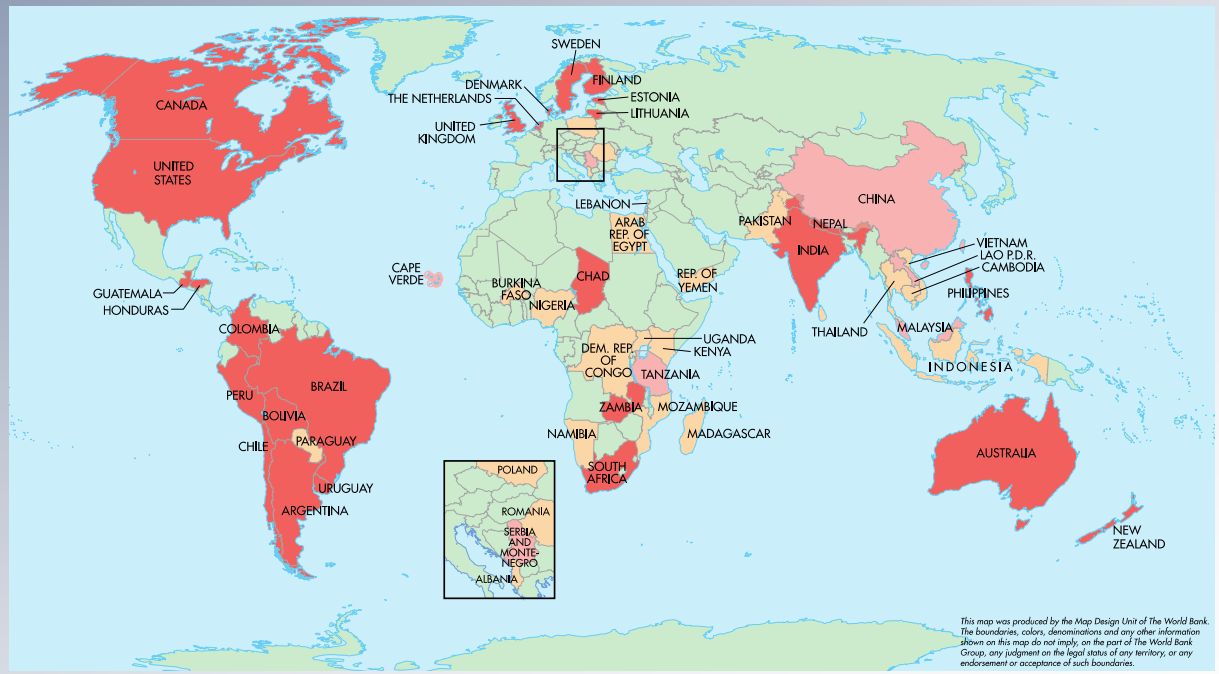
Session 4: International Examples

1. Length Man and Community Based
2. Bhutan: Hybrid PBMC
3. Yunnan: Output- and Performance-Based Road Contract
4. British Columbia: Comprehensive Long-Term PBMC



CAREC

Length Man and Community Based Systems

Length Man and Community Based Systems

- Manual tasks:
  - Vegetation control
  - Sweeping, litter, debris clearing
  - Drainage cleaning
- Hand tools only
- Suitable for low-volume roads
- Employment for low-income rural sector
- 1 – 2 km per person
- Simple contract – with individuals, cooperatives
- Africa, Caribbean, South Asia

CAREC

Bhutan: Hybrid PBMC


BHUTAN
TRANSPORT AND COMMUNICATION SECTOR PROJECTS
National Capital
District Capital
City/Town
Covered by loans 790-BHU, 1265-BHU, and 1763-BHU
Covered by loan 1763-BHU
Covered by loan 790-BHU
National Road
District Boundary
International Boundary
Boundaries are not necessarily authoritative.
Loan 970-BHU: Roadworks Mechanization
Loan 1265-BHU: East-West Highway Maintenance
Loan 1763-BHU: Road Improvement
PEOPLE'S REPUBLIC OF CHINA
INDIA
INDIA
0 10 20 30 40
Kilometers
89°30'E
91°00'E
28°00'N
27°00'N
GASA
Gasa
THIMPHU
PUNAKHA
WANGDUE-PHODRANG
BUMTHANG
LHUENTSE
TRASHI-YANGTSE
PARO
HA
SAMTSE
CHHUKHA
DAGANA
TSIRANG
SARPANG
TRONGSA
ZHEMGANG
MONGAR
PEMAGATSHEL
TRASHIGANG
SAMDRUP JONGKHAR
Tashithang
Punakha
She'ngana
Tangco Chari
Begana
Thinlegang
Drugyel Dzong
THIMPHU
Damthang
Paro
Ha
Chhuzom
Simtokha
Wangdue-phodrang
Samtengang
Nobding
Pubjikha
Trongsa
Kurjey
Tang
Jakar
Lhuentse
Tangmachhu
Trashi-Yangtse
Changkhada
Duksum
Bartsham
Mukhangkhar
Yang'nyer
Phongme
Drametse
Chazam
Riju
Trashigang
Lingmithang
Mongar
Chaskar
Tashiyangphu
Thrimshing
Tshelingore
Pemagatshel
Khodakpo
Samrang
Dalim
Bhangtar
Samdrup Jongkhar
Diafam
Zhemgang
Tingtibi
Gomphu
Tendru
Sipsu
Dorokha
Samtse
Pagli
Dungna
Phuen-tsholing
Kharbandi
Pasakha
Chhukha
Tala
Mirchim
Daga
Dagapela
Damphu
Lamidangra
Gelephu
Sarpang
Ho Mathola
Raidak
Kalikhola
Phibsoo
Lahai
Panbang
Nganglam

Bhutan: Country Characteristics

- Kingdom of Bhutan, constitutional monarchy
- 38,400 sq km
- 717,000 population
- Mountainous terrain: Himalayas extending to Siwalik Hills
- Devout Buddhists, strong traditions
- Economy
  - Per capita GDP: $5800
  - Agriculture
  - Limited tourism
  - Growing hydro-electric energy sector
- Enlightened social policies:
  - Free education and health care
  - Strong support for education sector
  - Gross National Happiness concept
- Four tiers of government:
  - Central
  - District (Dzongkhags)
  - Local (Geogs)
  - Municipal (Thromdes)

CAREC

Bhutan: Road Agency

- Department of Roads: 5 field divisions
- High workload:
  - Routine and periodic maintenance
  - Upgrading, widening, new construction of DOR and Dzongkhag roads
  - Emergency repairs
- Limited internal resources:
  - 5-6 engineers per district
  - Basic equipment only
  - Semi-skilled gangs
  - National Work Force (day labour)
- Road construction industry
  - Single state-owned road construction company
  - Limited number of private sector companies
- Government gave approval to introduce PBMC on the E-W Highway in 2010

CAREC

Bhutan: Contract Road

- East-West Highway, 500 km, Thimphu-Trashigang
- Mountainous, steep terrain
- Unstable geology with frequent land slips and rock falls
- Relatively low traffic but lifeline within Bhutan
- Two lane AC surface for 100 km and single lane DBST surface for 400 km
- Bridges: Bailey, Pony truss (Japan) and concrete arch (Switzerland)
- Large number of culverts
- On-going programme to build concrete L-drain and strengthen, seal shoulder on hill side

CAREC


M/S. PASSANG CONSTRUCTION
SITE
MOB # 17111927 / 17111592

Bhutan: Contract Road Condition

- Road condition:
  - Carriageway: fair, sealed but IRI >5, edge breaks, localised failures
  - Shoulders: good
  - Side drains: good
  - Culverts: intact and clear but missing parapets
  - Guard rail and parapets: good but covered only fraction of length needed
  - Signage: good but insufficient
  - Pavement markings, delineators, cats eyes: poor
- Conclusion:
  - Only labour-based routine maintenance activities were suitable for PBMC
  - Remaining maintenance based on input quantities

CAREC


ESCORTS
APOLLO

Bhutan: Hybrid Contract Features

- Hybrid contract
- Performance based:
  - Manual routine maintenance
  - Minor emergency clean-up
- Quantities based:
  - Equipment-based routine maintenance
  - Periodic maintenance
  - Major emergency repairs
  - Road road improvement
- Contractor Requirements:
  - Offer employment to National Work Force labourers
  - Take over DOR maintenance stations and stockpiled materials
- Employer Requirements:
  - Update condition database
  - Prepare programme for quantities-based works
  - Estimate quantities and costs
  - Provide provisional sum for emergency repairs
- Technical Documents
  - Basic maintenance manual
  - Technical specification for road construction (based on Indian Road Congress)
  - Standard Bid Document from Ministry of Finance loosely based on ADB SBD
- Conclusion:
  - Only labour-based routine maintenance activities were suitable for PBMC
  - Remaining maintenance based on input quantities

CAREC

Bhutan: Maintenance Activities

1	Performance-Based	Unit	Labour Gangs
1.1	Pavement Surface Cleanliness	km	X
1.2	Lined Side Drains Cleaning	m	X
1.3	Unlined Side Drains Cleaning	m	X
1.4	Culverts/Pipes Cleaning	no.	X
1.5	Roadside Vegetation Control	m	X
1.6	Minor Landslide Clearing	m^3	X
1.7	Whitewashing	m	X

3	Performance-Based After Initial Repairs	Unit	Mobile Gangs
3.1	Shoulder Maintenance	m^2	X
3.2	Parapets and Guardrails	no.	X
3.3	Road Signs & Distance Markers	no.	X
3.4	Road Markings	m	X
3.5	Bio-engineering	m^2	X
3.6	Bridge Maintenance	no.	X

2	Input Quantities-Based	Unit	Mobile Gangs	Construct-ion Unit
2.1	Potholes and Patching	m^2	X	
2.2	Pavement Cracks	m^2		X
2.3	Pavement Edges	m		X
2.4	Pavement Surface Deficiencies	m^2		X
2.5	Pavement Deformations	m^2		X
2.6	WBM Pavement Maintenance	m^2	X	
2.7	Shoulder Drop-off	m^3		X
2.8	Shoulder Maintenance	m^2		X
2.9	Culvert/Pipes Repairs	no.	X	
2.10	Structures Cleaning and Repairs	m^2	X	
2.11	Parapets and Guardrails	no.	X	
2.12	Road Signs & Distance Markers	no.	X	
2.13	Pavement Markings	m	X	
2.14	Slope Restoration/Protection	m^3	X	
2.15	Bio-engineering	m^2		X
2.16	Bridge Maintenance	no.	X	
2.17	Major Landslide Clearance	m^3	X	
2.18	Snow Clearance	km	X	

CAREC

Bhutan: Contracts and Procurement

- 5 contracts: 100 km, 3 years
- Bids contained:
  - PBMC lump sum for three years
  - Prices for BOQ
  - Price escalation allowed for year 2 and 3 based on indices
  - Bonds and securities for first year only
- Bid documents:
  - Government SBD based on ADB SBD with some changes
  - Single stage post-qualification
  - Lowest qualified bid
- Results:
  - Bids from private sector were high
  - Bids from SOE were lowest but significantly exceeded cost estimates and budget
  - DOR awarded contracts for 2 sections and continued with direct labour on 3 sections
- Monitoring 2 contracts

CAREC

Bhutan: Lessons

- Problems:
  - Prices sign of high risk perceived by bidders?
  - Road conditions in some sections were too poor for PBMC
  - Requirement to hire National Work Force too onerous?
  - MOF unwilling to release more budget for high bids
  - Five large contracts on E-W Highway too complex for first time
  - Insufficient consultation/education of contractors

- Recovery Steps:
  - Monitor progress of two contracts (what works, what doesn't)
  - On-going engagement with contractors
  - Design and test pilot contracts in different applications:
    - Shorter sections of EW Highway
    - District roads
    - Municipal roads

CAREC

Yunnan: Pilot PBMC


缅
甸
缅
四 川
贵
州
Gongshan County
Fugong County
Fugong County
丽江
Zhanhe Township
Huaping County
Zhaotong City
大理
保山
楚雄
Luquan County
曲靖
玉溪
Longchuan County
Lincang City
Gengma County
文山

Yunnan: Background

- Yunnan province in SE China bordering Myanmar, Lao and Viet Nam
- 46 million population
- 394,000 sq km
- Hilly and mountainous terrain: Himalayan source of Yangtze and other major rivers
- Temperate climate with near-tropical conditions in the south
- Diversified economic activity but still highly dependent on agriculture
- Per capita GDP: $2990 among lowest provinces in China
- All roads: 209,000 km
- Trunk roads: 24,089 km (national and provincial highways, county roads)
- 12% unpaved, 34% simple seal
- Roughness Quality Index: 37% good-excellent (RQI≥80)
- ADB co-financing highway projects with Provincial Department of Transport (YPDOT):
  - Southwest Expressway to Myanmar border
  - Yunnan Sustainable Road Maintenance Project (YSRMP)
- Scope of YSRMP:
  - Periodic maintenance, rehabilitation and improvement of state roads
  - Two PBMC pilots

Yunnan: Existing Road Maintenance

- YHAB responsible for maintenance of national and state highways excluding expressways
- 16 general divisions at prefecture level, 126 county-level maintenance divisions, 294 maintenance stations and 124 equipment stations
- 15,000 staff
- 2011 expenditure on road maintenance was CNY 2,239 million ($353 million) = $14000/km
  - 66% of expenditure is on salaries, bonuses and pensions, 9% on facilities
  - 25% of expenditure on maintenance: 17% routine and 8% on rehabilitation
- Agreement between each division and YHAB
- Performance bonus based on PCI (measure of pavement distress)
- Road condition measured by RTM (road test machine) vehicle

CAREC


XP302
XCMG


公路 检测
A
88270

Yunnan: Sustainable Road Maintenance Project

- YPDOT and ADB co-financing the YSRMP
- Rehabilitation of trunk roads
- Two PBMC pilots
- Road asset management
- Institutional strengthening
- Total: $230 million over 5 years

- Wenshan pilot in Wenshan prefecture
- Ruili pilot in Dehong prefecture

CAREC

Yunnan: Wenshan PBMC

- Output- and performance-based road contract
  - National Highway G323: 57 km
  - Class 4, 2 lanes, 7.5m pavement
  - 1500 ADT
  - Highway in poor condition
  - Initial works: seal 5 km, widen 30.0 km within 24 months
  - Routine maintenance for 5 years
  - Estimated cost: $10.7 million

- Open bidding to eligible companies (Class 2 or higher)
- MOF model bidding document 2012 (based on ADB SBD-Small Works)
- Employer will be YHAB
- Independent supervision consultant for inspection and measurement

CAREC

Yunnan: Ruili PBMC

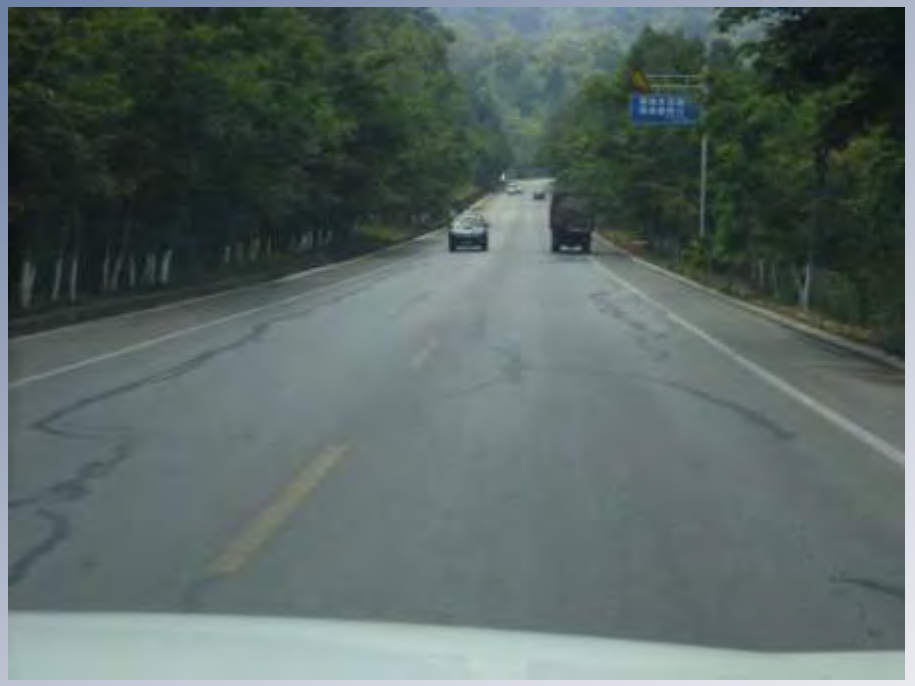
- Performance-based routine maintenance and medium repairs
  - National Highway G320, 50 km, Class 2, 2 lanes, 11.2 m pavement
  - Provincial Highway S234: 57 km, Class 2, 2 lanes, 9.2 m pavement
  - 7500 to 8200 ADT
  - Roads are in good condition
  - Routine maintenance over 3 years
  - Minor and medium repairs over 3 years: seal 18.7 km, DBST 16.1 km, overlay 23.5 km
  - Estimated cost: $7.6 million

- Negotiated agreement between YHAB and Ruili Maintenance Section (Ruili MS is equivalent to Class 3 contractor)
- Same Employer's Requirements as Wenshan
- Independent supervision consultant for inspection and measurement

CAREC


瑞丽欢迎您


190



Yunnan: Maintenance Classification

Road Elements	Minor Maintenance	Minor Repairs including Emergency Repairs	Medium Maintenance	Major Maintenance	Reconstruct-ion
Roadbed	Routine Maintenance: Performance-Based	Routine Maintenance and Repairs including minor Emergency Repairs: Performance Based	Periodic Maintenance: Input Quantities	Rehabilitation: Input	Improvement
Pavement					
Bridges Culverts Tunnels					
Traffic Engineering					
Greening					

- Wenshan pilot includes all types of maintenance
- Ruili pilot includes minor maintenance and repairs and medium maintenance

CAREC

Yunnan: Performance Standards 1

Right-of-Way and Road Formation

Defect Type	Allowance
Drains and ditches	• No more than 10% of the cross section of a drain or ditch is obstructed at any location • Lined ditches do not have structural damage and are firmly contained by surrounding soil or material
Vegetation control	• Height is <10cm within 5m of the edge of the pavement or side drain • No vegetation obstructs the view of road signs • No vegetation is located in structures or sealed surfaces • Vertical clearance of vegetation over the pavement is >6m
Retaining walls	• Retaining walls are stable, without damage and weep holes are clear
Slopes and fences	• Slopes are intact with no loose rocks and free of erosion • Fences are in good repair with no missing sections
Greening	• Trees, flower beds are properly tended and fertilised and trees are whitewashed as needed

CAREC

Yunnan: Performance Standards 2

Carriageway and Shoulders

Defect type	Allowance
Block/alligator cracks	• No cracks >3mm wide • Total area of cracks is ≤20m^2 per 1km section
Longitudinal/ transverse cracks	• No unsealed cracks >3mm wide • Total length of unsealed cracks ≤100m per 1km section
Potholes	• No potholes >15cm diameter or >3cm depth • Total number of potholes is ≤5 per 1km section
Ravelling	• Total area of ravelling is ≤20m^2 per 1km section
Rutting	• No ruts >3cm deep • Total length of rutting is ≤25m per 1km section
Depressions	• No depressions >3cm depth • Total area of depressions is ≤20m^2 per 1km section
Shoving	• No shoving >3cm height difference • Total area of shoving ≤20m^2 per 1km section
Bleeding	• Total area of bleeding is ≤20m^2 per 1km section
Edge break	• No loose or breaking pavement edges • Pavement width is at least 95% of design width as mentioned in contract
Shoulder	• Shoulders not >3cm lower than pavement and shoulders not higher than pavement • Maximum continuous length permitted with defects = 25m
Cleanliness	• No soil, debris, trash, other objects or oil/chemical spills on pavement or shoulder

CAREC

Yunnan: Performance Standards 3

Bridges, Culverts and Tunnels

Defect type	Allowance
Bridges	• Guardrails are present and not deformed • All metal parts of the overall structure are painted or otherwise protected and free of corrosion • The bridge deck is clean and the deck material is fully intact and bolted down • The drainage system is in good condition and fully functional • Expansion joints are clean and in good condition • There are no obstacles to the free flow of water under the bridge and up to 100m upstream • The clearance under the bridge is according to design • There is no erosion around bridge abutments and piers
Culverts	• No more than 10% of the cross section is obstructed at any location in the culvert • There is no structural damage and culverts are firmly contained by surrounding soil or material
Tunnels	• Lighting, ventilation and emergency equipment are fully operational • The drainage system is in good condition and fully functional • Footpaths are clear of debris and in good repair • External structures are in good repair and clear of vegetation • Entrances are painted reflective paint and clearly visible at night

CAREC

Yunnan: Performance Standards 4

Traffic Engineering

Defect type	Allowance
Signs	• Information signs are present, complete, clean, legible, and structurally sound • Warning and traffic signs are present, complete, clean, legible, structurally sound and clearly visible at night
Horizontal demarcation	• Horizontal demarcation is present, legible and firmly attached to pavement
Guardrails	• Guardrails are present, clean, without structural damage • No guardrail sections are missing
Lighting	• Lighting is functioning with no more than 5% of total lights unserviceable
Traffic signals	• Traffic signals are functioning with no lights unserviceable
Kilometre posts	• Kilometre and guidance posts are present, complete, clean, legible and structurally sound

CAREC

Yunnan: Payment Reductions for Defects

% applied to payment for each km with defect but not exceeding total payment for affected km

Performance Standard	Payment Reduction
Block/alligator cracks	50%
Longitudinal/transverse cracks	50%
Potholes	50%
Ravelling	50%
Rutting	50%
Depressions	50%
Shoving	50%
Bleeding	50%
Edge breaks	50%
Cleanliness	10%
Shoulder	**30%**

Performance Standard	Payment Reduction
Drains and ditches	30%
Vegetation control	20%
Retaining walls	10%
Slopes and fences	10%
Greening	10%
Bridges	50%
Culverts	20%
Tunnels	50%
Signs	20%
Horizontal demarcation	20%
Guardrails	20%
Lighting	20%
Traffic signals	50%
Kilometre posts	10%

% applied to entire payment

Performance Standard	Payment Reduction
Road Usability	20% (of total road length)
Monthly Report, Work Programme and Cash Flow	5% (of total road length)
Compliance with Plans	5% (of total road length)
Environmental Management Plan	**10%(of total road length)**

CAREC

Yunnan: Bid Documents

- MOF Model Bid Documents 2012 (similar to ADB SBD-Small Works)
- Section III Qualifications
  - Class 2 contractors or higher (except Ruili contract)
- Section IV Bid Forms
  - Lump Sum for routine maintenance
  - BOQ for works and emergency repairs
  - Contractor and Ruili Maintenance Section must submit personnel resumes and proposed work methods etc.
- Section VI Employer Requirements
  - PBMC requirements and performance standards
  - Additional requirements (traffic, safety, environment)
  - MOT construction and maintenance specifications
- Section VIII Particular Conditions of Contract
  - Payment
  - Holdbacks
  - Penalties for defects

CAREC

Yunnan: Issues

- Weak high-level provincial government support for contracting to private sector
- YHAB capacity in applying MOF and ADB procurement procedures to special PBMC requirements
- Interest from private-sector contractors and eligibility of SOEs
- Learning curve for Ruili Maintenance Section to act as private-sector contractor
- Learning curve for YHAB to administer PBMCs efficiently

CAREC

British Columbia, Canada: Comprehensive PBCM

Territory
Gulf of Alaska
Juneau
Sitka
Petersburg
Wrangell
Alaska
Prince Rupert
Terrace
Kitimat
Prince George
British Columbia
Dawson Creek
Grande Prairie
Fort Nelson
Alberta
Fort McMurray
Edmonton
Red Deer
Calgary
Lethbridge
Kamloops
Vernon
Kelowna
Penticton
Vancouver
Nanaimo
Powell River
Campbell River
Cranbrook
Nelson
Trail
Bellingham
Pacific Ocean
Watson Lake
Hinton
Jasper
Banff
Revelstoke
Quesnel
Williams Lake
Mackenzie
Chilliwack

British Columbia: Background

- 4.3 million population
- 950,000 sq km
- Mountainous 75%, 60% forested, 5% arable
- All roads: 70,000 km (2 lane equivalent)
- MOT highways: 47,000 km (30% unpaved)
- Highways are provincial responsibility in Canada
- Central government provides partial funding for roads of national interest
- Engineering standards are coordinated through an association of provincial road agencies and transport professionals

CAREC

British Columbia: Annual MOT Budget

Provincial Budget 2011/12 Estimates	CDN$ millions	%
Transport and infrastructure improvements	10.8	1.3
Public transport	331.8	41.1
Highway O&M	454.8	56.4
Commercial passenger transport regulation	1.3	0.2
Executive and support services	8.1	1.0
Total	806.9	100.0

CAREC

BC: Road Maintenance Privatisation Programme 1988

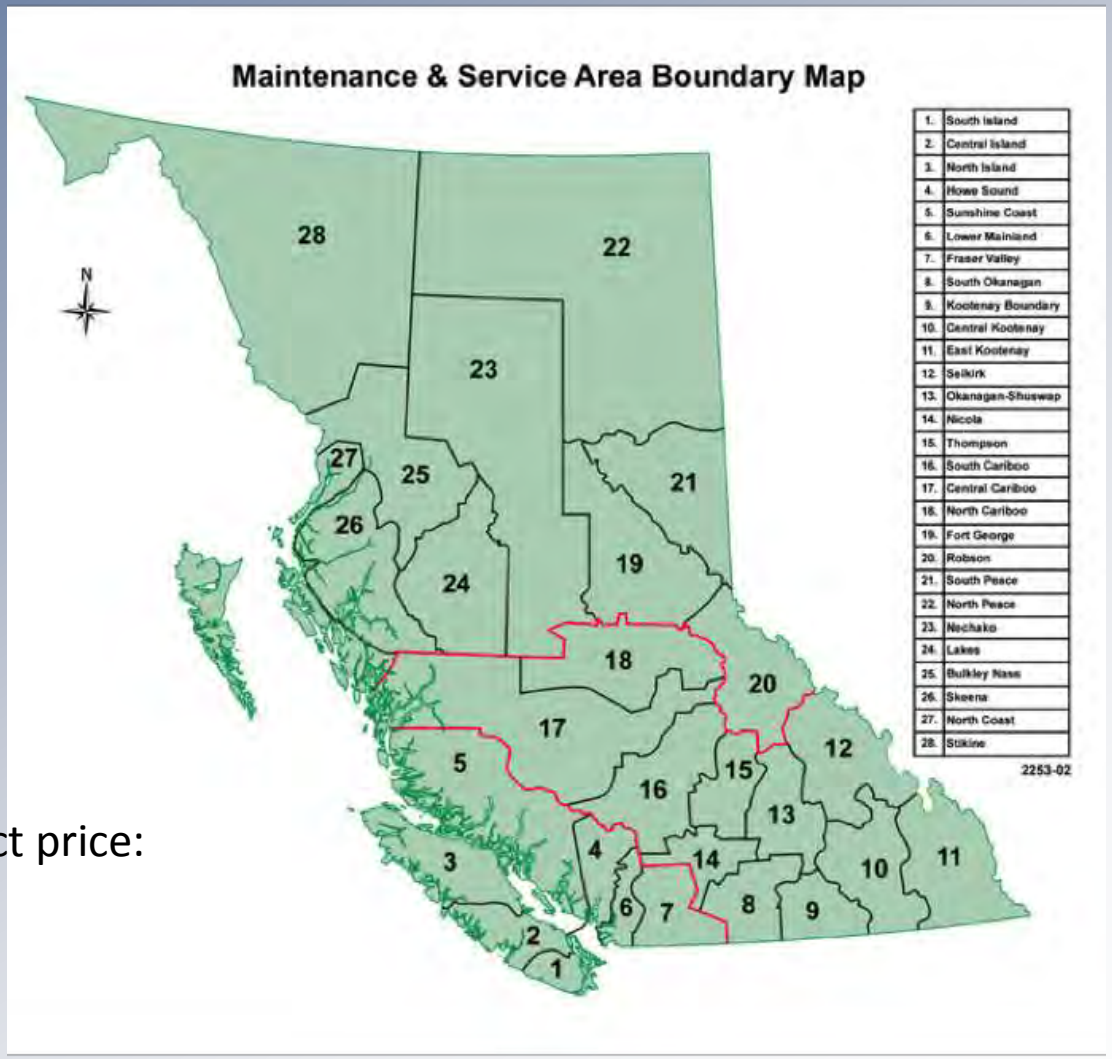
- Rationale:
  - Government should only plan and facilitate
  - Private sector should provide goods and services and deliver government programs (including road maintenance)

- Privatisation Programme:
  - Transfer 2280 MOT road maintenance employees to new employee-owned firms (220 refused and choose early retirement)
  - Road Maintenance Division reduced from 2700 to 200 employees
  - Financial advice provided on setting up companies
  - Minority partners from private sector allowed with <50% share
  - Lease of MOT facilities and equipment
  - 28 contracts for three years
  - 11 companies bid and 10 were successful
  - Initial total contracts amount was $750 million over 3 years
  - Not smooth process: union opposition and some financial losses

CAREC

BC: Maintenance Contracts

Year	No. of Contract-ors	Duration (years)	Total initial contacts amount (CDN$ million)
1988	10	3	250
1991	11	5	NA
1995	16	5	300
2003	18	10	286



- 2003-2013 average initial contract price: CDN$10.2 million (1st year)
- Average 1700 km per contract
- Average CDN$5900/km in 2003

CAREC

BC: Road Maintenance Contract

- 10 year term
- Initial contract price for 1st year
- Annual adjustments for:
  - Price indices for labour, fuel, other key materials
  - Changes in road inventory
  - Changes in level of service

- Evaluation and Selection
  - Prequalification to meet financial and technical requirements
  - Draft Quality Management Plan (QMP) submitted by each bidder for review
  - Revised QMP and Price Proposal submitted by each bidder
  - Price Proposals from bidders with acceptable QMPs are opened and ranked
  - QMP and contract issues are negotiated with lowest bidder

CAREC

BC: Maintenance Services

- Surface (AC, surface treatment, gravel, base, shoulders)
- Drainage (ditch, culverts, water course)
- Winter (snow removal, ice control)
- Roadside (vegetation, litter, fencing)
- Traffic (signage, temporary road markings)
- Structures (bridges, retaining walls)
- Emergency (flood, land slide, avalanche, temporary bridge)
- Inspection (inspection and patrol)

Separate PBMCs for:

- Pavement markings
- Highway lighting and signals

CAREC


BARE

BC: Quality Management System

- Contractors must develop and implement a Quality Management System (QMS) based on principles of ISO 9000-2000 standard
- QMS is a paid item ($100,000) deducted from contract amount
- Requires approval before payment
- QMS contains:
  - Quality policy and objectives
  - Management responsibilities
  - Resource management
  - Management of services delivery
  - Processes for measurement, analysis and improvement
  - Maintenance work procedures

CAREC

BC: Road Maintenance Classes

Summer Maintenance

Class	ADT in vehicles/day
1	> 10,000
2	5,000 – 10,000
3	1,000 – 5,000
4	500 – 1,000
5	100 - 500
6	10 - 100
7	0 - 10
8	Pedestrian and cycle paths

Winter Maintenance

Class	Definition
A	High volume traffic or commuter routes >5000 winter ADT
B	All trunk and main routes not included in A with winter ADT>1000
C	All school bus routes not included in A or B
D	All other regularly maintained routes
E	All other irregularly maintained routes

CAREC

BC: Maintenance Activities

Activities divided into:

- Routine:
  - Response time is most important and risk is minimal (except in winter)
  - Temporary until permanent repair implemented
  - Performance based
- Quantified:
  - Quality/warranty is most important and/or risk is high
  - Permanent repair
  - Unit price
- Mix of Routine and Quantified
- Mix of Routine and Provisional Sum
- Local area requirements for each Service Area

CAREC

BC: Example Maintenance Activities

Category	Examples of Activities	Type of Maintenance
Surface	1-100 Pavement Patching 1-110 Surface Treatment 1-120 Crack Sealing	Routine Maintenance Services – Performance Based Quantified Maintenance Services – Unit Prices
Drainage	2-250 Ditch and Watercourse Maintenance 2-260 Drainage Appliance Maintenance	
Winter	3-300 Patrol and Condition Reporting 3-310 Snow and Ice Removal	
Roadside	4-350 Roadside Vegetation Control 4-370 Litter and Graffiti Removal	
Traffic	5-440 Sign System Maintenance 5-450 Temporary Line Marking	
Structures	6-500 Bridge Deck Maintenance 6-520 Bridge Drain and Flume Maintenance	
Emergency	7-760 Flood Control and Washout Response 7-770 Mud, Earth and Rock Slide Response	
Inspections	8-830 Highway Patrol	

CAREC

BC: Example Maintenance Specification 1

SURFACE MAINTENANCE	Activity No.	Routine	Quantified
Pavement Patching	1-100	temporary	permanent
Surface Treatment	1-110		√
Crack Sealing	1-120		√
Gravel Surface Grading and Reshaping	1-130		√
Dust Control and Base Stabilization	1-140	repeat	new
Surface and Shoulder Gravelling	1-150		√
Shoulder Maintenance	1-160	√	
Road Base Maintenance	1-170		√
Pavement Surface Cleaning	1-180	√	
Debris Removal	1-190	√	
Highway Structures Maintenance	1-200	√	
Curb, island and barrier maintenance	1-220		√
Rail crossing maintenance	1-230	√	

CAREC

BC: Example Maintenance Specification 2

1-100 Highway Pavement Patching

- Routine:
  - Potholes, bleeding, distortion
  - Severity: high (based on Pavement Surface Condition Index)
  - Performance times:
    - Within 24 hours for carriageway lanes on Class 1 and 2 highways
    - Within 45 days for shoulders on Class 6 and 7
- Quantified:
  - Shoving, distortion, alligator, ravelling, rutting
  - Severity: medium to high
  - Performance times:
  - Within 21 days for rutting on Class 1 and 2 highways
  - Within 1 year for alligator on Class 6 road

CAREC

BC: Other Contract Requirements

- Quantified Work Plan each year
- Changes in contract highways <2%
- Contractor Worker Safety Program
- Contractor Non-Conformance Status Report
- Contractor Assessment Program
- Vehicle requirements and operations
- Environmental requirements
- Technical specifications for all works
- Traffic management requirements
- Employer audit

BC: Payment, Penalties and Bonus

- Contractor paid 1/12th at end of each month
- QMS payment withheld until approval then paid at end of month 1
- Month 12 payment may be retained as holdback
- Penalty for default is 2 x value of defective work
- Bonus up to 2% paid if contractor qualifies under Contractor Assessment Program
- Next year contact price adjusted for:
  - Price escalation
  - Changes in contract roads
  - Changes in quantities

CAREC

BC: Lessons

- Considerable political will needed to privatise road agency maintenance operation
- Objective of 1st round is to achieve transfer of road agency employees and establish new system
- Advantage is transfer road maintenance skills to private sector
- 100% PBMC not realistic for large road networks and in areas subject to severe natural events
- First contracts should be short (3 years) to minimise risk to road agency and eliminate poor performers
- Longer contracts provide many advantages
- BC MOT has totally changed its business processes
- Highly successful outcome after 15 years:
  - Competitive road maintenance industry with many players
  - Maintenance costs are reduced
  - Customer ratings in 2011/12 exceeded target
  - Other targets (road safety, environment) are being achieved

CAREC

Overall Findings

- Degree of success varies: several contract iterations are needed to reach satisfactory steady state
- Costs may be higher initially: especially if roads are in poor condition
- Significant government commitment needed to copy the British Columbia model: privatisation of road agency
- Road contractors may not cooperate if perceived risk is too high
- Pure PBMC is usually not practical: different hybrid models
- Pilot projects are practical course of action for most countries

CAREC

Thank you

for your participation

Janusz Sobieniak, M.Sc.,P.Eng.

janusz@sobieniak.com

CAREC