Consultancy Services for the Development and Implementation of a GIS based Road Maintenance Management System for Saint Lucia

Workshop on 12 March 2018
<table>
<thead>
<tr>
<th>Time</th>
<th>Subject</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.00-10.15</td>
<td>Questionnaire to participants</td>
<td>Sirway: Konsta, Esko</td>
</tr>
<tr>
<td>10.15-11.00</td>
<td>Background information to the workshop Introduction to modern data collection</td>
<td>Sirway: Konsta, Esko Reach-U: Gaspar</td>
</tr>
<tr>
<td>11.00-12.00</td>
<td>Working in the groups</td>
<td>Participants</td>
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<tr>
<td>12.00-13.00</td>
<td>Lunch</td>
<td>MIPEL</td>
</tr>
<tr>
<td>13.00-14.30</td>
<td>Presentation of the group works</td>
<td>Each group</td>
</tr>
<tr>
<td>14.30-15.00</td>
<td>Discussions, summary and future actions</td>
<td>Sirway: Konsta, Esko</td>
</tr>
</tbody>
</table>
1. Road sector experiences
There is a variety of institutional frameworks

Roots of road institutions are historical and difficult to change. But, trends are clear:
– Decentralization
– Private sector participation
– Predictable financing from road user charges

Ownership of the road asset is a key element in the management
Typical Organization

Owner

Administrator

Manager

Contractor

State ministry

Road Administration

Regional Office

Regional Office

Regional Office

Contractors
Assignments Are Often Unclear

**Owner**
- Funding, policy and legal framework

**Administrator**
- Effecting the policies and political aims of the owner

**Manager**
- Specifying activities, supervising, and monitoring

**Supplier -- normally the private sector**
- Delivery of services and civil works

In Saint Lucia case Administrator and Manager can be combined because there is no need for regional organisation level
# Phases in Restructuring the Road Administration

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Works Department</td>
<td>Identify Client &amp; Producer</td>
<td>Separate Client &amp; Producer Establish Road Board</td>
<td>Corporatize Producer</td>
<td>Corporatize Client</td>
</tr>
</tbody>
</table>

**Decreasing Direct Government Involvement**

**Increasing Decentralization**
Division of Responsibilities

- In Saint Lucia the main question in the future is how to define the responsibilities between the Ministry level and Administrator/Manager level in order to effectively use the management possibilities from RAMS.
The role of Administrator

- Sets objectives and decision-making criteria
- Considers and communicates the budget and other constraints
- Distributes monies by functional classification and sets targets for road condition
- Suggests a distribution of engineering actions
- Monitors program performance and communicates that to the public and the road management entities
The role of Manager

- Prepares the road program and engineering design
- Procures and supervises contractors
- Interacts with the local affected interests
- Informs and interacts with the Ministry
- Utilizes local knowledge and factors not in engineering or economic models
- Has direction and control but also freedom to manage
Classification of roads is an important management tool. Used e.g. for:
- Resource allocation and financing responsibilities
- Standards for design and maintenance
- Equity of road asset and distribution of funds
- Classification must be decided on a political forum
Structure of the Road Budget:

Same Regardless of the Funding Source

- Administration and management
- Routine maintenance and operations
- Periodic maintenance and rehabilitation
- Strategic and capacity increasing road investments
  - Only the last should be itemized for the Parliament
Principle of using Performance Indicators

- Government
  - Targets
  - Results shown by performance indicators
  - Reports

- Road Authority
  - Expectations
  - Results shown by performance indicators
  - Reports

- Road Users
### Examples of some key performance indicators

| Ministry perspective | Average road user cost  
| Accident risk: fatality and injury accidents/veh.km  
| Value of road assets  
| Percentage completion of the annual work program |
|----------------------|-----------------------|
| Road Administration perspective | Forecast values of road costs vs. actual costs  
| Paved road roughness (IRI)  
| Bearing capacity/deflection  
| Defective bridge deck area |
| Road User perspective | Number of road closings and road closing days  
| Processes for customer/road user feedback |
Transition level 4+

Owner
Administrator
Manager
Routine
Periodic
New works

Public sector
Govt company
Private sector
• Importance of timely maintenance (routine and periodic) has been recognized
• Predictable and stable funding for maintenance is being secured
• Appropriate Road Asset Management systems being developed and used to optimize activities with the aim of maintaining roads at minimum long-term costs (incl. road authority and road user costs)
• In-house maintenance is being replaced by the use of private sector contractors – on competitive basis - savings 30-50%!

• Contracting shifting from traditional short term and limited scale unit price contracts towards long-term wide-scale performance based contracts
The contracting of maintenance normally includes the following development steps:

- Outsourcing of works, like snow ploughing, grading, patching, cleaning of ditches, etc. — contracts on annual base
- Integrated works contracts on annual bases
- 1 year area network contracts including all maintenance works
- 3-5 year area network contracts including all maintenance works
- 5-10 year area network contracts including all maintenance works
- 10-30 years contracts as a part of the concession contract
WHY THE USE OF CONTRACTORS CUTS MAINTENANCE COSTS?

• Better efficiency and productivity
• Better utilization of equipment
• Less staff with considerably higher productivity
• Maintenance activities done when optimally needed and not when money is available
• Business environment promotes innovations in work planning, work methods and procedures
AVAILABLE CONTRACT TYPES FOR MAINTENANCE

- **Unit price contract**
  - unit rates for various work items
  - payments based on the quantity of acceptably completed work

- **Performance based contract**
  - performance standards/requirements for various items
  - fixed monthly payments if requirements are complied with

- **Long term concession contracts**
  - as performance based, but long term
• The contract defines minimum conditions of road, bridge and traffic assets during the contract period, leaving it to the contractor on how to achieve them.

• The contractor is free to decide what, when, how and where to do the work as long as the performance standard requirements are met.

• Payments are based on how well the contractor complies with the requirements, not on the work amount carried out.
EXAMPLES OF PERFORMANCE INDICATORS

- Absence of potholes and control of rutting and cracks
- Roughness of road surface
- Functioning of the drainage system
- Quality of road markings, traffic signs and other road furniture
- Control of roadside vegetation
- Removal of litter and debris on the road and its surroundings
TIME SPANS TYPICALLY FOR PERFORMANCE BASED CONTRACTS

• 1-3 years in piloting phase
• 5-7 years in established situation (routine maintenance)
• 8-15 years if periodic maintenance (especially new overlaying) is also included
• 20-30 years for long term concessions
• Maintenance Standards have to be clearly and understandably defined and preferably measurable
• In a performance based contract there may be items with traditional unit price/work amount basis
• Contractors’ personnel has to be trustworthy
• Close and open relationship between client and contractor needed
2. Introduction to modern data collection
3. Introduction to group works
Properties of the Road
Functional Condition
Structural Condition
Hilliness
Geometry
Traffic Data
Bridges
Culverts
Drainage Condition
Vulnerability for Natural Hazards
Videos
Photographs
Spots
Safety Hazards

RMMS
Road Database

Complete RAMS Model

GIS

Multi-year Maintenance plan, Expenditures
Strategic Analysis
Budgeting

Annual Reports
Key Performance Indicators
How to get data

- RAMS will be a very good tool but it needs accurate and updated data to be working correctly
- Data from the roads can be got by different devices
- Data from maintenance works and cost can be got from road experts like you
How to use cost data

- In RAMS there is a database for different works and their unit cost
- This data is used to calculate different options in different planning processes to find out which actions and programs are most viable and economical
- These unit costs are used for comparison of different options
- More accurate costs will be used in detailed planning processes
Why quality of the data is important?

- The quality of the programs and the whole organization activities is fully depending on the correct data
- Incorrect data can lead to wrong and expensive solutions
- It can also weaken the trustworthiness of the organization among different road user groups
Proposed Mid-term Maintenance Planning Process in Saint Lucia

**PM/FM/Cabinet**
- General financial frames to road sector

**Stakeholders**
- Discussions with stakeholders
- Comments and proposals to program

**PS/MPSEL**
- Allocation between construction and maintenance
- Discussions and possible changes

**Mainten./CE**
- Selection of maintainable roads and sections
- Preparing of 1st draft of the program
- Discussions about the comments and impacts
- Preparing of 2nd draft of the program
- Final version to distribution

**RAM Unit**
- Cross-asset (roads, bridges, etc.), Periodic/routine maintenance optimization
- Data: Traffic, Unit costs, Maint.Stand. Road safety
- Needed data to discussions and evaluation of impacts

**Consultants**
- Use of consultants if needed
- Comments and proposals to program

Time:
- January
- December

Approval

Final version to distribution

End
4. Some current data in Saint Lucia
IRI values by zone in 2016

<table>
<thead>
<tr>
<th>Zone</th>
<th>IRI (mm/m)</th>
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<tbody>
<tr>
<td>1</td>
<td>7.98</td>
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<tr>
<td>2</td>
<td>10.00</td>
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<tr>
<td>3</td>
<td>11.10</td>
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<td>4</td>
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<td>10.63</td>
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<td>6</td>
<td>9.04</td>
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<td>7</td>
<td>8.12</td>
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<td>8</td>
<td>5.32</td>
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Road condition by zone in 2016

Road condition by zone

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<tr>
<th>Zone</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
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TOTAL NUMBER OF COMPLAINTS PER YEAR

- 2012-2013: 77
- 2015-2016: 136
- 2016-2017: 167
- 2017-2018: 143
Money spent by zone 13-14

<table>
<thead>
<tr>
<th>Zone</th>
<th>Amount</th>
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<tbody>
<tr>
<td>1</td>
<td>$4,963,103</td>
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<td>2</td>
<td>$1,084,513</td>
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<tr>
<td>3</td>
<td>$1,618,681</td>
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<tr>
<td>4</td>
<td>$1,208,515</td>
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<td>5</td>
<td>$2,087,092</td>
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<td>6</td>
<td>$1,130,262</td>
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<td>7</td>
<td>$1,124,492</td>
</tr>
<tr>
<td>8</td>
<td>$13,026,474</td>
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</tbody>
</table>

Total: $13,026,474
Financing and complaints by zone

Money spent by zone 2013-14

- Zone 1: 50%
- Zone 2: 19%
- Zone 3: 6%
- Zone 4: 8%
- Zone 5: 5%
- Zone 6: 4%
- Zone 7: 4%
- Zone 8: 4%

Complaints by zone 2012-2013

- Zone 1: 44%
- Zone 2: 17%
- Zone 3: 12%
- Zone 4: 6%
- Zone 5: 3%
- Zone 6: 2%
- Zone 7: 1%
- Zone 8: 4%
5. Working groups
Group 3
Group 6
6. Some maintenance slides more
Towards Optimization of Maintenance

The outcomes of the optimized maintenance planning are long- and short term plans for the whole road network.
Main Activities

From the managerial perspective the main activities are usually defined as

- Development
- Rehabilitation
- Periodic Maintenance
- Routine Maintenance
Routine maintenance works are activities that are undertaken each year.

Routine maintenance means the act of preserving the pavement structures, shoulders, embankments, drainage structures, drainage systems, and road furniture against the combined effects of traffic, climate. 

-> Ensuring the road projects last the design life.

It includes preventive maintenance activities required every year before structural, functional and/or safety failures.

Activities may be grouped as scheduled and reactive works.

Scheduled works are undertaken by the frequency indicated by maintenance standards. Reactive works are undertaken, when certain intervention criterion (determined in maintenance standards) is reached.

Culvert cleaning is an example of scheduled works (dependent on environmental effects rather than traffic levels) and patching is an example of reactive works (carried out in response to the appearance of potholes).
Typical routine maintenance works are:

- Pothole patching
- Crack sealing
- Edge and shoulder repair
- Ditch and slope control
- Curvert maintenance
- Vegetation control
- Cleaning of traffic signs and railings
- Winter maintenance (Snow removal, de-icing)
- For gravel roads: light grading
Periodic maintenance means the act of restore the pavement structures, shoulders, embankments, hydraulic structures, drainage systems, and road furniture to some minimum acceptable structural, functional and safety condition levels.
Typical periodic maintenance works are:

Paved Roads:
• Thin overlay (slurry seal)
• Overlay AC
• Milling + overlay AC
• Levelling + overlay AC

Gravel Roads:
• Re-gravelling
• Heavy Grading
Rehabilitation

Rehabilitation means the activities required to restore the pavement and hydraulic structures to the same conditions they were at the time of construction or subsequent reconstruction.

It essentially includes strengthening activities to restore structural strength and functional performance for continued serviceability.
Typical rehabilitation works are:

- Pavement reconstruction
- Stabilization (Bitumen bound, cement bound, deep milling and mixing)
Development works consists of construction of new roads, capacity increases by means of adding lanes, and substantial realignment of a road which may or may not increase capacity.
Typical development works are:

- Partial widening
- Lane or carriageway addition
- Geometric realignment (horizontal and geometrical improvements)
- Road upgrading (gravel road -> paved road)
Funding requirements depend on specified maintenance standards & unit costs

Maintenance standards are optimized from road user costs / road agency costs
**Example of routine maintenance works**

<table>
<thead>
<tr>
<th>Work</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pothole patching</td>
<td>Reactive</td>
</tr>
<tr>
<td>Crack sealing</td>
<td>Reactive</td>
</tr>
<tr>
<td>Edge and shoulder repair</td>
<td>Reactive</td>
</tr>
<tr>
<td>Ditch and slope control</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Culvert maintenance</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Vegetation control</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Winter maintenance (Snow removal, de-icing)</td>
<td>Reactive</td>
</tr>
</tbody>
</table>
### Example of Maintenance Standards

<table>
<thead>
<tr>
<th>Group</th>
<th>From</th>
<th>To</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention levels based on IRI (mm/m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1,9</td>
<td></td>
<td>No treatment, only routine maintenance</td>
</tr>
<tr>
<td>2</td>
<td>2,0</td>
<td>4,4</td>
<td>Surface Dressing or thin overlay</td>
</tr>
<tr>
<td>3</td>
<td>4,5</td>
<td>6,5</td>
<td>At least 40mm overlay (+milling or levelling)</td>
</tr>
<tr>
<td>4</td>
<td>6,6</td>
<td>8,9</td>
<td>At least 60mm overlay (+milling or levelling)</td>
</tr>
<tr>
<td>5</td>
<td>9,0</td>
<td></td>
<td>Rehabilitation</td>
</tr>
</tbody>
</table>

* Bulgaria 2009