Road Asset Management Systems
+
Performance-Based Contracting

Session 2.1: Data Processing and Management

Serge Cartier van Dissel
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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**

Data processing and management

- Data is only useful if we can access it and analyse it
  - Data needs to be reliable
  - Data needs to be accessible
  - Combining of different data needs to be possible

- Data therefore needs to be:
  - Validated (checked for errors or issues)
  - Processed (right format, combining different data sources)
 - Managed (in a database)

Data validation

- Checking data for errors/inconsistencies
  - IRI value of 98.5 – this is not possible and should be marked as an error
  - RoadLab roughness app records IRI=1 if speed is too low – this should be recorded as no data rather than a very low roughness of IRI=1

- Validation to be carried out before data is uploaded into database
  - Based on raw data (or processed data)
  - May include auditing of sample of data
  - Complemented by automatic checks in database – e.g. values within thresholds

- This is an important activity that is often given insufficient attention
  - Errors or problems in data can make the RAMS useless

Data processing

- Transforming data into the required format
  - Transforming data into a format that can be imported into the database
  - Transforming the units of the data
    - Transforming from m^2 to a percentage of the pavement surface
    - Sometimes automated in the database

- Importing data into a database
  - Making data ready for import
    - Preparing as a single CSV sheet with fixed columns
  - Some equipment can export data into a specific format
    - ROMDAS uses MS Access database

- All raw data should be kept and properly stored
  - If issues are found with processed data, raw data can be checked
  - Proper folder structure + backup system are needed

Example: Cambodia

- Rural Roads Information Management System (RRIMS)
  - Data collection by provincial departments – 45,000 km
  - Data entry by different staff (working group of 25 people)
    - Limited time and responsibility

- Insufficient data validation and processing
  - Provinces used Excel sheets to send data – data errors and format inconsistencies
  - Data was not always validated and instead imported directly into the RRIMS

- Database contained many errors and corrupted data
  - Data entered in wrong location (road width instead of pavement type)
  - Data entered in wrong format (e.g. centimetres instead of metres)
  - Data not according to defined categories (e.g. wrong spelling)
  - Data was often incomplete
  - Database did not include automatic checks of imported data

- Analysis of the data proved impossible
  - Data cleaning required first – very costly (for out-of-date data)
  - Raw data not always recoverable
  - Data will need to be collected again – 45,000 km

Structure Data
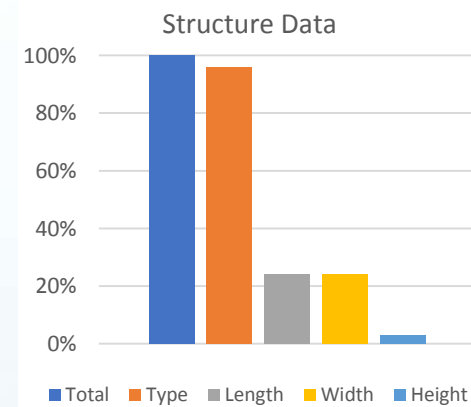
Example: Myanmar

- Road Data Bank (RDB) for trunk roads
  - 27,000 km surveyed using RoadRoid app and visual assessments

- Road data was only validated towards end of data collection
  - For much data the travel speed was too low to allow accurate IRI measurement
  - A lot of data had unrealistic IRI values
  - Only 16,800 km was found to have reliable IRI data
  - Over 10,000 km of IRI data was found to be unusable

- Although data validation was carried out and identified unreliable data, it was done too late in the process

Data management

- Data is entered into a database to facilitate access and combination of data

- Different complexities of database
  - Standard spreadsheet software (e.g. Microsoft Excel)
  - Standard database software (e.g. Microsoft Access)
  - Off-the-shelf road database software (e.g. HIMS, ArcGIS)
  - Custom-made road database software (often web-based)

- Start simple, gradually develop further
  - Using off-the-shelf software, find out what you want first
  - Later upgrade as needed

Database software

Software type	Advantages	Disadvantages	Examples
Standard spreadsheet (MS Excel or similar)	• Inexpensive • Easy to operate • Software often available • Support widely available • Simple interface possible	• Limited functionality • Need to develop structure	• Nepal (PTMP) • Kyrgyz (СУДА)
Standard database (MS Access or similar)	• Inexpensive • Support widely available • Simple interface possible	• Limited capacity • Need to develop structure	• Bangladesh (RSDMS) • Solomon Islands (SITAMS) • Tajikistan (HMS)
Off-the-shelf road database software	• Can be less expensive • Support widely available	• Not always suitable • Limited functionality • Language issues	• Georgia (ArcGIS) • Cambodia trunk (HIMS)
Custom-made database software	• Adjusted to needs • In own language	• Expensive • Limited support	• Myanmar (RDB) • Timor-Leste (ESTRADA) • Azerbaijan (RDBAze) • Pakistan (RMS) • Cambodia rural (RRIMS)

Database use

- Skill requirement
  - Is the software easy to use or only useable by trained staff
  - How feasible is it to train staff and retain them?

- Language
  - Is the database software available in a local/regional language?
  - Is it possible to have a local language interface?

Database access

- Remote access – central server
  - Does the database only work as a standalone desktop software?
    - Requires sharing and merging of database copies
  - Can it be accessed remotely by multiple users?
    - Central server within local area network (LAN)/wide area network (WAN)
    - Online access through internet

- Does the software allow for differentiated user rights?
  - Technical operators – data entry and editing
  - Road entity users – data viewing and exporting
  - Public users – limited data viewing

Data identifier

- Databases need unique identifiers for data sets
  - For roads use is made of road codes
  - Road names not unique + problems with spelling

- Road code needs to reflect
  - Administrative class
  - Road number
  - Link number (for link code)

- Codes for bridges and other structures
  - To include road code (important to know what road a structure is in)
  - Letter to indicate the type of structure (e.g. "B" for bridge)
  - Numbering preferably in sequence of chainage

- Exact format of code can be varied, but has to be used consistently
  - In database
  - In contracts

Database functions

- Related to functionality of the RAMS

- Database functions
    - Search/select data (multiple filters)
    - Show selected data (tables, graphs and maps)
    - Export data (generally as tables to PDF or CSV format, also as maps)
    - Standard reports (sets of agglomerated data for certain road types)
    - Calculate statistics and key performance indicators
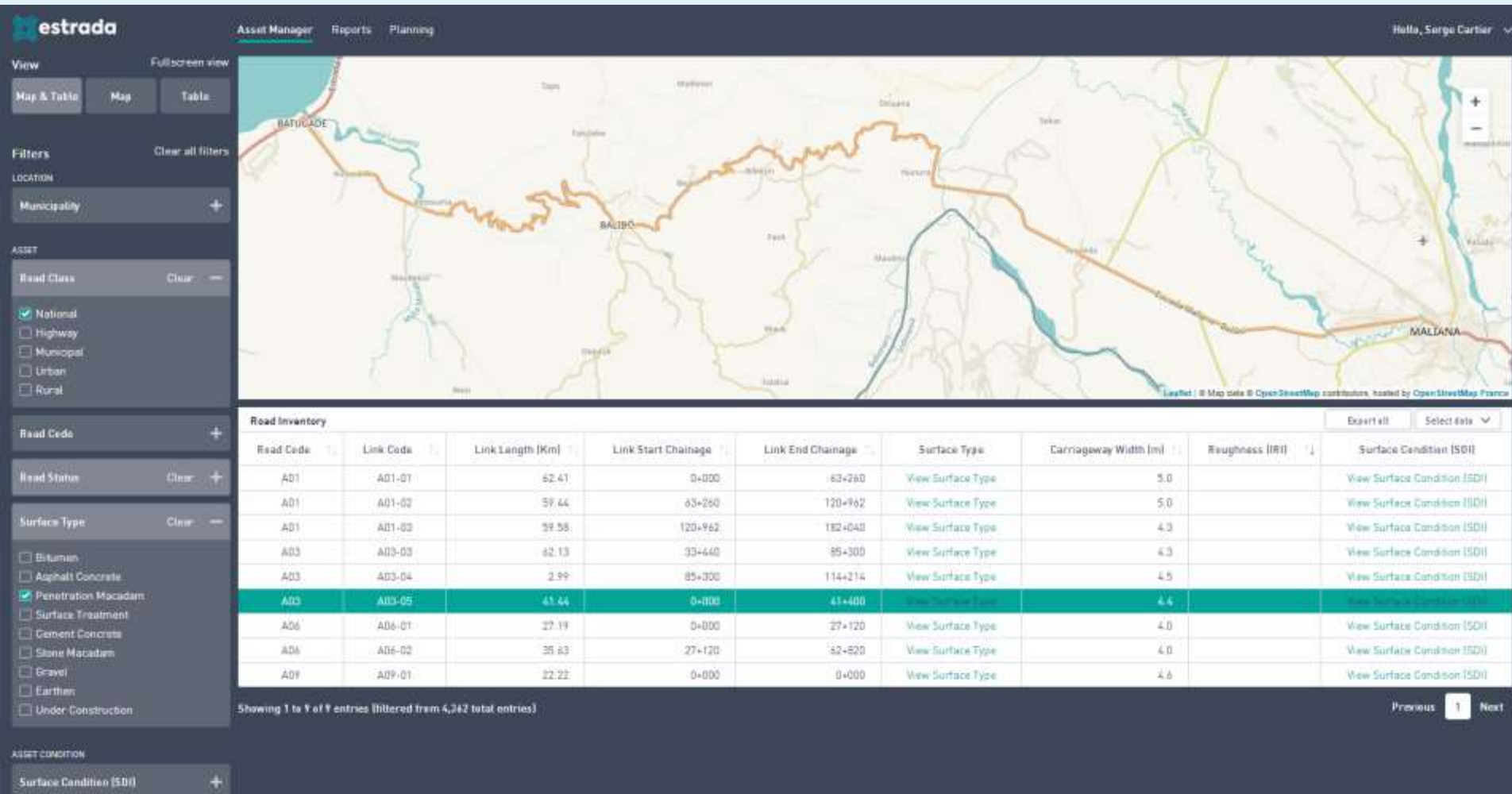
Example: Georgia

- Off-the-shelf software (ArcGIS Roads and Highways)
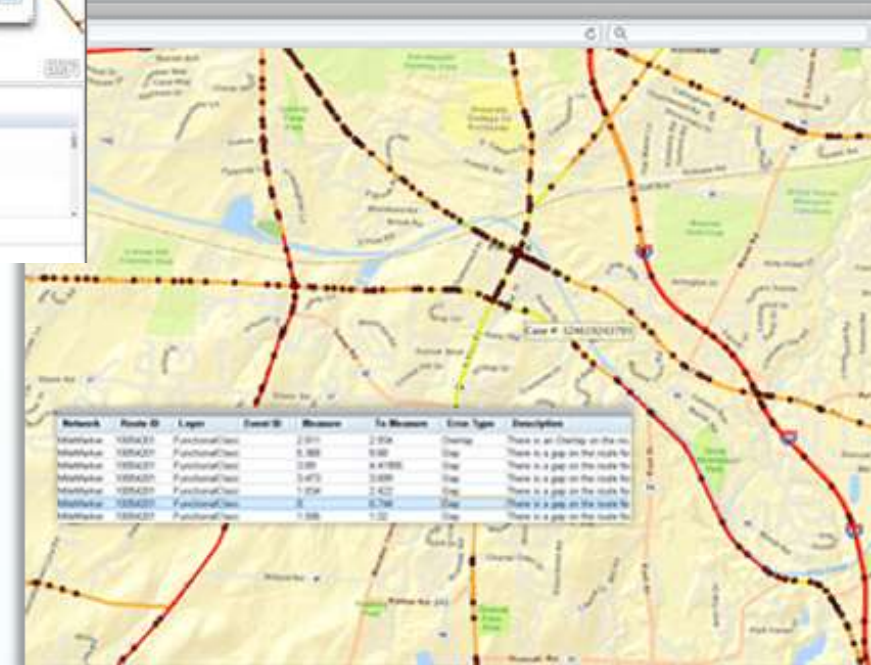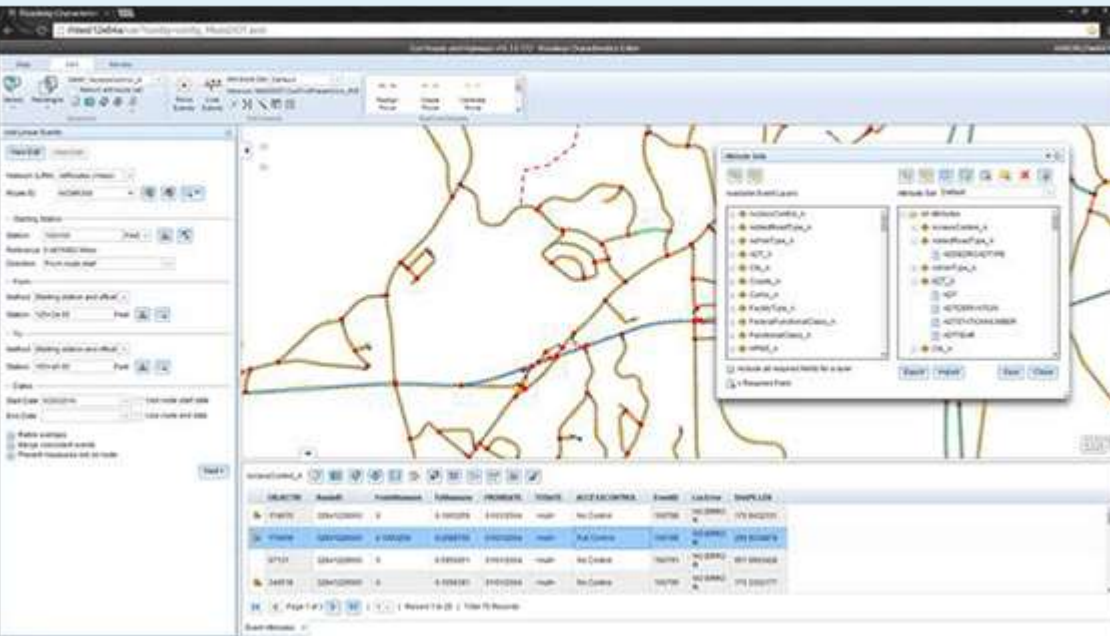
Example: Timor Leste

- Custom-made database (under development)

Example: Kyrgyz

- Custom-made database (under development)
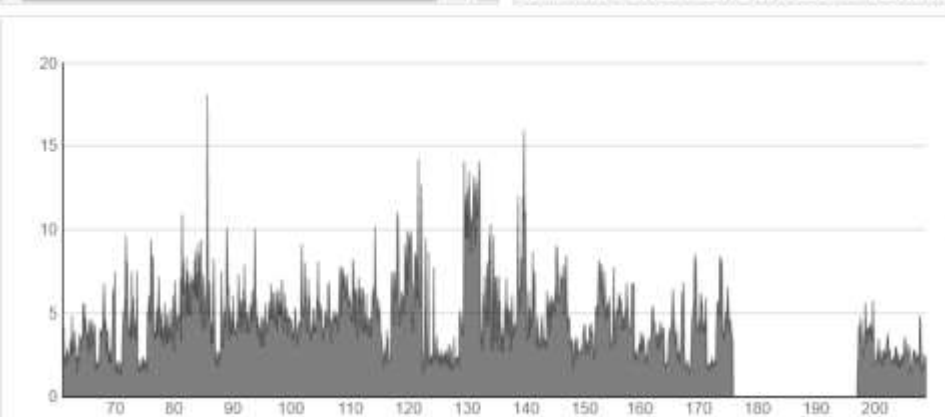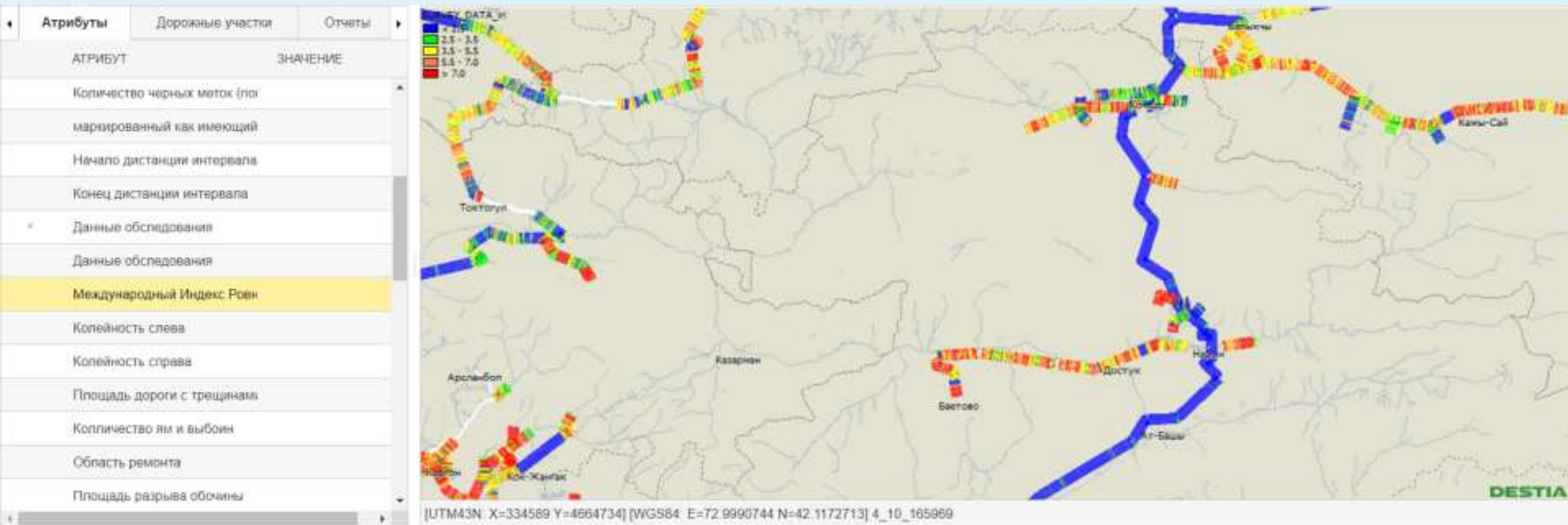
Database development

- Database development has to go hand-in-hand with data collection

- Do not develop the database before collecting any data
  - Problems in Timor Leste

- Do not collect all the data before developing the database
  - Problems in Myanmar

- Apply a stepwise approach
  - Collect data for a portion of the road network(s) to be included in the database
  - Check and validate the data collection
  - Develop and test the database
  - Collect the data for the rest of the network(s)
  - Complete database development and testing

Group Work

- Who will validate and process data?

- Who will manage and operate the database?

- What type of database do we need (initially)?

- Who should be able to access data and how?

- What in-house skills do we need?