Road Asset Management Systems
+
Performance-Based Contracting

Session 1.3: Data to be Collected

Serge Cartier van Dissel
February 2020

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**

Data

- A RAMS requires data
  - The data needs to be up-to-date (depends on type of data)
  - The data needs to be complete (entire network)
  - The data needs to cover the data types required for the function of the RAMS
  - The data needs to be reliable
  - The data needs to be sufficiently accurate for the function of the RAMS

Data collection

- Data collection is one of the weakest parts of any RAMS
  - Data collection costs money, time
  - New technologies reduce data collection costs
    - Automated traffic counters
    - Automated pothole and crack identification
    - LiDAR
    - Smartphone applications
- RAMS with missing/outdated data becomes useless
  - Especially condition data quickly becomes outdated

Data collection

- Keep data collection to a minimum
  - Avoid high data collection costs
  - Do not collect data unless you expect to use it
- Some data can be collected at no/little extra cost
  - Example: video data together with IRI survey data
  - Data processing still has a cost
- Balance data needs with collection costs

Network vs Project data

- RAMS is a network planning tool (general data for entire network)
  - Identify general needs and related costs
  - Prioritize allocation of available budget to specific roads or links
  - Propose future maintenance, rehabilitation and upgrading projects
  - Requires data for entire (sub-)network
  - Limit data to be collected to avoid high costs
  - Data collection may become more detailed as RAMS evolves and data collection technologies improve and become less costly

- Different from project planning (detailed data for few roads)
  - Project road (link) selected through network planning
  - Project preparation requires data only for the project road (link)
  - Requires more detailed data specific to the project
  - Collecting project data for entire network would be very costly – much of the data would not be used (only for project road links)

Data Accuracy

- More accurate data costs more to collect
  - More accurate data does not necessarily improve the results
  - IRI data can be collected through smartphone or laser profilometer
  - Technology improvements make more accurate data less expensive

- Information Quality Level (IQL)
  - IQL 1 = Research
  - IQL 2 = Detailed programme, project-level engineering (laser profilometer)
  - IQL 3 = Detailed network-level planning (bump integrator)
  - IQL 4 = General network-level planning, pavement performance (smartphone, visual)
  - IQL 5 = Network performance monitoring

- How accurate do we need the data to be?
  - High accuracy level — IRI 3.64 = IRI 3.61-3.67
  - Medium accuracy level — IRI 3.6 = IRI 3.3-3.9
  - Low accuracy level — IRI 3 = IRI 2-4 (Good, Fair, Poor)

Data Reliability

- Data needs to be reliable
  - Keep data errors within the predefined accuracy
  - Poor reliability can reduce the level of accuracy by an unknown factor
- Calibration of survey equipment
  - High accuracy equipment can give wrong data if not properly calibrated
  - Roughness apps have very varying accuracies depending on the vehicle used
  - Use equipment in defined operating ranges
- Avoid human errors
  - Avoid manual copying of data – ensure automatic data imports
  - Avoid fatigue - assess surface distress from video instead of directly on the road
  - Ensure replicability of data collection – properly store all raw data
  - Check resulting data for errors or inconsistencies

Data types

- General data
- Inventory data
- Traffic (and accident) data
- Condition data
- Project/Contract data (past, ongoing, planned)

General data

- General data
  - Road code
  - Road name (start – end)
  - Administrative road class
  - Construction year
  - Last repaving year
  - Responsible management entity
  - Administrative divisions GIS data (province, municipality, oblast, state, district, etc.)
  - Population data (location, number, density, etc.)
  - Rainfall (by class)
  - City/Town/Village GPS locations
  - Background GIS data (maps, satellite photographs)
  - etc.

- Collected from secondary sources

Inventory data

- Road inventory
  - Length (start + end chainage)
  - GPS location (coordinates)
  - Surface type
  - Carriageway width
  - Number of lanes
  - Terrain class
  - Technical class
  - Shoulder width
  - Drainage type
  - etc.
- Collected through surveys
- Does not change rapidly

- Bridge inventory
  - Bridge type
  - Length
  - Width
  - GPS location
  - Chainage
  - Deck material
  - Number of spans
  - Abutment type
  - etc.
- Other structures
  - Culverts
  - Retaining walls
  - etc.

Traffic and accident data

- Traffic data
  - Number of vehicles per day
    - Preferably by vehicle class
  - Road (link) code
  - GPS location
  - Survey date
  - Survey type
  - Traffic category
  - etc.

- Accident data
  - Accident date
  - GPS location
  - Number of fatalities
  - Number of serious injuries
  - Type of accident
  - etc.

- Collected through manual/ automated traffic counts
- For different roads or road links

- Collected from police?

Condition data

- Surface condition
  - Roughness (IRI)
  - Surface distress
    - Potholes
    - Cracking
    - Rutting
    - Edge break
    - Patching
    - etc.
  - Deflection
  - Gravel thickness
- Structure condition
  - Bridge condition
    - Deck
    - Abutment
    - Bearings
    - Beam
    - etc.
  - River/coastal protection condition
  - Culvert condition

- Collected through surveys
- Can change rapidly
- Either measured or as condition class

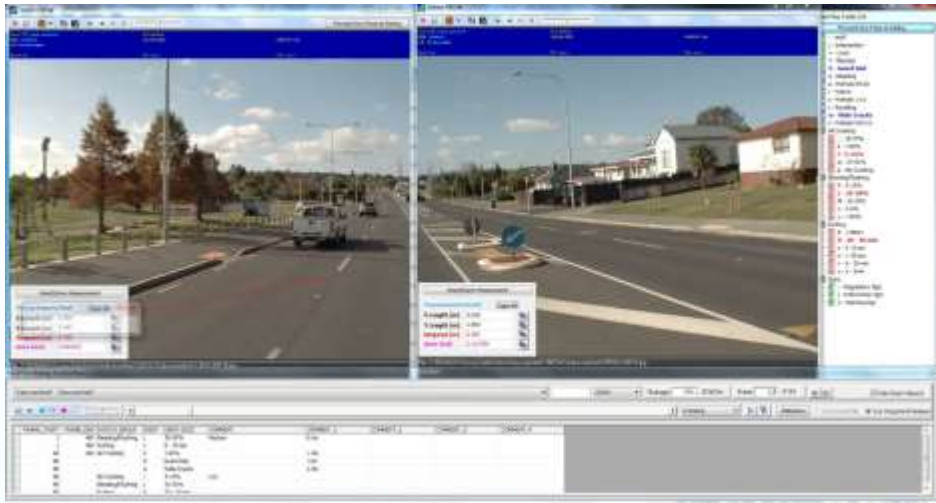
Project and Contract data

- Project/Contract data
  - Project/Contract code
  - Road (link) code
  - Location (start + end chainage)
  - GPS location (coordinates)
  - Treatment type(s)
  - Start/end date
  - Estimated cost/Contract price
  - Funding source
  - Contract documents
  - Contractor registration number
  - Contractor name
  - etc.

- Collected from planning or procurement unit

Video and Photo data

- Video and photo data can easily be collected as part of other surveys
- Important that it is georeferenced
  - Possible to indicate location on GIS map or Google Earth
- Allows for post-processing from the office
  - Inventory data (e.g. surface type, bridge, terrain category, etc.)
  - Condition data (e.g. surface distress, damages to structures)
  - Traffic data (e.g. moving traffic counts)
  - High replicability
- Use can be made of specific software for post-processing



Data needs overview

ROADS	TYPE	UNIT	SOURCE	REMARKS	FREQUENCY
Administrative class	Link	Category	DRBFC data, legal documents	A, C, D, E	5 years
Management entity	Link	Category	DRBFC data, legal documents	MPW/DRBFC, Municipality, Private	5 years
Municipality	Segment	Category	GIS administrative boundary data	Municipality list	5 years
Administrative Post	Segment	Category	GIS administrative boundary data	Administrative Post list	5 years
Suco	Segment	Category	GIS administrative boundary data	Suco list	5 years
Road code	Link	X##	DRBFC data, legal documents	Existing codes	5 years
Road name	Link	Text	DRBFC data, legal documents		5 years
Link code	Link	X##-##	DRBFC data, legal documents	Road code-two digit link number	5 years
Link name	Link	Text	DRBFC data, legal documents		5 years
Start name	Link	Text	DRBFC data, legal documents		5 years
Start chainage	Link	#+### m	ROMDAS odometer survey		5 years / After project
Start GPS coordinate	Link	X,Y,Z	ROMDAS GPS survey		5 years / After project
End name	Link	Text	DRBFC data, legal documents		5 years
End chainage	Link	#+### m	ROMDAS odometer survey		5 years / After project
End GPS coordinate	Link	X,Y,Z	ROMDAS GPS survey		5 years / After project
GPS track	Link	X,Y,Z	ROMDAS GPS survey		5 years / After project
Link length	Link	km (m)	ROMDAS odometer survey		5 years / After project
Terrain class	Segment	Category	ROMDAS video data post-processing	Flat, Rolling, Mountainous	5 years
Rainfall class	Segment	Category	Rainfall maps	<1000mm, 1000-2000mm, >2000mm	5 years
Technical class	Segment	Category	DRBFC data	R1,R2,R3,R4,R5,RR1,RR2, underclass	1-2 years / After project
Surface type	Segment	Category	ROMDAS video data post-processing, contract data	AC,PM,ST,CC,SM,GR,ER	1-2 years / After project
Pavement Class	Segment	Category	ROMDAS video data post-processing, contract data	Sealed, Unsealed	1-2 years / After project
Carrageway width	Segment	m	ROMDAS video data post-processing, contract data		1-2 years / After project
Number of lanes	Segment	#	ROMDAS video data post-processing, contract data		1-2 years / After project
Video data	Link	Video/GPS	ROMDAS video survey	.xls/.mp4	1-2 years
Roughness	100m	IRI	ROMDAS profilometer / ROMDAS bump integrator	For network analysis	1-2 years
Roughness survey date	100m	Date	ROMDAS profilometer / ROMDAS bump integrator		1-2 years
Surface distress class	Segment	SDI	ROMDAS video data post-processing	For network analysis	1-2 years
Surface survey date	Segment	Date	ROMDAS video data post-processing		1-2 years
Last treatment	Segment	Year	DRBFC data		1-2 years / After project
Last treatment	Segment	Contract	DRBFC data	Link to contract database	1-2 years / After project
Five Year Plan	Segment	Year	Five Year Plan	Year of planned works	5 years
BRIDGES	TYPE	UNIT	SOURCE	REMARKS	FREQUENCY
Bridge code	Point	X##-B##	Appoint	Based on road code+B+two-digit code	5 years / After project
Bridge name	Point	Text	DRBFC data		5 years / After project
River name	Point	Text	DRBFC data		5 years / After project
GPS location	Point	X,Y,Z	Bridge survey / ROMDAS video post-processing	Start of the bridge	5 years / After project
Chainage	Point	#+### m	Bridge survey / ROMDAS video post-processing	Start of the bridge	5 years / After project
Bridge type	Point	Category	Bridge survey / ROMDAS video post-processing	Beam,Arch,Truss,Suspension,Cable,Other	5 years / After project
Deck material	Point	Category	Bridge survey / ROMDAS video post-processing	Concrete, timber, steel	5 years / After project
Bridge length	Point	m	Bridge survey / ROMDAS video post-processing		5 years / After project
Bridge width	Point	m	Bridge survey / ROMDAS video post-processing		5 years / After project
Bridge spans	Point	#	Bridge survey / ROMDAS video post-processing		5 years / After project
Upstream protection	Point	Category	Bridge survey	None, Concrete, Stone masonry, Gabion	5 years / After project
Downstream protection	Point	Category	Bridge survey	None, Concrete, Stone masonry, Gabion	5 years / After project
Construction year	Point	Year	DRBFC data		5 years / After project

Group Work

- What data do we want/need to collect?
- What will we use that data for?
- How/where can we collect that data?
- How often do we need to collect that data?