A Case for Performance-Based Road Maintenance in Nigeria

A Paper Presented at the Technical Evening of the Nigerian Society of Engineers,
Port Harcourt Branch

By

Engr. Alozia E. Okezie MNSE MNICE

29 August, 2013
About the Author

Principal Consultant/CEO,
Indisys Nigeria Limited
(Civil/Structural Engineering Consultants)
Email: contact@indisys-ng.com

(Formerly Contracts Manager, Monier Construction Co. (Nig.) Limited)
1. Preamble

- Generally many road agencies around the world are facing difficulties controlling quality, cost and time in maintenance works using traditional methods of contracting.
- Privatization of maintenance works is now considered a cost-effective alternative.
- This relatively new approach involving the private sector in roads maintenance takes the form of Performance-Based Maintenance Contract (PBMC).
- PBMC has been deployed rapidly in the road sector in the past decade.
- Substantial success records have been reported in many developed and developing countries during this period.
2. Overview of Road Sector in Nigeria

- Nigeria has the largest road network in West Africa and the second largest in Sub-Saharan Africa which is generally managed by government agencies as a social service.
- Recent estimate puts the total length of the network at 200,000Km.
- The ownership structure is Federal (17%); States (16%); LGAs (67%), as shown in Fig. 1.
- Fig. 2 shows that 65,000Km of the roads are paved with bituminous materials while the rest is unpaved.
- Many of the roads are either not maintained or are poorly maintained.
- Only 27% of Federal roads are reported to be in good condition.
- Cost to the economy is huge as road transport accounts for 95% of passenger and freight movement in the country with Federal roads accounting for 80% of national vehicular traffic.
- Annual loss to the economy is estimated in the region of ₦175b (₦75b due to reduction in asset value; ₦88b due to increased vehicle operating cost; ₦12b due to increased turn around and increased travel time).
➢ To address the systemic failure the Federal Roads Maintenance Agency (FERMA) was created in 2002 with the responsibility to manage and maintain Federal roads

➢ At the State level maintenance contracts are let by the Ministries of Works (in some cases ad-hoc agencies)

➢ States have in some cases taken up maintenance of LGA roads due to weak governance at that level

➢ Both FERMA and State Agencies rely on traditional methods in contracting out road maintenance works

➢ This traditional contracting approach has generally failed to deliver road-user satisfaction and reduce maintenance cost

➢ Hence road agencies in many countries are adopting performance-based contract in roads maintenance as an alternative
Fig. 1 Ownership Structure of the Road Network in Nigeria

Fig. 2 Proportion of the Road Network Paved with Bituminous Materials

3. What is Traditional Method of Contracting in Road Maintenance Works

- Also referred to as method-based contracting
- Unit rate or work-order oriented
- Road Agency specifies methods, materials, and technologies to be used
- Payment is made at an agreed unit rate based on quantity of work done
4. Disadvantages of Traditional Method of Contracting in Road Maintenance Works

- Depends on annual budgetary provisions - (long budgeting process, dwindling resources, competing needs, monetary control, whims and caprices of Parliament)
- Build up of maintenance backlog
- Prone to corruption due to the inherent decision-making processes
- Encourages large bureaucracy
- Discourages innovation by contractor
- Not amenable to outsourcing or privatization
- Road Agency bears responsibility for failure
5. What is Performance-Based Maintenance Contract (PBMC)?

- Also referred to as output-based maintenance contract
- Client only specifies performance indicators, performance targets and response times to be met by the contractor
- Contractor determines the best methods, materials and technologies to be used to meet or exceed the performance indicators
- Payment made for management and maintenance of road assets directly linked to the contractor meeting or exceeding clearly defined minimum performance indicators
- Scope may be “simple” to cover individual asset such as street light maintenance (usually for several months to one year)
- Or “comprehensive” to cover all road assets within ROW, involving routine and periodic maintenance (usually for 3 to 10 years or more)
5.1 Why Performance-Based Maintenance Contract (PBMC)?

- Saves cost
- Greater predictability of expenditure by road agency
- Stable multi-year maintenance financing
- Ability to manage and maintain road network with fewer road agency staff
- Better road-user satisfaction with road service and condition
- Achieving sustainable road management system
5.2 How does it Save Cost?

- Inherent incentive for contractor to innovate and increase productivity
- Fewer Road Agency staff required to administer and maintain road network, hence lower overheads
- Greater flexibility to reward performance and sanction non-performers
- Variation orders are minimized
- Risk of cost over-runs transferred to contractor
- Cost savings in the range 10 - 40% over traditional methods have been reported in developed countries
5.3 Countries that have implemented Performance-Based Maintenance Contract (PBMC)

Successfully applied in the following countries:
- Canada - British Caledonia (1988), later Ontario and Alberta
- Australia - Sydney (1995), later New South Wales, Tasmania, Southern & Western Australia
- New Zealand (1998)
- UK, Finland, Sweden, Netherlands, Norway, France, Estonia, Serbia & Montenegro in Europe
- Argentina, Brazil, Colombia, Chile, Ecuador, Guatemala, Mexico, Peru in Latin America
- South Africa, Zambia, Chad in Africa
- Philippines, Thailand and Vietnam in Asia
## 5.4 Example of Performance Indicators Used in Different PBMCs in Latin America

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Component</th>
<th>Performance Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement</td>
<td>Potholes</td>
<td>No potholes</td>
</tr>
<tr>
<td></td>
<td>Roughness (asphalt)</td>
<td>IRI&lt;2.0 (Argentina); IRI&lt;1.8 (Uruguay)</td>
</tr>
<tr>
<td></td>
<td>Roughness (bituminous Treatment)</td>
<td>IRI&lt;2.0 (Argentina); IRI&lt;3.4 (Uruguay)</td>
</tr>
<tr>
<td></td>
<td>Rutting</td>
<td>&lt;12mm (Argentina); &lt;10mm (Uruguay, Chile)</td>
</tr>
<tr>
<td></td>
<td>Cracks</td>
<td>Sealed</td>
</tr>
<tr>
<td>Gravel Surfaces</td>
<td>Potholes</td>
<td>No potholes</td>
</tr>
<tr>
<td></td>
<td>Roughness</td>
<td>IRI&lt;6 (Uruguay); IRI&lt;11 (Chile)</td>
</tr>
<tr>
<td></td>
<td>Thickness of gravel layer</td>
<td>10cm (Chile, Uruguay)</td>
</tr>
<tr>
<td>Shoulders</td>
<td>Potholes</td>
<td>No potholes</td>
</tr>
<tr>
<td></td>
<td>Cracks</td>
<td>Sealed</td>
</tr>
<tr>
<td></td>
<td>Joints with pavement</td>
<td>Vertical alignment &lt; 1cm (Chile, Uruguay), sealed (Perú)</td>
</tr>
<tr>
<td>Asset Class</td>
<td>Component</td>
<td>Performance Indicator</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Drainage system</td>
<td>Obstructions</td>
<td>No obstructions. Should allow for free flow of water (Chile, Uruguay)</td>
</tr>
<tr>
<td></td>
<td>Structures</td>
<td>Without damages and deformations (Chile, Peru)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road signs</td>
<td>Complete and clean (Argentina, Chile, Peru)</td>
</tr>
<tr>
<td></td>
<td>Road markings</td>
<td>Complete and visible (Argentina, Chile, Peru)</td>
</tr>
<tr>
<td></td>
<td>Reflectivity of road</td>
<td>160 mcd/lx/sqm. (Argentina); 70 mcd/lx/sqm. (Uruguay)</td>
</tr>
<tr>
<td></td>
<td>markings</td>
<td></td>
</tr>
<tr>
<td>Right of way</td>
<td>Vegetation</td>
<td>&lt; 15cm height (Argentina, Uruguay)</td>
</tr>
<tr>
<td></td>
<td>Foreign elements</td>
<td>No foreign elements allowed</td>
</tr>
</tbody>
</table>

In the Performance Contracts in Latin America all Performance Indicators at to be met fully
(Performance Target = 100% for every indicator)

### 5.5 Example of Performance Indicators of the Performance Contract let in Sydney, Australia

<table>
<thead>
<tr>
<th>Asset</th>
<th>Outcome</th>
<th>Performance Target (% of Asset)</th>
<th>Performance Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross Pipes &lt; 36 ft sq)</td>
<td>Structurally sound</td>
<td>95</td>
<td>&lt; 10% deteriorated barrel &lt; 25% spalled no obstruction to flow of water</td>
</tr>
<tr>
<td></td>
<td>Open drains</td>
<td></td>
<td>&gt; 90% diameter open Joints intact End protection intact</td>
</tr>
<tr>
<td></td>
<td>Joints intact</td>
<td></td>
<td>No dip in road over pipe indicating structural problems</td>
</tr>
<tr>
<td></td>
<td>Adequate capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paved</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ditches</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aligned</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structurally sound</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clean</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smooth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safe</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sidewalks and ramps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smooth</td>
<td>90</td>
<td>No settlement &gt; ½” No unsealed cracks &gt; ¼” &lt; 25% spalled</td>
</tr>
<tr>
<td></td>
<td>Safe</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sound</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Australia, New Zealand and US, Performance Targets are allowed to be less than 100%

*Source: Zietlow, G. (2004)*
### 5.6 Example of Contract Standards and Response Times used in New Zealand

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

5.7 Lessons from Other Countries

Lessons from mostly Latin American countries include

- Funding security throughout contract duration (sometimes up to 10 years) critical to success
- Each PBMC should be customized to suit specific situations
- Where there is inadequate experience, gradual approach is recommended starting with short term contracts and simple performance indicators such as pot holes control, patching and drainage cleaning
- Well qualified contractors and inspectors are key to success. Traditional contractors would require training in modern management and maintenance techniques to adapt to the relatively new PBMC
- Duration should be long enough as an incentive to allow contractor innovate and optimize potential benefits
- Proper performance monitoring and strict application of penalties for non-performance is also critical to success of PBMC
- Performance indicators need to be further developed from the present rudimentary level
- Cost-savings may not be immediate
5.8 Key Issues to Consider in Introducing Performance-Based Maintenance Contract (PBMC)

- Road Agency to decide the type of road and duration of contract (Simple or Comprehensive)
- Define Performance criteria - to reflect road user expectations
- Consider starting on a pilot scale to enable road authority and contractor gain requisite experience
- Clearly identify risk exposures to the parties at the tendering stage
- Performance monitoring:
  - Level of Service Effectiveness - extent of compliance with performance criteria and performance targets in the contract
  - Timeliness of Response - evaluates response time of contractor to service requests
  - Safety Procedures - evaluates adherence to safety program to minimize exposure of road users and workers to risk of accidents
  - Quality of Service - assesses road user perceptions with respect to condition of assets and contractor performance
  - Cost Efficiency - assesses cost savings, if any, accruing to government as a result of engaging contractor on PBMC
Employee Issues -
  o road authority to plan for staff who will lose jobs
  o consider retaining enough staff to preserve experience base
  o Private operator or contractor to consider absorbing existing employees of road agency for the benefit of retaining experienced workforce

Payment and Termination of Contract-
  o Fixed fee to cover basic facility operating cost, any maintenance and major upgrades
  o variable fee tied to performance against a basket of outcome measures
  o Escalating scale of specific sanctions culminating in termination for non-compliance, non-performance or general breach of contract
5.9 Special Issues in Developing Countries

- Government commitment - governments are more interested in constructing new roads than in maintaining existing ones for political gains
- Political interference in selection of contractors
- Poor supervision by road agency due to corruption
- Secure funding independent of foreign aid or loans
- Challenges in estimation of the cost of PBMC due to lack of existing data base on roads
6. Requisite Reforms in Nigerian Road Sector To Implement PBMC

To successfully implement and take advantage of PBMC in the Nigerian road sector, the following key reforms are necessary:

- **Creation of Road Authority**
  - Independent of the Ministry of Works (FERMA does not meet this requirement)
  - Private sector representation on the board
  - Responsible for contracting out public works and road network management

- **Creation of a Roads Fund**
  - Ring-fenced from general government budget
  - Administered by an autonomous board
  - Funded from road-user charges and realistic fuel levy
6.1 Sub-Saharan African Transport Policy Program (SSATP) Criteria for Roads Fund

Well designed Roads Fund is expected to meet the following criteria:

- Clear legal foundation
- Separation of functions
- Application of road user charges
- Direct transfer of funds
- Representation of road users on the board
- Clear revenue allocation rules
- Independent auditing of accounts
7. Conclusion

Implementation of PBMC in the roads sector in Nigeria has the potential to:

- Positively affect economic activity due to improved road conditions
- Save cost which can be channeled to the expansion of the road network
- Enthrone transparency in the management and maintenance of the road network
- Increase road-user satisfaction with road service and condition

It is however necessary to:

- Implement requisite road sector reforms (creation of a Roads Fund and a Roads Authority)
- States and LGAs also need to carry out similar reforms as part owners of the national road network
- Learn from the experience of other countries that have implemented PBMC
Bibliography


7. Tirluka, S. (2011), Performance Based Contracts - Case Study of Road Sector


THANK YOU

*Download presentation at www.nseph.org*