear demand for providing support to ensure that the funds made available are used in a transparent manner and properly accounted for.

Management responsibility is linked to the ownership of the road. Here it is important to distinguish between community infrastructure and what forms part of the public road network. Although rural infrastructure is often related to community driven development activities, it is important to bear in mind that the majority of rural roads actually forms part of the public road network. As a consequence the ownership and responsibility for its operation and maintenance is already vested with a government institution either at central or local level.

It should be acknowledged that most communities have very limited technical and financial capacity to maintain rural roads. Rather than investing capacity building resources at community level, it would be more effective to consolidate this type of support within the local government agency or administration which was created for the purpose of providing such services.

Finally, the use of community driven arrangements has raised a number of new issues which still have not been resolved. A major concern in relation to this type of implementation arrangements is the legal status of the communities and to what extent its representatives can be held responsible when things go wrong. For construction enterprises and consultancy firms as well as government agencies, the legal framework in most countries provide adequate mechanisms for how to deal with issues such as liability, compensation in the case of accidents, responsibility for safety, insurance, litigation in relation to non-performance of contractual obligations and many more. In most cases of community driven infrastructure works, none of these issues have been dealt with.

Bearing in mind that the vast majority of rural roads forms part of the public road network, it would therefore be more logical to let the responsibility for maintenance works remain with the government agency which has already been identified for this purpose, rather than experiment with new social and political models which still lack the formal and legal context required to operate in an efficient and sustainable manner.

### Technology

Rural road maintenance is not a new topic. This type of works has been carried out since the Romans built their road network some 2000 years ago. Equally, in the 21st century we are in a position to implement such works applying the appropriate technology for this purpose. The evidence for this is clear from the works carried out and where rural roads remain passable after the wear and tear caused by traffic and the environment.

As most countries have the capacity to construct roads, the technical capacity to maintain the roads should be available in the ensuing stage. The technology as such, relating to the individual work activities, is not different from common work activities required to construct and rehabilitate roads. The work has been well documented in maintenance manuals and training material. Appropriate work methods and productivity rates have been established for this type of works in equal level of detail as for construction works. The management requirements are well known and effective procedures have been developed for implementation of rural road maintenance.

Without compromising the importance of maintenance, it is generally accepted that the technology required is simple and easy to apply. Experience also shows that the technology and work methods can easily be disseminated to local contractors and government staff.

### Work Contents

As a basis for assessing the optimal choice of technology and work methods, it is important to recognise the main features of the works involved when maintaining roads. In this respect, it is useful to divide the works into the three main categories of work, i.e. routine, periodic and emergency maintenance.

- Routine Maintenance Activities
- ◇ Remove any obstructions from the roadway
- ◇ Clear side drains to secure free passage of water
- ◇ Erosion control of shoulders and slopes
- ◇ Clear culverts and other waterways
- ◇ Perform minor repairs to culverts and retaining structures
- ◇ Repair and replace scour checks
- ◇ Repair potholes, cracks, ruts and other minor damages to the road surface
- ◇ Cut grass and bush
- ◇ Clean and maintain road signs

Routine maintenance works consists of the regular preventive measures to ensure that the various components of the road continue to function according to the original purpose for which they were constructed. The work is dispersed along the entire length of the road, so when covering an entire road network, the works cover a large geographical area. Another important feature of routine maintenance is that it normally requires very limited material inputs. In addition, due to the limited amount of works at each location where it is required, it can often be carried out relying entirely on the use of manual labour.

Under average conditions, one worker should be able to cover the routine maintenance works required on a 2 to 3 km road section. This work can be performed by workers recruited from the communities located in the vicinity of the road, with the added benefit of providing additional employment opportunities in the rural areas. It is also a useful mechanism to ensure the involvement of the road users in the maintenance of their access roads.

Periodic and emergency maintenance normally involve more comprehensive works, carried out when the road needs a more substantial overhaul. Common periodic maintenance activities include reshaping of the road surface, resurfacing works and repair or reconstruction of damaged drainage structures. Such works need to be organised in the same manner as when the road was first constructed or rehabilitated, relying on more substantial material and equipment inputs. Periodic maintenance of rural roads is on average required at intervals of 4 to 6 years. It constitutes the main portion of the maintenance demands for any road, and when carried out at the right time will take up 80 to 90 percent of the maintenance budget. Although this work requires more material and equipment inputs, it can still be carried out using a significant amount of local labour, thereby providing local employment and involvement.

Periodic maintenance is best identified during the annual maintenance needs assessment exercise. The required funds need to be specifically budgeted for, as they are not part of the yearly maintenance allocations. Forward planning for this component is important, as periodic maintenance activities can be very costly. The re-surfacing of a road often amount to more than 30 percent of the initial construction cost. The budgeting of periodic maintenance should be spread over the life of the plan. This is to ensure that the local authorities can build up the funds required and not be faced with a major expenditure in one specific year.

### Technical Planning and Supervision

Like any other civil works programme, the efficient implementation of rural road maintenance works, requires a sound technical organisation equipped with the necessary managerial and technical skills and resources. The performance of the road assets needs to be carefully monitored to ensure that they function as originally intended. When failures occur there needs to be established procedures and

resources available allowing for timely remedial action. This will ensure that access is restored minimising the inconvenience caused to the users of the infrastructure.

All maintenance works require careful planning, supervision and control. Proper monitoring of outputs and the resources required to achieve these outputs provide the basic information for planning and estimating future maintenance works. However, before these planning and implementation activities can commence there is a need for proper and regular road condition inspection and defects assessments, which form the basis for all consecutive engineering inputs.

The authority in charge therefore needs to be equipped with adequate management tools, including:

- Means and procedures for establishing and maintaining a road inventory, providing detailed information about the road assets;
- Established procedures for and logistical means to carry out regular inspection of the network;
- Road standards to provide guidance on how and when maintenance works should be carried out including procedures on how priorities are set for selection of where maintenance should first be carried out;
- Programming and budgeting procedures for the preparation of master plans, periodic plans and annual plans;
- Works implementation procedures: guidelines on choice of technology, use of the private sector and contracting arrangements;
- Skilled staff to carry out planning and works supervision;
- Logistical means to oversee the performance of the network and inspection of works;
- Financial and administrative support services to ensure effective budgetary and expenditure control.

#### Technology Choice

Rural road maintenance offers considerable scope for increasing efficiency by adopting work methods and approaches relying to a large extent on locally available resources. This not only includes the introduction of labour-based works technology but also by involving local construction firms in works implementation.

A heavy reliance on the use of large and sophisticated equipment requires high initial capital investments and in the case of rural road maintenance is not necessary. The use of heavy equipment increases the complexity of work operations with the result that work progress becomes more reliant on the steady supply of spare parts and repair services. Equipment also requires skilled operators, skilled mechanics and proper workshop facilities. If any of these items are not available, the equipment stands idle and road maintenance is not carried out. It is not uncommon that work progress is disrupted due to lack of simple spare parts or repair services. Moreover, due to the high initial investments, small-scale local

contractors are barred from carrying out works contracts which could be possible for them to manage if alternative work methods are allowed for. Despite this, work specifications in a number of developing countries still prescribe the use of heavy equipment for rural road maintenance.

By contrast, labour is practically always readily available and can be employed at a low cost. Labour-based techniques are very well suited to a wide range of maintenance activities, particularly when the work force is properly managed, relying on an output-based payment system. However, labour-based approaches demand proper planning and skilled supervision.

Often, a combined use of labour and machines provide the most appropriate solution. Certain maintenance tasks can be carried out more effectively using machines, while others are best carried out relying on manual labour. The most appropriate technology depends on the nature of the work and the availability of labour and equipment in the area. The table below shows which activities are best suited for labour and which require some use of equipment.

The choice between equipment and labour-based work methods affects the basic organisation of the road maintenance work. Relying to a high degree on the use of equipment will entail the involvement of larger contractors, whereas labour-based work methods favour more decentralised solutions.

Activity	Potential	
	Equipment	Labour
Ditch cleaning and reshaping	good	good
Minor bridge and culvert repairs	poor	good
Building scour checks	poor	good
Repair of structures	poor	good
Grading un-paved surfaces	good	poor
Patching, sanding or local sealing of bituminous surfaces	poor	good
Filling of unpaved surfaces and slopes	poor	good
Grasscutting	good	good
Repairing and replacing traffic signs	poor	good
Road line markings	good	good
Stockpiling gravel	good	fair
Re-gravelling	good	fair
Producing chippings	good	fair
Surface dressings	good	fair

In order to select the optimal approach, certain information needs to be collected and analysed. Road data relating to issues such as the function and condition of individual road links, traffic levels and available resources in terms of funds, labour, machines and materials need to be clarified. This includes data on staff skills and training requirements, availability and performance of equipment, labour productivities and the effect of critical resource requirements on general performance.

In most cases, the choice between labour and machines is not an either/or situation - it is possible to find cost-effective solutions combining the two approaches. Moreover, past experience has shown that an innovative use of intermediate equipment can be cost-effective for excavation, compaction and hauling, provided that locally available skills and materials are drawn upon in an imaginative way.

Road maintenance is a continuous process and its employment generation potential should not be under-estimated. These employment opportunities, whether they are temporary or on a continuous basis may provide a significant cash injection into rural communities where subsistence farming constitute the mainstay of the economy.

A recent ILO study carried out in Cambodia estimated that using labour-based work methods to carry out a programme of rural road rehabilitation, combined with labour-based maintenance of the existing maintainable road network could generate between 3.7 and 6.7 million workdays per year, depending on the extent of the programme.<sup>54</sup> Taking the maximum figure, this is equivalent to 33,000 full time jobs, and would also increase the market opportunities for the local construction industry through the award of 100 rehabilitation contracts and 270 maintenance contracts per year.

---

<sup>54</sup> Jobs or Machines, Comparative Analysis of Rural Road Work in Cambodia, Paul Munters, ILO ASIST AP, Bangkok 2003

## Bibliography

1. ADB. Road Funds and Road Maintenance. ADB 2003
2. ADB. When Do Rural Roads Benefit the Poor? ADB 2006
3. ADB. Reports and Recommendations to the Board for several projects
4. Andreski, Seth and Walker. How a Road Agency can Transform Force Account Road Maintenance to Contracting. World Bank 2006
5. Brennenman. Infrastructure and Poverty linkages. World Bank 2002
6. Burningham and Stankevich. Why road maintenance is important and how to get it done. World Bank Transport Note TRN 4 2005
7. Carapetis, Levy, Wolden. Road Maintenance Initiative: Building Capacity for Policy Reform. World Bank
8. Chandrasekhar. Maintenance of Rural roads - A case study of the PMGSY. Paper for the IFG technical meeting 2005
9. Department of Agriculture, Philippines. Maintenance of barangay and farm to market roads. 1998
10. Development Cooperation Committee. Guiding Principles on Using Infrastructure to Reduce Poverty. OECD 2005
11. DILG, Philippines. Road Maintenance Management Manual. 1993
12. Donnges. Improving Access in Rural Areas. ILO ASIST AP 2003
13. Edmonds and Johannessen. Building Local Government Capacity for Rural Infrastructure Works. ILO 2003
14. Edmonds and Johannessen. Building Local Government Capacity for Rural Road Management. ILO ASIST AP 2002
15. Edmonds. Infrastructure and Poverty Alleviation. Paper prepared for the DAC task team on Infrastructure for Poverty Reduction. ILO ASIST AP 2004
16. Edmonds. Road Maintenance and the Use of Local Resources in Cambodia. ILO 1996
17. Edmonds. Transport, Access and the Millennium Development Goals. ILO ASIST AP 2005
18. Fernando and Porter, Balancing the Load: Women, Gender and Transport. Zed Books and IFRTD. London 2002
19. Gupta. Maintenance of Rural Roads. Uttar Pradesh. World Bank and Ministry of Rural Development India 2003
20. Gupta. Maintenance of Rural Roads: Developing Policy and Implementation Plan for Himachal Pradesh. World Bank and Ministry of Rural Development India 2003
21. Gupta. Sustainable Maintenance of Rural Roads. ILO ASIST AP 2004
22. Hajj and Pendakur. Road Improvement for Poverty Alleviation in China. World Bank Transport Sector Unit WP 1. 2000

23. Hooke and Howe. Transport and the Millennium Development Goals. Background paper for the Millennium Project. 2005
24. Howe. Sustaining Africa's rural road networks: The asset management approach. 2001
25. Howe. Transport for the Poor or Poor Transport. ILO 1997
26. IFAD. Three reasons why improved roads can fail to benefit rural men and women. Mimeo 2003
27. ILO ASIST AP. Maintenance Study in the Philippines. ILO ASIST AP 2006
28. ILO ASIST AP. Situation Analysis of Rural Road Maintenance in Madhya Pradesh. ILO 2005
29. JBIC/World Bank/ADB. Study on East Asian Infrastructure. 2005
30. Johannessen. Rural Road Maintenance Management. ADB 1999
31. Johnston & Salter. Rural Road Investments, Maintenance and Sustainability. A Study in Cambodia. 2001
32. LanXang Intl. Development of Rural Transport Infrastructure Policy for Lao PDR. MCTPC 2006
33. Lebo and Schelling. Design and Appraisal of Rural Transport Infrastructure. World Bank Technical Paper 496. 2003
34. Malmberg Calvo. Options for Managing and Financing Rural Transport Infrastructure. WB Technical Paper 411. 1997
35. Merrilees, and Huong. Addressing Sustainability Issues for Rural Road Maintenance: Experience from Vietnam
36. Merani. Rural Road Maintenance Assessment in Jarkhand. World Bank 2003
37. Munters. Jobs or Machines. ILO ASIST AP 2003
38. Pearse. Lao Houaphan Household Survey, ILO ASIST AP 2006
39. Pouliquen. Rural Infrastructure from a World Bank Perspective. World Bank 1999
40. Sakko. The Socio-economic Impact of Labour-based Rural Infrastructure Rehabilitation and Maintenance in Siem Reap Province, Cambodia, ILO Bangkok 1999
41. Saletrero. Operation and Maintenance Manual for Completed Rural Infrastructure Projects. Department of Agriculture, Philippines 2003
42. SIDA. The Community Based Model as a means to sustainable development of basic access in Lao PDR 2004
43. Starkey, Ellis, Hine and Ternell. Improving Rural Mobility. World Bank Technical Paper 525. 2003
44. Starkey. Local Transport Solutions. SSATP working paper 56. World Bank 2004
45. Thongchai. Small Scale Contracting. ILO 2004
46. Vaidya and Tusanasorn. Review of Rural Road Maintenance in Lao PDR. ILO ASIST AP 2004
47. World Bank. Road Deterioration in Developing Countries. World Bank 1988
48. World Bank. Road Maintenance Problem and International Assistance. World Bank 1981
49. World Road Association. Road Maintenance Handbooks. Paris 1997
50. World Bank. Staff Appraisal Report for several projects



**ASIST AP** is a regional programme of the Employment Intensive Investment Programme (EIIP) of the ILO, concerned with developing and mainstreaming poverty alleviation strategies through sustainable infrastructure development. The programme is implemented through four major fields operation, viz : accessibility planning, labour-based works technology, small-scale contracting and infrastructure maintenance, thus providing a comprehensive approach to infrastructure development covering all stages from planning and construction to maintenance and operation.

Based in Bangkok, ASIST AP provides a full range of expert support to all stages of the project cycle from formulation, implementation, monitoring to final review and evaluation. These services include activities such as:

- planning, policy development and design of infrastructure programmes,
- influencing public investments in infrastructure towards the greater use of local resources,
- technical and managerial support to project implementation,
- information services,
- preparation of planning and implementation guidelines,
- developing appropriate methods for increased involvement of the domestic construction industry in infrastructure works,
- design and conduct of tailor-made training programmes, and
- design of appropriate maintenance management systems.

This document forms part of a range of publications from ASIST AP, in its efforts to develop and disseminate general and country specific guidelines, best practices and lessons learned in the context of planning and implementing infrastructure works programmes.

More information about ASIST AP can be found at [www.iloasist.org](http://www.iloasist.org) or by contacting us at

**ASIST Asia Pacific**  
P.O. Box 2-349 Bangkok 10200 Thailand  
Tel: 66 2 288 1790 ; Fax : 66 2 288 1062

## Rural Road Maintenance Sustaining the Benefits of Improved Access

Rural roads are the last link of the transport network, however, they often form the most important link in terms of providing access for the rural population. The permanent or seasonal absence of road access can act as a constraining factor in terms of providing rural communities with services such as education, primary health care, water supply, local markets as well as economic opportunities. The availability of such services and opportunities are only sustained when the rural road network is maintained at certain operational standards that provides the regular and efficient transport access required throughout the year.

Lack of finance has traditionally been the main excuse or reason for rural roads not being maintained. Rather than giving maintenance its due recognition and prioritising funding of maintenance of existing roads, the trend is often to spend available funds on expanding the road network.

However, the problems of rural road maintenance are not uniquely related to finance. There are also major technical and institutional issues which require careful consideration. In addition the measures required to rectify the situation are often underestimated. These include the scale of support and capacity development required and the time necessary in order to establish an effective road works organisation sufficiently equipped to provide regular and timely maintenance to the entire road network. In recent years the decentralisation of responsibility for maintaining rural roads to local government authorities has raised other problems in organisations in which adequate planning and implementation capacity is yet to be developed.

The ASIST AP programme of the ILO has been involved with rural road maintenance as part of its overall programme of developing local capacity for sustainable provision of rural infrastructure. With the careful choice of implementation arrangements, including key issues such as choice of technology, decentralised management, involvement of the local construction industry, it is possible to establish efficient maintenance arrangements which can clearly demonstrate the effectiveness of allocating sufficient resources to the maintenance of rural roads.

Investments in rural roads, including maintenance works, have significant potential for the use of local resources, and can thereby also support the local economy by creating increased employment opportunities and strengthening local commerce. Moreover, a constructed road merely creates access, maintenance sustains it.

International Labour Organization  
Regional Office for Asia and the Pacific



**ASIST AP**

ASIST Asia Pacific  
P.O. Box 2-349  
Bangkok 10200 Thailand

