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Performance-Based Road Management and Maintenance Contracts – Worldwide Experiences

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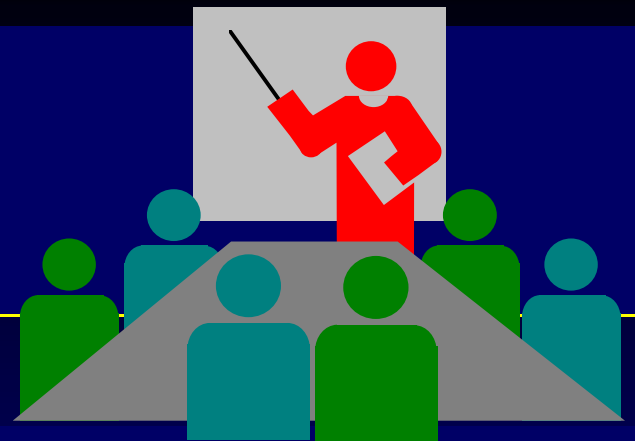
<http://www.performance-based-road-contracts.com>

Overview of Presentation (1)



- **Introduction**
- **Benefits and disadvantages of PMMR**
- **Performance standards and response times**
- **Risks**
- **Performance monitoring**
- **Payments and incentive systems**

Overview of Presentation (2)



- **Data management and ownership**
- **Customer perception and community involvement**
- **Tender design and evaluation**
- **Changes required by the client and consulting and contracting industry**
- **Implementation experiences and strategy**
- **Lessons learned**

Importance of Timely Maintenance



- When roads are in **poor** condition every \$ “saved” in road conservation will cost:
 - \$ 3 to road users in additional vehicle operating costs and
 - \$ 2 to the road administration (or the tax payer) in reconstruction and rehabilitation costs.

Contracting Out Road Maintenance Can Save Money

- Routine and periodic road maintenance done by in-house labor is being replaced more and more by contracts with the private sector worldwide.
- Studies made by the World Bank in the 1980's revealed that contracting out road maintenance to the private sector can reduce maintenance cost by between **30% and 50%**.

Type of Contracts

- Unit price contract (admeasured)
 - Unit rates for work items
 - Payments are based on quantity of completed work
- Lump sum contract
 - Definition of total work
 - Payment based on single price for total work
- Performance based contract
 - Performance Standards or Service Quality Criteria
 - Fixed monthly payments if performance standards are complied with
- Hybrid contract
 - Mixture of performance contract and unit price contract

Performance-Based Management and Maintenance of Roads (PMMR)

- **Performance Standards** define the minimum conditions of road, bridge and traffic assets as well as the management and operation of the assets during the entire contract period, leaving it to the contractor as to how to achieve them.
- **The contractor is free to decide**
 - What to do
 - When to do
 - How to do
 - Where to do
 - To do the physical works himself or subcontract (with certain restrictions)

as long as he meets the performance standards during the contract period

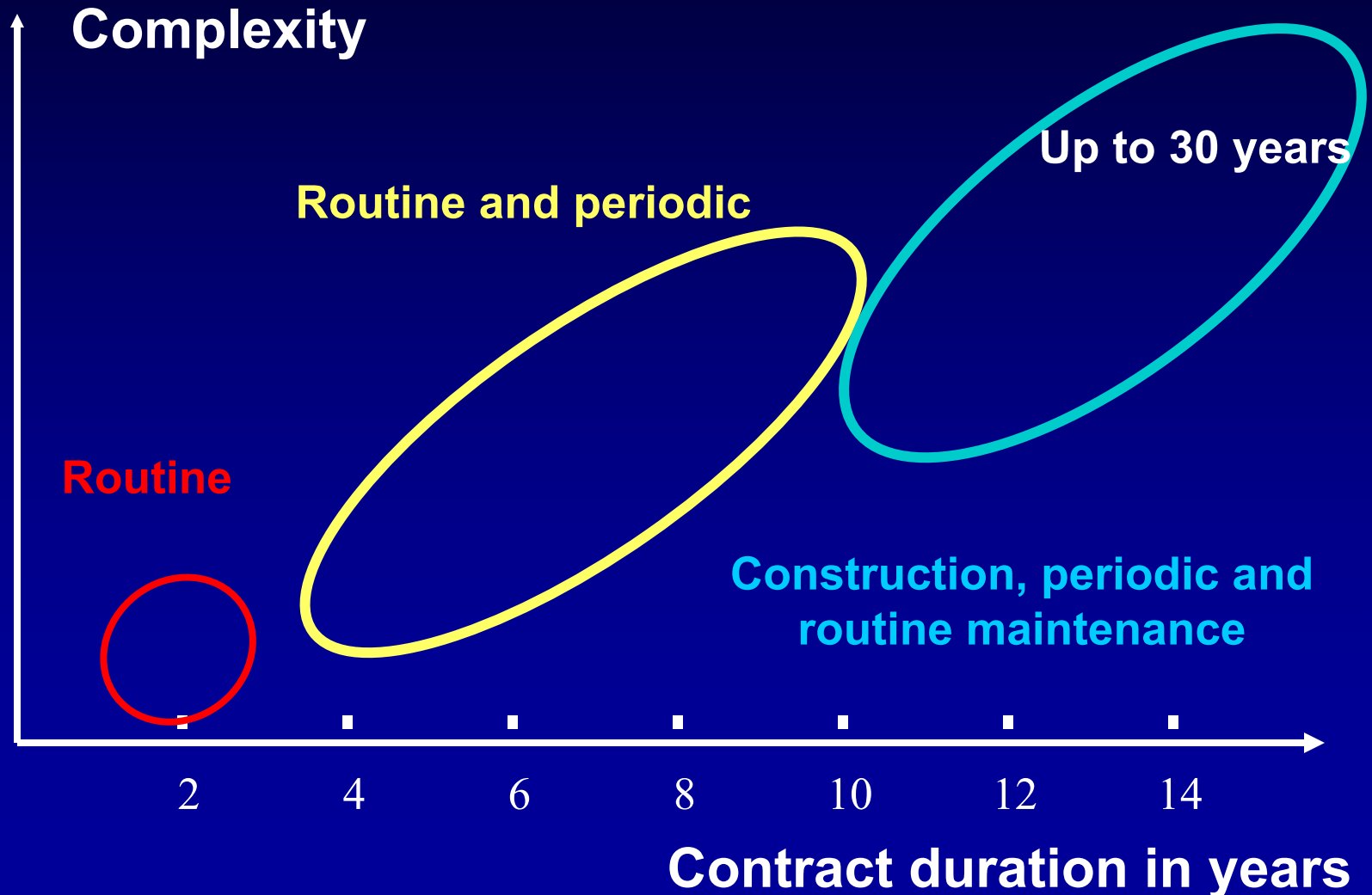
Performance-Based Management and Maintenance of Roads (PMMR) cont.

- **Lump sum payments** are made periodically and might be adjusted in accordance with the change of certain factors, like inflation or traffic volume.
- **Major emergency, rehabilitation and improvement works** might be paid based on unit prices for works agreed case by case.

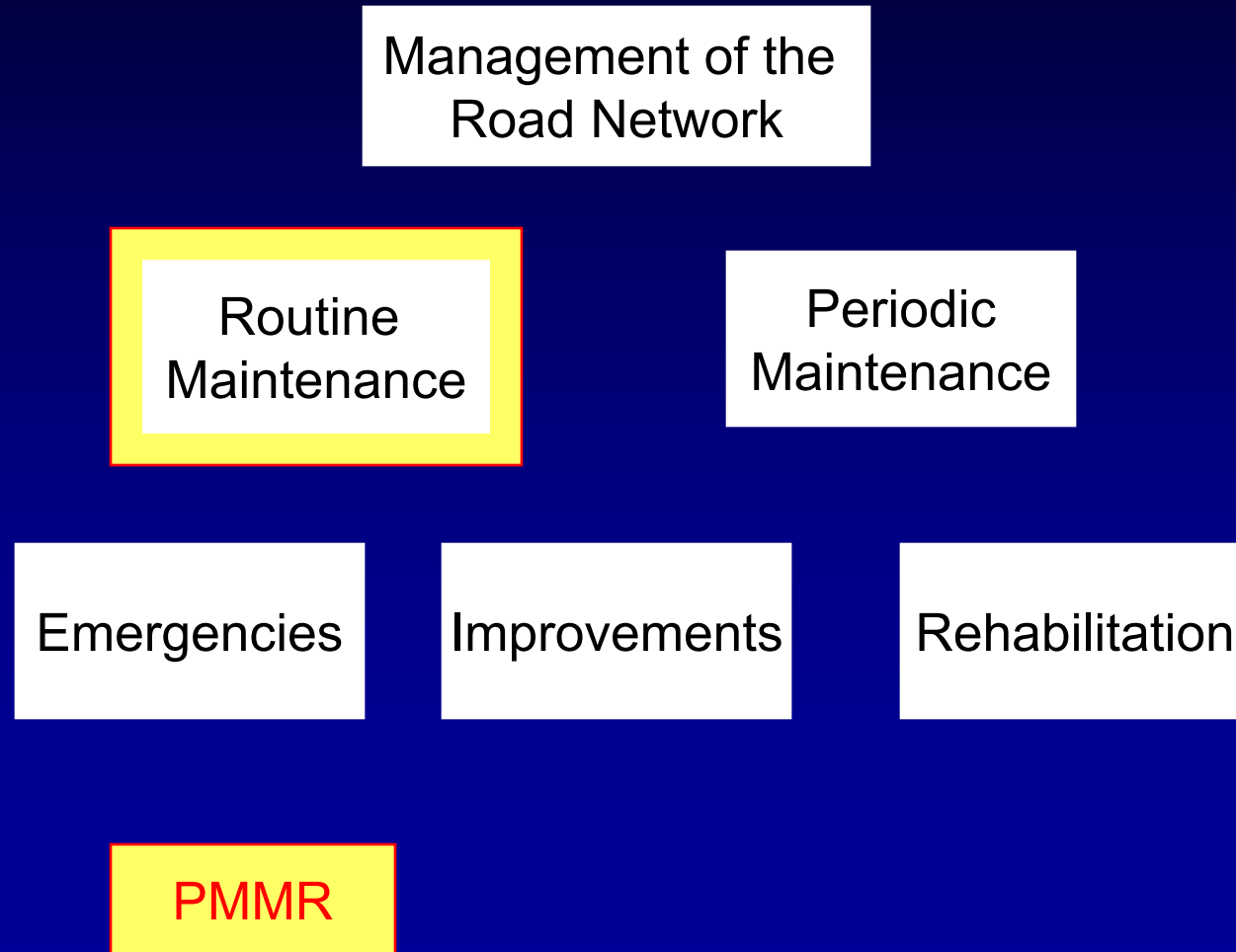
Performance-Based Management and Maintenance of Roads (PMMR) cont.

- **Deductions or penalties** are being made for non-compliance with terms and conditions of contract, especially with respect to the service level criteria.
- **Duration** of contracts should at least include one periodic maintenance cycle (4-5 years for gravel roads and 8-10 years for bituminous roads). Pure routine maintenance contracts can be 1-2 years.

Performance-Based Management and Maintenance of Roads



Scope of Services of PMMR (1)



Scope of Services of PMMR (2)

Management of the
Road Network

Routine
Maintenance

Periodic
Maintenance

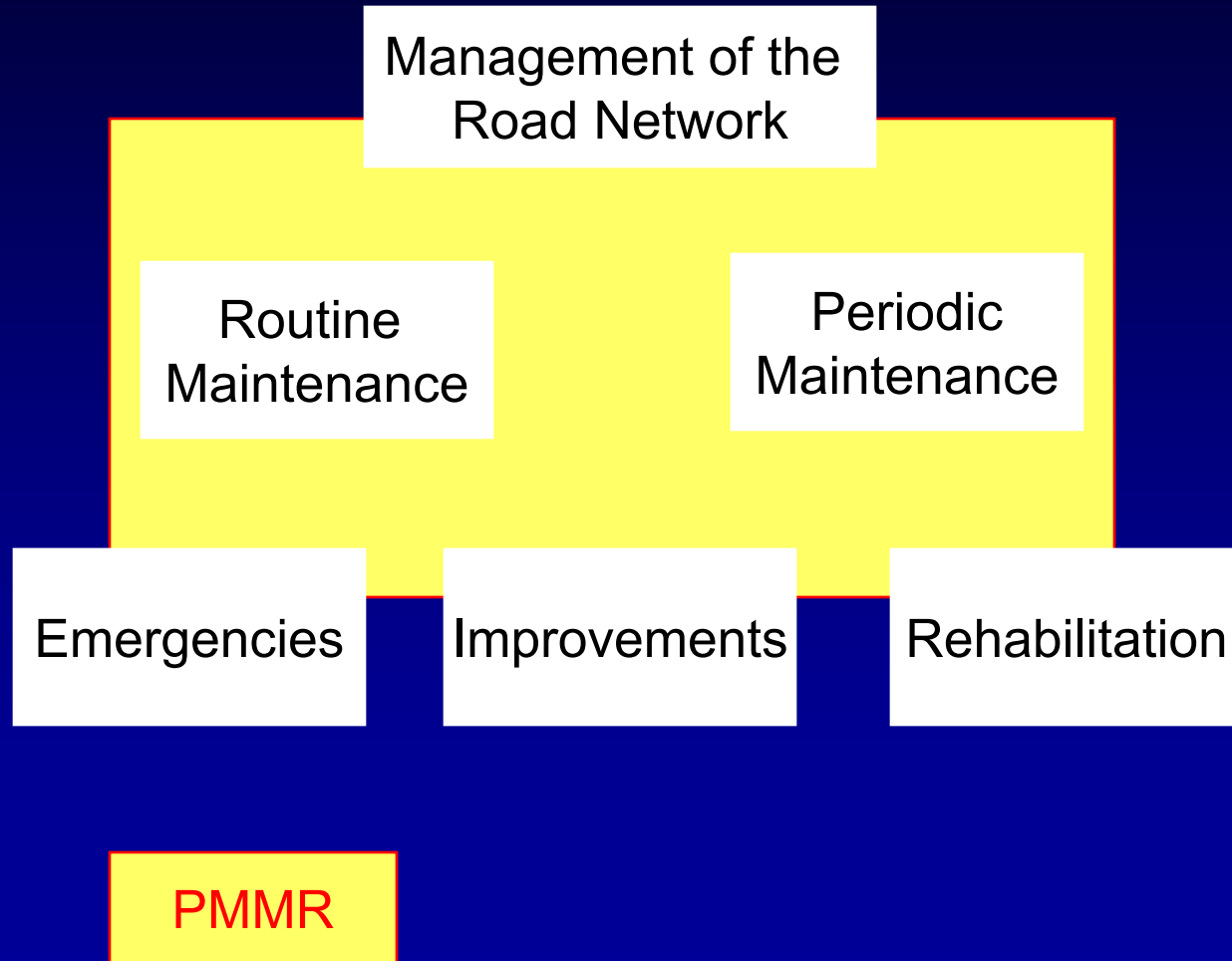
Emergencies

Improvements

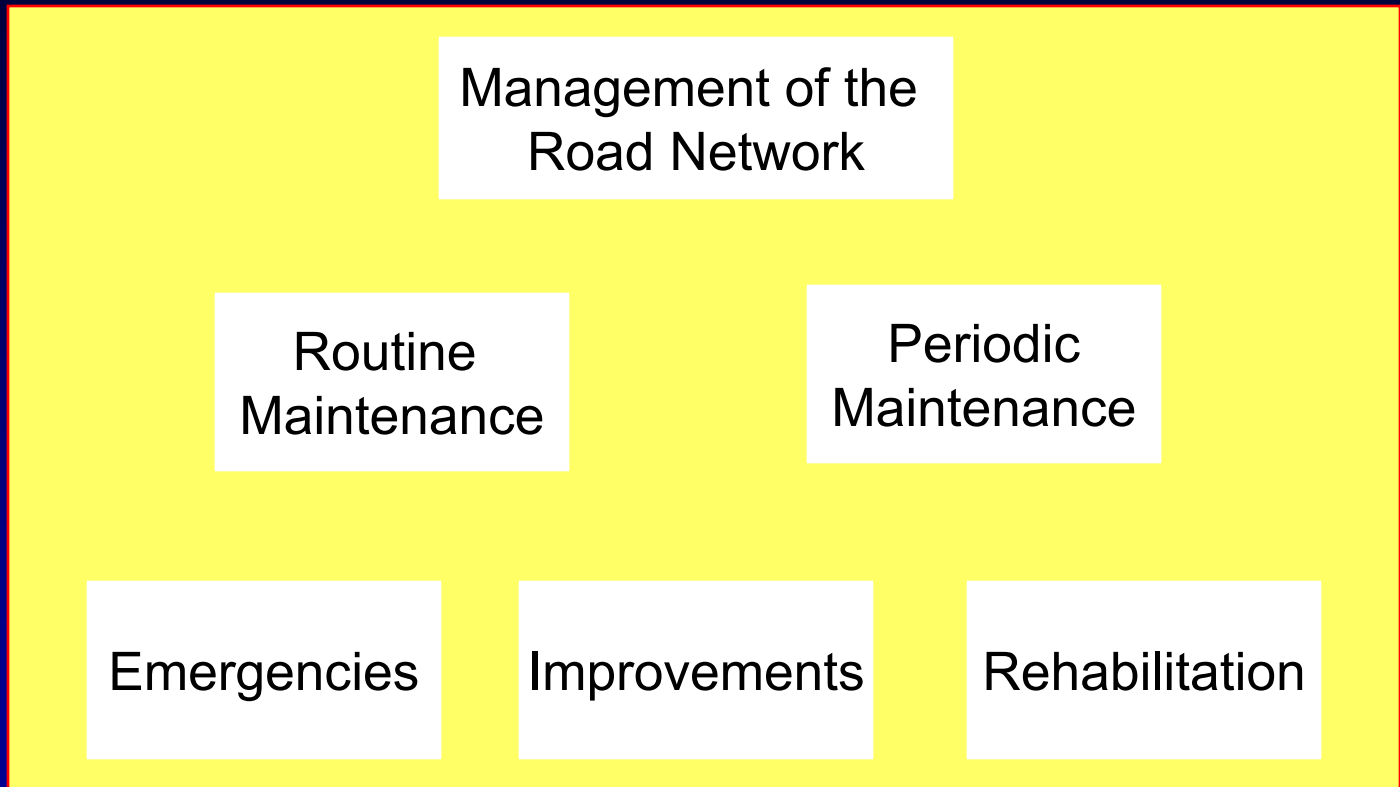
Rehabilitation

PMMR

Scope of Services of PMMR (3)

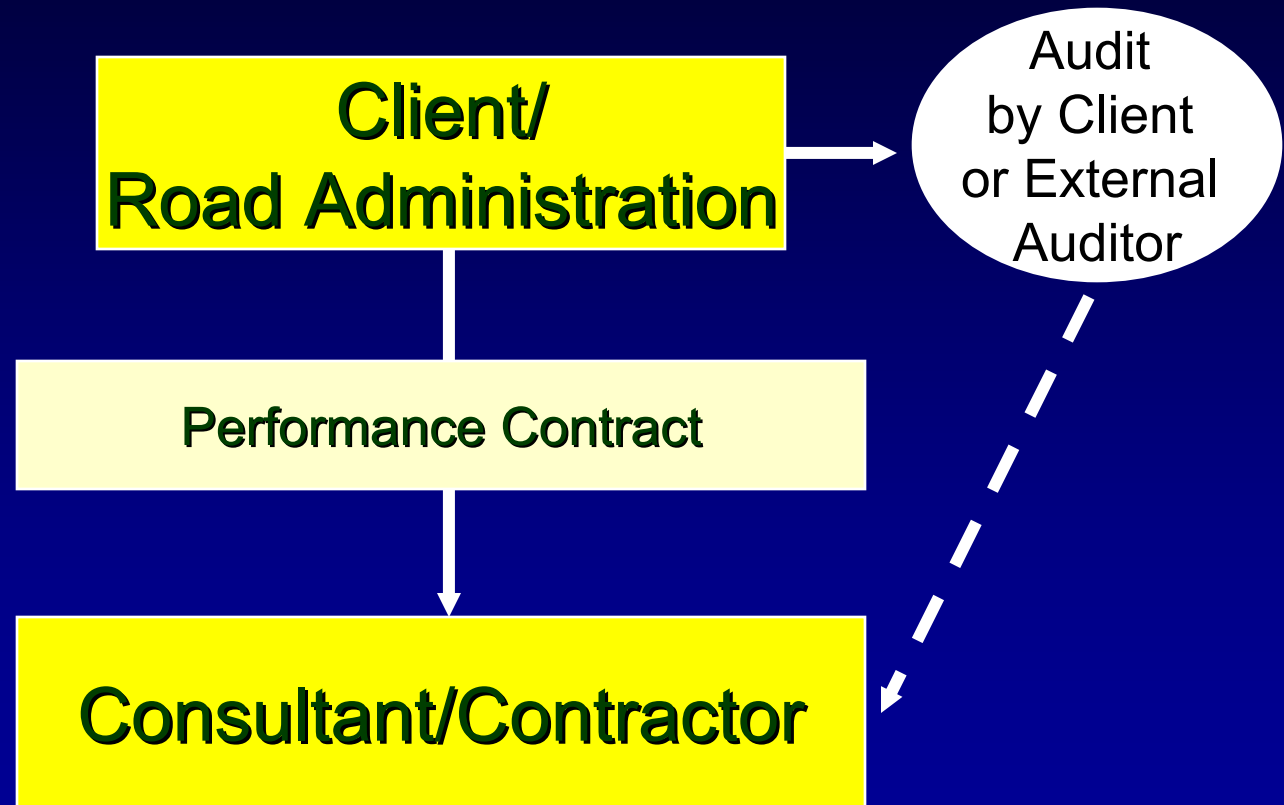


Scope of Services of PMMR (3)

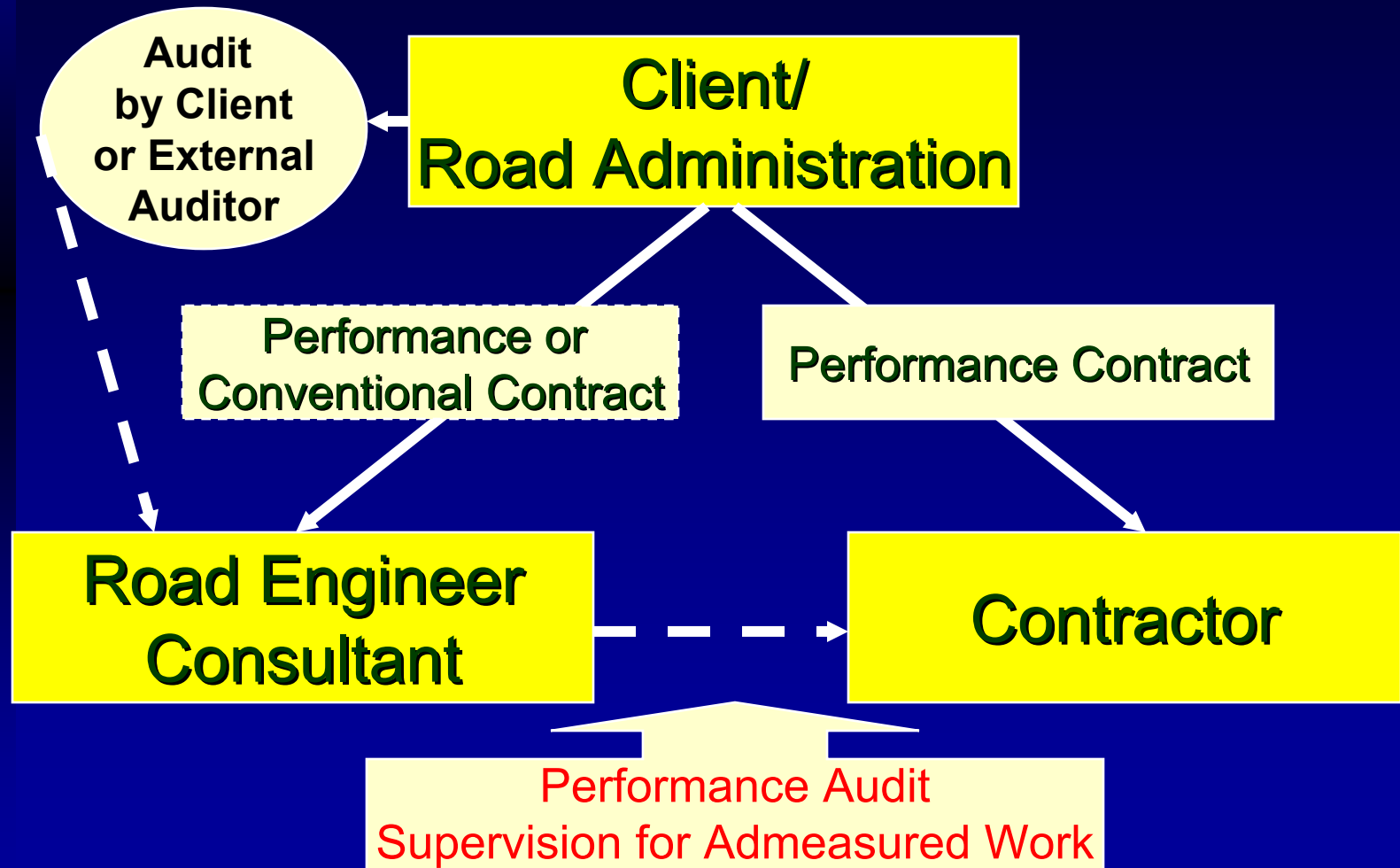


PMMR

Contractual Relationship of PMMR (1)



Contractual Relationship of PMMR (2)



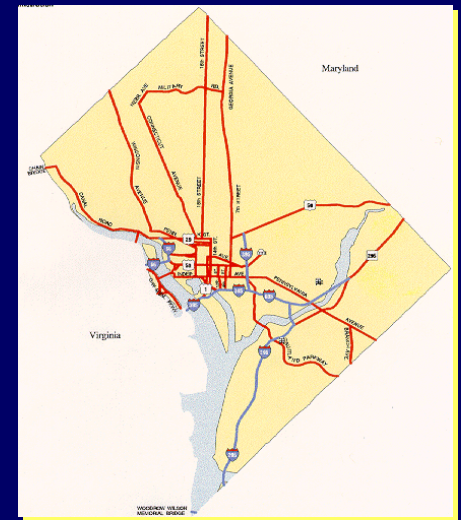
Performance-Based Management and Maintenance of Roads (PMMR)

is also referred to as

- Performance Specified Road Maintenance Contract, PSMC (Australia and New Zealand)**
- Highway Asset Management Contract (USA)**
- Maintenance Service Level Contract (Latin America)**
- Output- and Performance-based Road Contract, OPRC (World Bank)**

Brief History of PMMR

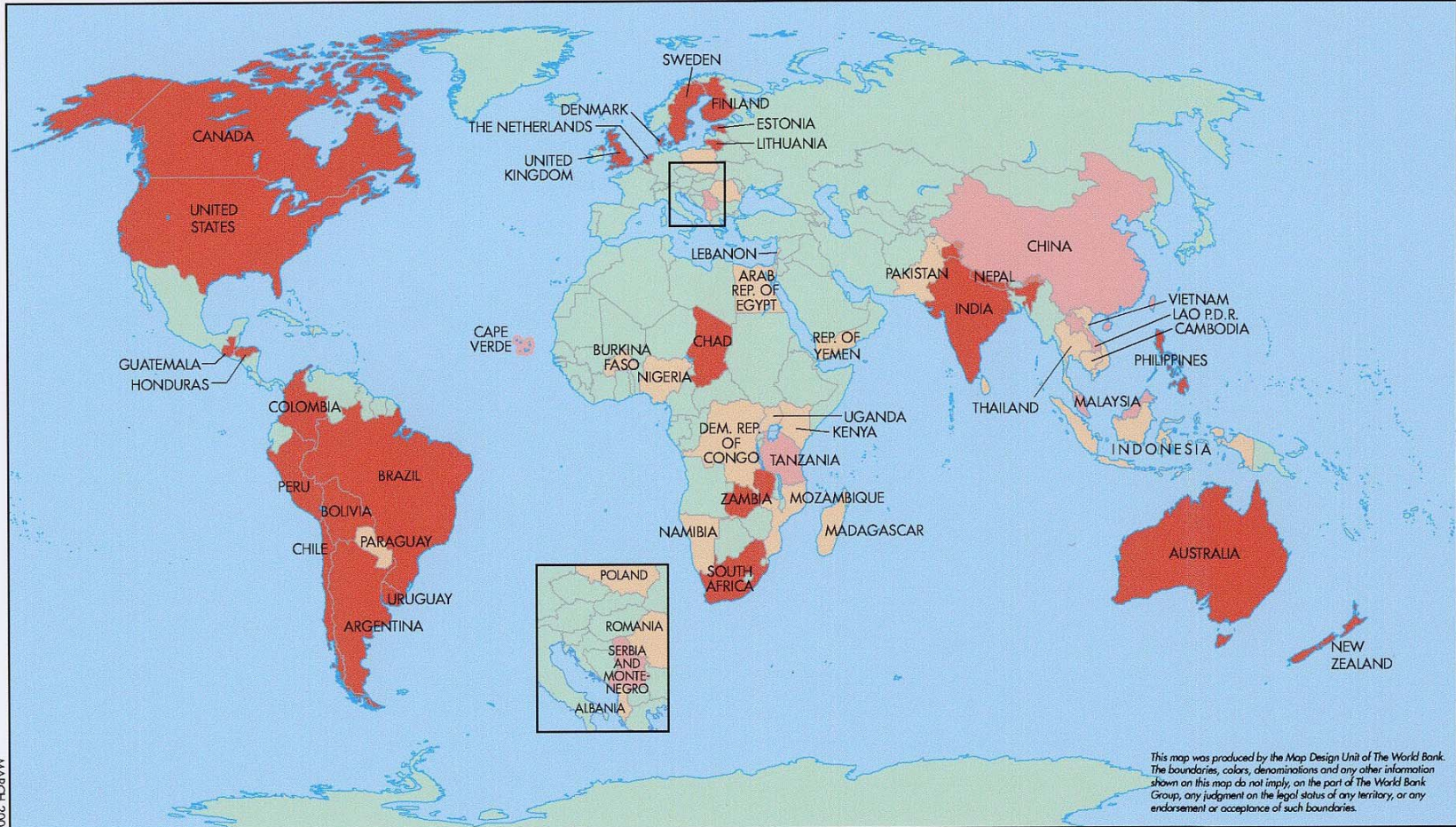
- 1988 British Columbia, Canada
- 1990 Argentina
- 1995 Sydney, Australia
- 1996/7/8 Uruguay, Chile, Colombia, Brazil, Peru
- 1996 Virginia, USA
- 1998 New Zealand, Finland
- 1999 Zambia
- 2000 Chad
- 2001 United Kingdom, Spain
-



APPLICATION OF PERFORMANCE-BASED CONTRACTING TO MANAGE AND MAINTAIN ROADS ACROSS THE WORLD

- COUNTRIES THAT HAVE ESTABLISHED PBC PROGRAMS
- COUNTRIES THAT ARE AT EARLY STAGES OF PBC PROGRAM IMPLEMENTATION
- COUNTRIES THAT ARE PREPARING TO LAUNCH PBC'S
- COUNTRIES THAT DO NOT USE PBC'S OR COUNTRIES FOR WHICH NOT RELATED DATA WAS LOCATED

NOTE: This does not imply that every province/region/state has PBC's: the data pertains to the national level only, not sub-national ones.



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MARCH 2006

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Benefits of PMMR (1)

➤ Road Agency

- Reduces workload
- Helps to assure long-term maintenance funding
- Provides better transparency and accountability
- Reduces maintenance cost
- Improves customer focus
- Improves control and enforcement of quality standards
- Avoids frequent claims and contract amendments to increase quantities of work by the contractor
- Reduces road rehabilitation
- Reduces risks

Benefits of PMMR (2)

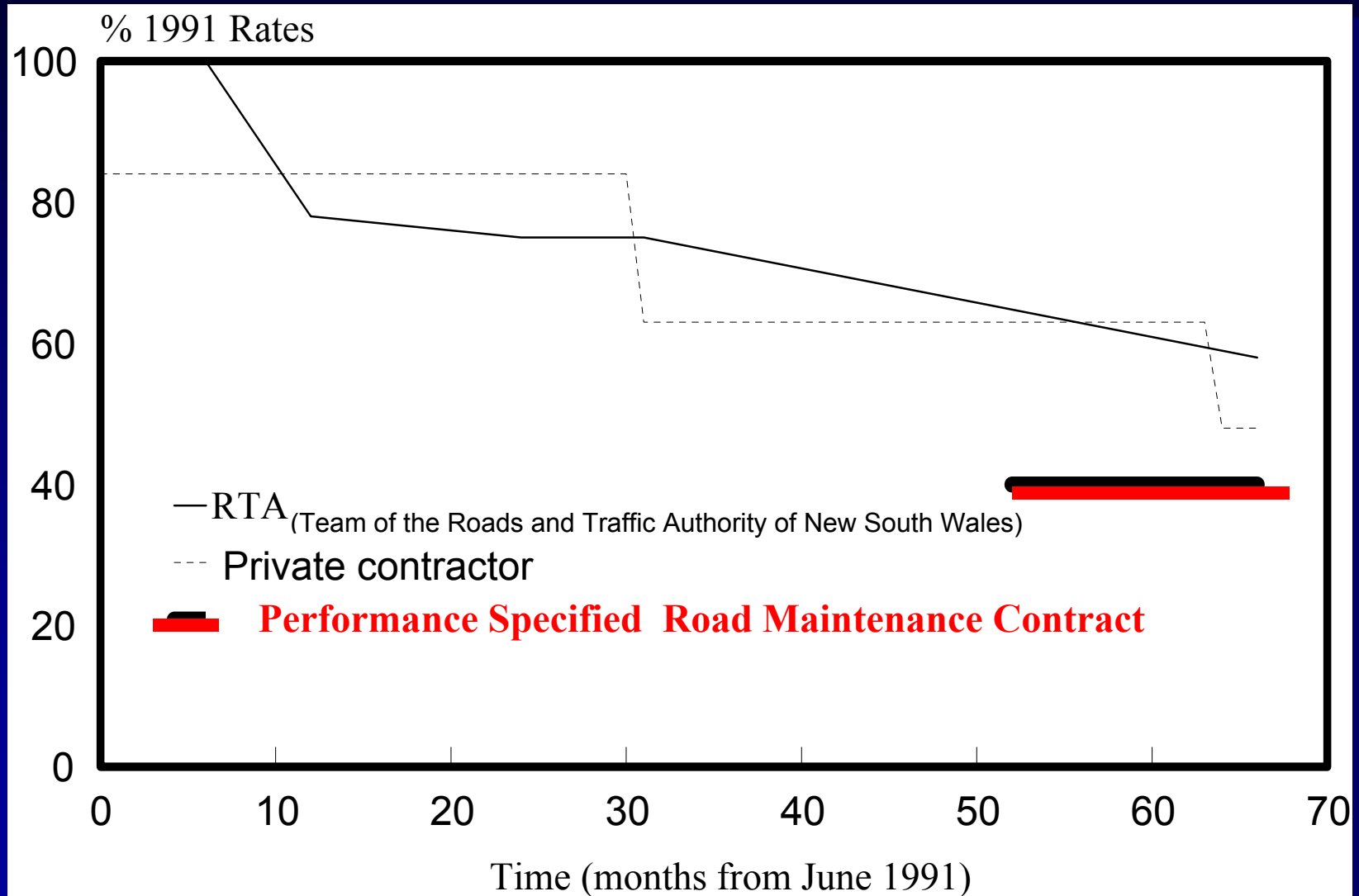
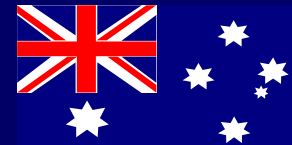
➤ Road Users

- Provides better and safer roads with consistent conditions
- Reduces road user cost

➤ Consultants and Contractors

- Guarantees workload over longer period
- Provides potential for increased margins
- Opens excellent opportunities for business growth

Development of Road Maintenance Cost in Sydney



Examples of reported savings by introducing PMMR

| | <u>Savings in %</u> |
|---------------------|---------------------|
| ➤ Australia | |
| ➤ Sydney | 35 |
| ➤ Tasmania | 20 |
| ➤ Western Australia | 15-35 |
| ➤ New South Wales | 37 |
| ➤ New Zealand | 15-40 |
| ➤ Virginia (USA) | 15 |

Reasons for reduction in road maintenance cost

Drivers of savings: Incentives / competition / long-term management

- **Modern management and work procedures**
- **Increased productivity**
- **Total life cycle costing**
- **Just-in-time maintenance**
- **Work package optimization**
- **Use of latest technologies**

Mobile Pothole Patching



CONVENTIONAL METHOD

Average Unit Cost:
\$120 per patch
\$900 per lane mile
\$5,900 per ton

** Production =
20-30 patches per day*

MOBILE PATCHER

Average Unit Cost:
\$22 per patch
\$38 per lane mile
\$880 per ton

** Production =
120 patches per day*



Disadvantages of PMMR

➤ Road Agency

- Tends to prolong tender period
- Requires new procedures, mentality change of staff, and training
- Might lead to loss of information if contractor is not obliged to supply detailed information on condition, interventions and inventory of the road
- Loss of flexibility
- Loss of expertise
- Might reduce competition

➤ Road Users

- None

➤ Consultants and Contractors

- Increases risks
- Requires mentality change of staff, new procedures, and training



Performance Standards

➤ Objectives

- To satisfy the road user
 - accessibility
 - comfort
 - travel speed
 - safety
- To minimize total system cost (cost to road users and agency – *life-cycle cost of assets*)
- To minimize environmental impacts

Examples of Performance Indicators/Standards

- **Absence of potholes and control of cracks and rutting, which affects safety and pavement performance;**
- **Roughness of the road surface, which affects vehicle operating cost;**
- **Amount of obstruction of the drainage system to avoid destruction of the road structure;**
- **Friction between tires and road surface for safety reasons;**
- **Retro reflexivity of road signs and markings for safety reasons**
-

Scope of Contract (Assets and Services)

Example Washington DC, USA

- **Drainage System**
- **Pavement, incl. markings**
- **Traffic assets (safety, signs, markings, signals, etc.)**
- **Roadside Assets**
- **Bridges**
- **Tunnels**
- **Traffic Services**
- **Emergency Response**
- **Snow & Ice Control**

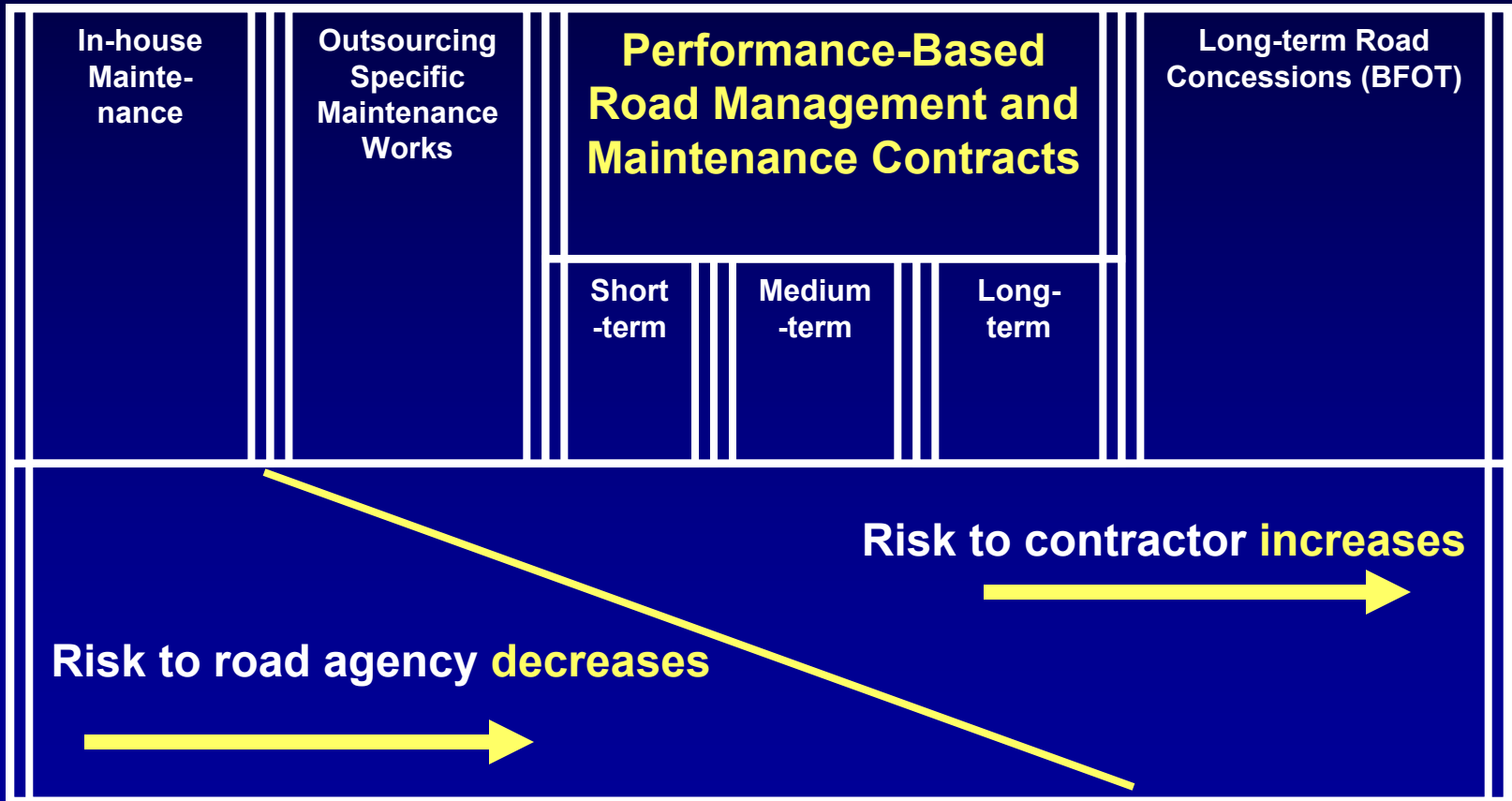
Examples of Performance Standards (1)

| Asset Class | Component | Performance Standards |
|-----------------|---------------------------|--------------------------------|
| Pavement | Potholes | No potholes |
| | Roughness (a) | IRI < 2.0 (A), < 2.8 (U) |
| | Roughness (b) | IRI < 2.9 (A), < 3.4 (U) |
| | Rutting | < 12mm (A), < 10mm (U) |
| | Cracks > 3mm | Sealed |
| Gravel surfaces | Potholes | No potholes |
| | Roughness | IRI < 6 (U), < 1 (C) |
| | Thickness of gravel layer | > 10cm (C,U) |
| Paved Shoulders | Potholes | No potholes |
| | Cracks > 3mm | Sealed |
| | Joints with pavement | Vertical alignment < 1cm (C,U) |

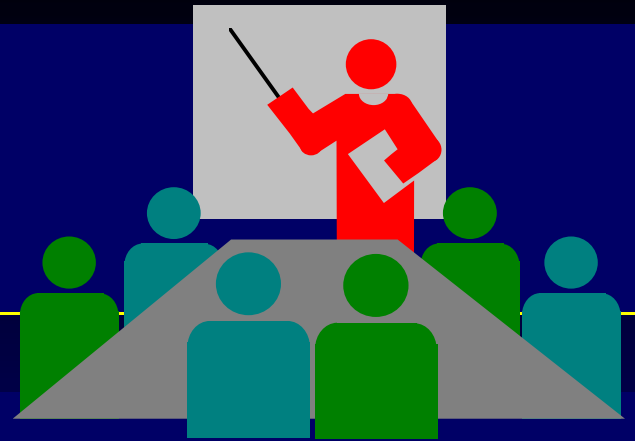
Typical Service Levels for Paved Roads (1)

| | Fair | Good | Very Good | Excellent |
|--|---------------|------------|-------------|--------------|
| Typical Traffic Volumes (Vehicles/day) | Less than 250 | 250 – 1000 | 1000 - 5000 | 5000 - plus |
| Potholes (Max Dia of any single pothole) | 400mm | 300mm | 200mm | None allowed |
| Potholes(max number in any 1000m with diameter greater than 100 mm) | 10 | 5 | 1 | None allowed |
| Patching (Response time) | 28 days | 28 days | 14 days | 7 days |
| Cracking (Response time) | 28 days | 28 days | 28 days | 28 days |
| Cleanliness of pavement surface and shoulders response time for safety related matters | 8 hrs | 4 hrs | 2 hrs | 1 hr |
| Cleanliness of pavement surface and shoulders response time for all other matters | 14 days | 7 days | 5 days | 3 days |

Distribution of Risk



Overview of Presentation



- Introduction
- Benefits and disadvantages of PMMR
- Performance standards and response times
- Risk identification, sharing, and mitigation
- **Performance monitoring**

Performance Monitoring

- **Contractor's self-control system**
- **Formal monthly inspections**
- **Informal inspections**
- **Road user complaints**

Self-Control Unit of Contractor

- Own organizational structure with qualified personnel
- Verifying continuously the compliance with the service level criteria
- Monthly reporting of compliance to client using standard formats
- Participating in monthly formal inspections

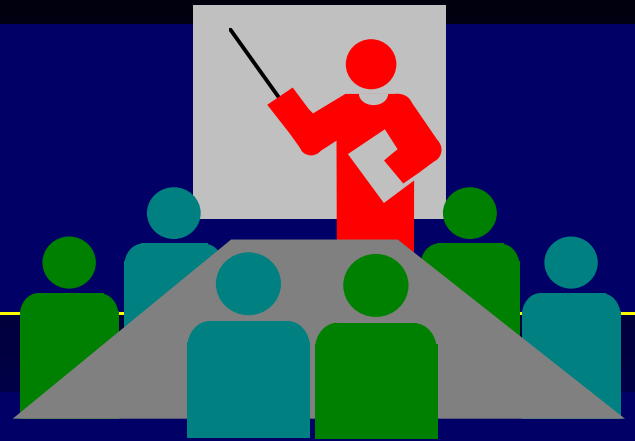
Performance Monitoring

Inspection System in Uruguay



- **Inspections for purposes of payment** done once a month taking 10% of the road network selected at random different stretches of 1 km length;
- **Informal inspections** done once a week selecting 5% of the network at random;
- **Inspections due to complaint by the public;** and
- **Follow-up inspections** to verify if contractor rectified deficiencies detected by one of the inspections mentioned above.

Overview of Presentation



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- Risks
- Performance monitoring
- **Payments and incentive systems**

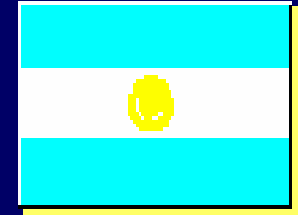
Payments

- Fixed monthly payments for scope of work and services contracted under service level or performance standards
- Rehabilitation works may be paid as fixed monthly payments as well or based on unit prices and quantities of work performed
- Emergency and improvement works to be paid based on unit prices and quantities of work performed
- PMMR should include schedules of rates as well

Bonuses and Penalties

- Monthly fixed payments might be reduced if contractor does not comply with the service level or performance standards
- Contractor might have to pay penalties for not rectifying deficiencies within the response times given
- Contractor might get bonus payments if he exceeds the performance standards

Example of Penalties for not Rectifying Deficiencies within Specified Response Times (CREMA, Argentina)

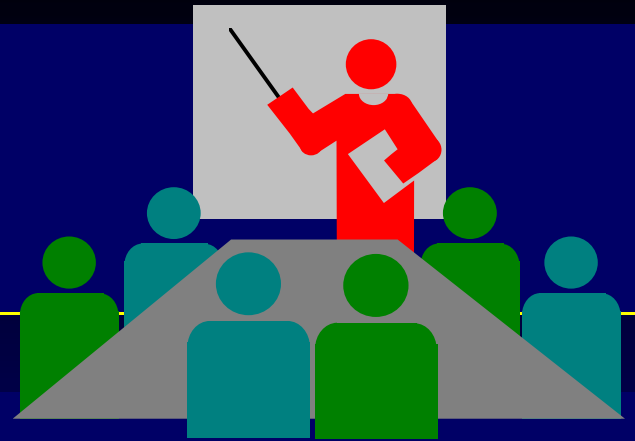


| Performance Standards | Penalty in US\$ |
|---|------------------|
| No pothole > 2cm deep on paved roads | 110/day/pothole |
| No edge failure on paved roads | 110/day/failure |
| No rutting > 20cm long and 12mm deep on paved roads | 66/day/rut |
| No cracking or raveling on paved roads | 88/week/km |
| Travel speed of at least 50km/hr on earth and 70km/hr on gravel roads | 176/day/km |
| No potholes > 2cm on paved shoulders | 44/day/pothole |
| Drains, ditches, culverts and other drainage structures to be clean | 44/day/structure |

Data Management and Ownership

- **Collection and management of data is being shifted mainly to the contractor.**
- **Road agency needs to ensure that data previously collected by the agency is being collected by contractor and transferred to the agency.**
- **Proper procedures have to be included in contract for collecting and managing data by contractor.**

Overview of Presentation



- Introduction
- Benefits and disadvantages of PMMR
- Performance standards and response times
- Risk identification, sharing, and mitigation
- Performance monitoring
- Payments and incentive systems
- Data management and ownership
- **Customer perception and community involvement**

Road User Perception and Involvement

- **Involvement of road users in the planning stage**
 - Information disclosure
 - Consultation on service level indicators
- **and during operation**
 - Publication of basic contract information
 - Publication of relevant service level indicators
 - Consultation on relevant service level specifications and the compliance by the contractor

Tendering

- Legal and financial feasibility
- Preparation of bidding documents
 - Scope of Work
 - Time frame
 - Pure performance-based or hybrid
 - Role of contractor in preparing bidding documents
 - Risk allocation
- Pre-qualification
- Evaluation criteria



Example of Bidding Documents

- **Sample Bidding Document: Procurement of Works and Services under Output- and Performance-Based Road Contracts (World Bank 2005)**
- **State Highway Maintenance Contract Proforma Manual SM032 (Transit New Zealand 2006)**

Changes Required

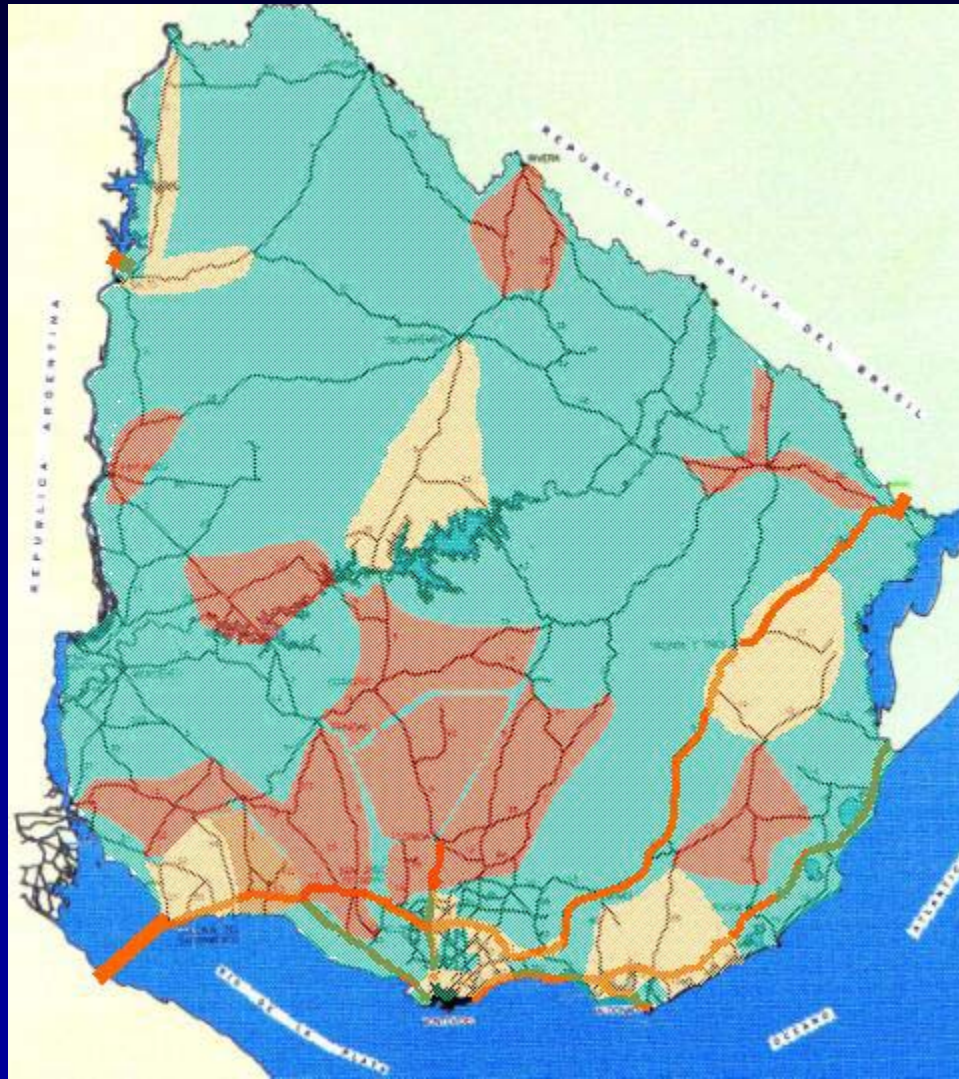
- **Road administration**
 - Attitudes
 - Procedures
 - Training
- **Consultants**
 - Procedures
 - Training
- **Contractors**
 - Procedures
 - Training
- **Road users**
 - Control of road conditions (claims)

First Pilot Project Uruguay



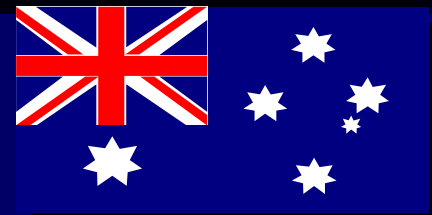
- **Extension: 359 km**
- **Contract period was 4 years**
- **Deadlines to comply with performance indicators:**
 - **2 months for potholes**
 - **6 months for other defects on main roads**
 - **one year for all roads**
- **The contractor is being paid a fixed monthly fee**
- **Sanctions for non-compliance**

PMMR - Uruguay



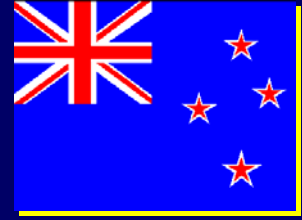
AUSTRALIA

PMMR



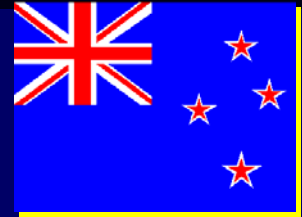
- **Actually, more than 20000 kilometers of road are being managed and maintained under PMMR in several provinces of Australia**
- **Some of the contracts are hybrid contracts (some works are being paid on a unit price basis)**
- **Reported savings are between 15% and 35%**

PMMR, New Zealand (1)



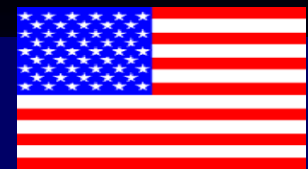
- **First contract covering 406 km of national roads was let for 10 years in 12/98**
- **Contract cost was 15% below comparable cost of traditional contracting**
- **Performance standards are very well elaborated**
- **System of quality control by the contractor (quality manual, quality plan, quality system procedures) in place**

PMMR, New Zealand (2)



- **In 2000 a similar contract was concluded and**
- **Two years later a third PMMR covering 1040 km of local roads and 122 km of state highways**
- **While the first contract resulted in 15% savings the latest one came in 22% below the cost estimate for comparable conventional contracts**
- **New Zealand will continue to expand PMMR**

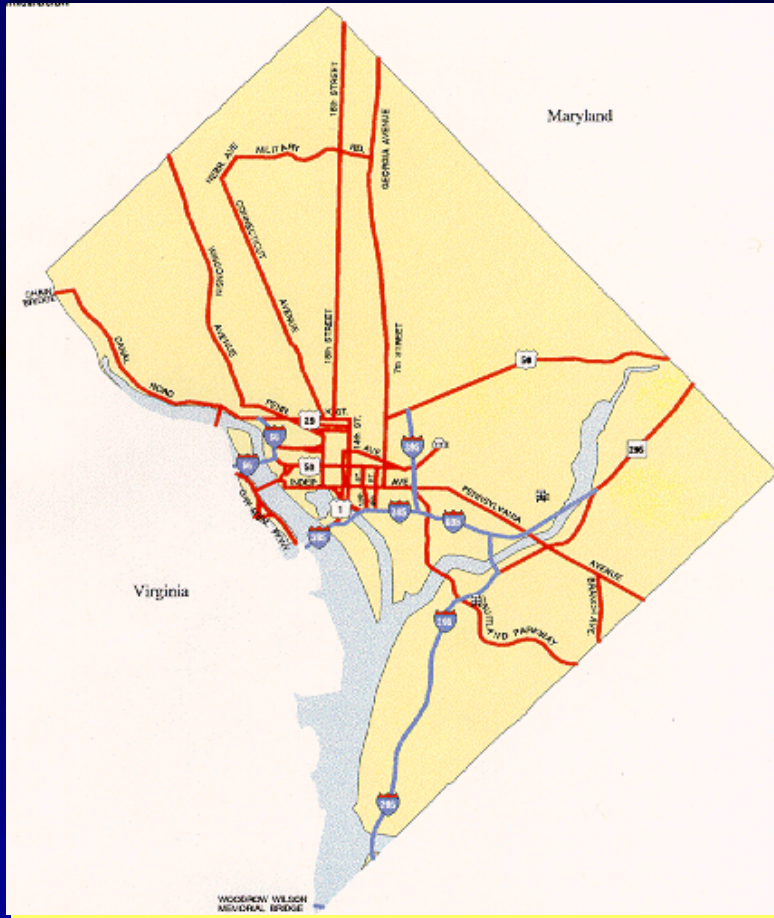
First Performance Based Road Management and Maintenance Contract in the State of Virginia (Comprehensive Agreement for Interstate Highway Asset Management Services)



- **Maintain and refurbish 1250 lane-miles on three Interstate Highways, 62 rest areas, and 7 visitor centers**
- **5+ year contract since early 1997**
- **131 million US\$ for 5 years with approximately 16% savings over VDOT cost**
- **Contractor is VMS**
- **15% of work is done by VMS staff**

Washington D.C.

Performance-Based Asset Preservation



- pavement (344 lane-miles)
- drainage (2950 catch basins, 7 miles of ditches)
- roadside and landscape (450,000' of curb and gutter)
- bridges (109 structures)
- tunnels (4 major)
- snow and ice control
- traffic control and safety (108,270' guardrail, 51 crash attenuators)

Colombia

Cooperatives



- >300 micro-enterprises for routine maintenance only
- 30-50 km of roads with 10-15 people each
- 1 road management firm supervises 4-6 micro-enterprises
- Micro-enterprises receive extensive training



Bangladesh

Labor contracting societies

- Off pavement maintenance only
- Simple performance levels
- Simple incentive scheme
- Predominantly in rural areas



Pilot project in Chad



RESEAU NATIONAL 2000 - 2009







Pilot Application of PRMM Contract in Chad

- 440 km of unpaved main roads
- 4 years (48 months)
- Contractor: DTP (Bouygues Group, France)
- Supervision: SADEG (Cameroon)
- Contract signed in April 2001
- Contractor started in July 2001

Pilot Application of PRMM Contract in Chad

- Includes (explicitly) Management and Maintenance, plus self-control of contractor
- Includes (implicitly) initial rehabilitation spread out over 21 months
- Includes (explicitly) reconstruction of drainage structures, signalling, emergency assistance for road users in case of accidents, cleaning up of accident sites, management of rain barriers, axle load control, etc.
- Includes Emergency Works (as needed)

PRMMC in Chad

Contract value and payments

- Contract value of US\$ 11.9 million
- 15% reserved for Emergency Works
- Management / Maintenance / Rehabilitation equivalent US\$ 5.740 per year/km (excl. taxes)
- Paid in fixed monthly payments of US\$ 210.000 (if full compliance)
- Initial advance payment of 20%
- Performance Guarantee of 10%





50

50

50

Difficulties encountered

- **No major difficulties - - overall a great success - - road in excellent condition, in compliance with contract.**
- **Contractor tried to make use of reserve for Emergency Works – without true justification.**
- **Contractor tried to exploit weaknesses of Supervision Consultant – especially on the side of contract management (claims and response to claims).**
- **Conciliation process to solve problem of road section on natural terrain.**
- **Increase in accidents, many by contractor's staff.**

Results

Road Users

- Are very happy, since service quality much better than ever before
- Appreciate that road is always good, not only after works are done
- Can now travel even in rainy season, which was impossible before

Road Administration

- Satisfied with the experience
- Wish to expand the %age of the network to be covered by PMMR contracts
- Road Maintenance Fund Board also positive

Overloading



Weigh Station

Caminos del Río Uruguay



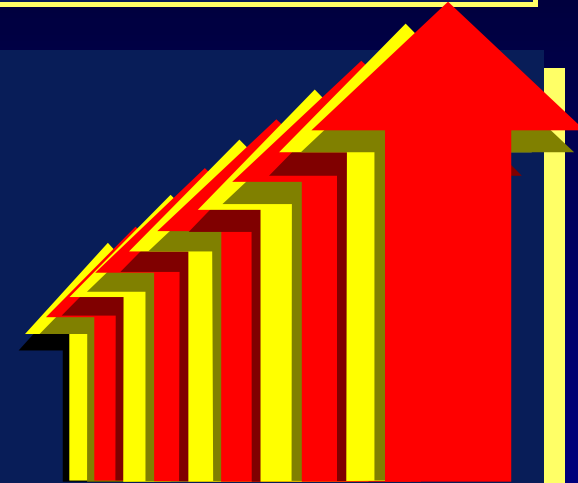
“Ideal” Conditions for PMMR

- **Well developed contracting environment with local contractors experienced in road maintenance**
- **Road agency with good contract management experience, committed to the PMMR concept**
- **Good knowledge and data of network, maintenance needs and cost**
- **Network does not need major rehabilitation**
- **Financing secured for contract duration**

Performance-Based Management and Maintenance of Roads - Implementation Strategy -

➤ Phased introduction of service level criteria.

- Routine maintenance
- Roughness and friction
- Deflection



➤ Increase time span of contracts.

- 1 to 2 years
- 4 to 5 years
- < 12 years

➤ Monitor implementation process.

Make Use of Available Knowledge and Experiences

- Invite experts in PMMR
- Arrange visits to countries which have implemented PMMR
- Use recourses available on the internet
 - Sample Terms of Reference for consultancy services
 - Sample bidding documents
 - Case Studies
 - Relevant presentations and papers

Lessons learned (1)

- **Financing needs to be secured for the entire contract period.**
- **Performance Contracts have to be tailored to each specific situation**
- **Pilot schemes should be carefully planned and implemented**
- **Road have to be in “maintainable” conditions**

Lessons learned (2)

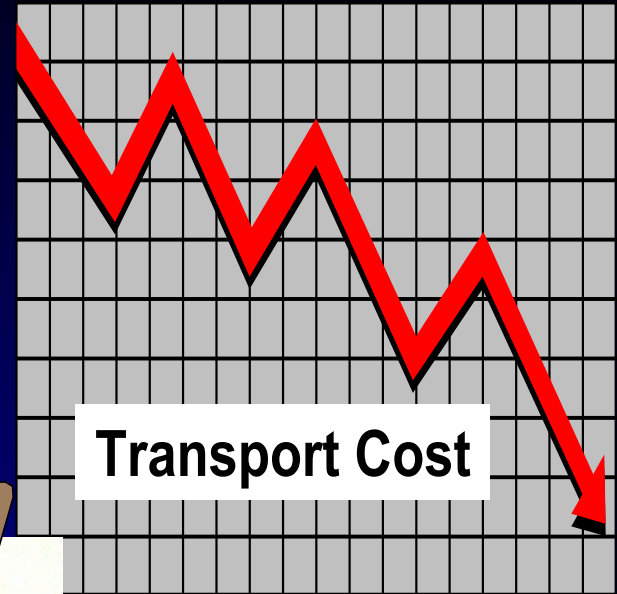
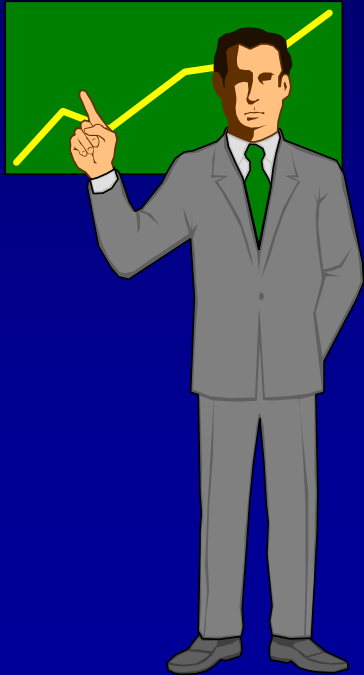
- **Full Performance Contracts should include at least one periodic maintenance cycle**
- **Risks shall be assigned to the party that can best bear and manage the risk**
- **Qualification of contractors and inspectors is key to success**
- **All contractors should use proper Quality Management Systems (QMS)**

Lessons learned (3)

- **Performance Contracts need strict performance monitoring and application of penalties for non-compliance**
- **Include Dispute Resolution Mechanism**
- **Performance standards need to be developed further**
- **Performance Contracts might not produce cost saving immediately**

VISION

Business Opportunities



Thank you for your attention