

COMPARISON OF PERFORMANCE-BASED AND TRADITIONAL ROAD MAINTENANCE CONTRACTS

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***Summary:** The aim of this paper is to present the practical implementation of performance-based road maintenance contracts through a comparative analysis of the advantages and disadvantages between this approach and the traditional road maintenance contracting model. On the other hand, author will present key guidelines for proper implementation of performance-based contracts on winter and summer road maintenance, with the aim of reducing maintenance costs and increasing the level of service quality provided by contractors. Furthermore, this paper will outline the experience of the implementation of performance-based road maintenance contracts in developed countries, as well as a review the implementation of this type of contracts in the Republic of Serbia.*

***Keywords:** Roads, maintenance, performance, contracting*

1. INTRODUCTION

Currently, there is a global trend that road maintenance contracts are contracted with the private sector. The main reason for this is improved efficiency and potential time and costs savings. If there are qualified road maintenance contractors on the market, as well as adequate and concurrent bidding process, potential savings that can be made are between 20% and 50% in comparison to traditional road maintenance approach [1]. In the above context, three types of road maintenance contract have been pursued by road authorities across the world [2]:

1. Method based or conventional contracts with unit rates for work items and payments based on quantities of completed works;
2. Output and Performance Based Road Maintenance Contracts (OPBRMC) with performance levels defined for each different road network and maintenance contractor under the contract with fixed payments if performance levels are met, or payment reductions for non-compliance;
3. Mixed or hybrid OPBRMCs which contain elements of both contract types.

Most OPBRMCs worldwide are mixed or hybrid OPBRMCs, where the majority of works and services are performance based. Emergency, major rehabilitation and improvement works are often paid on the basis of unit prices and quantities of work completed. Some

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works OPBRMCs contain output-based work items such as specified improvement works or rehabilitation works, which may be described, for example, as a number of kilometers of a defined overlay per year, which are paid on a lump sum basis. There is no common and agreed terminology for OPBRMCs. Each country is using different denominations and they differ in the scope, method of payments, duration and management arrangements [2]. Introduction of the OPBRMC methodology implies launching a small-scale pilot project that would allow both the road maintenance entity and the contractors to adopt a different approach. Successful implementation of the pilot project requires an adequate strategy that would enable road maintenance entities to contract maintenance activities more successfully and get value for money [3].

In Republic of Serbia, the World Bank Project included implementations of two Pilot Contracts for OPBRMC for routine road maintenance on about 1200 km of road network in Macva and Kolubara District for 3 years + additional 2 years (from 2004 to 2008). In order to improve maintenance practices and increase the efficiency of the sector, Government of the Republic of Serbia requested assistance from the EU and the World Bank in mainstreaming OPBRMC in Serbia building on the earlier pilot contracts in Mačva and Kolubara where, on average, cost savings of 40% were achieved [4]. The World Bank has continued to support Government of the Republic of Serbia in the introduction of OPBRMC through the Road Rehabilitation and Safety Project in line with Ministry of Construction, Transport and Infrastructure plans. In addition, the EU provided financing for the preparation of OPBRMC for an additional 3000 kilometers of the national road network. As can be seen, there have been multiple efforts on the subject and this operation will build on the progress in maintenance management.

2. OPBRMC KEY PRINCIPLES AND CONCEPTS

Under the OPBRMC approach to road maintenance, the contractor assumes responsibility for managing the condition of the road assets to ensure that a pre-set level of performance is achieved. The road owner specifies what needs to be achieved rather than how to achieve it. This incentivizes the contractors to adopt measures that improve the condition of the road asset for the duration of the contract rather than ad-hoc repairs. In return for the delivery of an agreed level of performance, the contractor receives a schedule of payments. The level of complexity of an OPBRMC can range from "simple" to "comprehensive" depending on the number of assets and range of services included. A "simple" OPBRMC would cover a single service (e.g., only street light maintenance) and could be awarded for relatively short periods (several months or one year). A "comprehensive" OPBRMC would typically cover all road assets with the right-of-way and comprise the full range of services needed to manage and maintain the contracted road corridor. Such services would include routine maintenance, periodic maintenance and traffic accident assistance, etc. [5]. Additionally, the contractors receive flexibility in achieving their work target under OPBRMC. This flexibility can be enjoyed either by choosing the desired engineering design and drawing or by using innovative technology. Also, the OPBRMC approach provides a financial incentive for the contractor to focus on achieving the performance standards. It also incentivizes the contractor to be innovative and minimize waste because the payments are based on a set level of performance rather on the value of inputs used.

On balance, OPBRMC provides asset owners, asset managers and asset users with a better balance of challenges and benefits. The ancillary benefits include the following [4]:

1. greater expenditure certainty for the road agency;
2. better allocation of delivery risk as the contractor is now responsible for predicting tear and wear of the managed asset, selecting an appropriate design and maintenance scope to be deployed, scheduling of maintenance efforts and estimating of quantities;
3. ability to manage the road network with fewer staff;
4. reduction in contract administration due to reduced measurement of inputs.
5. better customer satisfaction with road service and conditions; and
6. stable and predictable multi-year financing of maintenance.

Introduction of OPBRMC offers the maintenance companies possibilities to improve their capacity by investing in new equipment and optimizing utilization, improving productivity and offering new opportunities and new working methods. Introduction of OPBRMC and the move to competitive outsourcing of maintenance should also lead to a more flexible operational framework enabling “just in-time” maintenance, carried out when needed, and easier introduction of modern work methods and procedures, with updated rules and regulations for road maintenance.

3. COMPARATIVE ANALYSIS OF OPBRMC AND TRADITIONAL ROAD MAINTANANCE CONTRACTING

The traditional system aims at executing planned quantity of activities and not the effect which planned activities within given scope could have on the final condition of the road. Application of the traditional model is faced with difficulties in terms of control of quality, time, and expenses. Moreover, according to papers analysed, the traditional method is frequently connected with a high level of political influence and corruption. In other words traditional methods of contract are prone to corruption because of the nature of their decision making processes [6], while OPBRMC has the potential to reduce the scale of the decision making process by promoting transparency and good governance in road maintenance works [7]. The contractor in OPBRMC is paid on an output basis (maintaining the road at a specified service standard) rather than on an input basis as occurring under Traditional Road Maintenance Contracting. This difference can be illustrated by a simple example. Under a traditional input-based contract the private contractor gets paid for each repaired pothole, whereas under an output-based contract the contractor gets paid for each length of road it maintains at the required condition [8]. In return for achieving this standard, the government will periodically pay a fixed amount to the contractor or allow the firm to collect user fees (e.g., toll fees). In comparison to the Traditional Road Maintenance Contracting, the seven beneficial areas of OPBRMC are: cost savings (see Figure 1), risk sharing, assurance of quality, availability of initial funding sources, achieving a sustainable road management system, increased flexibility and increased transparency. On average, the indirect costs to contractors are 21% lower in OPBRMC, since contractors can improve their internal business process with more efficient manpower, equipment and materials due to the long term nature of OPBRMC [9]. Also, the road authority gets the option for the possibility of long-term sustainability in the management system using OPBRMC. Moreover, due to the longevity of the

contract, staffs are able to understand the network and have enough time to implement initiatives based on this knowledge as well as understanding which areas of the network are under stress and how these areas are likely to react to extreme events [10]. This type of contract makes it necessary for the Contractor to have a good management capacity. In other words, the Contractor is entitled to independently define: what to do, where to do it, how to do it and when to do it. The role of the Road Administration and of the Employer is to enforce the contract by verifying compliance with the agreed Service Levels and with all applicable legislation and regulations [11].

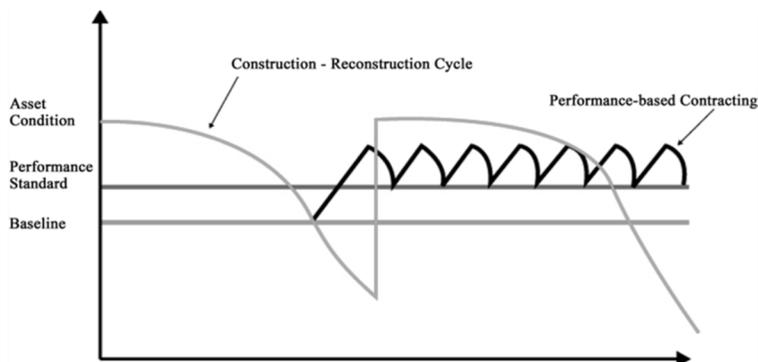


Figure 1. Difference in maintenance costs between OPBRMC and Traditional road maintenance contracting [2]

4. OPBRMC IMPLEMENTATION EXPERIENCES IN THE DEVELOPED AND DEVELOPING COUNTRIES

The application of the OPBRMC has a relatively short history. OPBRMC application began in the late 1980s and early 1990s. The first contracts of this type were realized in 1988 in Canada, after which a similar practice began to spread to other countries around the world. Two years later, Argentina contracted almost half of the state's travel routes using the OPBRMC, including periodic maintenance and rehabilitation, with a system of contractual penalties in case of non-fulfillment of contractual obligations by the contractor. In developed countries the use of the OPBRMC has been largely initiated by the state road agencies. Unlike in developed countries, which have significant financial resources which are necessary to introducing innovations into inert systems, an initiative to start implementing OPBRMC in developing countries is usually driven by international financial institutions such as World Bank, European Investment Bank, European Bank for Reconstruction and Development, various funds, bilateral development programs, etc. Complexity and duration of OPBRMC is conditioned with the level of development of road infrastructure in the country where such a contracting model is applied, so the complexity of contracts and their duration varies from country to country. Overview of contract duration and complexity of some of them are shown in Figure 2.

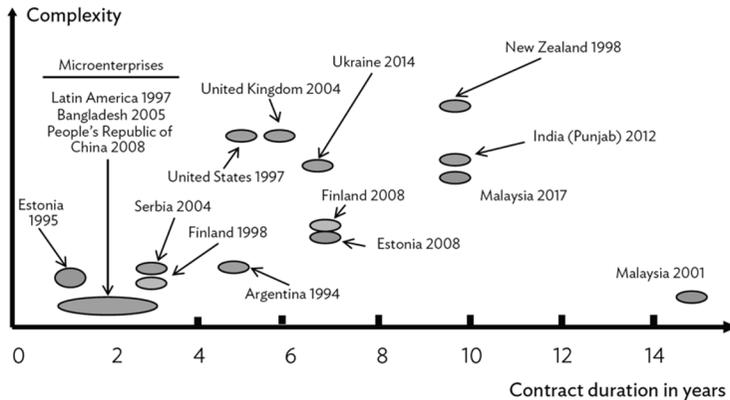


Figure 2. Complexity and Duration of Selected OPBRMCs [2]

During the 1990s, a large number of developing countries, such as such as Argentina (1990), Uruguay (1996), Chile (1997), Brazil (1998), Chad, Peru, and Guatemala, Republic of Serbia, South Africa, Zambia, Chad and the Philippines has also started its first pilot projects on the implementation of OPBRMCs. At the same time, the implementation of these agreements began in both Australia and New Zealand, as well as in Denmark, Estonia, Finland, the United States, while in most other countries the implementation of OPBRMC began in first decade of the 2000s. Although OPBRMC has been successful in the developed countries, it has been observed that the implementation of OPBRMC becomes challenging for developing countries [12]. To date, OPBRMC has almost completely replaced the traditional contracting model in Canada, Argentina and Australia, mainly due the savings chieived, which range between 15% and 30%, while e.g. in Australia, these savings go up to 40% [13].

Table 1. Savings of OPBRMCs against Conventional Unit Price Contracts [2]

Country	Reported Savings against Conventional Unit Price Contracts
Australia	10%-40%
Brazil	15%-35%
Canada	About 20%
Estonia	20%-40%
Finland	18%
The Netherlands	30%-40%
New Zeland	15%-38%
United States	10%-15%

5. OPBRMC IMPLEMENTATION IN THE REPUBLIC OF SERBIA

Inadequate performance by the public sector and the limited use of modern technologies and methods in Serbia have adversely impacted the road maintenance management and contributed to the deterioration in its quality. In 2004, Republic of Serbia started two hybrid type pilot OPBRMCs (in Macva and Kolubara region) which covered routine and

winter maintenance as well as routine bridge maintenance. Macva (660 km of regional roads) with its geographical position is a characteristic representative of the road network for regular road maintenance, while the Kolubara region (517 km of regional roads) is a characteristic representative for winter road maintenance works (mountainous terrain) [11]. At that time, many routine maintenance works were still paid on a unit price basis. Both contracts had 3-year terms, with a 2-year extension, if the contractor performed well and agreed to continue. Unfortunately, both pilot projects were discontinued after 3 years and 7 months due to lack of funds [2]. Nevertheless, both OPBRMCs were considered successful, since they significantly improved road conditions, reduced routine maintenance cost by an average of 49%, and reduced winter maintenance by an average of 52% compared with the central region of Serbia during the same period (see Figure 3).

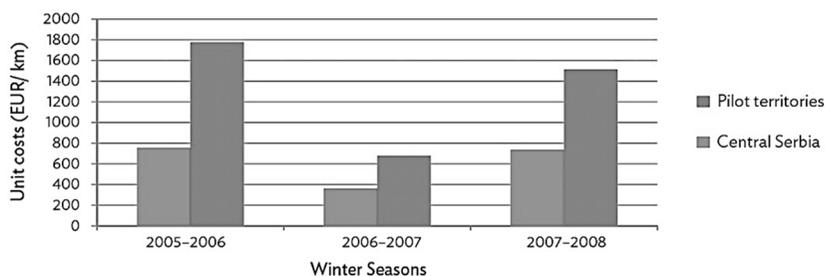


Figure 3. Difference in maintenance costs between OPBRMC and Traditional road maintenance contracting in the Republic of Serbia during Pilot project [2]

Based on this previous success, the World Bank has continued to support Government of the Republic of Serbia in the introduction of OPBRMC through the Road Rehabilitation and Safety Project in line with Ministry of Construction, Transport and Infrastructure plans. In addition, the EU provided financing for the preparation of OPBRMC for an additional 3000 kilometers of the national road network. This transition from traditional maintenance to OPBRMC brought better planning, contracting and fiscal discipline in the Public Enterprise Roads of Serbia, with following key program results indicators [4]:

1. Enhanced motorist satisfaction through better pavement condition.
2. Implementation of the Service Level Agreement between the Ministry of Construction, Transportation and Infrastructure and the Public Enterprise Roads of Serbia defining agreed maintenance service levels and the commensurate financing to ensure financial sustainability of the maintenance programs.

The aim of the new round of OPBRMC operation in Republic of Serbia was to ensure system preservation and substantial implementation of modern maintenance approaches. Program started with 1000 km in the first year following the traditional (existing) contractual approaches to maintenance while ensuring that certain performance standards were observed. In the second year, the program continued with additional 2000 km following an enhanced approach to maintenance contracts (traditional maintenance with performance standards). The program culminated in 3rd year with the beginning of the implementation of 3 year contracts covering 5000 km exclusively using OPBRMC. This approach ensured gradual building-up of the required institutional capacity driven by key principles such as efficiency, accountability, and transparency. This helped Public Enterprise Roads of Serbia evolve as the sector evolves, in order to manage road assets under a results oriented environment focused on client satisfaction. [4]

6. CONCLUSION

In order to maintain the road infrastructure in a quality and economical way, it is necessary, in addition to use of modern technologies of construction works and information technologies, to also use modern contracting systems for this type of services. Since the late nineties of the last century the implementation of OPBRMCs experienced a significant growth trend in comparison to the traditional road maintenance contracting and found its own application on the different continents, both in developed and developing countries. The aim of OPBRMC is to transfer responsibility for achieving road maintenance quality standards to the legal entity that is in the best position to manage technical and organizational challenges. The result of transferring aforementioned responsibility to road maintenance contractor should be more efficient and effective management of the road maintenance process. Enhanced motorist satisfaction through better pavement condition and ensuring that the physical condition of the roads meet the quality requirements over a longer period of time is the ultimate goal of the OPBRMC. Under the OPBRMC approach to road maintenance, the contractor assumes responsibility for managing the condition of the road assets, typically for 3-5 years, to ensure that a pre-set level of performance is achieved. The OPBRMC approach shifts the planning and delivery risks from the road owner to the maintenance contractor. The road owner specifies what needs to be achieved rather than how to achieve it. This incentivizes the contractors to adopt measures that improve the condition of the road asset for the duration of the contract rather than ad-hoc repairs. In return for the delivery of an agreed level of performance, the contractor receives a schedule of payments. The OPBRMC approach provides a financial incentive for the contractor to focus on achieving the performance standards. It also incentivizes the contractor to be innovative and minimize waste because the payments are based on a set level of performance indicators rather on the value of inputs used. This approach and the longer-term contract duration will maximize private sector competition and introduce professional management practices, while providing a better customer experience to the travelling public. When it comes to the implementation of such a model of maintenance in the Republic of Serbia, we come to conclusion that after the initial problems with adapting to the new concept of maintenance roads in the first year of implementation, the pilot project was successfully completed. The OPBRMC concept still has huge potential and for future researchers in order to find alternative ways of reducing maintenance costs, increasing the quality of works and reducing the chance of corruption in developing countries.

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ПОРЕЂЕЊЕ УГОВОРА ЗАСНОВАНИХ НА УЧИНКУ И ТРАДИЦИОНАЛНОГ ОДРЖАВАЊА ПУТЕВА

Резиме: Циљ овог рада јесте приказ практичне имплементације уговора за одржавање путева заснованих на учинку кроз компаративну анализу предности и недостатака у односу на традиционални модел уговарања одржавања путева. Са друге стране, аутор ће дати кључне смернице за правилну имплементацију уговора заснованих на учинку на зимско и летње одржавање путева, а у циљу смањења трошкова одржавања и повећања нивоа квалитета услуге од стране извођача радова. Додатно у овом раду биће приказана и искуства на примени уговора за одржавање путева заснованих на учинку у развијеним земљама, као и осврт на примену ове врсте уговора у Републици Србији.

Кључне речи: Путеви, одржавање, учинак, уговарање