Simon Done

Managing change to improve the delivery of road maintenance

by C C Parkman, K Madelin and R Robinson

Unpublished Project Report
PR/INT/182/00
[Project No. R6889]

DFID Department For International Development

TRL TRANSPORT RESEARCH LABORATORY

PROJECT REPORT PR/INT/182/00

Managing change to improve the delivery of road maintenance

by C C Parkman, K Madelin and R Robinson

Subsector:	Transport
Theme:	Reduce the costs of constructing, rehabilitating and maintaining road infrastructure and vehicle operation costs
Project Title:	Transferring road maintenance to the private sector
Project Reference:	R6889

APPROVALS			
Project Manager		Quality reviewed	

Transport Research Foundation Group of Companies
Transport Research Foundation (a company limited by guarantee) trading as Transport Research Laboratory. Registered in England, Number 3011746.
TRL Limited. Registered in England, Number 3142272. Registered Offices: Old Wokingham Road, Crowthorne, Berkshire, RG45 6AU.

TABLE OF CONTENTS

Parkman C (1999). Transferring road maintenance to the private sector – The Ghana experience. Unpublished Project Report PR/OSC/156/99
Parkman C (1999). Transferring road maintenance to the private sector – The Colombian experience. Unpublished Project Report PR/OSC/160/99
Parkman C and K Madelin (1999). Transferring road maintenance to the private sector – Examples of UK experience. Unpublished Project Report PR/OSC/157/99)

EXECUTIVE SUMMARY

The Transport Research Laboratory (TRL), in association with University of Birmingham, were appointed by the Department for International Development to carry out a study entitled 'Transferring road maintenance into the private sector' under their Knowledge and Research programme, and this report presents the findings of the project.

Despite the importance of roads in terms of both their intrinsic value and the role they fulfil, most are poorly managed and badly maintained in the developing world. It is estimated that in Sub-Saharan Africa alone, it would take in the order of £30 billion to restore all the roads requiring immediate rehabilitation and reconstruction. Similarly, for Latin America it is estimated that between one and three per cent of GDP is being wasted per year due to additional vehicle operating costs and rehabilitation caused by inadequate maintenance. More effective management of the infrastructure would therefore free up scarce funds and hence contribute to the economic well being of such countries.

In recent years, there has been a general worldwide trend towards increasing the use of the private sector in road maintenance, which has been seen by many as a means of stimulating more efficient and effective use of resources. The report reviews the documented evidence of such changes, and also draws on case study experience derived during the project from Ghana, Colombia and UK and from discussions with professionals with experience in the subject.

It is difficult to identify objective, quantitative conclusions on the experience of increased use of the private sector, since such changes are always concurrent with changes in other aspects of road management (such as funding mechanisms, funding levels or broader institutional structures). However it appears that:

- without adequate, stable funding, initiatives such as internal restructuring of a government organisation or increased use of the private sector can have little effect – the road network will continue to be poorly maintained. However, the symptoms might be different. Where a road administration is performing all operations in house, equipment and labour will remain under utilised and actual operations on the network will be minimal; where a road administration is making use of private contractors, the unstable flow of funds will result in sporadic appointment of contractors, and continual problems of payment defaults such that contractor operations might be ineffective and inefficient.

- functional separation of the different roles required for road management in an organisation, from policy level through to operations, is often seen as a key means of improving efficiency and effectiveness. If private contractors are to be used to a large extent, then this separation needs to have been properly institutionalised if the initiative is to be successful. However, for functional separation to be successful, there might often be the need to increase the number of staff involved in road maintenance. Clients have often underestimated their requirements for the management of contractors, and subsequently have either recruited extra staff or appointed external contract managers. Similarly, where direct labour organisations (in-house works organisations) have been required to operate on a more commercial basis, staff have often been recruited to strengthen the management of operations.

- most organisations report cost savings over the time period when use of the private sector has increased. The oft quoted view is that contractors tend to work more efficiently. However, it appears that the fundamental reason for such cost savings is due to the move to

a more competitive environment. It is apparent that government owned direct labour organisations might be just as competitive if they are allowed to compete with the private sector and, conversely, private contractors operating in an uncompetitive environment will be no more efficient than a public organisation. In addition, contractors pricing strategies in an uncompetitive environment might mean increases in the future above the actual increase in costs.

- due to the nature of road maintenance and the on going developments in the ways it might be specified, successful use of the private sector requires an environment of cooperation. Particularly where more significant risk is transferred to contractors (examples include South America, UK and Australasia), the need for a partnering type approach is apparent. Concern is expressed by some that such approaches might be problematic in environments where corruption is an issue.

A review of experience in the developed world reveals, in general, that the trend has been for a gradual stepwise approach to introducing the private sector into road maintenance activities. The approach has been to separate functions and restructure in house government organisations to improve their operations to the point where they are broadly viable and efficient in the operations they perform. During this time, the private sector has gradually gained in experience; from a starting point of performing on small, fairly tightly specified contracts, it has developed to the extent where large contracts, involving significant risk for the private sector, have been awarded. The transfer of efficient public sector organisations has occurred at this latter stage, in which the private sector has taken over the organisations on appointment to a large, long term contract (for example, responsibility for a local authority network, for both routine and periodic maintenance works, for a term of three to five years).

By contrast, it appears that experience in the developing world has been for more dramatic, less stepwise change. Often, where maintenance operations have been performed solely by the public sector, a gross lack of funding has meant that such operations have almost been non-existent. In such environments, there is also a lack of experienced contractors in the private sector. However, most initiatives seem to have concentrated on developing the private sector, and it appears that initiatives to develop the public sector organisation (with a possible view to later transfer to the private sector) have been limited. The focus has been on training and development of the private sector and issues such as determining suitable working methods (e.g. labour or equipment based) and establishing adequate and stable funds have been paramount.

Based on the principle of competition, this report argues that an environment in which both the public sector and private sector are able to compete for the same work is the most sustainable. It identifies the principles for such competition which have been learnt in the developed world, predominantly in the UK, and the steps which were taken to improve in house government operations. It also addresses the key issues faced by those seeking to develop a sustainable but competitive private sector in the developing world. It concludes that stepwise moves towards competition and use of the private sector are required and outlines the suggested steps, in terms of organisational changes within the road administration, and corresponding developments in contract maintenance procedures. It is therefore hoped that the report will aid all those who are seeking to improve their maintenance operations.

The report is structured to reflect the process which a road administration might go through in addressing how to change to a more competitive environment. The structure is explained in more detail in the introduction.

ABSTRACT

This report attempts to draw together the key issues relevant to road administrations which are aiming to make increased us of the private sector in road maintenance. It draws on recent literature together with experience collected during the project from case studies carried out in Ghana, Colombia and the United Kingdom. A number of other case study experiences have been incorporated from unpublished articles and discussions with practitioners in the subject area. The purpose of the report is to assist those considering implementing changes to the delivery of road maintenance, by identifying the range of options available and the steps required in the change process.

The key issues covered are: a) organisational models relevant to road maintenance; b) the process of change and its implementation; c) requirements in assessing existing maintenance and contracting operations; d) the need for competition; e) improving the performance of client operations, direct labour organisations and private contractors in road maintenance; and f) use of appropriate contracts and contract management procedures.

1. INTRODUCTION

1.1 Background

The importance of addressing road maintenance properly is now well understood and is illustrated by the consequence of neglect. For example, the World Bank has estimated that of 85 countries receiving their assistance for roads, the cost of reconstruction has been between three and four times the cost of earlier preventive maintenance which would have avoided the need for this later reconstruction. The effects on the road user are also significant: vehicle operating costs increase by similar or greater amounts due to such neglect (Harral and Faiz, 1988). If both the effectiveness (quality and timely work) and the efficiency (optimum cost) of road maintenance can be improved, then it is apparent that significant economic benefit will result.

The Road Management Committee of PIARC (Montreal Congress 1995) have reported that the majority of periodic maintenance work is undertaken by private contractors and the majority of routine maintenance is by in house direct labour organisations (DLOs, alternatively known as agency force). There is a general perception, but not necessarily proven, that DLOs are inefficient whereas private contractors are efficient. Examples exist of unproductive and inflexible DLOs, strongly unionised and resistant to change. An early study by the World Bank (Miguel and Condron 1991) recommended a policy of making more use of private contractors for maintenance whilst recognising that the process of change would require careful planning and preparation.

Another driver of change has been the restructuring of the road sector which also seeks to make more use of the private sector. This reflects the global trend of revising the role of government from that of being an operational organisation (with a large number of skilled and unskilled employees) to that of being an enabling institution (with a small number of skilled 'fund' managers) for operations performed by the private sector. Operating within this context, road managers who have been responsible for improving road maintenance have sought to develop appropriate management and procurement procedures for their own sub-sector, to obtain best value for money. At the same time, in the emerging world, realisation of

the road maintenance crisis has stimulated various initiatives (for example, the Road Maintenance Initiative in Africa and PROVIAL in Latin America) by development agencies, led by the World Bank, to consider fundamental restructuring of the road sub-sector. Hence increased involvement of the private sector has usually been one of many coincidental reforms.

1.2 Procurement methods

A number of different mechanisms are available for procuring road maintenance services. The traditional method was for all administration, management and service provision to be carried out by the road owner within one organisation. Several countries have experimented with reforms whereby some or all of the functions of the road administrator, manager and service provider have been contracted out. The wide variety of road maintenance contracts in use world-wide reflects the different levels of development as well as cultural aspects. At one extreme, contractors are appointed for long terms (5 years or more) after an extremely competitive bidding process, and take on responsibility for all road maintenance activities on a significant length of road. Payment might be made on the basis of road performance (for example, riding quality for pavements and response times for emergencies) rather than for work activities. This represents a significant transfer of risk to the contractor, and therefore requires an experienced contracting industry. Examples include Australia (Smith et al, 1994), Canada (Gaston, 1994) and more recently countries in South America (Zietlow, 1998a).

Given the nature and breadth of the reform process mentioned above, it is difficult to draw rigorous comparisons between the different methods of procuring road maintenance, in isolation from the more global effects of restructuring. In particular, cost comparisons are notoriously difficult due to the different government cost accounting systems used, market conditions and other factors which affect a contract price (Heggie and Vickers, 1998). However, examples of reported experience are:

i) In 1991 the UK Audit Commission released a study of the impact of competitive tendering on highway maintenance for 13 local authorities. The study concluded that increased competition in maintenance had created savings worth approximately £25 million a year without a deterioration in the quality of work. It found on average that authorities had saved 15% on the work newly exposed to competition with individual authorities experiencing reductions up to 29% (Audit Commission, 1991).

ii) It is reported that Brazil has reduced the costs of road maintenance by 25% for equivalent service quality through switching from force account to maintenance by contract (World Bank 1994).

iii) Zietlow (1998) suggests that savings of more than 50% of maintenance costs per km can be achieved when contracting is used compared with using the road administration's own work force. This is based on evidence in Latin America as well as documented evidence of experience in Australia (Frost and Lithgow, 1996).

Whilst the above examples show savings made, it is not clear exactly which changes have produced the savings. For example in the UK, the introduction of competition prompted consequential changes in procurement methods and the savings made were not necessarily the result of using private contractors.

Although most authors agree that maintenance by contract is generally cheaper than by in-house organisations the evidence is not universal. Apart from the lack of data to confirm how profitable contractors might be on any given contract, some road administrations suggest in-house costs are lower. For example, Roads Directorate of Chile (Vialidad) has been able to establish a reliable accounting system with which a direct comparison of contract and in-house maintenance could be made. The results indicate that some maintenance operations are on average performed 40% lower than by contract (Miquel and Condron, 1991). However the comparison is not conclusive because in-house operations are not necessarily performed to the same stringent standards required for similar operations performed by contract (it is understood, however, that the Chilean experience since the review is more favourable towards use of private contractors). Similarly officials from France believe that maintenance work can be carried out more efficiently in-house than by contract (Miquel and Condron, 1991).

Nearly all authors agree that force account work units become more efficient when they have to compete with private contractors. In the example of Australia quoted above (Zietlow, 1998), the in-house work force, competing with a private contractor, had in fact achieved significant improvements in productivity to the extent that later in the pilot project, cost comparisons suggested it was 6% cheaper than the contractor (Smith et al., 1994). Similar evidence is quoted for maintenance of a secondary network in the UK (Madelin, 1994). An established competitive environment therefore seems to be the key requirement. PIARC concluded that in-house organisations could compete effectively with private contractors given the opportunity, as long as a clear set of rules is defined and there is open accountability.

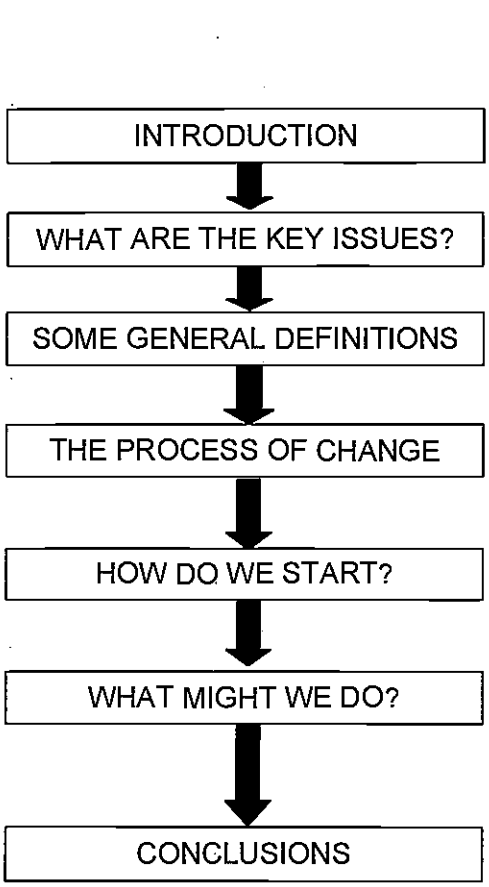
1.3 This study

The purpose of this study is to identify the different approaches adopted world-wide for increasing the use of the private sector for road maintenance and to assess the competing claims of public or private sector involvement. By providing a critical review, it is hoped that the report may be of some use to those countries currently considering such initiatives. The initiatives are often referred to as 'contract road maintenance' or 'maintenance by contract' - these latter terms, however, do not necessarily require increased involvement of the private sector (contract procedures can be applied for inter-departmental government works as well) but it is usually implied, and the terms can be considered synonymous for the purposes of this study. Indeed, as will be discussed later, appropriate procurement procedures and organisational changes appear more fundamental to ensure success than the issue of which organisation (public or private) actually does the work.

This report aims to address the above issues, by considering how best to deliver road maintenance, at the operational level, based on international experiences to date. It is designed to help governments and road authorities who are considering a move to increased use of the private sector, by identifying the key steps which should be assimilated if the move is to be a success. The report also addresses the potential for improving the performance of an in-house works organisation. It is considered that the reporting of practice, and of others experiences, is of more value than any general theory and so case studies and examples are presented throughout. Indeed, a key conclusion of the study is that increased dissemination of real practice through case studies and 'stories', will enable a much greater understanding of the process required for successful change.

The key tenet of the report is that road management is a process of continuing change and that the change process for each country will be unique. It is hoped that the layout reflects the change process, and helps to stimulate the reader to think about the required changes in their environment. The report is therefore structured in the following way, summarised in Figure 1.1.

First, key experiences from case studies, assembled in this project, and from a wider literature review are described in order to alert the reader to the important issues(Chapter 2). Then the background issues of organisation and management are addressed, showing how the road sector might be structured to ensure the needs of the user and the network are properly addressed (Chapter 3). The report then considers how road administrations might move to perform road maintenance more efficiently, in terms of the use of either in-house or private sector organisations. Chapter 4 considers the change process and the probable steps required to assimilate change within an organisation. Chapters 5 and 6 suggest approaches for assessing the existing situations and potential for change, and the remaining chapters then describe the possible models and arrangements for efficient and effective delivery of maintenance operations, drawing on case studies of world-wide experience. Key conclusions of the study are presented in Chapter 12. Acknowledgements are made in Chapter 13.



Chapter Nos.	*Description*
1	Introduction to the study
2	An overview of experience to raise the key issues
3	A framework to help us define where we are
4	What should we expect in the change process, and what can be reasonably managed?
5 - 6	What studies do we need to make, in order to determine the changes required? (Ch.5 – internal, Ch.6 – external)
7 – 11	Where might we move, and what are the priorities? (Ch.7 – competition, Ch.8 – client issues, Ch.9 – DLOs, Ch.10 – contracts, Ch.11 – contract management)
12	Key conclusions of the study

Figure 1.1 Structure of this report

Appendices are included to expand on aspects of the report. Since significant difference occurs world-wide in the terminology used in this subject area, a full glossary of terms is presented as Appendix A. Appendix B provides a selected bibliography of some of the references reviewed for the study.

The methodology of the study started with a literature review, which made considerable use of an earlier World Bank study (Miquel and Condron, 1991) and subsequent work by PIARC. Preliminary conclusions and views were then refined by a series of case studies in the UK, Ghana and Columbia. The cases studies were chosen to gain practical knowledge of a range of countries, conditions and experience with particular reference to the needs of low income countries. The case studies are currently unpublished reports (Parkman and Madelin, 1999, Parkman, 1999a, 1999b) but will be published as a separate companion to this report in due course.

2. LITERATURE REVIEW AND CASE STUDIES

2.1 Experience from countries and organisations

2.1.1 World Bank

Miquel and Condron reported in 1991 on maintenance by contract in 10 countries. Their main conclusion was to encourage more use of private contractors whilst recognising that:

- the change from DLO would require planning and the contractors would need support and training;
- private contractors did not have the necessary skills and would benefit from transferring skills, plant and equipment from the DLO; and
- road authorities need to specify maintenance tasks, prepare contract documents and supervise the contract.

Other World Bank reports (chiefly Lantran, 1990 – 1994 and Gyamfi and Ruan, 1996) focus on the ways and means of encouraging the move to contract maintenance by reporting on best practice.

2.1.2 PIARC

The Road Management Committee have confirmed that maintenance by private contractors can be successful but extended the 1991 World Bank study by focusing on the organisational implications and the benefit of subjecting DLOs to competition. Their report concluded that:

- major savings can be made by organisational change (e.g. client / contractor split) and better procurement policies, regardless of who undertakes the work;
- DLOs can respond to a competitive environment by increasing efficiency, provided that managers are given authority to manage and politicians restrict their role to policy development and do not interfere with operational matters;
- monopolies could emerge if all work was placed in the private sector;
- the length of contract and its packaging can affect the price tendered and the level of interest from contractors;
- the accounting rules for a DLO must be specified and the process of procurement open to scrutiny and audit; and
- there is a case for a mixed economy of efficient DLOs competing with private contractors.

2.1.3 UK experience

A number of highway authorities have transferred their DLOs into the private sector. The case studies of Berkshire, Somerset and Shropshire (Parkman and Madelin, 1999) do not reveal any immediate cost savings directly attributable to the use of contractors. The savings made in Shropshire followed from organisational changes, the development of client / contractor roles and improved management of the DLO in competition with private contractors. In all of these cases the move to contract maintenance was justified by the particular circumstances in the UK of:

- government imposed restrictions on the type and location of work for which a DLO could bid;
- expected budget reductions both locally and nationally;
- changes in the management of national roads reduced the work available for DLOs; and

- a requirement for total competition in 1996, including all emergency work, which left DLOs vulnerable to predatory bids from contractors.

Contract maintenance was arranged by a process of competition which required the successful contractor to accept on transfer the majority of DLO workforce, plant and equipment. Five year contracts were let which combined routine, emergency and some periodic maintenance.

2.1.4 North American experience

Studies by Gaston (1994, 1996) in both the USA and Canada indicated that budget reductions and political pressure were the main drivers of change. British Columbia was one of the first major privatisations and this is reported below. Gaston found no clear evidence of cost savings and his conclusion was to support a mixed approach of organisational, procurement and DLO improvement.

The case of Essex County in Massachusetts (Kerasiotes 1993) however revealed a story of gross DLO inefficiency and resistance to change. The DLO had become overstaffed and inflexible through strong unionisation, weak management and lack of political will. The transfer of all routine maintenance to private contractors by the Massachusetts Highways Department produced significant savings and improved performance.

In spite of the previous example, most commentators in the USA tend to favour the creation of a competitive environment to secure efficiency improvements rather than total contract maintenance (Lighthizer 1994, Jenson 1997, Forbes 1997). The advantages are seen as:

- retaining control over the activity for which government is responsible;
- preventing a private sector monopoly;
- demonstrating that the public sector can and must be efficient and compete successfully; and
- maintaining quality.

The General Accounting Office reported (General Accounting Office, 1997) on privatisation with the following conclusions:

- privatisation requires a political champion;
- government needs to establish an organisation and analytical structure for effective implementation;
- legislative changes and/or reduced funding may be required to encourage privatisation;
- reliable cost data on government activities are required to support informed decisions and assess overall performance;
- strategies are required to manage workforce transition; and
- monitoring and oversight are required to protect government interest when its role in the delivery of services is reduced through privatisation.

2.1.5 British Columbia - Canada

In 1988 British Columbia began privatising all highway maintenance in the province and published a review in 1994. It was a politically inspired change and the following lessons are pertinent:

- evaluation of costs from `before` (DLO) to `after` (contractor) is impossible because no common output measures had been established;
- there was a 15% increase from phase 1 to phase 2 contracts, a higher rate of increase than expected with in- house DLO activities;
- an adversarial relationship existed between the client and private contractor which must be avoided in future (caused by poor specification and difference of opinion about prioritisation of tasks);
- more client management staff were needed than predicted to supervise the contracts;
- the specification had encouraged short term maintenance activities at the expense of preventative maintenance;
- contract maintenance was a high risk endeavour because there was no evidence of anything wrong with the Ministry`s original maintenance programme;
- the Ministry lost the ability to estimate or monitor actual costs of specific maintenance jobs for future management purposes; and
- training and apprenticeships had almost been eliminated in the province.

2.1.6 Ghana

The original pressure for change came from an economic crisis and an over staffed civil service and was supported by donor organisations. A major problem for reform was to overcome the chronic shortfall in funding which left contractors unpaid and therefore reluctant to work. Initial reforms included the setting up of a Road Fund and a move towards payment by results for the DLO. Only limited success was achieved until the Road Fund was modified to increase income and to give it more independence. Current issues from the present arrangements (Parkman, 1999b) include:

- a reduction in the civil service has been achieved but the use of many small contractors for routine maintenance requires a lot of supervision;
- initial contracts were let by inviting expressions of interest for undertaking work at pre-established rates - the only competition was in the selection of contractor;
- as contractors become established there is a move towards competitive tendering;
- as the funding becomes more reliable there is a trend towards bigger contracts and larger contractors;
- contractors needed training in estimating, understanding specifications and in output measures. They also needed support in the provision of equipment and materials;
- concern about corruption leads to a need for close supervision, technical and financial audits and a rigorous procedure for contract variations. However, this can then lead to an increase in bureaucracy, inflexibility and late payments.

2.1.7 Colombia

A strongly unionised DLO, which was seen as inefficient, inflexible and resistant to change was the catalyst for using contractors. In the 1980s the government promoted a general programme of change under the banner of `Change with Equity`. The Ministry of Works (MOPT), responded with the proposal to encourage co-operatives of 10-15 workers to be formed , called microempresas (MA), to provide an alternative means of undertaking routine maintenance. In practice the use of MAs enabled the service to expand and recruitment to the DLO was frozen. The changes were supported by donor organisations and the specific objectives were to:

- improve delivery of service

- reduce costs
- increase local employment
- involve local communities

An evolutionary approach was adopted and care was taken to encourage and train the MAs. A further innovation was to appoint and train agents from the private sector who would in turn promote and train the MAs. The process took two years for an MA to become functional. The following key points are noted (further details Parkman, 1999a):

- the number of MAs grew from 28 in 1984 to a peak of 400 in 1995 when 84% of the network was covered. The size of an MA was limited by legislation to 15 members;
- contracts varied from 40-60 km per MA, based on an annual productivity of approximately 5 km per person;
- contracts were let for one year on a pre-determined cost base with the MOPT fixing salaries, overheads and providing some materials and equipment. MOPT engineers would direct the work with the MAs providing labour as required;
- contracts were eventually categorised on a work content basis, with a shorter length for difficult roads and a longer length for easy roads;
- the contracts have evolved towards being performance based and the payment method includes penalties for non compliance;
- supervision by MOPT became onerous and was also privatised with the appointment of Road Administrators (AMVs). Each AMV is responsible for about 150km of road and between 3-5 MAs;
- the trend on part of the network is now towards larger performance based contracts, using bigger contractors. These include both routine and periodic works, and were initially for a two year term (soon to be extended) with more risk transfer to these contractors. Contracts are awarded based on price and quality;
- it is difficult to prove cost savings due to lack of data but there is more satisfaction with the present system; and
- in spite of the apparent success of MAs, some local state governments refused to continue their employment when the MOPT decentralised maintenance responsibilities. They were concerned at the threat to their own DLOs.

2.1.8 Chile

Whilst not a specific case study, the authors received a report outlining changes in Chile (Nabalon 1998). The pressure for change was the expansion of the road network and a need to improve maintenance. It was decided to increase capacity by extending the use of private contractors (who were used for periodic maintenance) instead of the DLO (who undertook routine maintenance). The initial approach was to let one year contracts for the maintenance of networks of 400-600km, comprising routine and some periodic maintenance.

- the first contract was let in 1992 and increased to 55 contracts by 1998, covering 31% of the national road network;
- contracts were let on a unit price basis with monthly payments;
- no information is available about cost savings but road conditions have improved and there is satisfaction with the performance of contractors;
- contractors are now very interested in maintenance contracts;
- the DLO is now deployed on the secondary network which previously lacked maintenance; and

- multiple periodic maintenance contracts are now let to the network contractor, so reducing administrative costs.

The policy evolved in 1996 with the introduction of five year performance based contracts (similar to the Colombian experience above). Two contracts have been let each for 300-400km of road with the aim of gaining experience for both contractors and the Road Directorate.

- the specification includes the quality of the road surface, the provision of information and assistance to road users and emergency response;
- monitoring is by the Road Directorate; and
- contractors investigate, choose treatments and programme works.

2.1.9 Australia and New Zealand

A series of workshops were held on the topic of Road Maintenance by Contract in 1998. The issues which emerged in New Zealand were:

- partnering and risk sharing;
- the benefits of performance based maintenance contracts;
- road reform, commercialisation and funding;
- savings achieved of 30% using consultants for management and 17% using contractors since 1991 when compulsory tendering was introduced;
- an evolutionary approach is desirable; and
- the development of DLOs into Local Authority Trading Enterprises (public sector contractors) had generally been successful but took 3-5 years.

The issues for Australia were:

- benchmarking and competitive tendering had improve the efficiency of DLOs;
- a partnering approach is required for performance based contracts;
- initially all tenders had been won by DLOs;
- clear rules were needed for the evaluation of contracts balancing price and quality;
- contractors had difficulty understanding the client's requirements particularly for performance based contracts; and
- consultants began as managers but have now set up joint arrangements with contractors to provide o total maintenance capability.

2.2 General summary of experience

Based on the reported experience above and other authors (Robinson and others 1998), it appears that the following conditions are required to achieve effective and efficient management of roads by the private sector:

- Steady funding must be ensured by
  - political and economic stability to establish a climate of confidence and co-operation among operatives
  - provision of a predictable workload
  - timely payment for works carried out

- Adaptable bidding procedures and contract documents to suit the nature of works to be undertaken
- Accountability and transparency of bidding
- Application of incentives and sanctions as necessary
- Continuous monitoring and evaluation

Perhaps the most important and oft quoted requirement for successful contract maintenance is the need for an adequate and stable flow of funds. Indeed, case studies provided in the appendices illustrate this - until Ghana recently improved its funding mechanisms, contractors suffered delayed payments and the whole contract process (small contracts let on an irregular basis, which were therefore inefficient and difficult to manage) was founded upon the need to cope with unreliable funding. Hence securing reliable funding is at the heart of the reform process and without this, other issues affecting successful contract maintenance will have limited or no impact (Heggie and Vickers, 1998).

Countries with less experience in contract maintenance have often needed to consider how to develop a contracting industry capable of competing for road maintenance work. Extensive contractor development programmes have been implemented and these have often been supported by external funding agencies. Less significant transfer of risk has occurred in such cases, with contracts typically being of a shorter duration (one year or less), for smaller lengths of road in any given contract (which often include only certain activities), and with payments being made based on agreed quantities and unit prices. Examples include Ghana (this study), Lesotho (Miles, 1996), Pakistan (Miquel and Condron, 1991), and the Philippines (Tisbe and Mikkelsen, 1995). Countries with more developed private sectors have been able to transfer far more risk as contract maintenance has become established, as described in Section 1.2.

It is therefore apparent that contract maintenance can be implemented successfully in a wide variety of cultures, but that careful consideration needs to be given to precise approach adopted for each specific country. Many countries have reported that significant consideration should be given to the change process and that a gradual transfer of risk to the private sector is required, to allow contractors to gain experience. In addition, the changed role of the client road administration is often overlooked but is also important (Miles, 1996). This reflects the broader need for stepwise change in the road sub-sector in general, which allows institutions to evolve in a sustainable manner, fully able to derive the benefits from subsequent steps, rather than sudden change which might only be for the purpose of political fashion (Talvitie, 1996).

3. PURPOSE OF THE ORGANISATION

3.1 The different functions of road maintenance management

The management of road maintenance activities can be viewed in terms of four main functions: planning, programming, preparation and operations (Robinson and others, 1998). This study is addressing the delivery of road maintenance and its focus is therefore on the operations function. The relationship between the functions is illustrated in Figure 3.1.

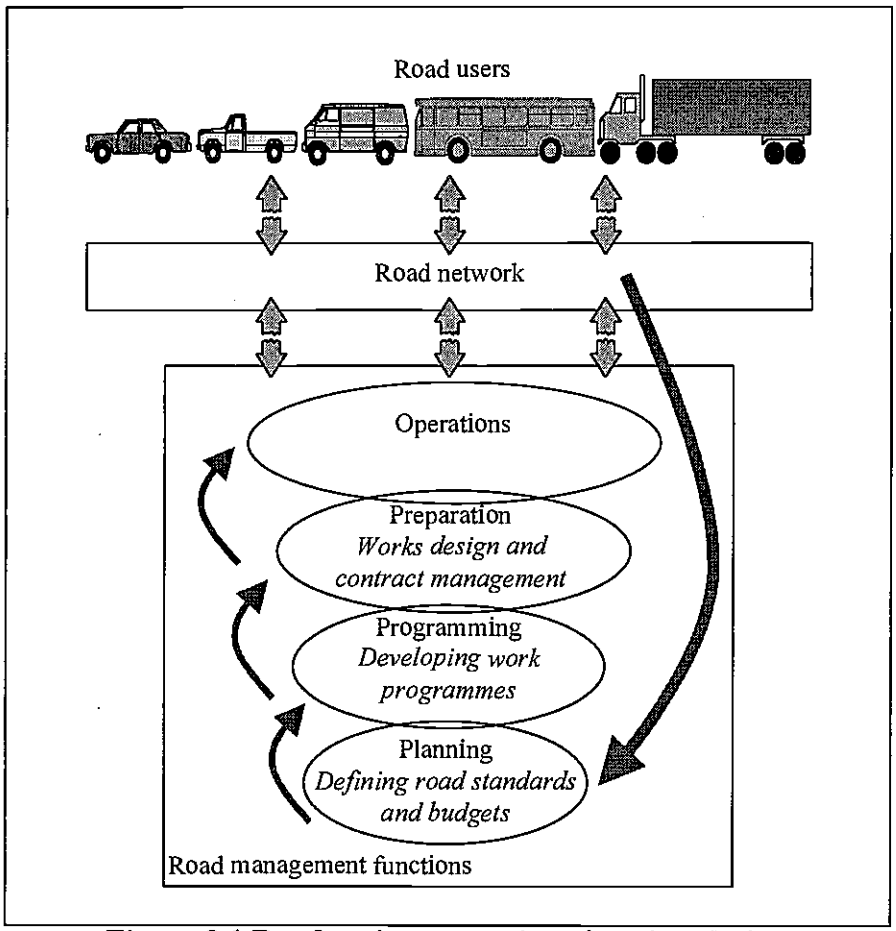


Figure 3.1 Road maintenance functions in relation to the road network and users

Maintenance at the operational level is optimised through maximising the efficient and appropriate use of the resources of labour, materials and equipment. For example, depending on the relative costs of labour and equipment, the use either of labour-intensive or equipment-intensive operations might be appropriate. This will have an impact not only on the way that operations are undertaken, but will also have implications for the supporting functions of planning, programming and preparation. Thus, an implication of Figure 3.1 is that, if road maintenance at the point of delivery is to be optimised, then the starting point is to address the operations function. However, the nature of operations depends on the maintenance policies and standards and these are addressed principally through the higher level functions of planning and programming. But the higher level functions will need to reflect the needs of the road user on the network. The key recommendation is therefore that any institutional

change should be driven from the needs and requirement of users and the network ('bottom up').

3.2 Organisational roles

The management of a road network is carried out by organisations that perform a number of different roles. Different terms are applied to these in different countries, but the following are used in this report.

Owner

The role, or organisation, responsible for funding, establishing road policy and the legal and regulatory framework for management of the road network. Typically, this will be a ministry of transport, or where the administration function is also combined, a ministry of works and transport. The ministry will normally be acting as the de factor owner of the network on behalf of the state.

Administrator

The role, or organisation, responsible for effecting road policy and ensuring that the performance of the road network meets the overall political aims of the owner. In many countries, this is referred to as the road authority or agency.

Manager

The role, or organisation, responsible for specifying activities to be carried out, supervising, controlling and monitoring activities. In most situations, the manager role is combined with that of the administrator, but increasingly worldwide there is a move to administration appointing managers under contract (typically, engineering consultants).

Contractor

The role, or organisation, responsible for delivery of operations by executing or undertaking works for the road administrator. The contractor is sometimes referred to as the supplier or producer.

Within the various types of organisations, functions may be performed or work undertaken under contractual or other types of relationship where the roles of the 'client' (or 'customer') and 'supplier' are identified formally. For example, the owner may be the client for an administrator who is supplying road management and works execution services; the manager may be the client within the administrator's organisation procuring works execution services from an in-house DLO or external contractor. A chain of client-supplier relationships may exist within the road network management system.

3.3 Organisational models

A number of organisational models are available for delivering road maintenance. The models differ in the way that the four roles mentioned above are set up and relate to each other. Different models will be adopted to reflect different political requirements for service delivery.

3.3.1 DLO unit

This is the traditional model for undertaking maintenance works (Figure 3.2). In this case, the administrator, manager and contractor are all part of the same organisation. In many cases, this will be the organisation of the owner, such as in a ministry of public works.

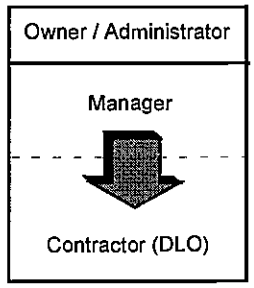


Figure 3.2 In-house unit (DLO) organisational model

3.3.2 Conventional contractor model

In this model, the manager role is taken by the road administrator who lets conventional civil engineering contracts to an external contractor for carrying out the works (Figure 3.3). The model has been widely used for carrying out development and periodic maintenance works. Some use has also been made of the model for carrying out routine and special maintenance works.

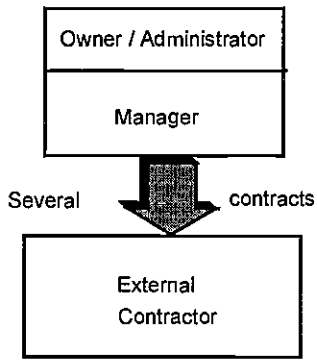


Figure 3.3 Conventional contractor organisational model

3.3.3 Conventional contractor - consultant model

In this model, contracts are let by the road administrator for both the manager's and contractor's role. Consultants typically undertake the role of the manager and have the task of supervising the work undertaken by contractors (Figure 3.4). In the specific case where a DLO unit has been awarded a contract after competition with the private sector, then it might be that an external Manager is under contract to a client to manage its own in-house works unit. This has happened recently in the UK (reported by D Robinson of W S Atkins Consultants as reported in Robinson and others 1998).

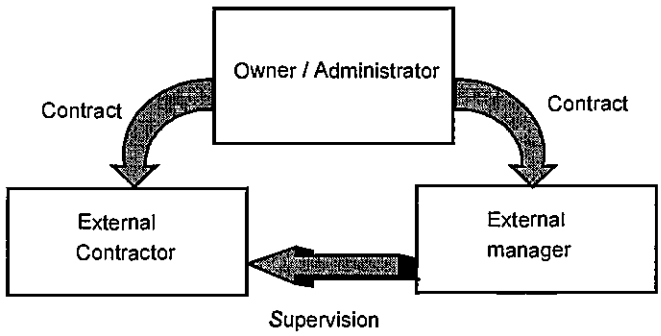


Figure 3.4 Conventional contractor - consultant organisational model

3.3.4 The total service provision model

In this model, a single contract is let by the road administrator to the manager (Figure 3.5). The manager is then responsible for providing all services to the administrator. The manager organisation can choose whether it will undertake the contractor roles itself, or whether it will engage contractors for this, either on a competitive or a negotiated basis. There are limited examples of this model as it represents the most significant transfer of risk to a private contractor and requires a mature contracting industry.

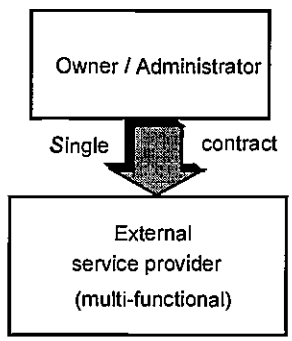


Figure 3.5 The total service provision organisational model

3.4 Owner / Administrator relationships

For effective management, ownership of the network concerned needs to be defined clearly. This can sometime be a problem at local government level, where the status and responsibility for minor roads may not be recorded formerly, but there can also be problems with major roads because of uncertainty about whether central or local government owns particular roads. Providing that ownership is established, the various organisational structures for undertaking road maintenance which have been introduced can operate, in principle, at central or local government level. However, the relationship between the owner and administrator functions will vary depending on the degree of decentralisation required.

Two basic approaches can be used when large networks need to be managed on a decentralised basis. In the first (Figure 3.6), the owner commissions road network management activities from road administrators based at a lower geographic level. The road administrator appointed can

then undertake work as considered appropriate using models such as those shown in Figures 3.2 to 3.5. In the second approach (Figure 3.7), the owner commissions the network management activities from an administrator based at the same geographic level. The administrator can then undertake the activities through managers and contractors based at a lower geographic level (Figures 3.2 to 3.5).

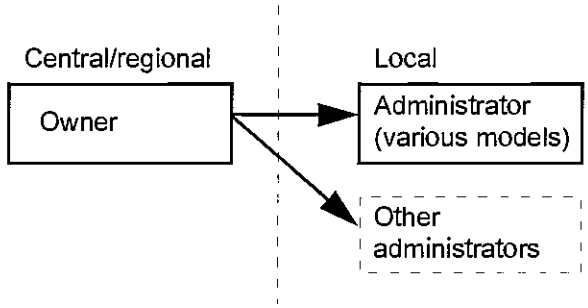


Figure 3.6 Decentralisation of road administrator role

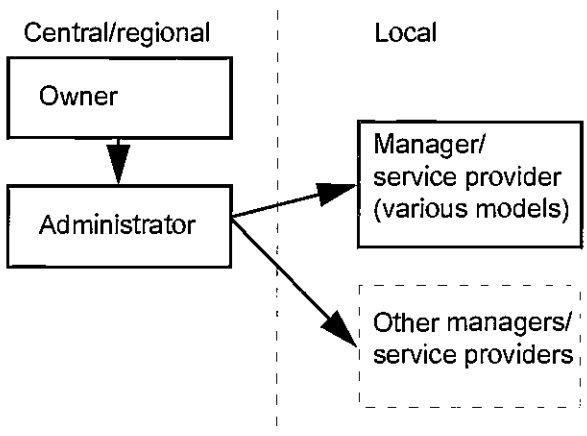


Figure 3.7 Decentralisation of road manager role

With all of these approaches, arrangements between the parties can be on a conventional contract basis or a top-down agency arrangement. Informal arrangements are also possible, but are not recommended.

There is a growing tendency in many countries to decentralise many government functions to the local level. This has often resulted in sizes of network that are well below the optimum for effective and efficient management, and in the local road administrator organisation lacking the range of skills and expertise needed for the managerially and technically demanding job of road management. In order to overcome this problem, one approach has been for the local authorities to club together and procure road administration and management services from another body. This body can be a central or regional government road administrator, or can come from the private sector. The arrangement is illustrated in Figure 3.8. This arrangement enables networks to be managed in an effective and efficient manner by organisations with sufficient skill and competence whilst, at the same time, retaining the responsibilities of ownership with the legally charged local government body. This is an example of the 'bottom-up agency model'.

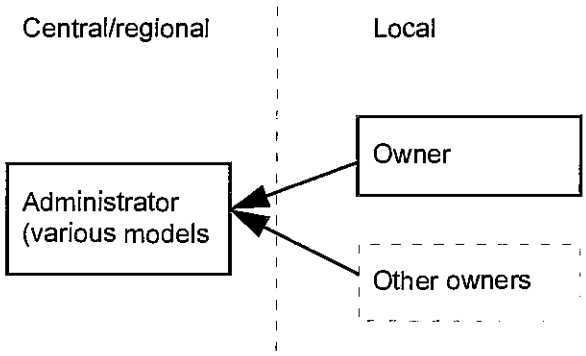


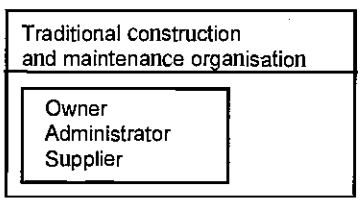
Figure 3.8 Bottom-up agency model

3.5 Organisational change

There are common features in the way that many road management organisations have evolved over time. In the road maintenance context, the trend has essentially been to move through the stages outlined in the order of section 3.3. In broader organisational terms, this is reflected in Box 3.1.

Box 4.1 Evolution of road organisations

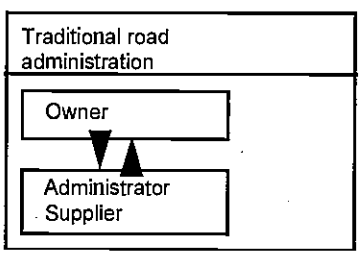
Stage 1: ***Establishment of a traditional construction and maintenance organisation***



All roles of owner, administrator, manager and contractor are combined, often in a ministry of public works.

In this stage, it is production that matters. Roads are built and sometimes maintained. Needs are well-defined, 'politics' are pervasive, and the constraint is funding. The road organisation is centralised and the ministry (of works) manages budgets and projects at a detailed level. The road administrator and contractor functions are combined. Emphasis is on technical issues, such as standards and specifications, and works execution. Construction of new roads has priority.

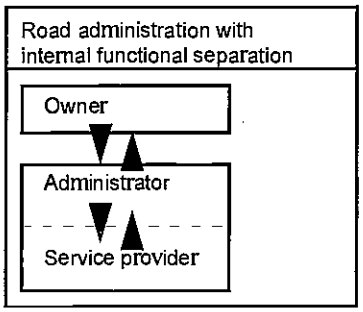
Stage 2: ***Identification of client (owner / administrator) and supplier (manager / contractor) roles***



The administrator and supplier roles are separated from those of the owner who is represented by a ministry; manager and contractor roles are identified within the administrator's organisation.

The road organisation begins to specialise with the identification of functions for planning and management (manager) and construction and maintenance (contractor). Political pressures force the ministry to have regional and sub-network perspectives in distributing monies, but occasional detailed project-specific management continues. Traffic safety and axle load control are perceived as problems due to their social cost. Road capacity starts to fail to meet demand. The ministry of transport, or equivalent, emerges as a competitor in the road sub-sector to take on the role of owner, and to regulate and to participate in policy guidance.

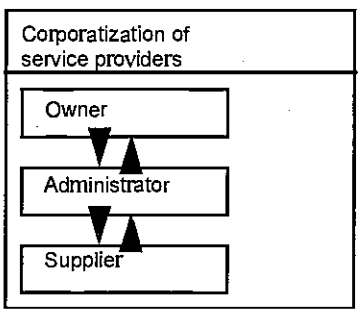
Stage 3: ***Separation of manager and contractor functions***



The manager and contractor roles are separated functionally to provide separate divisions within the administrator's organisation.

The need for accountability and efficiency, on the one hand, and the needs of the environment and economy on the other, create pressure for changing organisational orientation from that of a provider to focus instead on management. The ministry, acting as owner, begins to concentrate on policy, and the road administrator organisation starts to decentralise and takes on those road manager functions that are not assumed by the ministry. There is functional separation, with that for the manager remaining with the road administrator, and that for the service reporting either directly to the ministry of transport or to the central management of the road administrator's organisation. The decentralised administrator's organisation aims to provide for full accountability and improved efficiency. The ministry defines only the mission of the administrator, its broad goals, and fixes the budget and pricing rules. There is rivalry in the transport policy area between the ministries of works and transport, if both still exist. A roads board is likely to appear.

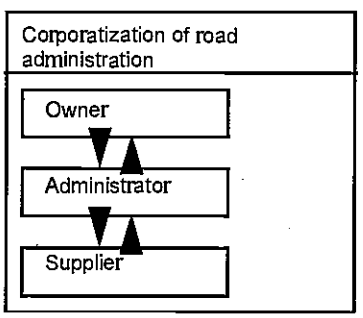
Stage 4: ***Corporatisation of the supplier organisations***



The contractor role is separated formally from that of the administrator by creating a separate public corporation; this may be followed by privatisation of this organisation.

In this stage a road fund may be established to provide for partial autonomy of the road administrator. The ministry is likely to delegate budget distribution responsibilities to the road administrator. It will concentrate on defining a policy framework, and exercises periodic oversight of the road administrator, normally through a board. The road administrator's organisation is small and manages effectively using modern technology and management systems. The roads and road programme are managed by regional offices, which are also involved in performance measurement.

Stage 5: ***Corporatisation of the administrator organisation***



The administrator's organisation becomes a public corporation; privatisation may follow, although this has been rare for other than the manager role.

Parts of the road administrator's organisation is corporatised and acquires delegated powers of legal ownership of roads on behalf of government. The administrator operates as a private company, subject to oversight from the ministry. Its income source is the road fund paid from road user charges. Management methods treat the road network as a capital asset for which a return on investment must be produced.

Developed from: Talvitie, A P, 1996. International experiences in restructuring the road sector. *Training Seminar on Management and Financing of Roads, World Bank, May 14-15, 1996.*

Organisational evolution can be a gradual process that takes place naturally over time as organisations seek to improve their operations. However, there has been a trend in recent years for governments to adopt policies that seek to encourage better value for money from operations in all sectors. In the road sub-sector, this has sometimes led to radical changes in the way the network has been managed. Change has been apparent in two main areas. The first has resulted from a drive for effectiveness and efficiency, and has led to organisational restructuring and reform. The second has resulted from adopting a customer-focused approach to road management, and has resulted in significant change of culture within organisations.

3.6 Hierarchy for change

Organisational change and development needs to recognise that the ability to do this depends on a number of factors. Some of these are within the ability of the organisation itself to control (internal factors). They can be broken down into technical factors relating to engineering issues and decisions, and institutional factors that relate to 'soft' issues such as finance, management and human resources. Other factors are outside the control of the organisation (external factors). Effective organisational performance requires that there is capability in both technical and institutional areas, and that the external environment is supportive of good performance.

Research undertaken by Brooks and others (1989), and subsequently refined by Robinson and others (1998), suggested that there was a hierarchy between the three organisational factors. Good technical output from an organisation requires that sufficient institutional capability exists to support this, and that the external context is conducive to effective and efficient management. Thus, if organisations are to change and develop, there is a need to address external and institutional factors first, before improvements can be made in technical capability. This can be illustrated using the pyramid in Figure 3.9. External factors form the foundation of the pyramid structure. A sufficient foundation must be in place before it is possible to build the institutional layer. Similarly, an adequate institutional layer must be in place before the technical layer can be built.

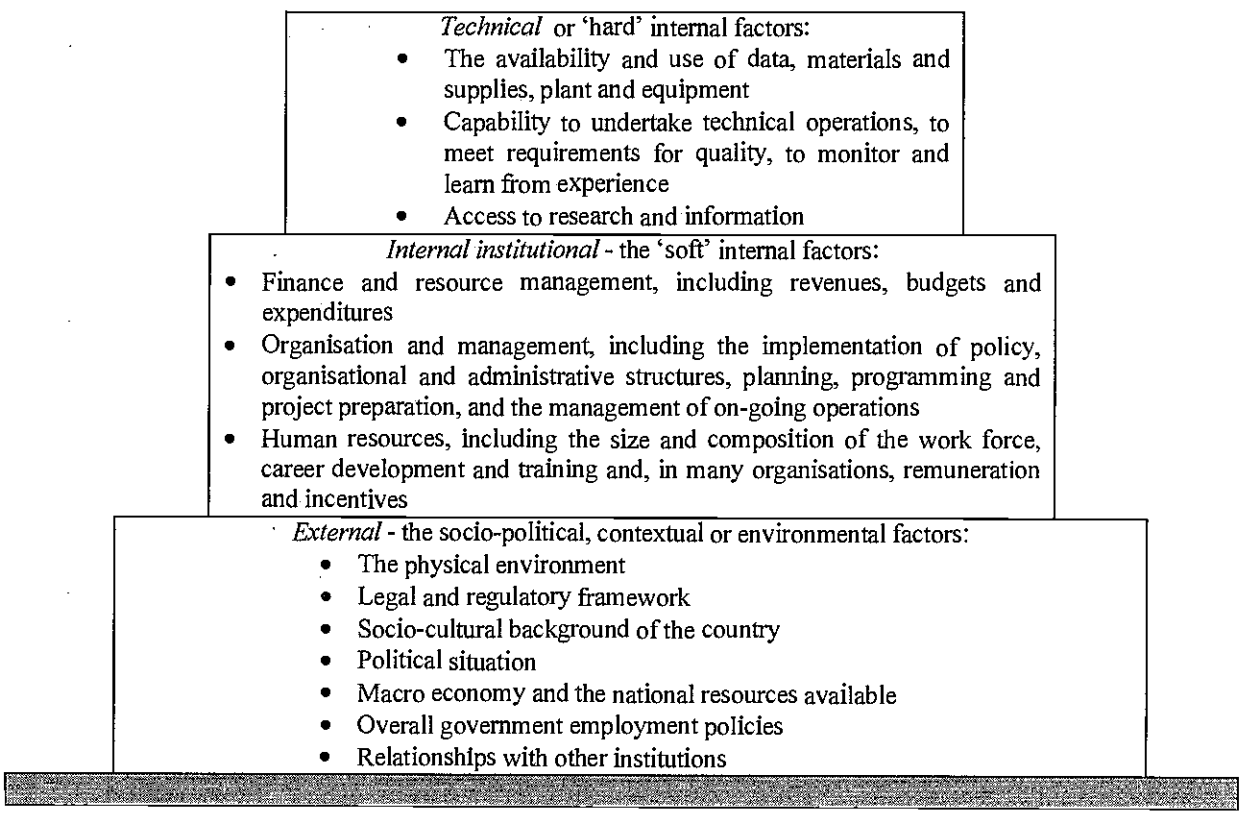


Figure 3.9 The 'Brooks' pyramid of organisational factors
(*Source:* Robinson and others 1998)

An implication of the Brooks pyramid is that if road maintenance organisations are to restructure and reform, then there needs to be a political will to do this. Governments need to adopt clear and relevant policies, and put in place appropriate external legal and regulatory frameworks to support reforms. Only then, can effective commercialisation, corporatisation or privatisation be achieved.

4. OPTIONS FOR CHANGE

4.1 Pressures for change

The pressure for change will usually come from both within and outside the administration. Within an administration, senior managers might be concerned to ensure that their organisation is fulfilling its statutory obligations as well ensuring they are operating both effectively and efficiently. However, this will often reflect external pressure on the administration from both within and outside government. The major external pressure on road administrations in the UK, leading them to increased use of the private sector during the last decade, was government requirements for competitive tendering and broader political desire to involve the private sector. International experience has been similar, often with the additional pressure brought about by development banks and agencies for similar requirements (for example, case studies: Parkman, 1999a, 1999b). Where road users and other stakeholders in the network have been involved (typically through Roads Boards), then they also have been promoters of the need for change.

4.2 Identifying the options

There are four basic options which should be considered for delivering highway maintenance:

- improving the performance of the existing DLO;
- developing the use of the private sector;
- a mixture of improved DLO and private sector; or
- do nothing.

It can be argued that the final option above is not relevant since there would be no change, but doing nothing is always an option and it is a benchmark against which any change should be assessed. Each option for change must also address the implications for the whole of the organisation of the road authority. Examples of initiatives with wider implications elsewhere in the organisation include:

- definition of client and contractor roles;
- organisational separation of client and contractor groups;
- procurement process suitable for both DLO and private contractor;
- specification of maintenance tasks and standards;
- methods of payment which are open and verifiable.

4.3 Managing the change process

Evaluation of the existing DLO and the contracting industry will normally have been carried out as part of a broader initiative within a road administration aiming to improve its operations and will therefore form part of a wider anticipated change process. For an organisation to change successfully, evolving according to the models described in Chapter 3, it is recommended that the process is properly managed. Various authors have suggested frameworks for this process and that proposed by Talvitie (1996) is summarised in Table 4.1.

Table 4.1
A framework for the change process

Stage	Associated activities
1. Develop contract for change	- Articulate the change process - Define the role of the organisation - Management understanding of issues
2. Object oriented studies	- Develop policy framework - Ensure stable funding - Conduct studies on important issues
3. Agency oriented studies	- Improve management structure - Strengthen management processes and procedures
4. Institutionalisation	- Expand human resources - Evaluate continuously all core processes - Develop processes and procedures

Source: Talvitie (1996)

Further details of the change process are described in Talvitie (1996); however, two key aspects are mentioned here. First, Stage 1 involves establishing commitment for change from those responsible for implementing new initiatives and experience elsewhere suggests that the need for this requirement cannot be overstated (TRL, 1998). Second, the process is gradual and one reason for this is to ensure that all employees are continually updated on the process. Most employees will not actually be affected by the changes until Stages 3 and 4, but experience suggests that consultation throughout the process will help to ensure that employees are better able to cope with the change (case studies support this).

During Stages 1 and 2 of the process, various tools might be used to assess the problems and identify possible solutions to the problems faced by the organisation. This helps to structure the problems and their causes. Problem tree analysis is an example of such a technique (Commission of the European Communities, 1993) which is commonly used. This technique is used to identify rigorously the symptoms (effects) of problems in an organisation so that the underlying causes of such problems can then be identified. Initiatives can then be developed which address the underlying problems in a structured way. Box 4.1 describes how a similar approach was used in Colombia.

Box 4.1 How the change was addressed in Colombia

In the early to mid 1990s, the Colombian Ministry of Public Works and Transport was restructured into the Ministry of Transport and various executing administrations, which included INVIAS who were made responsible for the national road network. However, there was minimal initial planning for the change, and so early in their existence, INVIAS had to perform a complete review of their operations to define how they might operate more efficiently and effectively. Road maintenance was being performed inadequately and the road network was deteriorating An approach similar to the problem tree was adopted – each key problem was identified and a problem tree diagram developed as illustrated below. This was carried out by senior staff within INVIAS.

Problem: *E.g. High level of deterioration of road network*
Champion: *Person responsible for 'owning' the initiative e.g. Director of INVIAS*
Shaded areas are within INVIAS control, unshaded areas are more external (these might be within other government departments control, or totally external)

Regulatory and cultural causes	Impacts	Effects		Indicators
Various regulatory and environmental causes stated and linked to relevant impacts	*Various impacts of the causes are stated (e.g. deficient system of monitoring and preventing emergencies) and interlinked to effects and causes*	*Various effects stated (e.g. accelerated deterioration of road network) and linked to relevant impacts*		*Various quantifiable indicators are noted which demonstrate the effects e.g. %age of roads in bad condition*

Consequences: *The broad consequences of the problem are noted at the foot of the table*

Particular impacts were noted as critical nodes, or bottlenecks, which were seen as key contributors to the problems faced by INVIAS. They were addressed by designing initiatives and implementing projects, and the progress of such initiatives was monitored against their contribution to alleviating these bottlenecks. The introduction of improved routine maintenance management procedures, in the form of revised routine maintenance contracts and the appointment of private sector road managers to administer the contracts as well as perform other duties, are examples of projects.

Source: Fernandez Ordonez (1998)

4.4 Specific issues for developing contract maintenance procedures

Talvitie (1996) warns that each phase of a road administrations development (see Chapter 3) needs to be experienced and institutionalised. If Phase 4 of Talvities organisational model is considered to be the first phase in which private contractors can be successfully introduced, and considering the framework for the change process recommended above, then various steps specific to developing successful maintenance with the private sector can be proposed. Evidence from case studies supports this proposal which is summarised in Table 4.2.

Table 4.2
Proposed steps for increasing private sector involvement in road maintenance

Step	Activity
Step 1	Institutionalise and be experienced in technical issues of road maintenance, in terms of applying appropriate techniques and standards (Phase 1 traditional construction and maintenance organisation)
Step 2	Identify and institutionalise roles of owner, manager and service provider with regard to road maintenance (Phase 2 identification of client and producer functions)
Step 3	Separate owner, manager and service provider functions into distinct autonomous operating organisations (Phase 3 separation of client and producer organisations)
Step 4	Identify change process required to move to transferring DLO into private sector. Define new roles of organisations, and involve senior staff in decisions and keep all staff informed
Step 5[1]	Establish secure and stable funding
Step 6[1]	Ensure suitable regulatory framework
Step 7	Assess the performance of both DLO and the private sector and identify requirements with regard to increasing the use of the private sector (competition)
Step 8	Pilot new approach and refine before adopting a national policy
Step 9	Implement new approach
Step 10	Monitor and continually improve new processes

Source: Developed from Talvitie (1996) and evidence from case studies

Notes: 1. Steps 1 to 3 involve institutionalising earlier organisational structures prior to introducing the private sector into road maintenance. Steps 4 to 10 articulate the change process of the final organisational move to using the private sector. For any road maintenance to be successful in Steps 1 to 3, stable funding and a suitable regulatory framework will be essential, but the steps are reemphasised here as evidence suggests that these are the key requirements for successful involvement of the private sector.

It appears from evidence in the case studies, due to cultural differences and the fact that each country has a different starting point, that it is not possible to be definitive about the time required for each step in the process above. Talvitie suggests that the change process itself, of moving from one organisational structure to another, takes at least three years before it can be properly institutionalised. From the above table, change processes are involved moving from Step 1 to Step 2, Step 2 to Step 3 and Step 3 through to Step 10. This would suggest a minimum of 10 years moving from a traditional construction and maintenance organisation through to a competitive environment for private sector road maintenance. This is borne out by the case studies:

- UK local authorities were traditional maintenance organisations in the early 1980s and, with a competent private sector (though inexperienced in road maintenance), moved to properly competitive road maintenance by the early 1990s, with the process still continually developing;

- Ghana and Colombia have both been restrained by varying degrees due to shortages of funding and existing regulatory frameworks. Nevertheless, Colombia first developed the microempresa system in the mid 1980s and it is only becoming properly institutionalised to the extent that further innovations have been introduced in the mid 1990s. A similar analysis could be made of Ghana.

In conclusion, as an organisation moves through the steps outlined above, it should become more effective and efficient. It can be seen that the use of private contractors is not mentioned until Step 4, and not implemented until Step 8. Whilst it is emphasised that each country will have its own course to follow, it is noted that major efficiency gains can be made by setting up a DLO to operate in a competitive, quasi contractual environment. Experience in the developed world, and case studies describe that in the UK, suggests this is so (Madelin, 1993). Furthermore, privatisation without competition might be no better than a public sector monopoly, and means a client has even less control to deliver work of an acceptable price and quality (The Observer, 1998). This report recommends therefore that both DLOs and the private sector should be developed and encouraged to operate in a competitive environment and the following chapters address how this might be achieved for road maintenance.

First, a review will be required of the existing DLO and private sector (Chapters 5 and 6). Then the means of introducing competition will need to be addressed (Chapter 7), before thinking about other aspects of operating maintenance by contract (subsequent chapters).

5. ASSESSING THE PERFORMANCE OF A DIRECT LABOUR ORGANISATION

5.1 The origins of direct labour

Direct labour organisations (DLOs) were established to provide a local, reliable and skilled labour force which could respond to the maintenance tasks identified by maintenance engineers at the local level. Working for a DLO provided reliable if low paid employment.

Maintenance is normally a combination of routine and responsive activities, and the mixture can change quickly according to climatic conditions, emergencies and available funding. The unpredictability of some tasks, the difficulty in preparing specifications and contracts, and the need to provide hands on guidance and control all supported the advantages of a DLO.

Traditionally contractors have not been interested in these activities because of the difficulty of estimating costs, planning the work and responding in the time required. Even major construction contracts have the facility to use Day Works Schedules (for labour, plant and materials), when unpredictable conditions are encountered.

Dissatisfaction with direct labour has arisen for a variety of reasons which include:

- low productivity and high costs;
- inability to respond to changing needs;
- strong unionisation limiting flexibility;
- loss of managerial authority by supervisors (e.g. no hire and fire);
- political interference and patronage;
- old customs and practices becoming entrenched;
- payment methods linked to attendance instead of output;
- an increasing use of private contractors providing comparative cost data; and
- maintaining employment levels in the DLO becoming more important than maintaining roads.

5.2 Consideration of change

If change is contemplated then reason for that change need to be stated clearly supported with good data. It is apparent that some road authorities (British Columbia 1994), have made changes towards contract maintenance based on subjective opinion rather than quantified data. The lack of a defined base precluded any real evaluation of the change.

This chapter will provide a basis for assessing the performance of a DLO together with the broader organisation within which the DLO is located. It is important that the assessment includes the whole maintenance organisation since perceived inadequacies of a DLO may be caused by constraints or limitations imposed or created by the wider organisation. There is already ample evidence (Case studies this project, PIARC 1995) that organisational changes, particularly the functional separation of client and contractor roles, can themselves lead to significant improvements and cost savings.

Assessment should not only identify any weaknesses in a DLO and the wider organisation, but also evaluate the scope for improvement. If there is no realistic hope of improvement then more radical options can be considered. But any potential for improvement should be pursued

because it will provide an even more competitive base line from which future benefits can be measured.

5.3 Performance measures

The performance of an in-house service provider needs to be assessed from the perspective of:

- Government in order that appropriate policies and budget levels can be set
- Commercial and transport service suppliers, and private users, such as passenger cars and pedestrians, who are concerned with the service qualities of the road network and the impacts of policy decisions on transport operations

'Performance indicators' are often used to track key measures of performance in the different areas. The relationships involved are illustrated in Figure 5.1.

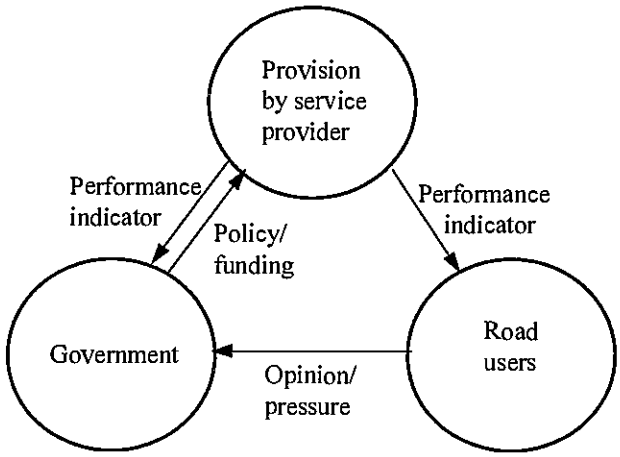


Figure 5.1 Relationship between quality of provision and customers for the provision

Appropriate performance indicators can be selected from typical operational statistics of the organisation, such as those shown in Table 5.1.

Table 5.1 Factors from which performance indicators can be selected for in-house service providers

Aspect	Performance indicator	Units
Productivity	Expenditure	Preservation ($ million) Development ($ million) Operations ($ million)
	Works	Kilometre by works type
	User savings	$ million /year
Efficiency	Preservation average cost	Expenditure/lane-km by works type
	Output per employee	Works expenditure per staff-year
Effectiveness: Asset Development	Network extension	Length (km) and percentage
	Congested road space reduction	Lane-km and per cent of congested road space
	Sub-standard geometrics reduction	Length (km) and per cent of sub-standard length
	Achievement of stable pavement condition	Length (km) and percentage increase
Effectiveness: Asset Preservation	Preservation standard	Pavement by length and percentage Bridge by number and percentage
	Asset condition	Pavement by length and percentage Bridge by number and percentage
Effectiveness: Programme	Programme benefits	NPV, average NPV per kilometre
	Programme savings-expenditure ratio	User savings/total expenditures
	Programme economic returns	Minimum and median EIRR
	Programme backlog	Kilometres deferred maintenance
	Budget shortfall	Percentage of expenditure deferred
Effectiveness: Safety	Fatalities reduction	Percentage
	Casualties reduction	Percentage
	Accidents reduction	Percentage and number by type
	Black-spots reduction	Number and percentage
Resource use	Materials	Aggregate, bitumen, cement (tonne)
	Recycling rate	Tonnes, Percentage of total by material type
	Energy-fuel consumption	Litres, gigajoules in work operations
	Emissions from works	Tonnes by NOx, SOx, particulates
Institutional	Contract expenditures	$ million and percentage of total

Source: Humplick and Paterson (1994)

The actual performance indicator chosen will depend on the customer for the performance information and the use to which the information will be put. For example, a government wishing to compare the performance of an in-house service provider with that of a private contractor undertaking a similar function could do this on the basis of measurement of the following indicators for each organisation over time:

- Effectiveness of asset preservation
  - condition of pavements
  - condition of bridges
- Efficiency
  - average cost of preservation per lane-km by works type
  - output per employee

Clearly, other factors could be used depending on the requirements of the particular customer.

5.4 Performance appraisal

In order to improve the performance of an organisation, it is first necessary to identify those areas where improvements are needed. Performance indicators represent areas where performance measurement is particularly visible and, therefore, these areas should perhaps be given priority. There is also a need to identify the strengths and weaknesses of the existing organisation. Institutional appraisal techniques can be used for this. SWOT and PEST analysis are two such techniques, and a brief description of their key features is given in Box 5.1. These are typically undertaken using a workshop approach within the organisation, where employees assess and analyse organisational performance in a critical way. Check-lists can also be used to assist with institutional appraisal. Examples are included in *Overseas Road Note 15* (TRL 1998) and in Bridger and Winpenny (1983).

Box 5.1 Useful techniques to assist with assessing performance

SWOT analysis

This involves an analysis of the following:

- *Strengths*
  The advantages enjoyed by the organisation
- *Weaknesses*
  the disadvantages as perceived by the organisation
- *Opportunities*
  The situations that could provide advantage to the organisation
- *Threats*
  Normally from competitors, but also from government and legislators

PEST analysis

This can make an organisation more aware of changes in the external environment and the organisation's position within this. It includes:

- *Political*
  the organisation must enjoy political stability; changes in taxation, monetary policy and legislation will have an impact on what can be achieved
- *Economic*
  the impact of growth rates, unemployment, interest rates, inflation and exchange rates will have an impact
- *Social*
  changes in taste and fashion may affect short term decisions; in the long term, demographic changes, increasing environmental awareness, and growth of pressure groups may also impinge on the organisation
- *Technological*
  the relevance of and ability to take advantage of developments in science and technology in the way that the organisation operates

This form of appraisal should be used to analyse both the existing and future situations, looking ahead at potential changes in political and economic climates. For example, will the organisation be required to grow or shrink to meet future needs? Will there be political pressure for change? Will the introduction of new maintenance management techniques by the client require the DLO to change in order to provide the standards and priorities now defined?

5.5 Appraisal of DLO

The appraisal of the DLO should be driven by the client engineers who are responsible for the maintenance of the roads. Since they advise politicians or road authorities on policy and budgets, they should identify the range and quality of service required for effective implementation. The aim must be to secure pre-determined road maintenance standards and services for the road user at the least cost. Appraisal should include:

- Efficiency
- Effectiveness
- Flexibility and response
- Skills and training
- Plant and equipment
- Depots and facilities
- Management and supervision

5.5.1 Efficiency

Efficiency may not be as easy to measure as first expected. The aim should be to establish comparative rates between the DLO and private contractors but in order to ensure a fair comparison:

- output measures should be established, including quality of work, safety arrangements and traffic control;
- there should be a good accounting system for the DLO to include fair costs and overheads; and
- contractor costs should be typical and profitable over a reasonable period (and not a loss leader or marginal cost).

5.5.2 Effectiveness

An assessment of effectiveness should extend beyond the quality of work produced to include the degree of client supervision required and the amount of trust which has been established between the DLO and client. (e.g. the ability for the DLO to act on its own initiative in identifying and dealing with problems).

5.5.3 Flexibility and response

DLOs should be flexible in order to meet changing maintenance needs:

- working in any reasonable location;
- encouraging multi-skills and avoiding demarcation practices;
- able to respond and mobilise within an agreed timescale.

5.5.4 Skills and training

A regular supply of labour and an internal training capability have usually been the attributes of a good DLO. Training may be local or regional but must be matched by the encouragement of supervisors and the willingness of the workforce to accept training. A range of available skills should be evident.

5.5.5 Plant and equipment

Specialist plant and equipment are often held in plant pools and the issues arising include:

- the ability to fund new and replacement plant;
- adequacy of maintenance facilities;
- availability of appropriately skilled maintenance staff;
- availability of spare parts;
- efficiency of plant utilisation and deployment;
- clear lines of responsibility and accountability for plant performance; and
- the scope for hiring from the private sector where available.

5.5.6 Depots and facilities

Depots and supporting facilities are an aid to efficient maintenance and a demonstration of the local presence of the road authority. But depots can also be a costly overhead and the value of both capital asset and the operating cost should be known. Custom and practice can lead to a proliferation of depots and local political sensitivity might be required if changes are to be considered.

5.5.7 Management and supervision

In a traditional DLO the senior management is usually exercised by an area maintenance engineer and support staff. It will be important to make an objective assessment of the quality of management since many of the perceived weaknesses of the DLO could be attributable to poor management and fragmented responsibility.

5.6 Conclusions

The whole process of assessment and appraisal must lead to clear conclusions and identify:

- any underperformance by the DLO;
- an understanding of the causes for such underperformance;
- an assessment of the degree of improvement that could be made;
- the political will for change; and
- the management skills available to bring about and sustain the necessary changes.

6. ASSESSING THE PRIVATE SECTOR

6.1 Contracting

Before assessing the capacity of the private sector in more detail, consideration needs to be given first to the more general environment for contracting. In particular, as noted previously, the key to delivery of effective and efficient maintenance appears to be the presence of competition. Risks of monopolies exist without competition, as illustrated in Table 6.1, and there will be a tendency towards supply monopolies if there is a trend of mergers and takeovers in the industry. This can be countered by ensuring contracts are of a small enough size to maintain competition but it should be noted that this strategy will require more client management. Conversely, particularly if contractors are expected to invest in specialist equipment, larger longer term contracts will be required for which only large contractors will be in a position to undertake such work (Madelin, 1994 and Lantran and Morse, 1995). Thus a review of the competitive environment will need to consider technical and management issues.

Table 6.1
Competition and monopolies

	SUPPLY (Contractors)	
DEMAND (client)	Multiple	One
Multiple	Total competition	Supply monopoly
One	Demand monopoly	Bilateral monopoly

Source: Madelin (1994)

6.2 Surveying the industry

Often a survey of the industry will not be limited to road maintenance but will review all sectors in which contractors are involved. Based on this survey, an action plan can be developed to address any deficiencies if the sector is to become more involved in road maintenance (described further in Chapter 11). Table 6.2 provides a typical checklist of the issues to be reviewed.

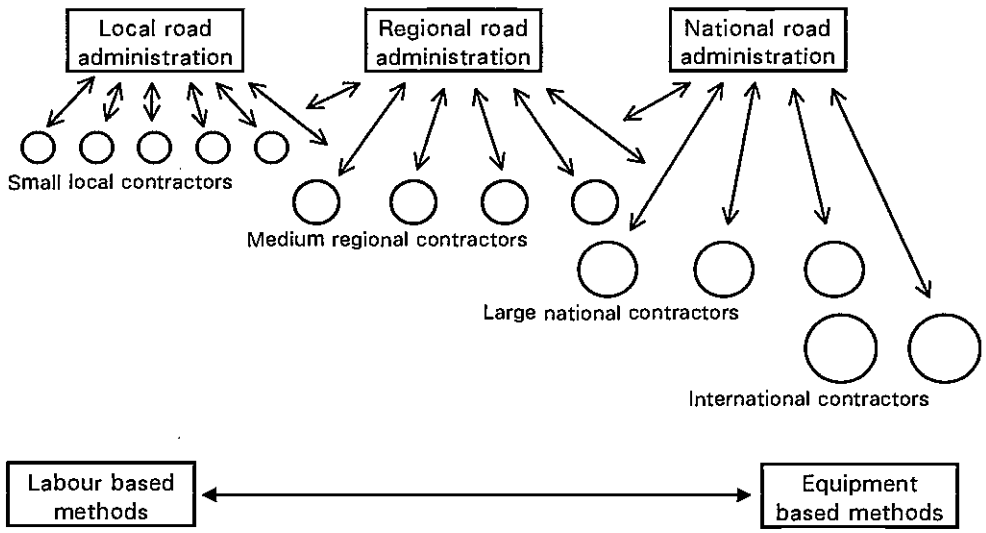
Table 6.2
Issues to be addressed in assessing the private sector

1	**DEMAND**	
1.1	Sub sectors	- What is the demand for contractors (maintenance and construction) by sub-sector: building (housing, schools, hospitals, industrial and commercial buildings) and civil engineering (roads, airports, maritime, water and urban and rural infrastructure)? Evidenced by past and existing development plans and budgets, in financial and project terms.
1.2	Customers	- Who are the customers and what is their market share: public sector, state owned companies, private firms, communities and households?
1.3	Regions	- How does the demand vary geographically?
2	**SUPPLY**	
2.1	Legal	- What are the basic laws relating to the construction industry? - What regulations are there for size of contracts / monopolies / requirements for competition / participation of foreign firms? - What forms of contract are used? - What is the nature and extent of litigation?
2.2	Representation	- What is the size of the industry? By size / type / status / location / employees etc. - How is the industry represented? Contractors associations / registration etc.
2.2	Financial	- What is the financial status of firms? - What are their financial needs? Access to credit, bonds and guarantees, foreign currency and importation, taxation and other charges. - How are firms paid? Procedures / reliability etc.
2.3	Management	- What are the procurement / contract administration procedures? Procurement modes, prequalification, bid evaluation and award, local/foreign collaboration, conditions of contract, monitoring etc.
2.4	Technical	- What standards and methods (labour based etc.) are used? Implications in terms of labour, equipment and materials. - What are costs? Comparison with similar countries etc. - Labour: availability, capability, wages and benefits? - Equipment: availability and spare parts, nature and quality, maintenance capacity (workshops, mechanics), operators, lease / rent schemes? - Materials: availability, costs, distribution, foreign exchange needs etc? - Development: training and education resources, use of new ideas (materials, techniques), methods of technology transfer?

Source: Developed from Lantran (1990)

When reviewing the size of the industry and opportunities for competition a range of clients and contractors of differing capacity will probably be present, as shown in Figure 6.1. Different sized contractors will respond to different types of client: for example, medium and large scale contractor will often have little interest in low cost dispersed rural routine maintenance contracts. In addition, many smaller local contractors might only be working in the building sector but a development programme will enable them to compete for work in road maintenance and might achieve the objective of increased local employment in such areas. Thus the whole existing and potential industry should be surveyed.

Figure 6.1
The different types of client and contractor for road maintenance



Developed from: Lantran and Morse (1995)

6.3 Constraints

There are a number of common constraints on contractors which will usually be revealed by a survey as described above. Typical constraints for lower income countries and small local contractors are (Larcher and Miles, 1997):

Financial	- Difficulty obtaining bonds and loans from banks who perceive contracting to be high risk
	- Clients slow to pay and require unrealistically high bonds and guarantees
Contractual	- Overly complex contract documents biased against small contractors
	- Contractor inexperience in producing tenders
	- Tender systems award contracts to unrealistic lowest bid, who is often incompetent and unable to carry out work at bid price
	- Contract documents bias against labour based techniques
Technical	- Specifications often vague or ambiguous
	- Lack of adequate site supervision and availability of the engineer
Materials	- Availability inconsistent and quality and cost variable
Business	- Lack of work continuity and availability

Knowledge of these constraints, and possible means of solving them, is often gained by workshops and meetings held with contractors and communities, as part of a wider dissemination exercise of improved government policy for management of the road network. Honduras instigated a national campaign to disseminate how it was moving to increased use of the private sector (Ruan and Gyamfi, 1996), and a similar approach was adopted in Colombia for the microempresas (Parkman, 1999a).

In countries with a more mature contracting environment, the issue will often be to determine how interested contractors are in being involved in road maintenance. For example, Berkshire

County Council in UK held a series of meetings with contractors and performed a 'market testing' exercise by issuing a draft Bill of Quantities and inviting three interested contractors to submit informal offers. Somerset County Council merely invited contractors to submit expressions of interest to prequalify, since by then, in the UK, the interest of the private sector was well established (Parkman and Madelin, 1999).

7. ESTABLISHING A COMPETITIVE ENVIRONMENT

7.1 Benefits of competition

Competition rather than privatisation has been identified as the main driver of improved efficiency. Competition creates a climate which can:

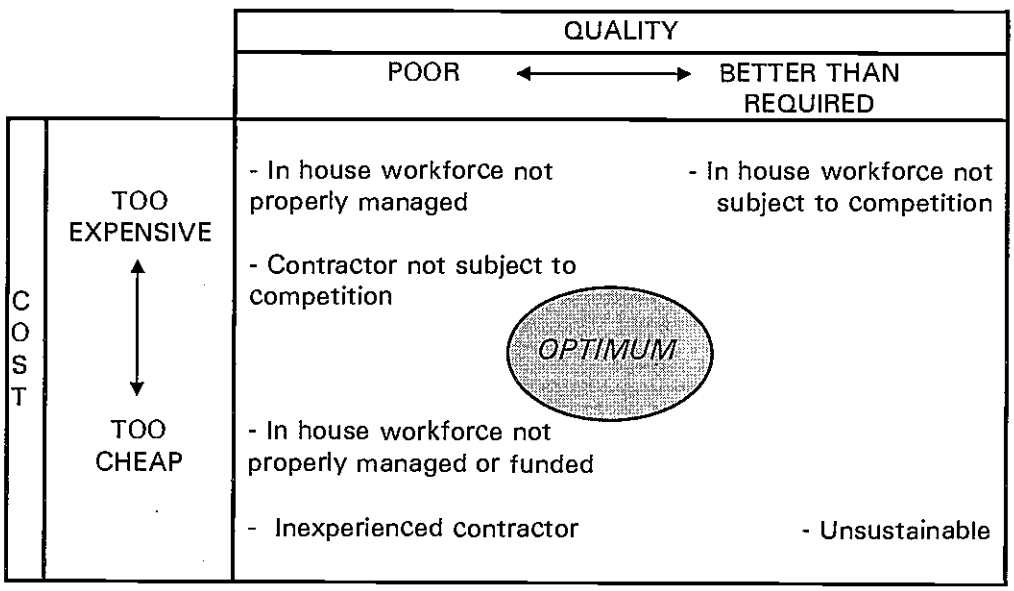
- challenge people to rethink ways of working;
- encourage innovation, learning and the adoption of new ideas
- balance risk with reward;
- make better use of information;
- identify gaps in knowledge; and
- deliver appropriate quality of service.

But the introduction of competition into a public organisation requires a change in culture and the implications can be threatening to existing civil or public servants. The traditional pattern of centralised control supported by a defined and regulated bureaucracy must be changed into a decentralised, devolved and delegated form of organisation. The management of this process of change has been dealt with in Chapter 4.

7.2 Aims and forms of competition

There are many forms of competition normally based on price, quality or performance, or a mixture of all three. The aim of competition should be to gain work of sufficient quality at the most efficient price. The relationship between quality and price, and the consequences of competition, are illustrated in Figure 7.1.

Figure 7.1
Quality, cost and competition



Examples of different types of competition include:

- open competition - public and private sector bidding against each other;
- open competition - private sector only bidding against each other;
- closed competition - public sector bidding against public sector;
- benchmarking - public and private sector performance compared with benchmark values;
- target cost - public sector performance measured against a pre-determined cost estimate;
- fixed price - public or private competition for fixed price activities based on quality or performance record; or
- two envelope - first selection based on quality then price considered.

A policy of competition must be guided by clear aims and objectives and this will normally be a task for national or local government. It should be recognised at the outset that whilst competition has many benefits it can also be quite destructive. Longer term consequences can be forgotten or marginalised in the quest for short term success. Concerns already identified in this study include a loss of skills and experience, lack of training , quality, safety and an awareness of customer needs.

A competitive environment should seek to balance the benefits and risks and typical aims should relate to:

- customer care - recognising the need for service delivery to please the customer;
- asset management - maintaining the value of the asset;
- efficiency - improving productivity and reducing costs;
- effectiveness - the right task at the right time;
- quality - appropriate speed of response and quality of work for the problem and budget;
- flexibility - ensuring that the client has real options for service delivery; and
- public/private - whether any minimum public sector capability is to be retained.

7.3 Fair competition and associated rules

The introduction of competition will require a clear set of rules which must be seen to be fair if those competing are to be encouraged to give of their best. Particular care appears to be needed when introducing competition in environments where there are possibilities for corruption and mismanagement. Competition (or the lack of it) is not the only difference between the public and private sectors and other factors can affect the apparent competitiveness of an organisation. The rules should take account of the following.

7.3.1 Accounting arrangements

If a public body such as a DLO is to be allowed to compete with private contractors then a clear set of accounting rules must be established. The rules must ensure that separate accounts are established for the DLO and that all fair costs and overheads are included. The accounts must be open to public inspection and independent audit.

7.3.2 Funding and purchasing

The public sector can raise money and purchase goods more cheaply than the private sector because it is a better risk. The public sector should be allowed to utilise this benefit.

7.3.3 Profits
The private sector has a choice about where and when it seeks to make a profit. Loss- leading contracts are well known as a means of reducing competition. Inadequate competition could lead to unreasonable profits, in excess of a fair return on the investment and risk.

7.3.4 Restrictive practices
A multiplicity of contractors is not enough to guarantee competition since restrictive practices and trade agreements can materialise unless adequate regulations exist to prevent and penalise such actions.

7.3.5 Bankruptcy
Private contractors face the ultimate risk of bankruptcy for poor performance whilst the public sector can resort to taxation.

7.3.6 Packaging of contracts
The packaging of contracts in terms of activities, geographic area and duration must encourage competition and not create an artificially restricted market. On the other hand contracts should not be so small as to prevent sensible economies of scale and flexibility.

7.3.7 Working practices
Government has the ability to direct the nature of competition to ensure that suitable working practices are used. For example, the issue of whether labour based or equipment based contractors are developed will need to be considered in developing the rules for competition. The reason many countries have developed labour based practices is to ensure sustainability, since the history of equipment based work has been poor. If, however, both types of contractor are allowed to bid for the same work on a price basis, and equipment based contractors win the work with unsustainably low prices, then the object of developing labour based practices will be lost. Rules for competition will need to consider such aspects.

7.4 Introduction of competition

7.4.1 Key tasks
Where there is inexperience in competing for work, it is evident from the case studies that price competition should be introduced gradually in order that a sustainable contracting industry can be developed (see Ghana and Colombia examples in 11.4). It appears that competition introduced in phases allows both public and private sectors to prepare and adapt to new ways of working. Indeed, in areas where there are extremely limited resources (such as rural secondary and feeder road networks), it has often been difficult to introduce genuine competition. In these cases, local community pressure can serve as a means of ensuring effective and efficient maintenance, as in the example of the microempresas in Colombia (this study) or other community based programmes (for example, IT Transport, 1999).

In the more developed world, evidence suggests that the initial phase should focus on improving the efficiency of the DLO and the later phase with strengthening the role of the private sector. In the less developed world, it appears that many DLOs have often been in such a poor state that policy makers have decided to abandon any attempt to improve the DLOs and have simply addressed the development of the private sector. However, for reasons mentioned earlier, a competitive mixed market seems to mitigate against problems of unsustainability and in many countries, the road maintenance skills within the DLO have had considerable past investment. For this reason, the approach adopted below is suggested.

In some countries there are separate DLO units, for example counties in the UK or states in USA. In other countries there could be a single government DLO or state owned company. The first task should be to define local or regional DLOs so that comparison can be made between each DLO. Other tasks include:

- defining the type of work that is considered appropriate for a DLO to undertake without competition. (It might be argued that there are no circumstances in which the DLO should perform without competition. However, at the early stages of change, it is likely that only certain tasks will be opened up for competition. It might also be the case that contractors might not be interested in some work so that the DLO will continue, in reality, to act without competition, e.g. specialist winter maintenance activities which might require heavy investment in expensive equipment);
- defining the type of work that the private sector will normally be invited to bid for, e.g. periodic maintenance;
- establishing the accounting rules for DLOs so that cost comparisons can be made with private contractors;
- establishing a system of independent audit to oversee the process of competition;
- benchmarking the performance of DLOs and (if information is available) private contractors;
- defining the extent and form of competition. e.g. which activities should be subject to competition and whether competition between DLO and private contractor is to be allowed; and
- defining the penalties which will apply to poor quality work and performance.

Two examples of policy and rules are given below.

7.4.2 Experience in the United Kingdom

The UK government was concerned with perceived inefficiencies of DLOs and introduced legislation in 1982 requiring a DLO to:

- compete with private contractors for projects valued above £100,000;
- establish a separate and defined accounting system;
- prepare estimates before work commenced;
- credit the account with the estimate as income and the actual cost of the work as expenditure;
- make a profit on the account of 5% over a three year period, calculated on the capital assets employed by the DLO; and
- subjected compliance to an independent audit commission.

Failure to comply with the rules and meet the profit target could lead to the closure of the DLO by the government.

The degree of competition was increased over a period so that by 1996 a DLO could not undertake any work without winning it first in competition with private contractors. Whilst some may consider the final position to be too severe and which forced even efficient DLOs to transfer to the private sector, the 14 year transition enabled dramatic improvements to be made in DLO efficiency and gave time for private contractors to prepare for the new opportunities. It could be argued that the same results could have been achieved in 5 years

had the government set out a plan and programme at the beginning. Instead each change in the rules was introduced with no indication as to the final position. (Conversely, it could also be argued that the change could not have happened in less time if it were to be properly institutionalised, since this might be an example of the need for incremental change and for people at all levels to properly absorb and react to successive changes).

7.4.3 Experience in Finland

The Finnish government also wanted to improve the efficiency of DLOs but prepared proposals to require DLOs to compete with each other. A common accounting system was defined and the penalty of failure was that the best performing DLOs could take over responsibility for the poor performers. Implementation of the proposals has been delayed and so results are not yet available.

7.5 Consultation

Competition should only be introduced after extensive consultations with those who will be most involved. The risk to current operational responsibilities should be spelt out particularly when there is a legal duty to provide a road maintenance service. It is unfair to expect an organisation with operational responsibilities to maintain its service and simultaneously undertake major changes in organisation and culture.

Consultation should also take place with staff and the workforce. It should be recognised that competition could ultimately result in the closure of a DLO or its takeover by a private contractor. This consequence should be reflected in the initial rules and included in the planning exercise. There are many examples of successful transfers of personnel to the private sector but all involved open consultation (see this study case studies).

8. ORGANISATION OF CLIENT

8.1 The client role

Chapter 3 defined various roles for the management of the road network as:

- Owner (e.g. Ministry of works or transport)
- Administrator (e.g. road agency or local authority)
- Manager (e.g. road agency, local authority or consultant)
- Contractor (e.g. DLO or private contractor)

This chapter will focus on the roles of the administrator and manager. For the purpose of simplicity these roles will be collectively referred to as the client role and restricted to the task of maintaining and operating the road network, as this reflects the current experience of many countries.

The recognition of the difference between the client and the supplier or contractor roles is the most important starting point in improving the delivery of road maintenance. This study has reinforced the view that the performance of a DLO can be strongly linked to the performance of the client. In many cases the client role and DLO operations have been so mixed up that the prime task of maintaining the roads has become submerged beneath the more pressing problems of labour management, trade union pressure or political patronage.

The key client tasks should include:

- Policy development
- Funding provision
- Budget control
- Procurement of services
- Monitoring of performance
- Communicating with road users.

8.2 Client structures

8.2.1 Typical structures

A typical client structure for road maintenance and operations is shown in Figure 8.1. This is a typical simplified approach that takes the first split of the client / supplier role, still retaining the manager role within the administrator. In a future development in which the role of manager was separated out from administrator, then in broad terms the Policy group, and part of Procurement, would remain with the administrator, and the Customer and Network Services, and part of Procurement, would fall under the manager role (both organisations would require some support services).

Figure 8.1
A typical generic client structure

Client operations			
Policy	Procurement	Customer & Network Services	Support Services
road data *data analysis* *policy & standards* *budget* *programmes* *performance review*	*Specification* *maintenance design* *contract documents* *tendering procedure* *quality* *payment*	*road management* *user interface* *supervising contractor* *road safety* *traffic flow* *safety inspections* *public utilities &* *development control*	*budget control* *administration* *legislation* *information systems*

Source: Developed from UK case studies

In a devolved or decentralised organisation, the customer and network services function would operate from several area offices.

8.2.2 Maintenance policy

The client should recognise that the spending of the road maintenance budget requires the same degree of investigation and preparation as would a major capital project. A road and maintenance management system should be implemented, supported by a full time team which can be dedicated to this task. The typical cost for this task will vary but estimates of the order of 2% are often quoted (LAA Code of Good Practice, 1989). The policy group should prepare strategic advice on the longer term needs of the network and the budget implications, and in the short term ensure that the budget is spent where the need is greatest.

The outcome from the policy group should be a series of reports setting out:

- maintenance options and long term strategies;
- current maintenance policies and standards;
- budget allocations to area offices and a basic programme of work for the coming year; and
- performance review of the maintenance programme completed in the previous year.

8.2.3 Procurement

The task of this group is to translate maintenance policy into action by determining the best means of delivery. Most clients have considerable experience in procuring capital projects and periodic maintenance, but much less experience in procuring routine maintenance. There are difficulties in specifying routine maintenance in measurable terms and many countries are moving towards performance specifications, which in turn is leading to longer contracts.

The procurement group has the task of advising on the best way of specifying and packaging maintenance work, the size and duration of contracts, and the capability of the DLO or private contractor. Once a procurement strategy has been developed, the group may be involved in, or arrange for, maintenance tasks to be designed and incorporated into contract documents. It is strongly recommended that all maintenance tasks are properly designed and specified. The

provision of this information is a major aid in improving the efficiency of the DLO and would be essential for contracts awarded to the private sector.

The procurement group should take a strategic view about the capability of the DLO and private contractors, and establish standards for quality, environmental protection and health and safety. The group should also consider a policy of encouraging and supporting private contractors in order to maximise the options for delivering road maintenance.

8.2.4 Customer and Network Services

This function is likely to be based in the area offices with a small group at HQ. The task of the group is the day to day management of the road network for the benefit of road users (or customers) by instructing and supervising the DLO or contractor delivering maintenance. The group should be responsible for certifying performance and arranging for payments. Formal payment will normally be made by a treasury or finance department on receipt of authorisation from the client. The failure to pay on time, or not at all, is a serious problem for some countries and if the client cannot arrange regular payments then the whole contract process breaks down.

The group will also be the most visible local presence of the road authority to whom the road user and local politician can and should relate. The actual role of the group could vary according to the degree of devolution and it may be practical to undertake local design and procurement of maintenance work.

The group should input local knowledge to the policy group and be involved in the development of maintenance policies and plans. In the longer term they should help in setting performance targets for the network which reflect the needs and expectations of road users. Other tasks include regular safety inspections, coordination with local road authorities and public utilities and advice on development control.

8.2.5 Support Services

This would be either a free standing group or the skills would be attached to the technical groups. The aim is to ensure that technical staff are supported by administrative and financial staff so that the best use is made of all skills.

The client role requires the a variety of information systems to support policy development, maintenance management and performance review. These systems require the regular collection, storage and retrieval of data. Data is expensive to collect and must be managed carefully. Good quality financial information is crucial for budget control. The aim is to help technical staff to monitor the progress of works orders (DLO or contractor) and enable new or varied instructions to be given in time.

8.3 Wider organisational implications

Whilst the client role has been described in four groups, each with a particular focus and responsibility, the groups must support each other so that collectively they can maintain the asset value of the road network and deliver the best quality service to the customer that can be afforded by the budget.

The proposed reorganisation of the client role may not be sufficient to achieve these objectives. The client groups must be prepared to identify other shortcomings in the wider organisation which may act as a constraint to effective management. Examples could include:

- inadequate or unstable basic funding mechanisms;
- lack of flexibility in the governmental budget process (i.e. the structure of the budget is not conducive to a maintenance management system);
- approval processes which extend beyond the client control;
- restrictive recruitment and personnel policies;
- inflexible national procurement processes;
- insufficient delegation to client staff.

However, one of the most oft quoted problems affecting client organisations is their ability to take on the clearer role as a 'client' rather than the old role of combined client / contractor. Considerable training needs to be given to help change this culture and ensure that staff become efficient contract managers (Miles, 1996).

9. IMPROVING THE PERFORMANCE OF A DLO

9.1 The role of the DLO

This chapter is based largely on UK experience of one of the authors, since there is limited documented evidence of experience elsewhere in this area.

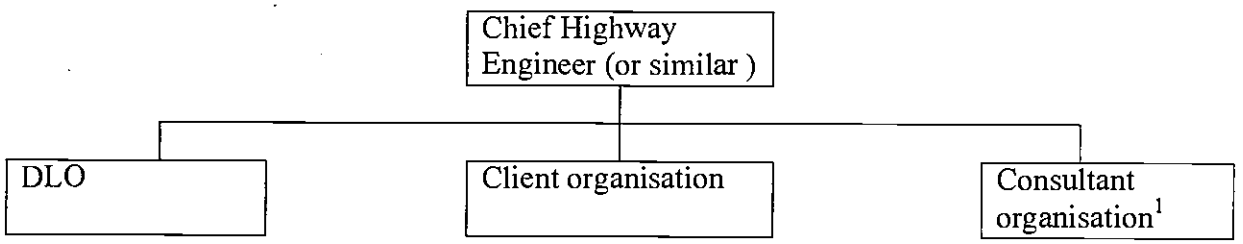
The prime role of the DLO is to be a publicly owned contractor undertaking maintenance tasks and services which are specified in a contract prepared on behalf of the owner or client. The form of contract could vary from a method specification, where the client instructs the contractor to undertake specific tasks, to a performance based contract where the DLO provides a more integrated service measured by outputs (see Chapter 10). No DLO can begin to improve its performance until its role is clarified and agreed by the key participants, namely the government (which is also likely to be the owner of the road network) and the client. The key task of the DLO then becomes that of assembling and managing the resources required to undertake the work in the timescale specified.

9.2 Separation of roles

The separation of client and contractor roles, which have often become confused in a DLO, will have considerable implications for the existing organisation. The preferred model is for the head of the DLO to report to the head of the roads department. (Fig 9.1). This ensures that both the client and DLO are under unified control and this is important where the DLO works for a single client. Experience in the UK has shown that the policy of the client in issuing instructions to the DLO can significantly affect the efficiency of the DLO. Such an arrangement can be criticised in that the client may not be impartial in the treatment of the DLO compared with a contractor. A strong and open system of audit is required to ensure that the rules of competition are complied with.

The alternative is to set up the DLO as a freestanding agency outside the control of the roads department. This arrangement can be justified when the DLO has a multiplicity of clients and has more opportunity to balance the workload required by the various clients.

Figure 9.1
Suggested lines of responsibility after functional separation



Notes: 1. A consultant organisation might exist if the administrator / manager role has been functionally separated.

9.3 Issues to be addressed

9.3.1 Rules of competition

Competition is the key to improving performance and the rules of competition must be established, normally by the government, as described in Chapter 7. The most critical rules are financial, relating to the choice of contractor, the internal accounting practice and the measurement of profit and loss. Once the rules have been established then the DLO can become focused on the achievement of success.

9.3.2 Management and supervisory skills

The key task of the DLO is to manage people, plant, equipment and materials in order to deliver the wishes of the client efficiently and competitively. Management and supervisory skills will be required in addition to more traditional technical skills. It is possible that the separation of the client and contractor roles could reduce the management skills available to the DLO and steps should be taken to share such scarce resources. Additional recruitment and training may be required to create the management base for a successful DLO.

9.3.3 Cost based accounting systems

It is apparent from the case studies that few, if any, DLOs had a clear understanding of the real cost of their activities prior to the introduction of competition. Very little evidence was put forward to refute claims that private contractors were more efficient and many changes were made in ignorance of good cost information. Where change was introduced more gradually, and cost systems established, then evidence shows that DLOs could compete. The need for an appropriate and reliable cost accounting system is crucial if a DLO is to measure its performance against competition and secure improvements in efficiency.

DLOs have always had financial controls but these were based on budget control rather than cost control. Budget control tend to set separate spending targets for workforce, materials, plant and equipment. Cost control focuses instead on total project cost and income. Most public bodies are controlled by budget approvals where the target is to achieve the budget rather than to be efficient. The change to a cost based accounting system requires a major change of culture and could be resisted by the central treasury who may see the move as a reduction in central control.

In practice the DLO not only needs an independent accounting system to meet its new role as a contractor but it also needs independent financial advice. Since it will probably remain within a government or local government framework, it needs advice to establish its true cost base. The experience of Shropshire County Council in UK was that the DLO was being burdened with inappropriate overheads which the central treasury was initially reluctant to acknowledge. A key issue is: who should pay for the cost of democracy? i.e. the added cost of operating the political system of committees and policies which are superfluous to the needs of the DLO.

9.3.4 Estimating, programming and work planning

To be competitive requires an ability to predict performance and estimate costs. These skills have rarely been used by DLOs whose main need was to account for the final cost of a task or series of tasks. The DLO will need to set up an estimating capability and recruit the necessary skills. Training existing personnel is an alternative although experience is an advantage. Estimating and planning will be helped if the client provides good information within the contract documents or when giving instructions to the contractor.

Managers and supervisors should contribute to the estimating process so that they agree the resources required or the improvements needed to be competitive.

9.3.5 Employment and payment of workforce

The DLO management must be given the power of hiring, retaining and, where necessary, firing the workforce. The DLO will have to provide a suitably skilled workforce to meet the need of the contract and which will vary according to the seasons and budget changes. If the DLO is used as an instrument of social policy to provide employment which is not properly justified by the contract then the additional cost should be recorded and paid for separately.

Payment to the workforce should be linked to outputs instead of time serving. The payment system should help the DLO to produce the quality and programme of work required by the contract.

The terms of employment should enable flexible multi-skilled working where required and there should be no obstacles to deploying the workforce over the designated network.

Employment policy and control is likely to be the responsibility of a central department who may be reluctant to delegate authority. However the DLO cannot be held responsible for efficiency and performance if it does not have executive control over its key resources. There can be considerable tensions within the public sector when separate agencies are established to deliver services on a commercial and competitive basis. Sometimes these tensions will only be resolved by political decision.

9.3.6 Use of sub-contractors

A DLO should not aim to employ every skill needed nor have sufficient labour to meet peak workload. A more flexible approach will be required which could involve the employment by the DLO of sub-contractors for specialist tasks and to smooth out peaks and troughs of work. The DLO should create a pool of sub-contractors from which to draw. The important change is that the DLO will make the decision when to use sub-contractors and take responsibility for their work. The client continues to pay the DLO regardless of who undertakes the work.

9.3.7 Project planning and supervision

Project planning and supervision must be focused on delivering the maintenance tasks specified in the contract. If payment is based on a method specification, then the DLO must comply. If a performance based specification is used then the DLO will have the freedom to organise the work so long as the required performance is achieved. The whole culture of the DLO must change to achieve the specification set by the client. The formal process of specifying maintenance tasks, and where appropriate the issue of plans and standard details, all help the DLO to improve its project planning and supervision.

9.3.8 Training

The DLO must become responsible for the training of the staff and workforce if it is to be accountable for quality and performance. The DLO managers must assess the core skills required, together with health and safety implications, and arrange appropriate training. Training should be justified on a business basis since the cost will be an overhead borne by the DLO. Priority for training should go to those skills which will help the DLO to become profitable or where failure to perform carries high penalties. Training will include:

- skills for maintenance tasks;
- skills for using plant and equipment;
- work planning and supervisory skills; and
- management skills

9.3.9 Vehicles, plant, equipment and depots

A review of all assets should be undertaken to identify the minimum investment required to achieve the maintenance tasks. The under-utilisation of plant and equipment has been a common fault of DLOs often due to a rigid system of allocation to depots rather than a more flexible deployment to where needed. The establishment of central plant pools is commended and preferably under the control of a plant manager whose job is to maximise utilisation. Where available, a policy of hire form the private sector has advantages and can help meet peak workload. An internal system of plant hire is also commended so that each project bears the true cost of plant and supervisors are encouraged to maximise utilisation.

The policies adopted for vehicles, plant and equipment will be dependant on the geography, accessibility and availability of alternative resources. A labour based approach to maintenance may be appropriate for some countries.

9.3.10 Purchasing policy

The DLO must have freedom of action and take direct responsibility for purchasing or securing all materials, plant and equipment needed to support the work tasks. The services of a central purchasing organisation could be used where available but the DLO must control the specification and suitability of the product.

9.3.11 Performance review

A successful DLO must have a system of performance review so that lessons are learned and improvements made. The cost accounting system is part of such a process and managers should discuss with supervisors outturn costs compared with estimates. A close relationship should be established with the client so that client satisfaction can be monitored. The DLO should be required to publish an annual statement of accounts showing its achievements and which should be subject to independent audit.

9.4 Planning and managing the change

Change on the scale suggested above requires careful planning and managing. The case studies have shown that the changes are both organisational and cultural and take several years to reap benefits. Both Colombia and the UK adopted an evolutionary process over 10 years and which is still moving on. Studies in the USA have also identified the need to have a political champion for change and the benefit of providing support and training to the workforce undergoing change. Road maintenance is a continuing activity which must respond to changing operational needs. The organisation cannot close down for a few months for retraining and reorganisation. The process of change will be costly and clear benefits must be identified before the process commences.

10. MAINTENANCE CONTRACTS

10.1 Risk

10.1.1 Allocation of risk

The form of contract and its documents define each parties responsibilities and allocate the various risks inherent to the road maintenance work. Risks can be usefully grouped according to those which affect quality (the possibility of the work not meeting the requirements of the client), cost (the possibility of the cost of work being different from that predicted) and time (timely delivery is less an issue for maintenance than for construction projects, and is closely related to cost). Political fashion in recent years has been to transfer as much risk as possible to the private sector but experience has now shown that risk is best allocated to the party most suited to cope with that risk (Grubb, 1998). In countries where maintenance has traditionally been carried out using in house procedures, the private sector will often not be in a position to take on significant new risk, nor will the road administration be in a position to manage properly the private sector. Experience outlined below suggests that successful approaches adopt a stepwise transfer of risk to the private sector, adopting contract strategies to suit. Figure 10.1 illustrates the issues of risk with respect to road maintenance.

Figure 10.1
Contracting strategies and allocation of risk

Issue	*Client required to manage risk* ←				→ *Contractor required to manage risk*
Type of contract	Hourly rates	Single activity	Grouped activity	Performance based (short term)	Performance based (long term)
Payment method	Cost re-imbursable	Target cost	Price based (Schedule of rates)	Price based (Admeasure)	Price based (Lump sum)
Term of contract	Short term				Long term
Packaging	Many small contracts				Few large contracts

Notes: 1. No comparison of relative risk can be made from the table between different issues.

10.1.2 Type of contract

The type of contract determines the basis on which the contractor will be paid for his services. Three types of contract have been used in road maintenance as follows:

Hourly rates. Labour, equipment and materials are paid for based on an agreed rate (sometimes referred to as dayworks). These are cost based contracts (see 10.1.3) and represent a minimal transfer of risk to the contractor. The manager retains responsibility for management of operations and the quality of work, but long term responsibility for staff and equipment (and possible 'downtime') rests with the contractor. These types of contract have sometimes been used as a first step towards contract maintenance, allowing contractors to develop experience in bidding and cost accounting of their operations (for example, Northern Territories, Australia [Hornsby, 1990] and Brazil [Miquel and Condron, 1991]).

Procedural (activity) based. The contractor is paid for work in accordance with a specification, the amount of work being measured and paid for based on agreed rates for different work items. Contracts can be sized according to the number of items to be included

and this will depend on contractor capability and specialism of activities. Examples of specialist single activity contracts are linemarking or provision of road signs. Small grouped activity contracts for inexperienced contractors include the single man contractor system in Ghana (Parkman, 1999b). Larger grouped activity contracts include Pakistan (Miquel and Condron, 1991), latest experience in Ghana and experience in the UK (Parkman and Madelin, 1999) but often, once the option of combining periodic and routine road maintenance in one contract is considered, the use of performance based contracts is adopted.

Performance based. The contractor is paid an agreed rate if his performance, measured by performance of the road network, meets the specification. These can be subdivided into short and long term performance requirements. Short term requirements set standards for routine maintenance activities (for example, potholes to be patched within 24 hours, drains to be free of silt) and some countries have moved directly to these type of contracts when implementing contract routine maintenance, but they require an appreciation of productivities and maintenance requirements (Colombian microempresas [Parkman, 1999a], Kenyan lengthman system [Jones and Petts, 1991]). Long term requirements set standards for periodic maintenance (for example, roughness and deformations less than specified values) - these can be included with the short term requirements to let combined routine and periodic maintenance contracts for larger areas of the network over a longer term. Examples of these contracts include Colombia (Parkman, 1999a), elsewhere in Latin America (Zietlow and Bull, 1999), British Colombia in Canada (Gyamfi and Ruan, 1996) and Sydney, Australia (Smith et al, 1994, Frost and Lithgow, 1996).

10.1.3 Payment method

There are two fundamental methods of assessing payment in a contract, with variations within each.

Cost based contracts represent less risk to the contractor, as reimbursement is made for the actual costs incurred in carrying out the work, adjusted to cover any additional expenses such as overheads and equipment depreciation and an allowance for profit, so that the contractor takes no risk for the productivity of work. Hourly rates contracts are the simplest example of cost based contracts. Procedural based contracts do not lend themselves to this method of payment, but performance based contracts have often developed using this approach. For example, the Colombian microempresas first developed, in essence, using hourly rates with loose arrangements for quality of work. As the system became more institutionalised, defined performance indicators were established as the basis of the contract (Parkman, 1999a). Somerset County Council in the UK has also implemented a cost based performance approach, and this includes incentives for the contractor to achieve efficiency through a 'target-cost' approach (Parkman and Madelin, 1999).

Price based contracts represent a greater risk to the contractor since risk for productivity and performance in accordance with the specification is transferred to the contractor. They are used for either activity or performance type contracts and might be built up from various work items or be lump sum.

For activity type contracts, the contractor might either bid an adjustment against published rates (less risk) or will be required to derive his own bid prices (more risk). If there is reasonable certainty of quantities of work, a Bill of Quantities might be published so that contractors can base their estimates on predicted work, although they are paid for the actual work done (admeasure). However, some owners appoint contractors based on an agreed

Schedule of Rates, with no indication of quantities of work actually expected in advance. These approaches to contract maintenance are the most commonly used worldwide (Miquel and Condron, 1991).

Lump sum contracts can be used for activity based contracts, although these are better defined as Lump Sum with Variation since they usually include an allowance for alterations to the payment if different work items are significantly different from that originally predicted. In this way, they can be considered as an extension of the schedule of rates/admeasurement approach. Performance based, price based contracts, adopt a lump sum type of contract and represent the greatest transfer of risk to the contractor. Payments are made based on a pro rata monthly proportion of the lump sum or based on an agreed schedule of payments. Examples of these approaches are the long term contracts noted above.

10.1.4 Term of contract

Shorter term contracts require a greater degree of management due to the increased frequency of contract tendering and appointment activities. Often, contract terms have been shorter than managers would prefer, but this has been due to uncertainty over future ability of government to pay (for example, case study on Ghana) where funding has been unreliable, or regulatory requirements preventing longer term commitments for government funding.

The term for separate periodic maintenance contracts is established in accordance with the estimated work programme, in a similar way to construction projects. The term for separate routine maintenance contracts, particularly grouped activity and performance based (short term), is most typically one year, since this suits normal budgeting procedures. For long term performance based contracts, with combined periodic and routine maintenance works, the term is usually longer to ensure the contractor takes on genuine responsibility for performance. Examples include Sydney (10 years), Uruguay (4 years), Argentina (12 years) and Somerset, UK (5 years) and experience suggests that countries adopting this approach should consider minimum terms of 4 years (Zietlow, 1998).

10.1.5 Packaging

For contracts which require a greater transfer of risk to the contractor (in terms of payment method and contract type), the size needs to be large enough in order to be attractive to the private sector (adequate capacity of the private sector is assumed in these circumstances). A reduced amount of contractor supervision is usually required due to there being less contracts and due to the contractors assumed capability. Sizes typically vary from 200km upwards.

For more inexperienced countries, sizes have been matched to the capacity of the contracting industry. The lengthman system is typically 2 - 5km (Jones and Petts, 1991) and small local contractors often manage between 30 - 80 km (Ghana, Colombia [Parkman, 1999a,b], Guatemala [Zietlow, 1998]). Supervision requirements by the manager are often overlooked but are discussed in Chapter 11.

Examples of evolution of contracting strategies are given in Box.10.1.

Box 10.1 Examples of evolution of contracting strategies

Ghana. On deciding to develop contract maintenance procedures, Ghana first had to establish a capable private sector. It achieved this in the first instance by appointing existing in-house labourers as Single Man Contractors to perform routine maintenance operations (grouped activities) for terms of a few months at a time (although these were usually renewed) on 3km of road, based on prices set by the owner. This approach is still used in some areas, although more recently larger contracts (50 - 100 km) for one year terms, still adopting a price based (admeasure) approach have been let based on rates set by the owner.

Colombia. Colombia adopted contract maintenance procedures by establishing local cooperatives (microempresas) as a means of involving local communities and creating employment. Local cooperatives of typically 10 members were developed, and routine maintenance (grouped activity) contracts for approximately 50km were sized based on their estimated productivity for one year terms. Initially, these were in essence cost based contracts, the cooperatives being paid monthly based on a fundamental rate build up set by the owner. Recently, performance indicators have been introduced which have become the basis against which the payment is judged, the base price still being set by the owner (lump sum performance [short term]).

UK. UK adopted contract maintenance in response to government requirements for competition. At first, contractors (UK has experienced contracting industry) competed with local in house workforces for single activity type contracts. As government requirements for competition became more stringent, some administrations developed grouped activity contracts and competing contractors tendered to take on the work and the existing in house workforce. In this way the in house workforce was transferred to the private sector. Most contracts are price based (schedule of rates) for 3 - 5 years for networks in excess of 2000km.

10.2 Contract documents

Contract documents comprise the instructions to bidders, contract provisions, pricing documents, measurement procedures and standards and specifications. Most countries have developed their own contract documents based on experience with construction projects which have more history of delivery by contract - however, caution is recommended to ensure these properly address the differences between maintenance and construction (Gyamfi and Ruan, 1996). It is not possible to address all the issues pertinent to development of suitable contract documents in a report of this size. However, specific issues related to contract documents for maintenance contracts are addressed below and further aspects of contract management are discussed in Chapter 11.

If road maintenance by contract is to be successful, then consistent, appropriate contract documents need to be developed. Consistency will help to reduce the possibility of errors and omissions in bids submitted by contractors and help to build all parties experience and confidence in contract procedures (Lantran and Morse, 199?).

Careful consideration needs to be given to the development of appropriate contract documents. On programmes which have been aiming to develop a local contracting capacity in less developed areas, the tendency has often been to develop specific, simple contract documents. Whilst these might be beneficial in the short term, they might not properly prepare fledgling contractors for the wider industry in the long term. A stepwise approach, in which contract documents are progressively expanded in line with the value of the contracts has been used in South Africa (Larcher and Miles, 1997). Elsewhere, standard national contract documents have been adopted (for example, Pakistan [Miquel and Condron, 1990]) and this appears to be successful if the owner and manager are flexible in using such documents with inexperienced contractors (Butler, 1998).

Specifications and standards also need to be consistent and examples of both performance based and procedural type specifications are included in the case studies (Parkman, 1999a,b).

11. MANAGING THE CHANGE THROUGH APPROPRIATE CONTRACT MANAGEMENT PROCEDURES

11.1 Scope

It is not possible to cover all aspects of this subject in a document of this size. The reader is referred to other reports which consider the issues in more depth – the World Bank have produced recommendations (Lantran, 1990-1994) and a recent publication by the International Labour Office (Bentall et al, 1999) addresses the topic with particular regard to employment intensive methods. More general publications on procurement procedures are also appropriate. This report highlights those aspects which have been emphasised during assembly of the case studies.

11.2 Transferring existing operations

11.2.1 Basic approach

Earlier chapters have emphasised the need for competition as being the key requirement to achieve effective and efficient maintenance, rather then a more simplistic approach of merely changing ownership from public to private sector. In many countries, the existing DLO operations might need considerable improvement before they can be considered for transfer to the private sector, should that be considered desirable. The approach for these improvements has been described in earlier chapters. However, where DLO operations are considered to be performing to a standard where transfer is possible, then considerable planning will be needed to manage the transfer. Case studies indicate the following points are critical:

11.2.2 Staff involvement

Case studies suggest that staff need to be fully involved and informed during the planning of the transfer process. A prospective contractor considering taking over an existing DLO will need to be confident that the transferred staff will be fully motivated in the new environment. This will be achieved if staff feel they have been given the most favourable option in the transfer. Somerset County Council in UK, one of the most recent to transfer its operations, shortlisted prospective contractors who then gave a series of presentations to staff on how they would manage the new approach. As well as cost and past experience, the final decision was also based on the contractor's staff and personnel policies.

11.2.3 Full assessment of costs and liabilities

To ensure that contractors offer the best price, the full liabilities and costs must be clear so that they can be properly priced. Issues that will need to be considered include staff terms of employment (often government employees will expect to transfer with their employment rights which might have considerable financial implications), plant and equipment value, and office and depot facilities.

11.2.4 Adequate guaranteed work

Where contractors are to take on a substantial DLO operation, then they will need to have a genuine incentive if they are to offer competitive bid prices. The key to this will be the guarantee of a supply of work over a substantial term. Clearly the nature of the guarantee will depend on the type of contract to be awarded – what will the term of the contract be? What will be the minimum value of guaranteed work (for schedule of rates type contracts)? What will the size of the network be? How much opportunity will there be for the contractor to undertake works outside the contract, or for additional work within the contract?

11.2.5 Partnership culture

Notwithstanding the comments below concerning corruption, a clear lesson from cases where there has been a transfer of substantial DLO operations (UK and other countries involved in large, area wide contracts) is the need for a sense of partnering. The difficulty of specifying every detail of maintenance operations means that there must be a sense of understanding between the parties to the contract.

11.2.6 Adequate client capacity

As stated previously, most client authorities have underestimated the requirements for managing a contract should a DLO be transferred. The client might need to recruit staff in order to ensure successful contract management.

11.3 Evolution of procedures

A fundamental aspect to note is that there will be a continual process of change as the contracting industries role in road maintenance develops. As contractors develop, so the forms of contract and procurement adopted by clients has changed as noted in chapter 10. Hence there will be a continual need to update procurement procedures and methods as all parties become more experienced.

The degree of continual change will depend on the growth of the private sector and a prediction of this will need to be made during the initial assessment of the industry (chapter 6) and development of any programme. A typical rule of thumb for development of the industry is (Lantran, 1990):

- The initial starting point for amount of work that contractors can undertake is no more than the existing work in similar (civil engineering) activities and one third of the existing work in different (housing) activities; and
- Growth rate can be no more than 20% per annum in real terms.

11.4 Training of contractors

A prerequisite of selecting suitable contractors is that they are capable of undertaking the work. This can be assessed through prequalification procedures (see below) but in most countries, initial training has been required to develop a contracting industry which is able to compete for and carry out various road maintenance contracts. A mature contracting industry is able to achieve this without any proactive training assistance from the client authorities (UK case studies indicate this). Where the contracting industry is less developed, then client authorities need to implement training programmes for prospective contractors. In these cases, the client is accepting that contractors will make mistakes during their development process as they gain experience. An understanding of this fact seems to have formed the basic principle for developing most contractor training programmes.

Box 11.1 gives examples of contractor development programmes in different environments.

Box 11.1 Examples of contractor development programmes

Lesotho. The Road Maintenance and Regravelling (ROMAR) initiative aimed to develop small scale contractors using appropriate technology methods. A study of the domestic contracting industry had led to a 30 month technical co-operation project for training and development. The required output was 15 trained contractors, and so 20 domestic contractors were selected for training, assuming a 25% attrition. Client capacity, a training centre and suitable contract procedures were also developed during this time. Selection of suitable contractors ('Import') was followed by training over a 12 month period. The contractors were trained in 2 batches, each batch undergoing the following programme:

- Classroom technical training (3 weeks)
- Practical field training (4 weeks)
- Classroom business training (3 weeks based on a standard ILO package 'Improve your construction business')
- Practical training in contract execution (6 weeks)
- Classroom training in contract documents and bidding procedures (1 week)
- (if successful so far) bid for routine maintenance test contracts (12 weeks)
- (if successful so far) bid for regravelling test contract (12 weeks)

After supervision in these contracts and the award of initial contracts, contractors were then expected to be self-reliant (assuming a conducive environment).

Colombia. The establishment of microenterprises (MAs), community based contractors responsible for routine maintenance of packages of approximately 50km of the network, required a considerable degree of promotion as it was a new initiative (see Box 10.1). 'Promoters' were contracted for 6 month terms by the road administration and during this time they worked in an area of a size usually to develop 2 or 3 MAs. During this time, they initially had to promote the initiative and encourage locals to form such MAs, and then assist them in establishing their operations. By the end of 6 months, the MAs had usually started work but were still very inexperienced – at this stage, the road administration and other government organisations (training agency, and cooperative agency) took over responsibility for on-going training. By the end of 2 years, MAs were expected to be self sufficient. The initial selection and development of the Promoters themselves required extensive training and development by the government. A long term financial commitment to the programme was made by the UNDP who provided funding over a 10 year period.

Source: Miles (1996) and this study

11.5 Prequalification and tendering

11.5.1 Selection for training

There are various stages at which contractors skills might be assessed for suitability to perform road maintenance contracts. In contractor development programmes, an initial screening is made in terms of selecting contractors for development and training. In the Lesotho experience quoted above, the selection of contractors for training started through advertisements in the media. Entrepreneurial flair, educational background, and technical qualification and experience (in that order) were the basis for initial selection, after which candidates were tested for numeracy and literacy before a final interview. Each candidate then had to submit a training fee. (Bentall et al, 1999).

11.5.2 Prequalification

Subsequent to any training that might be required, is the issue of prequalification of contractors. The purpose of prequalification, particularly if competitive bidding procedures are based solely on price, is to ensure that the only contractors who bid for the work are those who are fully able to carry it out. This will mean that they are not only technically competent, but also have the available financing and resources to sustain their operations.

Ghana has developed a system of contractor registration operated by the Ministry of Roads and Transport. This enables each administration reporting to the Ministry to avoid prequalification since for any advertised work, the contract advertisement specifies which class of contractors are allowed to tender. Contractors are categorised as Roads Airports and Related Structures (Category A), Bridges Culverts and Other Structures (Category B), Labour Based Roadworks (Category C) and Steel Bridges and Structures (Category S). A contractor can be placed in more than one category if he can demonstrate the relevant competence.

Within each category, contractors are classified within four classes. A contractor in a given class is not allowed to tender for any single contract, or have work on hand, in excess of stated threshold values. For a contractor to be rated in a given class, he must meet the requirements for that class in terms of: employing a minimum number of staff, a minimum asset value and annual turnover, recent work experience and minimum qualifications for key staff. Contractors are required to submit an annual licence fee for classification and to resubmit for classification every two years (Class 3 and 4) or every three years (Class 1 and 2). Attendance at various training programmes is also a requirement.

11.5.3 Tendering

In Colombia, the selection of labour based microenterprises (MAs) for routine maintenance is made solely on their anticipated ability to carry out the work. The road administration fixes the rates to be paid, and so there is no element of price competition. The basis for selection is similar to a prequalification procedure and considers:

- registration of MA with the appropriate bodies (e.g. local chamber of commerce, and government training agency);
- training record of members of the MA;
- experience in contracts of a similar nature;
- ownership of required tools; and
- local residency

A similar system of selection has been used in Ghana after prequalification, focusing on the particular aspects relevant to each specific project, such as local knowledge and experience. This appears to support worldwide experience of the development of sustainable contracting industries, in which price competition is seen as an eventual goal rather than an initial requirement. A phased introduction of price competition in tendering might be achieved in the following manner, which is that currently being considered in Ghana (Parkman, 1999b):

- bidders are first provided with bills of quantities and schedules of rates which indicate all costs of materials, labour, equipment and site administration and overheads. They are required to tender a percentage to cover profit and other risks (similar approaches are still used elsewhere in the developed world [Miquel and Condron, 1991]); then
- bidders are provided with bills of quantities and expected productivities and are then expected to price all costs of materials, labour, equipment and site administration and overheads, and mark-ups for profit and risk; and finally
- totally unrestrained price competition.

The development of acceptable rates and productivities is an activity to which contractors associations can usefully contribute (see 11.7), to ensure full stakeholder participation and agreement with the adopted approach.

There appears to be a need to regulate the market when developing contract maintenance if it is to be sustainable and this needs to be carefully monitored as the contracting industry develops. In addition to the above discussion on phased price competition, there is also an issue of how different types of contractor might compete; in particular, the parallel development of labour based and equipment based contractors.

For example, in Ghana, it is considered that some projects will be cheaper if carried out by labour based methods. If totally unrestrained competition were allowed, equipment based contractors might submit unsustainably low bids in order to win the work. In the short term, the client will still appear to be gaining value for money. However, in the long term, the equipment based contractors would go out of business since they would eventually be unable to maintain and replace their equipment due to lack of on-going investment; at the same time, the labour based contractors would have been squeezed out of the market by such contractors. Hence the original initiative of introducing labour based methods, to develop sustainable working methods, would not have achieved its objective due to the unrestrained nature of the bidding. (This example is a specific case of the more general requirement to ensure sound rules are in place to ensure sustainability within a competitive environment).

Various actions can be taken by client authorities to mitigate against the above. A simple approach would be to restrict certain types of work to particular types of contractor. However, care would be needed to ensure a genuine competitive environment still developed. In South Africa, a system of targeted procurement has been developed to counter this situation, in which contractors are not only marked for their price, but also for their ability to meeting socio economic (e.g. labour intensive targets) indicators. In this situation, the client has to specify the socio-economic indicators which will be marked, and clarify how the marking system will operate (Bentall et al, 1999).

11.6 Client supervision and corruption

Corruption is a an unfortunate reality in many countries and contract management procedures need to be developed which mitigate against this as far as possible. Nevertheless, it is usually a much broader institutional issue than the road sector, and for this reason any initiatives to combat corruption need to be addressed at a government policy level rather than purely within the area of road maintenance. Little is reported in the literature concerning corruption, but the widely held view is that clear, transparent, and consistent procedures at all stages of the road management process will be the major means of reducing the possibility of corrupt practice. In addition, the ability to measure performance against an agreed set of objective criteria should also help mitigate against corruption.

The move to contract maintenance has often been simultaneous with an attempt to reduce operating costs by road administrations. The case studies suggest that the role most often overlooked during this change process is the operational role of client staff, who change from being works foremen and supervisors, to being contract managers and inspectors. However, their role at the operational level is crucial if corruption is to be avoided, and also to enable the sustainable development of contractors – as mentioned previously, an element of flexibility and judgement will be required when dealing with inexperienced contractors.

Client training can help with developing the in house staff to supervise works. Relevant staff in Ghana attended the same courses as those for contractors (the training for contractors is

similar to the Lesotho case in Box 11.1). Client staff then received further 'on-the-job' training as required, and the case study suggests that the major lesson has been the realisation by the client that high calibre staff are needed for this role. The Lesotho experience (Miles, 1996) goes further in recommending that a distinct programme is required for client staff, and that it is not just a matter of them following the programmes for development of the contractors.

The supervision and monitoring of contractors will be an intensive activity and often client administrations will not have sufficient resources or time for this. Colombia experienced this problem and for this purpose developed the system of Road Managers as described in Box 11.2.

Box 11.2 Development of Road Managers in Colombia

A system of community based microenterprises for carrying our road maintenance had been established in Colombia in the 1980s (Box 10.1) but by the early 1990s, due to a reform process which had not adequately addressed the client role (as well as other issues), the system had become ineffective. One initiative to remedy this situation was the introduction of private Road Managers (AMVs) to identify needs on the network and manage the implementation of works by the microenterprises. A separate technical assistance project was set up, which identified a programme for development of AMVs, by establishing their responsibilities and a timetable for their introduction. Considerable interest was shown by the private sector, and interested parties attended training and dissemination workshops.

An AMV is responsible for about 150km of the network, which usually means managing the activities of between 2 and 3 microenterprises. An AMV will usually have an assistant Inspector who manages site activities, an office based secretary to deal with the public, a driver and a vehicle (with other administrative support as necessary). The role attracted interest from local consultants and also individuals. The key requirement for their selection is that they are technically competent as well as being professional and community/socially aware, to both the needs of the road users as well as the microenterprises. Their selection is competitive, based on these factors and also their proposed cost.

AMVs manage the activities of the microenterprises, but also carry out broader road management duties for the road administration, such as keeping an up to date road inventory and information on the road network (network condition, traffic and axle load levels), identifying user satisfaction with the road network, identifying and planning future maintenance work etc. They maintain a constant liaison with the road administration. Their payment is based on performance indicators related to these activities, and is also linked to the performance of the microenterprises. Whilst such a system might seem to encourage collusion between the AMV and the microenterprises, the clear link of their activities to the satisfaction of the general road user should mitigate against this happening.

Source: This study

There has been a more general move worldwide towards more performance based contracts in recent years and these require the maintenance contractor to take on more responsibility for managing the road network to a defined road standard. In many cases this has been associated with reduced client supervision but this appears to go against the principle of maintaining a substantial supervisory role to mitigate against corruption.

The Colombian system described above has moved to performance based contracts and they note that a necessity of such an approach is flexible, partnership type attitudes to the work. It would appear that such an approach is inappropriate if the culture is litigious or corrupt (both factors might cause problems due to difficulties in defining and agreeing clear objective indicators to measure performance). The Colombian response is that the road management process must be clearly related to road users and the local community to mitigate against such

pressures. Elsewhere, the need has arisen for increased independent auditing operations, to assist the client administrations in monitoring the performance of both consultants and contractors. This is a feature of the UK experience (see Appendix ???) and emphasises the need for clients to ensure they have adequate procedures in place for monitoring and supervising road maintenance contractors.

11.7 Contractors associations

Contractors associations can provide a powerful communication focus between individual contractors and various client authorities. Particularly where the contracting industry is developing, they can assist with identifying and articulating key problems and constraints. The experience of Ghana is outlined in Box 11.3.

Box 11.3 The importance of contractors associations in Ghana

The Road Contractors Association (RoCA) was formed in 1993 from a previous more general Association of Civil Engineering and Building Contractors, as a specific need was perceived for an association of contractors addressing issues and problems peculiar to the road sector. It has a constitution, with bye-laws, a code of practice and ethics, for which there are disciplinary committees to ensure each member complies. In addition, sub committees sit for various reasons, such as reviewing rates for work and conditions of contract. Benefits of RoCA include a forum for discussion and social support, an opportunity for business collaboration (for example, coordinated bulk procurement of equipment), and representation. Members pay an annual subscription based on the size of their firm.

The Chairman of RoCA is a member of the committee which is responsible for classification of contractors, and there is also a representative on the Ministerial Advisory Committee which advises on new development projects. Perhaps a key role is that of the representative which sits on the Road Fund Board thus representing their interests as stakeholders in the network. In addition, representatives of RoCA can bring matters of concern to the various agencies attention - for example, it was felt that the initial requirement for contractors to register with MRT on an annual basis was too onerous, and RoCA requested that this be extended to the current requirements. Also, on occasions where agreed national rates for activities have been found to be unreasonable, RoCA have requested that these be revised by the agency concerned.

The Labour Based Contractors Association (LaBCA) exists for similar reasons to RoCA. Labour based contractors consider they have a specific interest which is better represented by a separate organisation, although discussions have been held to consider the possibility of a merger with the RoCA. LaBCA was recognised officially by government in 1989, and its role was important as the labour based programme was innovative and all parties were new to the approach. Concerns and representation of LaBCA are similar to RoCA. Specific concerns currently include the issue of competitive tendering and the possibility of equipment based contractors gaining a larger share of the market at the expense of labour based contractors. It is considered that many contractors will also need training in competitive bidding and LaBCA might develop training courses for this.

Source: This study

11.8 Resources for contractors

11.8.1 Finance

Adequate finance is key to the success of the sustainable development of contractors. The fundamental starting point to achieve adequate finance is for there to be reliable and timely payment mechanisms from clients to contractors. The case is particularly true for labour

intensive contractors, whose major resource is the labour they employ – if payment is not timely, then they are unable to pay their staff who are often on very low wages to the extent that non payment has serious consequences. As well as ensuring that the cash flow of the contractor is maintained, reliable payments also develop a stable industry which appears worthy of investment by the banks and lending agencies. For example, the recent restructuring of the Road Fund in Ghana and hence improved reliability of funding has seen the lending banks become more amenable to loans to contractors.

Traditional construction type projects require bonds and sureties to be presented by the contractor. However, for maintenance contracts which are often of a lesser value (particularly if routine maintenance), the need for such guarantees is reduced. Also, where small contractors are involved, insurance companies and banks will be less inclined to negotiate since these firms have little collateral (Thiam, 1998). South Africa has set different levels of performance bonds for different sizes of contracts as follows (Bentall et al, 1999):

- Major contracts: 10 – 12.5 %
- Minor contracts: 2.5 – 5 %
- Micro contracts: 0 %

Other suggestions as to how such burdens might be reduced for developing contractors are (Thiam, 1998):

- Replace the bond requirement by appropriate prequalification procedures
- Government offer loan guarantee schemes through commercial banks and in association with contractors associations, or possibly through small business credit agencies
- Reduction in retention money from the usual 10% to 5%

11.8.2 Equipment

A major need for contractors to have access to finance is for the purchase of equipment and tools. Various approaches have been adopted for this issue:

- The Colombian microenterprises are awarded a 20% advance payment on contract award to make any advance purchases of tools and equipment. This advance is paid back in equal instalments over the term of the contract.
- In Ghana, the Bank for Housing and Construction was established whose purpose was to provide assistance to contractors in the form of bank guarantees and loans for purchasing of equipment, as well as commercial banking services. In addition, it set up a subsidiary Plant Pool Ltd, which hired equipment (new equipment funded by donor assistance) to contractors.

In the case of Ghana, the plant pool is actually no longer in operation. It appears that there is a culture within Ghana of ownership, rather than hire, and contractors preference was to use the pool only as a last resort. With less than full utilisation, the rates for hire soon became uncompetitive and some private firms offered equipment at better rates for those contractors who needed to hire. In addition, the plant pool was based in Accra, which made it difficult both logistically and financially for contractors based further afield. This illustrates the need for such arrangements to closely match the culture and needs of a particular country or region.

12. CONCLUSIONS

Conclusions from the study have been presented throughout the text. However, key issues are summarised below.

Organisational models
There are a number of models for considering the involvement of the private sector. The various roles can be described as:

- Owner (e.g. Ministry of works or transport)
- Administrator (e.g. road agency or local authority)
- Manager (e.g. road agency, local authority or consultant)
- Service provider (e.g. DLO or contractor)

The private sector can undertake one or several of the above roles.

Funding mechanisms
A stable funding mechanism is essential if privatisation or contract maintenance is to be considered. Unstable funding is a cause of inefficiency in a DLO and in the reluctance of private contractors to bid for work. Unless there are stable funding mechanisms in place, little appears to be gained by proceeding with other changes outlined below.

Competition is more important than privatisation
Evidence confirming the importance of competition as a spur to efficiency is growing. Public sector DLOs can compete with the best contractors given the chance to do so. 'Sustainable competition' and clearly specified and enforced maintenance standards and activities are the key to greater cost effectiveness.

Management of change
The introduction of competition requires clear aims and objectives, careful planning and managing and is best introduced in a phased or evolutionary way. Involvement in the planning of change, of those affected by the potential change, contributes to a smoother and more successful transition. DLOs can transfer successfully to the private sector providing that the staff are fully consulted on the changes. Private contractors can play a greater role in road maintenance but may require support and training.

It is also apparent that the change process is unique for every organisation. It is therefore difficult to be prescriptive as to how the change process should be managed, but it is considered that knowledge of how similar organisations have gone about change is of most benefit to others considering change (the case studies and references included in this report are provided for this purpose).

Client / contractor split
Organisational change involving client / contractor separation is required if competition is introduced. This change, together with an improved process of procurement, can contribute significantly to efficiencies regardless of who does the work. Training and development of clients in their new role is required, just as it is required for developing a competent contracting industry.

Packaging of contracts
The size and scope of contracts will affect competition and the size of contractor. The initial aim may be to encourage small contractors but the trend is towards large contracts and large contractors in order to reduce the cost of supervision, benefit from economies of scale and facilitate performance based contracts. However, for these contracts, a sense of partnering and collaboration between the parties is required and there is sometimes a concern that such contracts might not be successful if corruption is a local problem.

Monopolies
There is a need for incentives if DLOs are to improve efficiency but there is a risk of private sector monopolies developing unless steps are taken to regulate the industry and the process of competition.

Cost savings
It is difficult to assess accurately the cost savings that occur due to any restructuring in a road administration. However, it appears that the introduction of competition, particularly subjecting DLOs to competitive tendering, has resulted in significant cost savings of the order of 5 to 20 per cent. But there is evidence that the savings can reduce in subsequent tendering rounds if there is not enough competition. For many countries the existence of an efficient DLO is an important part of the competition and should be encouraged.

The above savings due to contracting out can be compared with other possible improvements (Talvitie, 1996):

- Decentralisation in programming the outputs can increase efficiency by 10 - 15 per cent;
- 'Optimal' timing and scheduling of works through efficient road management reduces total transport costs by 5 - 30 per cent;
- Efficient, decentralised data collection costs 2 - 3 per cent of the maintenance budget;
- Reworking the planning processes can shorten the planning and design cycle.

13. ACKNOWLEDGEMENTS

This report is the output from a project at the Transport Research Laboratory (Programme Director: Mr T Toole) undertaken for the Department for International Development (DFID) under the Knowledge and Research programme. Any views expressed are not necessarily those of the DFID.

The authors would like to express their appreciation to all those who assisted in providing information for the study. In particular, the case studies carried out at Berkshire County Council, Somerset County Council, Ghana, Colombia and discussions at the World Bank all involved various staff giving of their time to discuss the issues. Their contribution is gratefully acknowledged.

14. REFERENCES AND BIBLIOGRAPHY

BENNATHAN E and L S THOMPSON (1992). Privatization problems at industry level: Road haulage in central Europe. World Bank Discussion Paper No.182, World Bank.

BROOKS D M, R ROBINSON and K P O'SULLIVAN (1989). Priorities in improving road maintenance overseas: a check-list for project assessment. Proceedings of the Institution of Civil Engineers, Part 1. 86(Dec), 1129-1141.

BROWN T J and M I CHOUDHURY (1990). Periodic maintenance by contract of regional highways in north west Bangladesh. Volume 1, Sixth conference proceedings, Road Engineering Association of Asia and Australasia, Kuala Lumpur.

BUTLER R (1998). Personal communication with C Parkman.

COMMISSION OF EUROPEAN COMMUNITIES (1993). Project cycle management. Brussels: Commission of European Communities.

CONRAD J F, P NELSON and K JONES (1993). Project cost evaluation methodology approach to privatization in the Washington State Department of Transportation. Transportation Research Record 1409, TRB.

DUNLOP R J (1998). Roading agency of the future. IRF/GTZ web site, http://www.mindspring.com/~irfgtz/Srdnz.htm

FERNANDEZ ORDONEZ H O (1998). Conversations during study visit to Colombia. Unpublished.

FORBES, D E (1997). Road maintenance - To privatize or not to privatize. Transportation Research Board presentation, TRB.

FRANK GRAHAM AND PARTNERS (1992). Contracting out motorway maintenance in England - a consultants viewpoint. Unpublished.

FROST M and C LITHGOW (1996). Improving quality and cutting costs through performance contracts: Australian experience. Road management training seminar, Washington 17-18 December 1996, World Bank, unpublished.

GASTON B (1996). New methods, new partners (Ontario Maintenance and Operations). Ministry of Transportation, Ontario, unpublished.

GASTON B (1994). Lessons from the BC privatization experience. Ministry of Transportation, Ontario, unpublished.

GENERAL ACCOUNTING OFFICE (1997). Privatization: Lessons learned by state and local governments. United States General Accounting Office, Washington DC 20548.

GERKE R J and P J SAWCHUK (1997). Privatization of a complete primary highway network, 'The Alberta Experience'. Presentation to AASHTO subcommittee for maintenance, Saratoga Springs, NY, July 1997.

GRUBB S R T (1998). The private finance initiative - public private partnerships. Proceedings of the Institution of Civil Engineers (Civil Engineering), 126, August, pp133-140.

GYAMFI P and G RUAN (1996). Road maintenance by contract: Dissemination of good practice in Latin America and the Caribbean region. Regional studies program, Report No.44, World Bank, Washington DC.

HARRAL C and A FAIZ (1998). Road deterioration in developing countries. World Bank, Washington DC.

HEGGIE I and P VICKERS (1998). Commercial management and financing of roads. World Bank, Washington DC.

HEGGIE I (1995). Management and financing of roads: an agenda for reform. World Bank technical paper number 275, Africa technical series, World Bank.

HORNSBY K R (1990). Road maintenance by contract: the Northern Territory experience. Volume 1, Sixth conference proceedings, Road Engineering Association of Asia and Australasia, Kuala Lumpur.

HYMAN W A (1997). Role of novel procurement procedures and intelligent transport systems in the development of maintenance management systems. Presentation to AASHTO subcommittee for maintenance, Saratoga Springs, NY, July 1997.

JONES T E and R C PETTS (1991). Maintenance of minor roads using the lengthman contractor system. Fifth international conference of low volume roads, Raleigh North Carolina, 19-23 May 1991. Transportation Research Record 1291, Volume 1, Transportation Research Board, Washington DC.

KERASIOTES J J (1993). Essex County privatization. Transportation Research Board, 72nd annual meeting, January 10 -14 1993.

LANTRAN J-M and C MORSE (1995). Development of the private sector (Module 6). Framework and competition *and* Procurement and contract management. Proceedings of the highway policy seminar for the countries of the former Soviet Union, Moscow, 15 - 19 May 1995. Washington DC: The World Bank.

LANTRAN J-M (1990-1994). Contracting out of road maintenance activities: Volumes 1 to 5. Infrastructure divisions, Technical and Sahelian Departments, Africa Region, World Bank.

LARCHER P and D MILES (1997). Developing small scale contractors for road maintenance. ?????.

LIGHTHIZER O J (1994). The pros and cons of privatization. State Government News, The Council of State Governments, February 1994 issue.

McGILLICUDDY J (1996). A blueprint for privatization and competition. International City/County Management Association, Public Management, November 1996.

McMULLEN C C (1986). Maintenance activities accomplished by contract. National Cooperative Highway Research Program Report 125, TRB.

MADELIN K B (1993). The case for in-house staff. Proceedings of the Institution of Civil Engineers (Municipal Engineer), 98, June, pp85-88.

MADELIN K B (1994). Maintenance by private contractor or direct labour. Routes/Roads No.282, pp61-70, PIARC.

MADELIN K B (1996). Driven to action. New Civil Engineer, 7 November 1996, pp10-11, Institution of Civil Engineers.

MILES D W J (1996). Promoting small contractors in Lesotho: privatization in practice. Proceedings of the Institution of Civil Engineers (Civil Engineering), 114, August, pp124-129.

MINNESOTA DEPARTMENT OF TRANSPORTATION (1997). Managing competitiveness position paper. Unpublished.

MIQUEL S and J CONDRON (1991). Assessment of road maintenance by contract. Report INU91, Technical paper, World Bank.

NABALON (1998). Management of contract maintenance in Chile. Unpublished.

NEWMAN R B, J E GARMONG and H P HATRY (1991). Maintenance contracting. National Cooperative Highway Research Program Report 344, TRB.

NORWELL G and G YOUDALE (1997). Managing the road asset in Australia and New Zealand. Routes/Roads No.296, October 1997, pp59-68, PIARC.

OBSERVER (1998). Delivering an unexpected blow to the privates. The Observer, Sunday 2nd August, 1998.

OLIVER J (DoT) (1992). UK developments in procurement of maintenance. Overheads for lecture to PIARC committee on road management, meeting 13/15 October 1992, Shrewsbury, UK.

PARKMAN C and K MADELIN (1999). Transferring road maintenance to the private sector: Examples of UK experience. Unpublished project report PR/OSC/157/99. Transport Research Laboratory, Crowthorne, UK.

PARKMAN C (1999a). Transferring road maintenance to the private sector: The Colombian experience. Unpublished project report PR/OSC/160/99. Transport Research Laboratory, Crowthorne, UK.

PARKMAN C (1999b). Transferring road maintenance to the private sector: The Ghana experience. Unpublished project report PR/OSC/156/99. Transport Research Laboratory, Crowthorne, UK.

PLETAN R (1996). Notes on visit to UK to learn of maintenance operations and views for application in Minnesota. Unpublished.

ROBINSON R, U DANIELSON and M SNAITH (1998). Road maintenance management – concepts and systems. Macmillan, UK.

SIR OWEN WILIAMS AND PARTNERS (1992). The experience of a consultant in managing highway maintenance. Paper to PIARC committee on road management, meeting 13/15 October 1992, Shrewsbury, UK.

SMITH R B, M FROST and J S FOSTER (1994). Contract road maintenance in Australia: a pilot study. Proceedings of third international conference on managing pavements, San Antonio, May 1994, TRB.

SMITH R B, J S FOSTER and J SHARP (1996). Contract road maintenance in Australasia: a review. REAAA journal, January 1996, pp7-15.

STENBERG I L (1990). Road maintenance by contract. Volume 1, Sixth conference proceedings, Road Engineering Association of Asia and Australasia, Kuala Lumpur.

TALVITIE A (1996). International experiences in restructuring the road sector. Paper to annual meeting of the Transportation Research Board, January 1996.

TARMAC ROADSTONE (1992). The experience of a contractor in undertaking all aspects of highway maintenance. Paper to PIARC committee on road management, meeting 13/15 October 1992, Shrewsbury, UK.

TISBEE T T and T MIKKELSEN (1995). Maintenance by contract ion the Philippines: Experience gained during four years of progressive privatisation of road maintenance activities. REAA Journal, January 1995 pp10 - 13.

TRANSPORT RESEARCH LABORATORY (1998). Overseas Road Note 15: Guidelines for the design and operation of road management systems. Transport Research Laboratory, Crowthorne, UK.

UNAUTHORED (1992). Contracting out of highway maintenance. Paper to PIARC committee on road management, meeting 13/15 October 1992, Shrewsbury, UK.

ZIETLOW G J (1997). Reform of financing and management of road maintenance. IRF/GTZ web site, http://www.mindspring.com/~irfgtz/vortrweb.htm

ZIETLOW G J (1998). Performance specified road maintenance contracts. Lecture and notes at IRF executive conference on road maintenance, June 14 - 19, Washington D C.

ZIETLOW G J AND A BULL (1999). Performance specified maintenance contracts – the road to the future. The Latin American perspective. PIARC XXIst World Congress, Kuala Lumpur, 3 – 9 October 1999. (see: http://www.zietlow.com/docs/Psmce.htm)

NUMBER.....

NAME.....

DOCUMENT	DATE SENT	DATE RECEIVED	NOTES
General Enquiry	N/A		
Course Leaflet		N/A	
Sponsor Details			*
Sponsor Information		N/A	
Sponsor Confirmation			*
Booking Form	N/A		*
VAT Information			*
Confirmation of Booking		N/A	
Travel Arrangements			
Admin Arrangements		N/A	
Invoiced		N/A	*
Paid	N/A		*

ARRIVAL DATE/TIME.....

DEPARTURE DATE/TIME.....

Contact Name: .....
Address: .....
.....
.....
.....
EMAIL: .....
Telephone: .....
Fax .....

Participant's Address: .....
.....
.....
.....
.....
EMAIL: .....
Telephone: .....
Fax .....

APPENDIX A: GLOSSARY OF TERMS

Administration (road)
The function, or organisation, responsible for effecting road policy and ensuring the performance of the road network meets the overall political objectives of the owner (government). In many countries, this is referred to as the road agency or authority.

Activity
Any work or intervention that is carried out on the road network.

Audit
A physical check, usually on a sample basis, that work has been carried out, where specified, to pre-defined standards or procedures, and that costs and other resources have been accounted for properly.

Budget head
Normal pre-defined headings under which expenditure is allocated by a Ministry of Finance.

Capital budget
The government budget normally used to fund major projects.

Contract maintenance
Road maintenance (works) which are carried out in accordance with a set of contract documents. Usually the term refers to the use of a private contractor contracted to the road administration. For the purposes of this study, it can also be considered to apply to government owned works organisations, if they are operating in a competitive environment and under the same terms as the private sector.

Cost based contract
Type of contract in which the contractor is paid for according to rates agreed for inputs (labour, equipment, materials etc.) rather than outputs. The alternative is a price based contract. This type of contract represents a greater level of risk to the client than a price based contract, since he retains a degree of responsibility for achieving the output.

Cost-benefit analysis
A formal comparison of costs and benefits to determine whether or not an investment is worthwhile.

Cyclic works
Scheduled works whose needs tend to be dependent on environmental effects rather than traffic. These works are programmed in advance and include such activities as, for example, culvert cleaning.

Development works
Projects planned at discrete points in time that result in improved road capacity or changes in alignment.

Direct Labour Organisation (DLO)
See in-house works.

Emergency works
Works undertaken to clear a road that has been blocked.

Global cost
The 'broadest brush' category of cost-estimating technique which relies on libraries of achieved costs of similar works; eg cost per kilometre of bituminous resurfacing.

HDM-III
The 'Highway Design and Maintenance Standards Model Version III', which is a computer-based decision-support system, developed by the World Bank, and used for economic appraisal of road projects.

Hourly rates contract
A type of contract (cost based) in which a contractor is paid for supply of resources at an hourly rate - typically, traditional civil engineering dayworks. Alternatives are performance based or procedural based contracts.

In-house works
Works that are performed by government employees within a road administration, rather than private contractors. Often referred to as direct labour, direct control or force account operations.

Information system
A computer-based system that collects, organises and stores data.

Institutional appraisal
An investigation of an organisation that identifies its strengths and weaknesses, success in meeting defined aims, and the constraints under which it operates.

Inventory
A record of the physical attributes of the road network or other asset being managed.

Lump sum contract
Price based type of contract in which the contractor is paid a lump sum amount for completing the agreed works. A true lump sum contract is fairly rare - most references to these types of contracts are usually lump sum with the possibility of variations once the contract is carried out.

Maintenance management system
A computer-based system for assisting with the management of maintenance (note that in UK English, this term will often be used synonymously with the term 'pavement management system' whereas, in US English, the term will normally refer to an 'operations management system'); to avoid confusion, the use of this term should be avoided.

Management cycle
A series of well-defined steps which take the management process through the decision making tasks. Typical steps would be i) define aims; ii) assess needs; iii) determine actions; iv) determine costs and priorities; v) implement activities; vi) monitor and audit. The process typically completes the cycle once in each periodic cycle of the particular management function.

Manager (road)
The function, or organisation, responsible for managing the road network for the road administration. This function might be carried out by the road administration, or by a separate organisation under contract to the administration. Typically, this will be referred to as the Engineer or the Project Manager in any contract between the a road administration and contractor.

Management function
A means of defining a management task based on its objective. Management functions are undertaken so that the requirements of the policy framework are met; examples are planning, programming, preparation and operations.

Mission (statement)
This outlines, in broad terms, the goal of the organisation responsible for the road network, and justifies its existence.

Multi-year programme
A schedule of road works planned to take place in discrete years into the future.

Network
A particular grouping of roads for management purposes; examples are the national road network; trunk road network; paved road network, etc.

Network information system
An information system that stores data about the road network and its inventory.

Network referencing
The process of breaking the road network down into successively smaller links, segments and sections, each of which can be defined uniquely for road management purposes.

Operation(s)
The on-going activities of an organisation, for which management decisions are made on a near-term basis. Examples include the scheduling of work to be carried out, monitoring in terms of labour, equipment and materials, the recording of work completed, and the use of this information for monitoring and control.

Operational cost
A fundamental cost-estimating technique that builds up the total cost of the work from its component activities described by the method statement and programme, in terms of labour equipment and materials.

Owner (road)
The function, or organisation, responsible for establishing road policy and the legal and regulatory framework for management of the road network. Typically, this will be a Ministry of Transport, or, where the administration function is also combined, a Ministry of Works and Transport.

Performance based contract
A type of contract in which the contractor is paid for providing a service to a given standard. Typical standards for long term works might be, for example, to ensure a road does not exceed a given roughness value. Typical standards for short term works might be, for example, to maintain vegetation below a defined height. Alternatives are procedural based or hourly rates type contracts.

Performance standard
This specifies the quality of finished work for an activity, and builds up a consistent description of the activity based on a preferred method of working, and requirements for equipment, labour and materials.

Periodic works
Works planned on a regular basis to take place at intervals of several years. In UK, these works are often referred to as 'planned maintenance'.

Planning
This involves an analysis of the road system as a whole, typically requiring the preparation of long term, or strategic, estimates of expenditure for road development and conservation under various budgetary and economic scenarios; predictions may be made of expenditure under selected budget heads, and forecasts of road conditions, in terms of key indicators, under a variety of funding levels.

Policy framework
A set of statements, normally comprising a mission statement, objectives and standards, that define in detail the aims of an organisation and how it proposes to achieve these.

Preparation
The near-term planning stage where road schemes and projects are packaged for implementation. At this stage, designs are refined and prepared in more detail; bills of quantities and detailed costings are made; together with work instructions and contracts; detailed specifications and costings are likely to be drawn up.

Preventive works
Addition of a thin film of surfacing to improve surface integrity and waterproofing that does not increase the strength of the pavement.

Price based contract
Type of contract in which the contractor is paid based on agreed prices for work outputs (could be unit price, lump sum or performance based) rather than for work inputs (equipment, labour, materials etc.). The alternative is a cost based contract.

Problem tree analysis
A method of problem solving that works backwards from a problem statement, breaking this down into more detailed components, and then develops these to find a solution.

Procedural based contract
Type of contract in which the contractor is paid to provide works in accordance with a specification, which defines how each activity should be carried out. This is the most traditional civil engineering type contract. Alternatives are performance based and hourly rates type contracts.

Procedure
A documented series of steps for carrying out a particular activity or task.

Programming
The preparation, under budget constraints, of multi-year works and expenditure programmes in which those sections of the network likely to require treatment, and new construction possibilities, are identified and selected; a tactical planning exercise.

Reactive works
Works responding to minor defects caused by a combination of traffic and environmental effects.

Recurrent budget
The government budget which is normally used to fund those works that are needed every year, including such items as staff salaries, running costs of a road administration, and maintenance works for the road network which are undertaken on a regular basis.

Road class/hierarchy
A grouping of road sections according to pre-defined rules, often based on issues of ownership, function, funding source, etc.

Road management
The process of maintaining and improving the existing road network to enable its continued use by traffic efficiently and safely, normally in a manner that is effective, and environmentally sensitive; a process that is attempting to optimise the overall performance of the road network over time.

Routine works
Minor works that need to be undertaken each year. In UK, these works are often referred to as 'reactive maintenance'.

Service Provider
The function, or organisation, responsible for delivery of service to the road administration. Usually referred to as the Contractor. The Manager, if contracted by the road administration, is in a sense a specific type of service provider, but for the purposes of this study it is useful to consider the Service Provider as being responsible for the delivery of Operations, whereas the Manager is responsible for monitoring the delivery of Operations through Preparation and Programming activities.

Special works
Works the frequency of which cannot be estimated with certainty in advance.

Specification
A detailed description of the attributes of the output from an activity, or of the steps by which that activity is carried out.

Stakeholder
Those with a vested interest in the performance of the road administration, including the road users, industry, agriculture and commerce, who are its 'customers', plus the road administration itself and the road engineering industry.

Standard (maintenance)
A requirement, sometimes legally enforceable, that a road administration is obliged to meet as part of its road management activity.

Strategic
Pertaining to actions, often wide ranging, designed to achieve defined objectives in the long term.

System
A structured group of discrete entities which interact for a particular purpose; examples are:
A 'computer system', which is a collection of software and hardware designed to carry out a particular function
A 'management system' which is a set of procedures designed to assist the management process (which may also include a computer system)

Tactical
Pertaining to actions designed to achieve defined objectives in the short to medium term.

TUPE
Transfer of Undertakings (Protection of Employment). A UK term referring to the statutory requirements and obligations defined by government for any private sector organisation which is taking on former employees of the government under a privatisation initiative.

Unit price contract
A price based contract in which the contractor is paid in accordance with agreed unit rates for works activities. Sometimes referred to as an admeasure or schedule of rates contract - the former being based on estimated quantities of work which are then used to give an initial estimate of the contract price; the latter not necessarily including any estimate of quantities of work.

Unit rate
A cost-estimating technique based on the traditional bill of quantity approach to pricing engineering work, typically relating to aggregate quantities of work to be carried out, measured in accordance with an appropriate method of measurement.

Works
All construction and maintenance activities.

APPENDIX B – SELECTED BIBLIOGRAPHY

BENNATHAN E and L S THOMPSON (1992). Privatization problems at industry level: Road haulage in central Europe. World Bank Discussion Paper No.182, World Bank.

This report discusses the issues involved with privatization of the road haulage industries in central Europe, with specific reference to the experience of Poland and Hungary. It describes the process which these countries went through in order to develop an efficient haulage industry, and emphasises that such a process must be carried out in stages. Specifically, countries must ensure that publicly owned enterprises of doubtful viability must not be transferred until they are made viable, so that enterprise restructuring must happen first. Only then should a programme of privatization be embarked upon, and this will require decisions on the regulatory regime to be adopted.

BROWN T J and M I CHOUDHURY (1990). Periodic maintenance by contract of regional highways in north west Bangladesh. Volume 1, Sixth conference proceedings, Road Engineering Association of Asia and Australasia, Kuala Lumpur.

This paper describes an IDA funded initiative to improve road resurfacing maintenance in Bangladesh and adopt contract maintenance procedures. The method of rating roads is described and this was used in order to develop cost estimates for the resurfacing projects. An extensive programme of pavement testing and materials investigation was carried out and specifications have been reviewed for use in contract maintenance. All contracts included preliminary pavement repairs as well as resurfacing works. The ability of contractors to perform works to specification was checked at prequalification, which reduced the number of tenderers from 55 to 19, and indicated the need for intermediate equipment to be used, as even with a 30% loan on offer, contractors had a limited capital base and suitable 'high tech' equipment was simply unavailable. General conditions of contract were developed based on the New Zealand Standards Association, which were considered to apportion risk more equitably than FIDIC, from which they were derived. The ability to cope with variations during the contracts, which were admeasured based on a bill of quantities, was paramount and two alternatives for achieving this are discussed in the paper. The paper concludes that the major obstacle to achieving a good road network in Bangladesh is the quality of routine, and not periodic, maintenance.

CONRAD J F, P NELSON and K JONES (1993). Project cost evaluation methodology approach to privatization in the Washington State Department of Transportation. Transportation Research Record 1409, TRB.

Due to increased interest in the different methods of procuring road projects, the Washington state legislature commissioned this study in 1985 to better understand the differences and compare costs between works carried out by the public and private sectors. A methodology (PCEM) for comparing costs on a project by project basis was developed and a 3 year pilot test was conducted to assess how useful it might be. Results from the maintenance element of the study have shown that increased flexibility in allowing competition for works would be beneficial. Typical issues highlighted during the study included the need for specifications where work has traditionally been carried out by a DLO, and the incompatibility of existing budget procedures with maintenance practices. The method is recommended by the authors as an effective decision tool, but it is noted that it is more applicable to large, easily specifiable projects rather then smaller and less defined projects where an element of subjective interpretation is required.

FORBES, D E (1997). Road maintenance - To privatize or not to privatize. Transportation Research Board presentation, TRB.

This presentation describes the lessons learnt by the Oregon Department of Transportation in commercialising road maintenance. Oregon considered 'full privatisation' rather than simply contracting out the various maintenance activities. The key lessons were: 1) Competition is more important than privatisation. For this to be effective, full accounting of all costs is required in order to make valid comparisons, there must be a number of viable public and private sector competitors and economies of scale must be introduced. 2) A 'philosophy' must be built which defines the extent of maintenance, its relationship to construction, and the principles of priority (eg safety, useability and appearance). 3) Levels of service (LOS) must be established which are related to the class of road and which can then be related to the priority rules to determine maintenance needs for each road. 4) Clearly outline responsibilities of public and private sectors for such issues as activities, road closure, road/bridge rating, major investment, displaced government employees and transfer of equipment. Safety and emergency items should be retained by client, who should be careful not to retain only low profit/high overhead items. The biggest gains will come from collapsing client service delivery structure. 5) Avoid loss of control - define LOS in contract, monitor, tie compensation to performance, share the risk, define the status of displaced workers and maintain an ability to bring back work in house.

FRANK GRAHAM AND PARTNERS (?). Contracting out motorway maintenance in England - a consultants viewpoint. Unpublished.

This outlines the changes that occurred, from a consultants viewpoint, when a section of the UK motorway network (West Yorkshire) was handed over to private contractors and consultants for road maintenance works. Consultants were appointed in 1985 to manage the maintenance of this network and in late 1985 they set up a working group with the Department of Transport to address the issues involved in appointing contractors for the work. It was agreed that familiar conditions of contract should be used, and so the ICE 5th edition was amended for this purpose. Most work for routine and emergency maintenance was carried out by works order, so that a Schedule of Rates replaced the usual Bill of Quantities and the various amendments to the contract are outlined. The usual UK specification ('Blue book') was used as a basis for the specification but it needed amendments to cover safety management, emergency procedures, routine maintenance, stocks of materials and winter maintenance. During the tender period, many enquiries were received and on appointment of the successful bidder (by comparing schedule of rates against ghost quantities and rates) a six week 'work-in' period was allowed prior to contractual handover from the DOT DLO to the contractor on 1 April 1996. The paper concludes by suggesting that the client now receives a more effective and cost effective delivery of road maintenance.

FROST M and C LITHGOW (1996). Improving quality and cutting costs through performance contracts: Australian experience. Road management training seminar, Washington 17-18 December 1996, World Bank, unpublished.

This paper describes developments in contract maintenance in New South Wales with the RTA. Contract maintenance had already been trialed (see Smith et al, 1994) but it was decided that a performance based 10 year contract, covering 450km, would be let in 1994. For such a significant shift of risk to the contractors, it was decided that tenderers should submit their 'concept' proposals and that these would be developed. After a 10 month tender preparation

period, the proposals were evaluated and the preferred bidder chosen with whom detailed contracts were developed. Some staff from RTA were offered the chance of transferral to the contractor but most declined and voluntary redundancies were allowed. The contract includes five documents: 1) Conditions of Contract (to which no changes are expected), 2) Code of Maintenance Standards (containing Level of Service requirements and Intervention Standards for every asset), 3) Maintenance Services Specification, 4) Commercial Schedules and 5) Benchmark Information (BI). The BI lists the assets, inventory and pavement models to be used when anticipating road performance. Payment is made for base services on a monthly basis without invoicing, and additional work is paid for under Provisional or Additional Services. Since the contract is performance based, it does not mention detailed procedures and materials to be used except in the case of major bridges, embankments, force majeure, as RTA retain the risk of these for fear of excessive price if handed over to the contractor. RTA require regular monitoring and the contractor has established a PMS for this purpose. For such a long term agreement, the principles of 'partnering' have been adopted.

GASTON B (1996). New methods, new partners (Ontario Maintenance and Operations). Ministry of Transportation, Ontario, unpublished.

These overheads summarise a presentation outlining the current plans for Ontario to develop a new strategy for the delivery of highway maintenance by the private sector. The MOT has reviewed the experience of a number of countries worldwide and has concluded that a stepwise process should be undertaken, which maintains competition, encourages entrepeneurial flexibility and recognises that 'nobody has got it just right, so far'. Two strategies are being trialed and a decision will be made after this period as to the direction to proceed. Managed outsourcing is one option, in which MOT staff will be responsible for road patrolling and delivery of maintenance through a series of functional unit price tenders. Area maintenance contracts are another option, which will be awarded on the basis of a lump sum for all routine maintenance operations over a three year term. The contractor will work to performance targets, be allowed to purchase surplus ministry equipment, and be subject to penalties for non compliance. Term maintenance contracts have been considered, which include construction and maintenance in a long term (five year) performance type contract, but these are not being pursued at present.

GASTON B (1994). Lessons from the BC privatization experience. Ministry of Transportation, Ontario, unpublished.

This summarises and comments on a review undertaken by the Minister of Transportation and Highways (British Columbia) in 1993, which sought an independent perspective on the cost effectiveness of the province's recent privatisation program. The purpose of the summary is to highlight issues which might be pertinent to initiatives in Ontario. The summary addresses operational, human resource, financial and economic impacts. It notes that finding optimum maintenance levels is complex, and that the often conflicting objectives of maintenance (eg salt and sand actually cause deterioration in a road surface) are therefore better managed by the client/owner, rather than transferring management to the operator; in extreme cases, there might be a commercial advantage for a contractor to reduce preventive maintenance. End result specifications are recommended, although their development is difficult and their application requires dispute resolution procedures. Whilst comparison of costs by DLO or contract are difficult, it is considered that the public has a right to know but that this will involve detailed cost auditing procedures. Loss of knowledge by the client is inevitable when work is outsourced, and labour regulations are complex and difficult to solve. Management of contracts often requires more staff than originally anticipated and costs do not necessarily reduce (it is suggested that BC

costs increased).

GERKE R J and P J SAWCHUK (1997). Privatization of a complete primary highway network, 'The Alberta Experience'. Presentation to AASHTO subcommittee for maintenance, Saratoga Springs, NY, July 1997.

Alberta Transportation and Utilities (ATU) decided in 1995 that it would undertake wholesale privatization of the road maintenance activities in the province in an attempt to reduce total cost whilst maintaining standards on the network. A review of worldwide experience was undertaken, and after close consultation with counterparts in British Columbia, ATU decided to opt for setting up large scale geographically based contracts. The implementation strategy adopted is described and this involved setting up a team of seven members from all levels within ATU to manage the process. Documentation and specifications were developed (using ideas from RTA in Australia for a Code of Practice) and extensive consultation with industry and employees was carried out. Proposals of tenderers were evaluated and this process required considerable preplanning. Considerable training of those ATU staff retained in their new 'client' role was anticipated. Employee consultation was continual and clearly successful as initial negative rexctions were transformed. A half day workshop was held initially, followed by more detailed 2 day workshops and continual newsletter updates and employee involvement. Similarly intensive consultation was performed with potential contractors. The paper concludes with a summary of lessons learnt and the perceived benefits of the privatization.

HORNSBY K R (1990). Road maintenance by contract: the Northern Territory experience. Volume 1, Sixth conference proceedings, Road Engineering Association of Asia and Australasia, Kuala Lumpur.

Increased government pressure meant that the Northern Territories embarked on a programme of use of the private sector in road maintenance. This has resulted in staff reductions, but these have been achieved through normal rates of attrition, and plant reductions, which has enabled government expenditure to be diverted to other activities rather than equipment management. Two forms of contract have been used - a simpler Service Order which includes no liquidated damages, and a form based on National Conditions of Contract which is applicable to more complex projects. Contracts have been procured on an Hourly Hire, Specific Work (either by schedule of rates or lump sum)or Period basis and the above order is that recommended in order to develop a more experienced contracting industry, based on the experience in NT. Hourly Hire contracts require the same type and degree of management by the client as DLO. Specific Work contracts have been used for resurfacing projects, but the most innovation has occurred through the Period contracts. These require a long term commitment from government (NT have used a three year term, with annual reviews and possibility of cancellation of subsequent years works), but NT have found that quality improves with time (unlike trends noted in USA). Client staff, used to DLO procedures, require a significant amount of training for these contracts but have responded by becoming more effective, mainly due to their less ambiguous and more clearly defined role.

HYMAN W A (1997). Role of novel procurement procedures and intelligent transport systems in the devlopment of maintenance management systems. Presentation to AASHTO subcommittee for maintenance, Saratoga Springs, NY, July 1997.

This paper analyses trends in the use of maintenance management systems and notes that these have developed due to new technology and introduction of life cycle costing techniques. There

has also been a trend towards performance, rather than method, specification in the management of roads. Maintenance management systems must reflect this and the example of Maryland, who let the specification of a maintenance management system as a turnkey project, is described. If the public and private sector are to compete in developing MMS, then true cost comparisons must be made. An option of developing ideas is to allow open solicitation, by which private consortia can develop proposals for partially or completely self financing projects. These proposals are then made public so that other competitors can submit proposals during a limited period and then the project, if aproved, is awarded to the best proposer. The idea of Partnership Proposals, where prospective tenderers put 'ideas' on the table and develop these further with the client is also considered, and the article concludes by suggesting that the lowest bid option should not be the criteria for project selection.

KERASIOTES J J (1993). Essex County privatization. Transportation Research Board, 72nd annual meeting, January 10 -14 1993.

The author of this paper was appointed Commissioner of the then Department of Public Works of the Massachusetts Highway Department (MHD) in 1991. After ordering a study of MHDs labour force that year, a decision was taken to embark on a programme of privatization of the entire maintenance operations of the Essex County regional office. Conditions prior to privatization are described and these were particularly unsatisfactory, showing a labour force which appeared to be operating extremely ineffectively and inefficiently. State workers were offered the opportunity to compete for the new contracts, but ultimately the MHD felt the union plan for this was unacceptable. The direct cash benefits of the process are presented and the paper states that the quality of maintenance has dramatically improved under the new procurement procedures.

LANTRAN J-M (1990-1994). Contracting out of road maintenance activities: Volumes 1 to 5. Infrastructure divisions, Technical and Sahelian Departments, Africa Region, World Bank.

LIGHTHIZER O J (1994). The pros and cons of privatization. State Government News, The Council of State Governments, February 1994 issue.

The author is secretary of the Maryland Department of Transportation, which has reviewed its use of the private sector in carrying out many of its functions. The DOT has 10,000 employees, a budget of US$2 billion and is responsible for all modes of transportation within the state. A review was undertaken to recommend opportunitites for privatisation, and there was initial surprise that the existing practice included so much (51%) use of the private sector. Consideration was given to privatisation of the airport, but it was decided that the complicated planning processes and the governments ability to raise large sums of money both meant it was easier to retain the operation of the airport in-house. Privatisation is a solution if the private sector is better and cheaper but is not preferable if there is a risk to vitality of an economic asset as exampled by the Maryland Port Administration. Privatisation is also recommended where the application of a new technology is required to improve a service, since it avoids the need for government investing in technology which might become obscelete or training and devoting resources to such technology.

McMULLEN C C (1986). Maintenance activities accomplished by contract. National Cooperative Highway Research Program Report 125, TRB.

This report draws on a review of literature and the results of a survey by questionnaire in 1983 of 75 agencies in the USA involved in road maintenance. The questionnaire sought information from agencies on: 1) which activities were carried out by contract, 2) the decision criteria for use of contractors or agency staff, 3) cost comparison methods, 4) administrative and legal issues encountered, 5) contract methods and organisational control, 6) experience in the use of 'total' maintenance packages (rather than specific activities or grouped activities) which was found to be negligible, 7) inspection and work control procedures and 8) major problems or successes that had been encountered. After listing the various issues which influence whether contract maintenance will be used by an agency, from the viewpoints of various relevant parties, the report goes on to note that for agencies wherethe experience of the contracting industry is minimal, a gradual process of contract maintenance implementation is required with considerable communications between all parties. In deciding whether to contract out maintenance, an agency should consider 4 key issues on which the report expands: 1) Is it a requirement? 2) Is it needed? 3) Is it feasible? 4) Is it desireable? All the different aspects of contract administration are then summarised and finally the research needs in this area are highlighted, which include the development of guideline road maintenance activity specifications and also the development of appropriate inspection and quality control procedures.

MADELIN K B (1993). The case for in-house staff. Proceedings of the Institution of Civil Engineers (Municipal Engineer), 98, June, pp85-88.

This paper discusses the relative merits of using in-house staff or private consultants. The particular area discussed is that of design services for local authorities in the UK. It starts with four basic assumptions: that private consultants will always be required for some aspects of local authority work, that the quality of work from either in-house staff or private consultants is the same, that the in-house organisation is already divided into a client and consultant organisation, and that everybody makes mistakes. The paper states what it considers should be the objectives of a private consultancy and then outlines the benefits of in-house staff in terms of cost, quality, added value and competition. The paper then concludes by suggesting that an expert client provides long term benefits for the public: by properly briefing, monitoring and controlling a consultant, by understanding and good judgment of the inherent risks in engineering, and by providing an informed and expert opinion in wider political discussions within government. A final mention is made of the public sector ethos to serve the public, which might be eroded by working solely for the profit motive.

MADELIN K B (1994). Maintenance by private contractor or direct labour. Routes/Roads No.282, pp61-70, PIARC.

This article reviews the practice of using private contractors or direct labour to conduct road maintenance work. It is based on presentations made by members of the Committee of Road Management (C6) in 1992 and from subsequent submissions. It also draws on information from a report by the World bank in this area (Miguel and Condron, 1991). It notes that there is a need to understand and separate the client and contractor roles, and to apply specification and contract procedures to the Direct Labour force (DLO). This process improves efficiency and there is no evidence of savings when comparing an efficient DLO with a private contractor. A DLO should be retained as it can respond to emergencies, has local knowledge and pride of ownership, can be flexible and provides competition for private contractors. Competition should be promoted

between organisations, both between DLO and private contractors, as well as between local DLOs and by setting performance targets. Appendices provide data from various countries experiences and outlines typical costs of efficiency improvements in Shropshire, UK.

MADELIN K B (1996). Driven to action. New Civil Engineer, 7 November 1996, pp10-11, Institution of Civil Engineers.

This article recognises that there is a drastic need for road maintenance to improve. Whilst significant improvements by means of needs budgeting, consistent standards and monitoring have been achieved, the public demands that further improvements are still required. The key might be to look at the water industry, which fell into disrepair and under investment but was then privatised. Significant improvements were then put in place, but these were at a cost and a major contributing factor was the fact that water charges were directly levied by the provider to customers, rather than the previous unstable flow of funds by means of local council rates. A major review of roads should be undertaken which: 1) identifies roads for movement, which should be privatised, and roads for access, which should remain under control of local government, 2) establishes road performance criteria, 3) establishes a direct payment mechanism between road users and road operators and 4) develops sustainable methods for road charging on roads for movement.

MILES D W J (1996). Promoting small contractors in Lesotho: privatization in practice. Proceedings of the Institution of Civil Engineers (Civil Engineering), 114, August, pp124-129.

This paper is based on experience with the road maintenance and regravelling project (ROMAR) in Lesotho and outlines how a strategy was implemented to develop small contractors to carry out these tasks using appropriate technology. The process adopted was: 1) to study the local contracting industry, 2) design a programme of development, 3) develop contractors based on the management training principle 'import/convert/export', 4) implement a system of accreditation. Bottlenecks encountered during this process were those of changing entrenched attitudes within the client, from becoming a DLO to a client type organisation, and more research is recommended for this area.

MINNESOTA DEPARTMENT OF TRANSPORTATION (1997). Managing competitiveness position paper. Unpublished.

This paper was circulated to all DOT managers to inform current discussions within the department between employees on this subject, and to seek feedback on their views. The stated position of the DOT is 'to be competitive in everything we do'. Out-sourcing, the method by which services are procured from an external organisation with accountability for the outcome remaining with DOT, is often used by DOT but privatization has not been carried out. Competitiveness is measured in terms of cost, quality and responsiveness/timeliness and DOT want to measure these so that objective decisions can be made on the use or not of outsourcing. The strategy is to seek customer requirements, identify how these will be achieved, and then determine how best to deliver the services. Initiatives for accurate measurement of cost, quality and responsiveness are underway and services will only remain in-house if they prove to be competitive

MIQUEL S and J CONDRON (1991). Assessment of road maintenance by contract. Report INU91, Technical paper, World Bank.

This is a report based on a survey of the experience of using contract maintenance to date in a number of countries. It lists the reasons given for use of contract maintenance and notes that no cost comparisons have usually been carried out when a country has moved from use of a DLO to increased use of the private sector. Work to be contracted out must be clearly defined and measurable, and there should preferably be a concentration of work in a given location for it to be attractive to contractors. Good quality control procedures must be in place. The most common type of works to be contracted out are periodic maintenance activities, with some contracting of routine maintenance, but emergency and winter maintenance is usually considered too critical to let by contract. The various types of contract are discussed, and these vary in terms of the risk allocation between client and contractor, from lump sum term contracts through to maintenance activities specified by works orders. Each step in the procedure of letting contracts is reviewed and the report specifically notes that developing countries with inexperienced contracting industries have had to establish procedures to ensure participation and development of local contractors. This transition requires planning in advance which should be flexible to future change and must be a gradual process. Results of specific country surveys are included as appendices.

NEWMAN R B, J E GARMONG and H P HATRY (1991). Maintenance contracting. National Cooperative Highway Research Program Report 344, TRB.

This reports on a study whose objective was to prepare guidelines for carrying out road maintenance by contract. Draft guidelines are included as Appendix A and the main body of the report describes the background and major conclusions from the study. Questionnaires were sent to agencies and contractors, but responses, particularly from contractors, were not too forthcoming. The reasons for contracting out road maintenance are discussed, and it is concluded that most work can be performed by contract and that many agencies carry out a nominal (10%) amount in-house in order to maintain a client expertise and a minimum staffing level for emergencies. A system used by Texas to determine the 'contractibility' of works is presented, as are the various methods in practice to compare costs between the two alternatives. Contract maintenance is defined as project type (eg overlays), maintenance type (eg litter collection) or smaller, purchase order type arrangements. The guidelines in Appendix A suggest that a clear strategy for procuring road maintenance is required, and then go on to discuss requirements pre-award and during contract administration. Appendix B provides a summary of experience in British Columbia.

NORWELL G and G YOUDALE (1997). Managing the road asset in Australia and New Zealand. Routes/Roads No.296, October 1997, pp59-68, PIARC.

This article presents the latest developments in the Antipodes concerning best practice in road management. Austroads has been used as a coordinating body to initiate strategic developments and considers that improving asset management relies on the following issues: 1) recognition of community benefits, 2) knowledge of road system performance, 3) knowledge of asset features, 4) knowledge of asset condition, 5) understanding of asset use, 6) understanding of physical treatments and 7) management of use of the asset. Using this as a framework, agencies can therefore develop their own improvements in road asset management.

OLIVER J (DoT) (1992). UK developments in procurement of maintenance. Overheads for lecture to PIARC committee on road management, meeting 13/15 October 1992, Shrewsbury, UK.

This lecture defines the background to UK developments, noting they were driven by government policy to subject the widest possible range of activities to competition. The report on maintenance in 1982 had identified that competitive tenders were required for most work, that pilot projects for use of the private sector in total maintenance should be established, that better definitions of maintenance works were required and that sharper agency agreements were necessary. The background is given (see Sir Owen Williams and Partners and Unpublished, both at this meeting) and benefits are reported as crisper agreements, dedicated teams and 10-15% savings in cost. Disbenefits are noted as more management required by the client and a loss of local knowledge/continuity. Problems of extending these pilot trials to municipal areas are mentioned, where work tends to be of a smaller nature and more liaison is required with local bodies.The future holds for reorganisation of both DoT and Local government and is unclear.

PLETAN R (1996). Notes on visit to UK to learn of maintenance operations and views for application in Minnesota. Unpublished.

These notes highlight apects of various conversations and interviews which the author had during a study visit to the UK in February 1996. They provide a summary of the current UK approach to procuring road maintenance, as discussed elsewhere - see Frank Graham and Partners (?), Oliver (1992), Sir Owen Williams and Partners (1992) and Tarmac Roadstone (1992). The author summarises that privatisation had been used in UK by government as a means of driving down costs by introducing competition and that procurement of maintenance was modelled on traditional lines of construction procurement. He identifies a preferable approach as: 1) to define maintenance in product/service categories rather than activities, based on customer requirements determined from surveys, 2) to determine indicators to gauge these products/services and develop means of measuring performance against these indicators, 3) to build a competitive spirit and compare districts using these indicators , 4) to write performance based contracts for districts and measure performance, 5) to derive costs of activites within these 'product' lines, and only then 6) to open up competition between public and private sector.

SIR OWEN WILIAMS AND PARTNERS (1992). The experience of a consultant in managing highway maintenance. Paper to PIARC committee on road management, meeting 13/15 October 1992, Shrewsbury, UK.

This paper details the experience of a consultant managing a network in the UK for the Department of Transport (DoT) - for background see Unauthored, 1992. The consultants are appointed as agents for the DoT by a two envelope system (technical and financial). The financial bid is separated into Lump Sum items, which are for acting as agents on the term maintenance contracts (routine and winter emergency) and are given as a percentage of those contract values, Basic Fee items, which are for design of major maintenance works and are inversely proportional to the value of such works and Additional Fee items, which are for such activities as detailed inspections and for site supervision of major maintenance and are cost plus. Monthly billing is in operation. The consultant submits annual bids for funds for maintenance of the network and often these requests are not fully met, so that a problem noted is that of a conflict between the Codes of Practice to which the consultant is obliged to work and the necessary reduction in standards due to this funding shortfall. The Term Maintenance contracts are carried out by Works Orders and Works Instructions and emergency maintenance is covered

by ensuring that some staff are on standby at all times. The paper concludes that this method of working has been a success but notes that it is based on a good working relationship between the consultant and contractors.

SMITH R B, M FROST and J S FOSTER (1994). Contract road maintenance in Australia: a pilot study. Proceedings of third international conference on managing pavements, San Antonio, May 1994, TRB.

This paper describes a 12 month pilot study that was undertaken by the Roads and Traffic Authority (RTA) of New South Wales in 1990/91 to compare road maintenance delivery by the private and public sectors. Three pilot networks were established :1) maintained by contractor and managed by private sector manager, 2) maintained by RTA DLO and managed by private sector manager and 3) maintained by RTA DLO and managed by RTA managers. Ideally a 5-10 year performance contract would have been used but future uncertainty over budget, poor records of maintenance history, inventory and pavement performance meant that schedule of rates (with provisional quantities) contracts were used. A major concern if using a performance contract was the possibility of claims for latent defects by a contractor who had not constructed the roads. The contracts followed QA procedures, and a maintenance Code of Practice. This established priorities for works activities, intervention levels and response times. Significant improvements in the technical quality of repairs were noted, as well as a general shift of work from routine to structural works based on this needs driven approach. Comparisons over a short period are difficult, but there was a definite improvement in productivity of DLO and this was due as much as anything to restructuring within RTA along contract procedural lines and increased competition. The paper concludes by suggesting that performance contracts would be the ideal, but that more information will be needed for these for such a significant change to the risk sharing of road maintenance.

SMITH R B, J S FOSTER and J SHARP (1996). Contract road maintenance in Australasia: a review. REAAA journal, January 1996, pp7-15.

This paper is based on a position paper commissioned by the Regional Transport Authority of New South Wales. A questionnaire was sent out to Australasian road authorities and information was also sought from UK, USA and Canada. The various approaches adopted by different authorities are summarised, and this reveals a considerable difference in both the amount of maintenance contracted out as well as the type of contracts adopted for this work. There is little data available on cost comparisons, as the introduction of private sector operations into road maintenance has usually been motivated by politicians, but it is generally considered that competition has promoted more efficient operations. The major lesson is that it is the split of asset ownership/supervision from service delivery which allows a greater emphasis on needs based rather than resource driven maintenance activities. A range of models of management are summarised with their advantages and disadvantages, and these vary from total owner provided service provision through to management and provision of maintenance works being the responsibility of a contractor under a long term performance contract. Finally, advantages and disadvantages of direct labour versus contract works programmes are highlighted.

STENBERG I L (1990). Road maintenance by contract. Volume 1, Sixth conference proceedings, Road Engineering Association of Asia and Australasia, Kuala Lumpur.

This paper reports on an on-going World Bank funded project in Belize, Central America, which is aiming to develop a road maintenance contracting industry. Traditionally, road maintenance

has been carried out by direct labour on a district basis. Whilst the quality has been fair, it is suggested that improvements could be made by addressing issues of plant maintenance and availability, knowledge of personnel, and diversion of maintenance resources to other activities. A pilot trial on a section of the network was conducted: local contractors attended seminars and this formed one basis for prequalification. FIDIC conditions were adapted to suit. Specification of the works has been by method and materials, rather than end result, and extraordinary maintenance has been included as a provisional item on dayworks. Activities are measured on a cost/km basis. Cost comparisons show the contractors to be more expensive than the traditional DLO, but these are not reliable as the quality and effectiveness of maintenance has improved dramatically.

TARMAC ROADSTONE (1992). The experience of a contractor in undertaking all aspects of highway maintenance. Paper to PIARC committee on road management, meeting 13/15 October 1992, Shrewsbury, UK.

Tarmac Roadstone secured the contract for maintenance of the South Yorkshire motorway network in April 1986 and this paper describes their experience. The original contract documents were based only on a Schedule of Rates, with no indication of quantities of work, but this has now been revised although the contractor still cannot claim if there are substantial changes to the quantities in the contract. Tarmac took on the DLO operators, and used specialist subcontractors where necessary and for winter maintenance intended to use employment agencies for HGV trucks on a call off basis. The basis of the contract was the ICE 5th edition and the 1987 version of the Method of Measurement for Highway Works. Work is carried out by Works Order, each being subject to a completion and maintenance certificate. Winter works are carried out based on a 'level of response' time, for which the contractor is obliged to respond within a defined time limit depending on the time of year (eg.High repsonse times are required for December to February) and a similar priciple is adopted for emergency maintenance. The paper concludes that it is the characters and cultures rather than the contractual specifications which make these projects a success or otherwise.

UNAUTHORED (?1992). Contracting out of highway maintenance. ?Paper to PIARC committee on road management, meeting 13/15 October 1992, Shrewsbury, UK.

This paper briefly summarises UK experience of the 1980s in this subject. In 1986, the maintenance of trunk roads in four areas (Manchester, South Yorkshire, West Yorkshire and West Midlands) was contracted out. Consultants were appointed to manage the maintenance, using contractors who were employed on term maintenance agreements (using schedule of rates). The consultants term was 5 years, the contractors term was 2 years, so that consultants supervised different contractors during their appointment. A Model G agreement was developed for the Client/Consultant relationship, which draws on previous consultant terms of appointment as well as local authority agency agreements. Since this form of procurement was untried, a clause was included to allow either contractor or client to terminate after one year of service. Ex authority staff were taken on by both consultants and contractors. The second terms began in 1988 for which tighter contracts had been developed and for which there was more competition than previously, suggesting the trial had been a success. Cost comparisions are difficult - a straight comparison suggests a 15% reduction in costs, but the cost of managing consultants by the client in addition to other client functions is difficult to track, and issues of professional indemnity insurance are also relevant.

ZIETLOW G J (1997). Reform of financing and management of road maintenance. IRF/GTZ web site, http://www.mindspring.com/~irfgtz/vortrweb.html

This paper has been developed during a joint IRF/GTZ initiative entitled 'Financing and Institutional Reform of Road Maintenance in Latin America and the Caribbean'. It notes that the fundamental problems which have led to a crisis in road maintenance in many countries are twofold: 1) a lack of adequate and stable flow of funds and 2) a number of institutional barriers which prevent effective and efficient road maintenance being carried out. In terms of financial reform, shadow tolls, tariffs and separate Road Funds are advocated. In terms of institutional reform, autonomous Road Maintenance Boards which represent stakeholders in the road network are recommended. In terms of management of maintenance, it is suggested that substantial cost savings can be made by using private contractors to carry out the work in a competitive environment. Unit price contracts are most common but long term performance based contracts such as those used by the RTA in New South Wales (see Frost et al, 1996) and Argentina are encouraged. However, these require well qualified contractors, but even where less experienced contractors are available, the case is argued for a shift to the private sector.