German Development Cooperation (GTZ)

Implementing Performance-based Road Management and Maintenance Contracts in Developing Countries - An Instrument of German Technical Cooperation -

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Eschborn, November 2004

Abstract

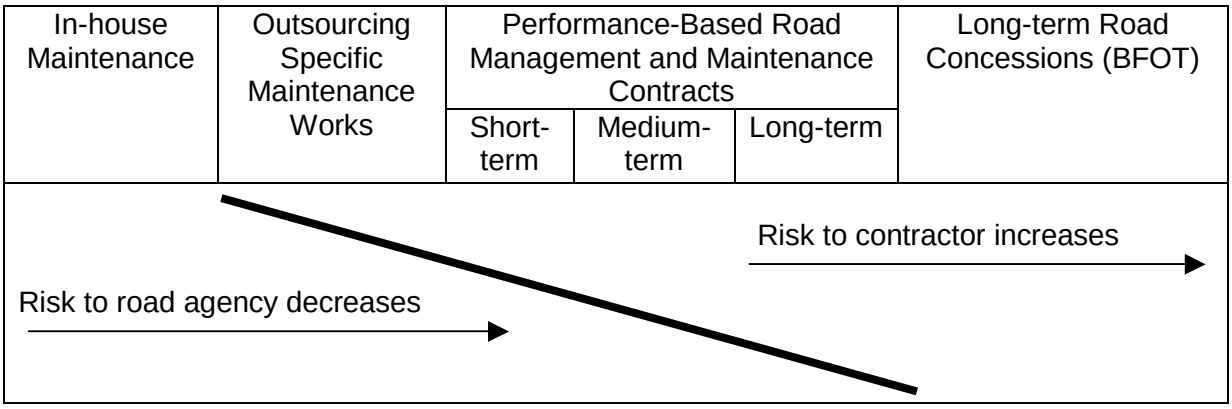
Cutting the cost of road maintenance and improving road conditions are the main reasons why several Latin American countries have started to look for new ways of contracting out road maintenance. With technical assistance from the International Road Federation (IRF), the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and the German Agency for Technical Cooperation (GTZ), several countries in Latin America have initiated so called Performance-Based Road Management and Maintenance Contracts between 1995 and 1998. Most of these contracts cover routine and periodic maintenance, and in some cases road rehabilitation as well.

The article provides an overview of the scope and the experiences gained with these Performance-Based Road Management and Maintenance Contracts in Latin America as well as in other continents and gives recommendations for implementation of future contracts.

1. Introduction

The traditional way of contracting out road maintenance is based on the amount of work being measured and paid for on agreed rates for different work items. These are also referred to as unit price contracts. By contrast, Performance-Based Road Management and Maintenance Contracts (herein after referred to as Performance Contracts) define minimum conditions of road, bridge, and traffic assets that have to be met by the contractor, as well as other services such as the collection and management of asset inventory data, call-out and attendance to emergencies, and response to public requests, complaints and feedback. Payments are based on how well the contractor manages to comply with the performance standards defined in the contract, and not on the amount of works and services executed. Performance Contracts are defining a product and it is up to the contractor how to achieve this. Therefore, work selection, design and delivery are all his responsibility. Hence, the choice and application of technology and the pursuit of innovative materials, processes and management are all up to the contractor. This allocates higher risk to the contractor compared to traditional contract arrangements, but at the same time opens up opportunities to increase his margins where improved efficiencies and effectiveness of design, process, technology or management are able to reduce the cost of achieving the specified performance standards.

Figure 1: Distribution of risks to road agencies and contractors with different forms of performing road maintenance services.



2. Brief History of Performance Contracts

The development of Performance Contracts for road maintenance started in the late 1980's and early 1990's. First **British Columbia in Canada** contracted out its road maintenance in 1988. But performance standards were still more oriented towards work procedures and materials to be used, rather than result oriented, very much limiting the contractor in the application of new technologies.

Shortly afterwards, **Argentina** concessioned approximately 10000 kilometers of its national roads, using end result performance specifications for the maintenance services and a penalty system for not meeting response times for rectifying deficiencies. In the mid 1990 the maintenance of another 10000 kilometers was contracted out using similar performance specifications. But this time without applying tolls, since average traffic

levels were below 2500 vehicles per day and therefore could not sustain a tolling system. These contracts are also referred to as CREMA, contracts for rehabilitation and maintenance.

In the mid 1990's **Uruguay** started its first pilot scheme of Performance Contracts on a small network of 359 kilometers of its national roads. In the same year Montevideo followed suit by contracting out the maintenance of 150 kilometers of its main arterial urban roads. The new contracting scheme proved to be so successful that now, only five years later, 50% of the national roads in Uruguay are being maintained through Performance Contracts.

Several other countries in Latin America such as **Brazil, Chile, and Colombia** have started similar contracts and others such as Ecuador, Guatemala, and Peru are planning to do so. Most of these contracts include partial rehabilitation to bring roads to maintainable conditions. Today more than 40000 kilometers of roads in Latin America are being maintained under Performance Contracts.

Australia started its first Performance Contract in 1995 covering 459 kilometers of urban roads in Sydney (Frost, M. and C. Lithgow. 1996). Since then several new contracts have been implemented in New South Wales, Tasmania, and Southern and Western Australia. Some of them as so called hybrid contracts, where some of the works are being paid based on quantities and unit prices an others based on performance criteria.

In 1998 **New Zealand** let its first Performance Contract for the maintenance of 406 kilometers of national roads. Presently, 15% of New Zealand's national roads are maintained using the new contract scheme.

In the **United States of America**, the State of Virginia pioneered a Performance Contract called "Asset Management and Maintenance Contract" for the maintenance of 402 kilometers of Interstate Highways in 1996. Four years later Washington D.C. followed suit with a similar contract that covers 119 kilometers of federal roads (Federal Highway Administration. 1999). Both contracts are considered pilots. Since than, several other states like Florida and Texas have started to contract out maintenance on parts of their road networks applying performance specifications.

More recently, performance contracts have spread to European, African and Asian countries. These efforts are strongly supported by international donors like the World Bank, the European Bank for Reconstruction and Development and the Asian Development Bank.

3. Main Reasons for Implementing Performance Contracts

The main reasons for contracting out road maintenance implementing Performance Contracts are to

- reduce maintenance costs through the application of more effective and efficient technologies and work procedures;
- provide transparency for road users, road administrations and contractors with regard to the conditions roads have to be maintained;
- improve control and enforcement of quality standards; and
- improve overall road conditions.

The introduction of Performance Contracts in road maintenance has resulted in cost reductions of between 10% and 20% in Australia, the United States and New

Zealand. No cost comparison studies have been undertaken in Latin America. But rough estimates indicate that performance contracts have resulted in cost savings of around 10% with regard to traditional unit price contracts in Latin America. Since these contracts are in an early stage of development more cost savings can be expected in the future.

4. Main Characteristics of Performance Contracts

The primary objective of performance-based road management and maintenance contracts is to preserve the road asset according to predefined performance standards on a long-term basis. The task is to develop performance standards, which will ensure that the objective is being met as effectively and efficiently as possible.

To define the “right“ performance standards or indicators is a rather challenging task since it has to satisfy a set of goals such as:

- to minimize total systems cost, including the long-term cost of preserving road, bridge and traffic assets and the cost to the road user, and
- to satisfy comfort and safety of road users.

In addition, to avoid ambiguity, performance indicators have to be clearly defined and objectively measurable.

Typical performance indicators are:

- The International Roughness Index (IRI) to measure the roughness of the road surface, which affects vehicle operating cost;
- The absence of potholes and the control of cracks and rutting, which effects safety and pavement performance;
- The minimum amount of friction between tires and the road surface for safety reasons;
- The maximum amount of siltation or other obstruction of the drainage system to avoid destruction of the road structure; and
- The retro reflexivity of road signs and markings for safety purposes.

Typically, performance contracts contain a list of between 20 and 100 performance indicators.

As traffic conditions vary from road section to road section, different sets of parameters will create minimal system cost, taking into account road maintenance and vehicle operating costs. The application of the Highway Design Model (HDM) can be helpful to define some of these parameters, such as the IRI.

Examples of performance standards applied in different contracts in Latin America are compiled in Figure 2. For more details see http://www.zietlow.com/docs/spadocs.htm and go to Contratos de Conservación Vial por Estándares ó Niveles de Servicio.

Figure 2.: Examples of Performance Indicators Applied in Different Performance Contracts in Latin America

Asset Class	Component	Performance Indicator
Pavement	Potholes Roughness (asphalt) Roughness (bituminous) treatment) Rutting Cracks	No potholes IRI < 2.0 (Argentina), IRI < 2.8 (Uruguay) IRI < 2.9 (Argentina), IRI < 3.4 (Uruguay) < 12mm (Argentina), < 10mm (Uruguay, Chile) Sealed
Gravel surfaces	Potholes Roughness Thickness of gravel layer	No potholes IRI < 6 (Uruguay), IRI < 11 (Chile) 10 cm (Chile, Uruguay)
Shoulders	Potholes Cracks Joints with pavement	No potholes Sealed Vertical alignment < 1cm (Chile, Uruguay), sealed (Peru)
Drainage system	Obstructions Structures	No obstructions. Should allow for free flow of water (Chile, Uruguay) Without damages and deformations (Chile, Peru)
Road signs and markings	Road signs Road markings Reflectivity of road markings	Complete and clean (Argentina, Chile, Peru) Complete and visible (Argentina, Chile, Peru) 160 mcd/lx/sqm. (Argentina) 70 mcd/lx/sqm. (Uruguay)
Right of way	Vegetation Foreign elements	< 15cm height (Argentina, Uruguay) No foreign elements allowed

While in the Performance Contracts in Latin America all performance indicators have to be met 100%, the contracts in Australia, New Zealand, and the United States allow performance targets to be less than 100%, see Figure 3. For a list of performance indicators used in the contract in the State of Virginia go to http://www.zietlow.com/docs/washdcap.pdf and for a list of performance indicators and response times used in New Zealand go to http://www.transit.govt.nz/technical_information/content_files/Amendment68_PDFFile.PDF

Figure 3. Example of Performance Indicators of the Performance Contract let in Sydney, Australia

Asset	**Outcome**	**Performance Target in % of Asset**	**Performance Indicators**
Cross Pipes < 36 ft sq)	Structurally sound Open drains Joints intact Adequate capacity No erosion	95	< 10% deteriorated barrel > 90% diameter open Joints intact End protection intact No dip in road over pipe indicating structural problems
Paved Ditches	Aligned Structurally sound Clean	95	< 1" settlement < 25% spalled no obstruction to flow of water
Sidewalks and Ramps	Smooth Safe Sound	90	No settlement > ½" No unsealed cracks > ¼" < 25% spalled

For each performance indicator there is a response time and often a penalty defined for non-compliance. For example, in the Argentinean CREMA contracts for each pothole more than 2 cm deep, a penalty of US$ 100 is being applied for each day it stays open. For a detailed list of performance indicators and response times of the CREMA contract see http://www.worldbank.org/html/fpd/transport/roads/c&m_docs/7thiclv.pdf. Another good example for performance indicators and response time is the latest State Highway Maintenance Contract Proforma Manual SM032 of Transit New Zealand. The document can be downloaded from http://www.transit.govt.nz/technical_information/content_files/Amendment68_PDFFile.PDF

Figure 4. Example of Contract Standards and response times used in the State Highway Maintenance Contract Proforma Manual SM032 of Transit New Zealand

Feature	Contract Standard	Response Time
Potholes on highways with > 10000 vpd	Not more than 3 potholes with a diameter greater than 70mm on any 10km section	48 hours
Potholes on all highways	No potholes greater than 150mm in diameter	48 hours
Depressions and Rutting	No ponding greater than 30mm in depth at any location	6 months
Edge Break	No more than 2m of edge break within any continuous kilometer greater than 0.5m	1month
Lined Channels	No lined channels with more than 10% of the cross-sectional area obstructed, and free of vegetation	1 week

In addition to the performance indicators defining asset conditions, there are other indicators covering, for example, emergency response times and reporting procedures.

Performance indicators and response times vary widely from one contract to another. Each country seems to follow a slightly different path due to a variety of factors. One thing is clear that performance indicators are still evolving and continue to be a subject of further analysis and debate. Recently, the World Bank has developed a "Sample Bidding Document" which might contribute to a more unified approach (World Bank 2002).

The duration of the contract should be of sufficient length in order to make full benefit of the advantages of performance contracts. As a rule of thumb, the contract should include at least one periodical maintenance application. This implies a minimum contract period of 8 to 10 years for bitumen carpet, 6 to 8 years for double surface treatment, 4 to 6 years for gravel roads and 2 to 4 years for earth roads and tracks.

For low volume gravel and earth roads performance standards should be simple and inexpensive to measure and control. For example the performance contracts in Chad uses:

- The usability of the road, which implies that the contractor has to ensure that the road is open to traffic and free of interruptions at all times;
- The average vehicle speed, whereby the contractor has to ensure that The Contractor has to ensure that a specified vehicle is able to circulate in a safe manner (i) at a certain average speed defined below, and (ii) that road surface conditions never constrain the vehicle speed below a certain minimum;
- The road user comfort which is defined by specifying the road corrugation amplitude, the rut depth, other surface degradations, and the condition traffic signs;
- The durability of the road to ensure the long-term "survival" of the substance of the road by defining performance criteria like usable road surface width, cleanliness and condition of the drainage structures, and the height of the vegetation within the right of way.

Since most of the roads do not comply with the performance standards set in the contract, the contractor has to be given time to bring up the road to the required levels depending on the specific circumstances.

Whenever there is a shortage of contractors for road maintenance or the ones available are not sufficiently qualified, it might be necessary to divide the performance contracts into to parts. One contract would take care to maintain the roadway and bridges and the other one would take care of all other road assets, including road signs, drainage structures, and vegetation control.

A similar system is being used in several countries in Latin America. The routine maintenance activities are undertaken by road maintenance cooperatives having between 10 and 15 members each and being responsible for a 25 to 40 kilometer stretch of road. The cooperatives are supervised and trained by small road management companies responsible for 200 to 300 kilometers of roads. Both, the cooperatives as well as the road management firms have to work according to simple performance standards.

Typical performance standards for contracts with cooperatives would be as follows:

- Culverts and inlets have to be structurally sound and clean to allow for the free flow of water;
- Surface drainage systems have to be structurally sound and clean to allow for the free flow of water;
- Vegetation should not exceed a height of 30 cm;
- No trees should obstruct traffic or pose a safety hazard;
- Compliance with the program to control erosion;
- Roadway and right-of-way should be free of litter, debris and road-kill;
- There should be no potholes;
- Cracks more than 3 mm wide should be sealed;
- Joints have to be sealed;
- Bridge structures should be clean;
- Bridge railings should be clean and well painted;
- Riverbeds have to be clean within 100 meters from the edges of bridges;
- There should be no obstruction of the roadway;
- Road and traffic signs should be clean;
- Milestones should be complete, clean and visible. Missing milestones should be replaced within 24 hours;
- Guardrails have to be clean, complete and visible;
- Road markers, road markings and horizontal road signs have to be clean;
- Responded in due time to emergencies;
- There should be no billboards within the right-of-way.

For more information on the system used in Latin American countries please refer to: http://www.zietlow.com/docs/Using Micro-Enterprises.pdf

5. Implementation

The approach taken to implement Performance Contracts varies form country to country. The experiences of the road administrations with contracting out road maintenance and the competence of local contractors played a major role. The longer the experience of contracting out road maintenance, the more comprehensive was the scheme that has been adopted. Guatemala and Honduras, which previously had executed all road maintenance by in-house staff started with one or two-year contracts with performance indicators related to routine maintenance only.

Brazil, Chile, and Uruguay have started with pilot contracts with a road network of approximately 300 kilometers each, concentrating mainly on roads with asphalt concrete and bituminous treated surfaces. In some cases gravel roads were included as well. Typical contract duration was between 3 to 5 years.

Before embarking on such pilot scheme, it is necessary to analyze its legal and financial feasibility first. One of the most important legal aspects is the maximum contract period allowed by law. In most of the countries in Latin America, for example, the maximum contact duration is restricted to either four or five years, making it necessary to change laws in order to accommodate long-term contracts. Financing has to be secured for the entire duration of the contract.

Prior to the preparation of the bidding documents a number of steps have to be taken to define the road network to be contracted out, to make an inventory of the assets

involved and to determine its condition, to select and define the performance indicators, select and define the methods of measuring those indicators, to define the likely maintenance and possibly rehabilitation works, and to prepare preliminary cost estimates. The data on the inventory and the conditions of the assets are given to the potential contractor as reference only. It is the responsibility of the contractor to make sure that the information is correct, since he has to assume responsibility for meeting the performance criteria. A methodology of designing a pilot contract can be retrieved under http://www.zietlow.com/docs/actcns.pdf

For the preparation of bidding documents, existing bidding documents used for road construction can be used, but they will have to be adapted to suit the special nature of Performance Contracts. Performance Contracts that are being used in other countries might be helpful. Good examples are the Performance Contracts for road rehabilitation and maintenance in Argentina (CREMA) and the bidding documents prepared by the DNER of Brazil for a similar scope of work, and the Performance Contracts for road maintenance in Uruguay. Uruguayan bidding documents can be found under http://www.dnvuruguay.com/licitaciones/pliegos-r8.htm and for the Technical Specifications of the CREMA, see http://www.zietlow.com/docs/crema.htm . A Sample Bidding Document for Performance-based Management and Maintenance of Roads prepared by the World Bank can be found under http://www.worldbank.org/transport/roads/c&m_docs/pmmr_final.doc

Since Performance Contracts are new for road administrations and contractors alike, close cooperation between both parties is vital for success. Both sides have to be comfortable with the contractual arrangement and understand the risks involved. In all Performance Contracts that have been let until now, road administrations and contractors have closely worked together in preparing the bidding documents.

In some countries such as Uruguay the road administrations, which were used to prepare bidding documents without consulting contractors, had to adjust to the new situation, because of a lack of interest from contractors to embark on the new contracting scheme. In the United States it was the contractor who actually initiated the process and presented a draft of the bidding documents to the road administration. In this case the Virginia State Parliament had to pass a law first to allow for unsolicited bids to be accepted by the Virginia Department of Transport.

In all the other Performance Contracts competitive bidding procedures have been used after pre-qualification of potential contractors. Especially in the case of pilot schemes the qualification of the contractor is a major factor besides the overall price. Therefore, the contractor who offers the lowest price does not necessarily wins the contract. Since performance contracts shift much of the risk, which is normally assumed by the road administration, to the contractor, potential bidders have to be given sufficient time to prepare their bids. This time of course is much longer than in the case of “traditional” maintenance contracts.

Performance Contracts essentially are fixed price contracts. But they often do contain a schedule of prices for emergency works. If sections of the road in question are in poor condition, the contract should include the rehabilitation of these sections as well. In this case rehabilitation works may be carried out in the "traditional" form, with official design and paid on the basis of unit prices as in the cases of Chile, Colombia and Uruguay. Or alternatively, final design of rehabilitation works can be left to the contractor and payment for these works can be included in the lump sum contract price. Argentina has taken this approach whereby 55% of the lump sum has been paid in three installments during the first year (rehabilitation period) and 45% in 48 equal monthly installments in the years two to five of the five-year contract period. To include initial rehabilitation works in the Performance

Contracts has two main advantages: first, it gives the contractor incentives to perform well on the rehabilitation works to avoid premature repairs which would increase maintenance cost, and second, it insures that maintenance will start immediately after the rehabilitation works have been finished.

Normally, the fixed monthly fees are adjusted in accordance with a pre-established formula to account for any possible inflation or deflation of prices. The adjustment formula used in the Performance Contract in New Zealand can be found under http://www.zietlow.com/docs/PSCM-NZ.htm).

Performance Contracts mainly are management contracts and traditional road construction or maintenance contractors often do not have the required qualifications necessary for this type of contract. Consulting firms with extensive know-how in managing other contractors and experiences in pavement management systems seem to be more suited for the job. In Virginia, for example, the Performance Contract is managed by a firm, which has been formed by two consulting firms. Most of the maintenance works are subcontracted, allowing for an efficient resource allocation (just on time principle). A joint venture of a road construction firm and a consultant might also work well. The evaluation criteria and weights that have been applied to award the Performance Contract in Washington D.C. are compiled in Figure 5.

Figure 5: Evaluation Criteria and Weights Applied for the Award of the Performance Contract of Washington D.C.

Technical	Experience, knowledge and understanding of issues relating to preservation and maintenance of the assets covered by this contract. Soundness of technical approach for meeting the performance measures for all of the assets referenced in this contract	20%
Staffing, Quality Control/Quality Assurance, Management	Staffing Plan	5%
	Management Plan	5%
	Quality Control/Quality Assurance Plan	5%
Past Performance	The extent to which the Prime Contractor's and subcontractors' past performance on similar asset preservation, maintenance, and management contracts demonstrates a likelihood of successfully performing all of the tasks set forth in this contract.	15%
Cost	The extent to which proposed costs are realistic and reflect the likely overall cost to the government over the term of the contract	50%

Performance monitoring is key to the success of this new way of contracting road maintenance. Appropriate control procedures as well as penalties for non-compliance have to be well defined in the contract documents. Procedures defined in various contracts, as well as experiences, vary.

In the case of road concessions in **Argentina** inspectors are inspecting the road and making random checks to verify compliance at least twice per month. Over time, inspectors become more experienced and familiar with trouble spots along the roads. Experience underlines the importance of having a well-documented inventory of the road

as well as daily records of activities undertaken by the contractor. This helps to understand the specific behavior of the roads and contributes to better preventive maintenance. Inspectors and personnel of the contractors went through a valuable phase of learning and adaptation to arrive at an effective control system. In Argentina a very important role is given to the active participation and control of the road user. Each toll station is keeping a complaints and suggestions book and users are encouraged to report incidents to the Road Administration. Extensive use of this mechanism has helped to improve road conditions and has revealed an increasing satisfaction of the road users with the new scheme. As for the CREAMA contracts performance monitoring and payment procedures are very similar to the ones in Chile.

In **Chile** there are four kinds of inspections: (i) monthly inspections cover 10% of the roads under contract. Selection of stretches of 1 km each is based on a random sample well defined in the contract; (ii) weekly inspections looking at 5% of the roads randomly selected; (iii) non-programmed inspections to respond to complaints by road users; and (iv) follow-up inspections to verify that appropriate action has been undertaken by the contractor to rectify non compliance. Payments to the contractor are based on the results of the monthly inspections. A percentage of compliance is being calculated based on a formula using the results of each individual performance standard as input data. Full payment will only be made on 100% compliance. During the first two years of the contract, compliance has been around 95%. Penalties are being applied if the contractor does not rectify established deficiencies within a certain time limit.

In order to enable the contractor to manage the contract properly and the road administration to monitor, it is vital that the contractor has a proper management and quality control system in place. The Argentinean, Chilean and Uruguayan contracts are especially specific in this respect. Part of the obligations of the contractor is to keep records of his inspections, quality control procedures and works undertaken. This is especially important to monitor and to make necessary adjust to the pilot projects as well as to gain experiences for further contracts. For example, due to the excellent contract monitoring system in place in Uruguay, the recently let contracts show significant improvements over the earlier contracts.

Since the contractor has taken over the responsibility of the quality control in his own interest, the road administration has been saving on costs for supervision and control of the contracts. Unfortunately, no study has been made until now to quantify the amount of these savings.

Experiences have shown that the road users can play a vital role in controlling the compliance of the contractor in regard to the visual performance standards like the existence of potholes, the state of the drainage system and the obstruction of the road way, as long as he or she knows to what standard the road should be maintained to. For this purpose the contractor has the obligation to put up signs along the road to clearly indicate the name and address of contractor in charge of the specific road as well as a telephone numbers of the contractor and the responsible road administration to be able to report claims.

In **Australia, New Zealand, and the United States** the management and quality control systems used by the contractors are even more sophisticated compared with the Performance Contracts in Latin American. The maintenance management system that is being used in the contracts in Virginia covers:

- Asset inventory and condition assessment (updated annually)
- Pavement management program
- Bridge management program

- Snow and ice control operations plan
- Safety management and traffic control plan
- Emergency response plan
- Hazardous materials communications plan
- Customer response plan
- Public information plan
- Implementation plan
- Annual work plan updated every 3 months
- Extensive reporting procedures

The monitoring of the performance of the contractors is done on a daily, monthly, and annual basis. For more details on how this is being done in the case of the contract in Washington D.C., see http://www.zietlow.com/docs/washdcap.pdf

Due to the poor state of same of the road networks in developing countries full or partial rehabilitation is often required to make the road "maintainable". As long as the rehabilitation does not surpass 50% of the contract value, it is recommended to include the rehabilitation in the performance contract and to make payments either on a unit price basis or to include them in the fixed monthly payments. Both methods are being used in Latin America. In cases where initial rehabilitation was substantial, the fixed monthly fee was higher during the period of initial rehabilitation.

7. Lessons Learned and Recommendations for Future Contracts

Most of the Performance Contracts have left the pilot project stage and have matured over the period of 6 to 8 years. In general the experiences have been very good, which is reflected in the fact that countries like Argentina or Uruguay are now managing and maintaining more than 50% of there national road network with these new kind of contracts. Mainly based on the experiences gained with the Performance Contracts in Latin America the following conclusions can be drawn.

- **Securing finance on a pluriannual basis is critical to success.** Normally, Performance Contracts have duration between 4 and 10 years. It is important to secure financing for the entire contract period before starting such a contract.

- **Each Performance Contract has to be tailored to each specific situation.** Performance Contracts are still in an early stage of development and differ widely from country to country and even within countries. Studying the experiences of existing Performance Contracts in several countries is recommended before embarking on this new type of contract.

- **Pilot schemes for contracting out road maintenance based on performance indicators should be carefully planned and implemented.** The complexity of the contracts, especially with regard to performance indicators, road surfaces and contract duration should be based on past experience in contracting out road maintenance, the ability of the road administration to prepare and monitor such contracts, and the qualifications of local contractors to manage this new type road maintenance contract. Wherever there is little experience with contracting out road maintenance, a gradual approach is recommended, starting with short-term contracts and simple performance indicators with regard to the control of potholes and cracks and the cleaning of the drainage system. Whenever roads are not in maintainable conditions, rehabilitation is necessary, either based on unit prices or included in the fixed monthly payments the contractor receives over the contract period.

- **Performance Contracts should be long enough to include at least one periodic maintenance application in order to maximize the potential benefits.** The longer the contract the greater is the incentive for the contractor to try-out and apply new technologies and to optimize resource allocation.

- **Well-qualified contractors and inspectors are key to the success of Performance Contracts.** Training programs which have been conducted for small-scale enterprises and inspectors in Uruguay and Honduras have shown good results. Equally, traditional contractors require training in modern management techniques and the application of new maintenance procedures and technologies.

- **Proper performance monitoring and strict application of penalties for non-compliance have proven to be critical to the success as well.** Wherever road administrations did not properly monitor the performance of the contractor or did not apply proper penalties for non-compliance, contractor's performance was deficient.

- **Performance indicators need to be developed further.** The development of performance indicators is still at its early stage. Until now each road administration has developed its own indicators by slightly modifying the ones they used before for in-house labor or contractors.

- **Performance Contracts might not result in cost savings immediately.** Until now only the contracts in Australia, New Zealand and the United States have reported substantial cost savings. As for the contracts in Latin America no comparable cost analysis has been undertaken. Nevertheless, some of the contracts have been awarded for lower prices than expected by the road administrations, which indicates possible cost savings. But contracts also might turn out to be more expensive than expected. Recently, the DNER of Brazil had to cancel a tender for Performance Contracts, as the prices offered were much higher than expected. This was mainly due to the high risks perceived by the bidders that the government might not honor its payment commitments. Therefore, a balanced approach towards the distribution of risks is recommended. The party that controls the risks should also take the risks.

The principal advantage of contracting out road maintenance based on performance indicators is its **potential** for reducing road maintenance costs and improving road conditions. Another important advantage of this new contracting scheme is that the users know exactly the road conditions they can expect and demand. Unfortunately, improper implementation of this scheme could backfire and produce adverse effects. It is to be expected that contracting out road maintenance based on performance standards will quickly spread all over the world and eventually will replace the traditional way of contracting out road maintenance based on unit prices.

Biography

Federal Highway Administration. 1999. Asset Preservation Plan for the District of Columbia National Highway System, Federal Highway Administration, U.S. Department of Transportation and District of Columbia Department of Public Works, November 1999. Document can be downloaded from http://www.zietlow.com/docs/washdcap.pdf

Frost, M. and C. Lithgow. 1996. Improving Quality and Cutting Cost through Performance Contracts – Australian Experience. Paper prepared for Road Management Training Seminar of the World Bank, December 17-18, 1996. Can be retrieved from http://www.zietlow.com/docs/frost.htm.

Lande, K. 1999. Privatized Highway Asset Management – Management of Subcontract Maintenance. Paper prepared for the Symposium on Innovative Financing of Transport Projects, Hanoi, September 29 – October 1, 1999. Paper can be retrieved from http://www.zietlow.com/docs/vms1_00a.htm

Transit New Zealand. 1998. Performance Specified Maintenance Contract PERFORMANCE SPECIFIED ROAD MAINTENANCE CONTRACT 001. Partial document can be downloaded from http://www.zietlow.com/docs/PSCM-NZ.htm

Transit New Zealand. 2002. State Highway Maintenance Contract Proforma Manual SM032. New Zealand, March 2002. The document can be downloaded from http://www.transit.govt.nz/technical_information/content_files/Amendment68_PDFFile.PDF

World Bank. 2002. Procurement of Performance-Based Management and Maintenance of Roads (Output-based Service Contracts). Sample Bidding Document. World Bank, Washington DC, February 2002. Paper can be downloaded from http://www.worldbank.org/transport/roads/c&m_docs/pmmr_final.doc

VDOT, 2000. Report on VDOT's Comprehensive Agreement for Interstate Asset Management Services, Richmond, Virginia, December 2000.

VMS Inc., 2001. Privatized Highway Asset Management, Presentation given at the 80th Annual Meeting of the Transport Research Board, Washington DC, January 8, 2001.

Zietlow, G. and A. Bull. 1999. Performance Specified Road Maintenance Contracts – The Road to the Future, The Latin American Perspective. Paper prepared for the PIARC XXIst World Road Congress, Kuala Lumpur, October 3-9, 1999. Paper can be retrieved from http://www.zietlow.com/docs/Psmce.htm

Zietlow, G. 2002. Cutting Costs and Improving Quality through Performance-Based Road Management and Maintenance Contracts - The Latin American and OECD Experiences. Paper prepared for the Senior Road Executive Courses on Innovations in Road Management, University of Birmingham, May 27–31, 2002. The paper can be retrieved from http://www.zietlow.com/docs/PBRMC2002.pdf

Zietlow, G. 2002. Using Micro-Enterprises to Create Local Contracting Capacity - The Latin American Experience in Road Maintenance -. Paper prepared for the Senior Road Executive Courses on Restructuring Road Management, University of Birmingham, 19-23 April 2004. The paper can be retrieved from http://www.zietlow.com/docs/Using Micro-Enterprises.pdf

Note: Additional documents on Performance-Based Road Management and Maintenance Contracts can be found on the Website:
http://www.zietlow.com/docs/engdocs.htm

Appendix: Examples of Best Practice

A. Uruguay

National Road network

In 1996 the Ministry of Public Works started a program to introduce performance-based contracts for the maintenance of the national road network of Uruguay. Basically, there were two types of contracts; one covered routine maintenance only and the other one included initial rehabilitation and periodic and routine maintenance.

The first type of contract was developed to give employees of the Ministry of Public Works an opportunity to form their own private enterprises and to reduce the Ministry's staff at the same time. To provide additional incentive the staff was given the opportunity to return to the ministry during the first year of the contract in case the system failed. None of the contracts failed and more people wanted to join the new systems than new contracts could absorb.

The second type was introduced as a pilot project and rapidly went beyond this stage as the systems was producing excellent results in a fairly short time-period. By January 2000 42% of the national road network was being maintained by performance based road maintenance contracts. Key to the success was careful planning and implementation of contracts. Due to legal restrictions contract duration is limited to 5 years.

City of Montevideo

Montevideo started the first performance based contract for 138km of its city roads in 1996 as well. Due to deficiencies parts of the road network required initial spot rehabilitation, which was paid for on a unit price basis. The 3-year contract allows for a 3-year extension, whereby the monthly fixed payments will be reduced by 40% during this extension period.

Performance standards, response times and penalties for non-compliance are defined for

- Pavements
- Shoulders
- Drainage systems

Since actual road conditions were substantially below the performance standards defined in the contract, the contractor was given between 3 and 12 months to upgrade the different assets to the required standards.

As the first contract turned out to be very successful, Montevideo went for another two contracts, whereby on contract includes gravel roads as well (see picture above).

B. Chad

In 2001 Chad started its first performance-based road management and maintenance contract covering 440 kilometers of unpaved roads with help of the Word Bank. The contract period is 4 years. The contractor is a French firm employing primarily local labor. An engineering firm from Cameroon does the supervision.

The contract includes:

- Explicitly the management and maintenance as well as the self-control of the contractor;
- Initial rehabilitation over a period of 21 months;
- Reconstruction of drainage structures and road signs;
- Emergency assistance for road users in case of accidents;
- Management of rain barriers and axle load control; and
- Emergency works as required.

The contractor is being paid a fixed monthly fee, except for emergency works that are paid on a unit price basis. The advance payment is 20% and the performance guarantee 10% of the contract value. The total cost per kilometer of road is US$ 5740 and includes the management, rehabilitation and maintenance.

Until now no major difficulties have been reported. The contract is considered to be a big success rendering the road in excellent conditions. Unfortunately, due to higher vehicle speeds the accidents rates have increased substantially.

Nevertheless, roads users appreciate that the road is always in good conditions and not only after specific works where completed. Especially important is that they can use the road in the rainy season, which was impossible before.

The Road Maintenance Fund of Chad is considering to expand the percentages of roads to be covered by performance-based road management and maintenance contracts.

C. Popayán, Colombia

In 1999 the municipality of Popayán in Colombia with technical assistance of the GTZ initiated performance-based road maintenance contracts for its 580 kilometers road network out of which 300 are in rural areas.

15 cooperatives have been formed and trained to maintain the urban and rural roads and 1 nursery cooperative using performance-based contracts. The management of the road network and the supervision of the cooperatives are being done by 6 small engineering firms.

The cooperative received a direct contract for one year and renewable for consecutives years if they perform well. Initially, they received an advance payment of 20% of contract value to allow for purchase of tools and safety devices and living expenses during the first month. The monthly payments are being received within the first 5 days of the months.

The cooperatives are being paid a fixed monthly fee of 85 US$ per kilometer, while the engineering firms get 50 US$ per kilometer and month. The fixed fee of the cooperatives is calculated on the basis of:

- The minimum wage
- Pension fund contributions
- Personal and third party insurance
- Food allowance
- Transportation allowance
- Allowance for tools, work clothes, and safety devices

The initial training of the road maintenance cooperatives covered subjects like:

- Characteristics of a micro-enterprise
- Problem solving techniques
- Efficient use of the human, physical, financial, and natural resources at hand
- Management of the micro-enterprise
- Road maintenance and road safety
- Experiences from other countries

The scheme is very successful and the cooperative members with their yellow uniform are highly visible in the streets of Popayán. They also managed to educate the people not to throw garbage on the roads or sidewalks, which is a common problem in urban areas. The nursery that primarily is formed by female members (see picture) is responsible to supply the other cooperatives with plants and trees to be planted alongside the roads.