

Road Asset Management Systems + Performance-Based Contracting

Session 3.1: Introduction to Performance-Based Contracts

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Agenda

Day 1 Road Asset Management System (RAMS)	Day 2 Road Asset Management System (RAMS)	Day 3 Performance Based Contracting (PBC)
Session 1.1 Introduction to RAMS	Session 2.1 Data processing and management	Session 3.1 Introduction to PBCs
Coffee break	Coffee break	Coffee break
Session 1.2 Functions of a RAMS	Session 2.2 Data analysis and planning	Session 3.2 Performance standards
Lunch	Lunch	Lunch
Session 1.3 Data to be collected	Session 2.3 Road asset management	Session 3.3 Inspections and Payments
Coffee break	Coffee break	Coffee break
Session 1.4 Method of data collection	Session 2.4 Conclusions and way forward	Session 3.4 Conclusions and way forward

PBC in the CAREC Region

- Guide to Performance-based Road Maintenance Contracts (April 2018)
- Concepts of PBC
- Implementation Experiences
- Lessons Learned
- PBC Implementation Strategy for CAREC region
- Recommended Options for PBCs





Terminology

- No fixed terminology for PBCs
 - Performance-based Management and Maintenance of Roads - PMMR (World Bank)
 - Performance Contract (Western Australia)
 - Asset Management Contract (United States)
 - Performance-Specified Maintenance Contract (Australia, New Zealand)
 - Contract for Rehabilitation and Maintenance - CREMA (Argentina, Brazil)
 - Area Maintenance Contract (Finland; Ontario, Canada)
 - Managing Agent Contract (United Kingdom)
 - Output- and Performance-based Road Contract - OPRC (World Bank)



Terminology

- Performance indicator
 - Indicator depicting degree of damage or condition of certain road element
- Performance threshold
 - Maximum/minimum allowable value of performance indicator
- Performance standard
 - Combination of performance indicator and allowable threshold
- Service level
 - Set of different performance levels applied to a specific contract/road
- Performance payment
 - Fixed payment to be paid upon compliance with performance standards
- Payment deduction
 - Deduction to the performance payment in case of non-compliance



Main Types of Payment

- Input-based
- Output-based (volume-based)
- Outcome-based (performance-based)
- Hybrid

Input-based contracts

- Payment according to inputs (time, materials, etc.)
- Usage
 - In-house force account units
 - Dayworks for contractors
- Actual costs depend on
 - Standard to be achieved (design)
 - Actual volumes of work required (design BOQ)
 - Actual inputs required per volume of work (productivity, efficiency)
 - Agreed rates (per unit of input)
- High variation of costs (planned vs actual)
 - Accuracy of BOQ, productivity
 - Risk lies with employer



Output (volume)-based

- Payment according to volume of work completed
- Usage
 - Bill of Quantities contracts with contractor
- Actual costs depend on
 - Standard to be achieved (design)
 - Actual volumes of work required (accuracy of design)
 - Agreed rates (per volume of work)
- Lower variation of costs (planned vs actual)
 - Accuracy of BOQ
 - Risk lies largely with employer (BOQ), partly with contractor (productivity)



Outcome (performance)-based

- Payment according to resulting condition/standard
- Usage
 - Routine maintenance
 - Winter maintenance
 - Periodic maintenance with lumpsum payments
- Actual costs depend on
 - Standard to be achieved (design)
 - Agreed rates (lumpsum for achieving defined outcome)
- Very low variation of costs (planned vs actual)
 - Lumpsum payments with deductions in case of poor performance
 - Risk lies with contractor



Hybrid contracts

- Performance-based payments + volume-based payments
- Output- and Performance-based Road Contracts (OPRC)
 - Upgrading, rehabilitation or periodic maintenance works volume-based
 - Subsequent routine maintenance performance-based
 - (Provisional sum for emergency maintenance volume-based)
- Sometimes performance-based combined with input-based
 - Zambia: performance-based off-carriageway maintenance combined with dayworks for on-carriageway works
 - Preferable to use provisional sum with volume-based payments

Performance payments

- Lumpsum payment against compliance with performance standards
 - Often divided into monthly lumpsum payments
- Inspection verifies compliance with performance standards
 - Does not look at volume of work completed or inputs used
 - Payment is not related to volume of work completed
 - Payment is only related to compliance with the performance standards
 - Can be an issue in some countries (procurement or financing/payments)
- Payment deductions are applied in case of poor performance
 - Non-compliance with performance standards
 - Deductions may depend on type and degree of non-compliance
 - Related to cost of repairing the defect
 - Related to potential impact of defect on road and road users
 - e.g. blocked culvert, landslide

Performance standards

- SMART performance standards define what needs to be achieved
 - **S**pecific – define specific elements of the overall standard to be achieved
 - **M**easurable – contractor and employer can objectively verify compliance
 - **A**chievable – the defined threshold must be achievable at acceptable cost
 - **R**elevant – must be relevant to the standard to be achieved
 - **T**ime-bound – the standard must be achieved within a specific timeframe
- Example:
 - Number and size of potholes per kilometre
 - Maximum height of vegetation within 1 metre of carriageway
 - Degree of blockage of culvert (not length of blockage)



Benefits of PBCs

- **Employer**
 - Predictable funding needs (lumpsum payments) – easier to secure funding
 - Predictable road conditions (performance standards)
 - Reduced management burden (simpler inspections)
 - Reduced costs (after initial introduction period)
 - Higher quality works (reduce future maintenance needs)
- **Contractor**
 - Greater flexibility (improved efficiency in technology, process, management)
 - Longer-term contracts (invest in equipment, materials)
 - Steady workload (keep staff and equipment occupied – winter)
 - Greater risk (can lead to higher costs in the short-term when experience is lacking)

Cost savings

- Initially often cost increases
 - Greater risks allocated to contractors
 - Lack of experience with PBCs

- Longer term cost savings due to efficiency gains
 - Investments in new equipment
 - Use of new technologies
 - Better management of maintenance activities

- Should not be the main objective
 - Only after initial introduction period 5-10 years
 - Only with experienced contractors
 - Only with competitive construction market

Country	Savings
Australia	10%–40%
Brazil	15%–35%
Canada	About 20%
Estonia	20%–40%
Finland	18%
Netherlands	30%-40%
New Zealand	15%-38%
United States	10%–15%

Suitability for maintenance

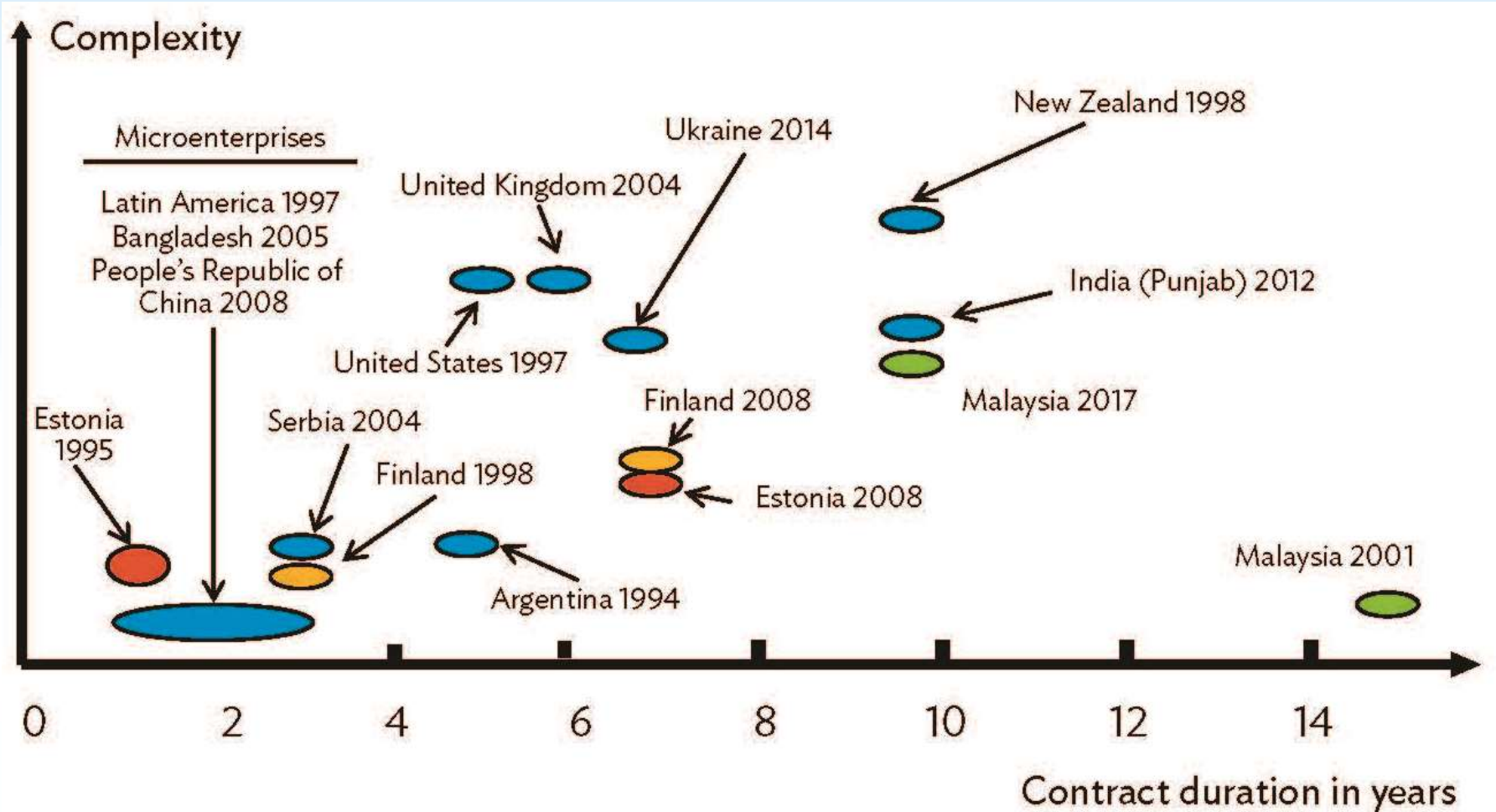
- Volume-based contracts not suitable for routine maintenance
- Incentive to let damages increase in size
 - Reduce number of interventions (reduce mobilization costs for contractor)
 - Increase work volume and payment (increase payment for contractor)
- High management burden to approve and measure completed works
 - Many small interventions spread over long time period
 - Measure works before starting
 - Measure works after completion
- Risk of insufficient volume and additional costs beyond contract price
 - If volumes of work have been underestimated, contract costs will increase
 - Worse with routine maintenance where damages cannot all be measured before contracting



Suitability for maintenance

- Performance-based contracts more suitable
- Incentive to repair damages when they are still small
 - Fixed payment amounts
 - Smaller damages reduce costs (smaller material costs for contractor)
 - Smaller damages avoid deductions (higher payment for contractor)
- Management burden reduced to performance inspections
 - Inspections are simplified – measure only if performance appears to be poor
 - As experience is gained, inspections can be done on sample of roads
- Fixed payments that can only go down
 - Lumpsum payment is fixed
 - Payments may be reduced as a result of deductions in case of poor performance

Varying durations and complexities



- Road Maintenance Groups (RMGs)
 - Groups of people from local communities along the road
 - Maintenance microenterprises, community-based maintenance groups
 - Performance-based off-carriageway maintenance
 - Limited on-carriageway maintenance (unpaved roads)
 - No rehabilitation or periodic maintenance
- Duration 1-3 years
 - Sometimes with option to extend
- Contract size
 - 5 km – 50 km (length often restricted by transport)
 - Generally one road (section)
 - High management burden if contracted directly (rural roads)
 - Often subcontracted by contractor (trunk roads)



- Performance-Based Routine Maintenance (PBRM)
 - Equipment-based small- or medium-sized contractors
 - Performance-based routine maintenance (on- and off-carriageway)
 - Includes smaller emergency maintenance (e.g. landslides <math><10\text{ m}^3</math>)
 - May include provisional sum for larger emergency maintenance (volume-based through work order)
 - No rehabilitation or periodic maintenance
- Duration 3-5 years
 - Depending on road conditions
 - Restriction to routine maintenance increases risks if duration is very long
- Contract size
 - Longer road lengths to attract larger, more qualified contractors
 - 50 km – 300 km (only roads in good-fair condition)
 - Often area-based contracts – covering different road classes within a specific area

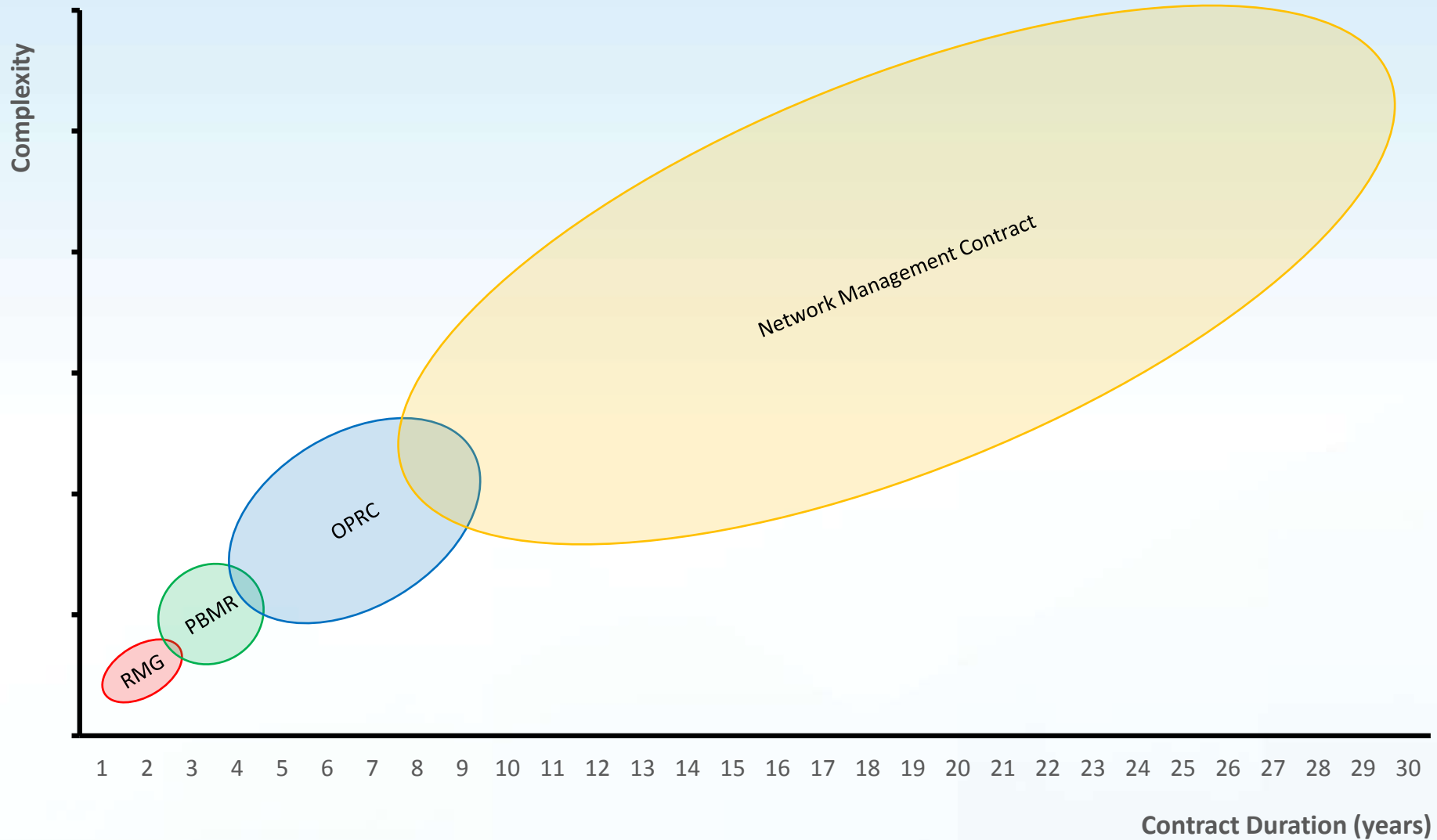
- **Output- and Performance-based Road Contract (OPRC)**
 - Equipment-based medium or large-sized contractors
 - (Initial) upgrading/rehabilitation/periodic maintenance works volume-based
 - Performance-based routine maintenance (on- and off-carriageway)
 - Includes smaller emergency maintenance (e.g. landslides <math><10\text{ m}^3</math>)
 - May include provisional sum for larger emergency maintenance (volume-based through work order)
 - Link improvement works (better quality) to maintenance (reduced costs)
- **Duration 5-7 years**
 - Conditions improved at start of contract
 - Duration should not be too short – little maintenance first years after improvement
- **Contract size**
 - Improvement works already attract more qualified contractors
 - 50 km – 500 km (generally improvement works only on portion of the length)
 - Individual roads or area-based contracts



Network Management Contract

- Network Management Contract
 - Equipment-based large-sized contractors / management consultant
 - All types of works included (upgrading/rehabilitation/periodic/routine/emergency)
 - Performance-based (lumpsum payment)
 - Concession-type contracts
- Duration 10-30 years
 - Full lifespan of the roads
 - Conditions partly improved at start of contract
 - Subsequent improvements during contract at specified times or triggers
- Contract size
 - 500 km – 1,000 km
 - Road (sub-)networks or area-based contracts

Varying durations and complexities



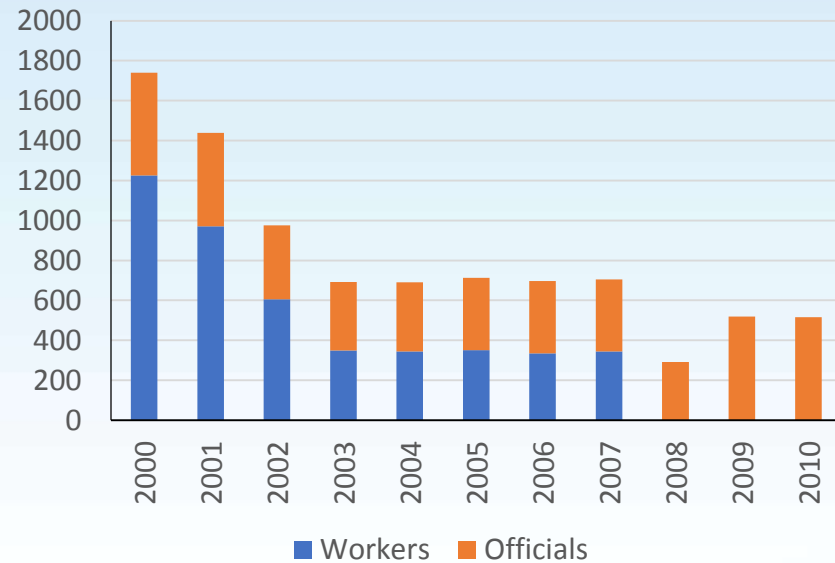
Contract Duration (years)

Basis for payment

- **Periodic maintenance / rehabilitation**
 - Large, pre-defined work volumes, implemented in short period
 - Generally paid on volume-basis
 - Increasingly paid as outcome-based lumpsum with predefined standards
 - At start of contract or when trigger is reached – agreed length of road
- **Routine/winter maintenance**
 - Small, roughly estimated work volumes, implemented over extended period
 - Generally paid on performance basis
 - Payment based on resulting condition (deductions in case of poor performance)
 - Activities that are difficult to predict are paid on volume basis or additional payments (e.g. snow removal with different rates depending on snowfall)
- **Emergency maintenance**
 - Small-large, unpredictable work volumes, implemented in short period
 - Generally paid on volume basis
 - Often included as provisional sum
 - Avoids need for lengthy procurement – simple issuing of work order
 - Damages of limited size included under performance-based routine maintenance

Example: Estonia

- Introduction of PBCs in the 1990s
 - 1995-2000: 1- and 2-year PBCs
 - 2000-2005: 5-year PBCs
 - Since 2007: 7-year PBCs
 - Since 2008: all 16,500 km under PBCs
- Routine and winter maintenance
 - No rehabilitation or periodic maintenance
- Combined with privatization reform
 - Move away from in-house implementation
 - Many staff ended up working for PBC contractors



Example: Georgia

- Kakheti (2016-2021) – being implemented
 - 117 km secondary roads - Flat terrain, limited snowfall
 - 38 km rehabilitation (80% of price) - design by contractor, lumpsum payment
 - Routine/winter maintenance (20%) - fixed monthly lumpsum on performance basis
 - Provisional sum for emergency maintenance
 - Awarded to Georgian contractor
- Guria (2020-2025) – under bid evaluation
 - 240 km - Steeper terrain and more snowfall
 - 68 km rehabilitation (55% of price) - design by RD, payment on volume basis
 - 107 km periodic maintenance (25%) - design by contractor, lumpsum payment
 - Routine/winter maintenance (20%) - fixed monthly lumpsum on performance basis
 - Provisional sum for emergency maintenance (7%)
 - Georgian and Chinese bidders
- Mtskheta-Mtianeti – being prepared
 - 140 km recently rehabilitated roads
 - 20 km rehabilitation
 - Bidding documents under preparation





Example: Tajikistan

- Maintenance implemented by force account staff
- 4 PBC contracts by contractors
 - Nuromod to Nimich (73 km) + Vahdat to Obi Garm (76 km)
 - 3 years 2013-2016
 - Initial repairs + routine/winter maintenance
 - Maintenance cost \$5,800/km/year (\$2,850 routine, \$1,650 winter, \$1,300 emergency)
 - Sayron to Karamyk (89 km) + Vose to Khovaling (87 km)
 - 3 years 2018-2020 (+ option to extend)
 - Recently rehabilitated roads – only routine/winter maintenance
 - Maintenance cost \$1,500/km/year (very low - \$750 routine, \$500 winter, \$250 emergency)
- Hybrid contracts
 - Rehabilitation paid on volume basis (scope defined in contract)
 - Routine maintenance paid on performance basis
 - Winter maintenance paid on volume basis (requires work order)
 - Emergency maintenance paid on volume basis (requires work order)



Plenary

- How is maintenance currently carried out?
- Is any maintenance contracted to contractors?
- What experiences with PBCs exist?
- Could PBCs function under current legislation/systems?