

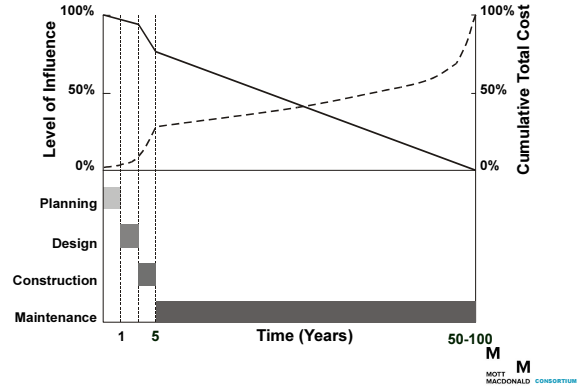


### Technical Assistance to Connectivity in the Western Balkans

Preparation of 5 year maintenance plan for the indicative extension of TEN-T Rail core/comprehensive networks in Western Balkans

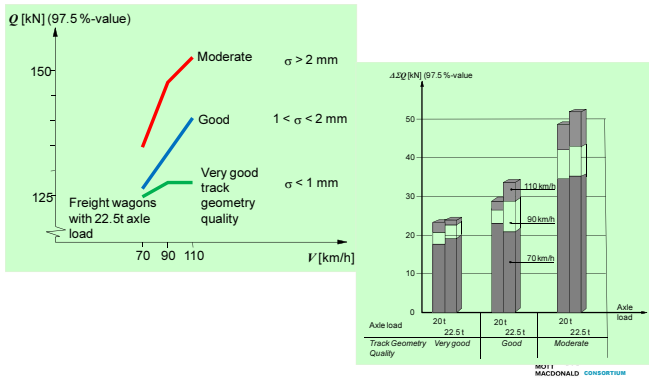
### Rail Maintenance & Renewal (M&R) Plans sub-project

#### Motives: Importance of maintenance



### Rail Maintenance & Renewal (M&R) Plans sub-project

#### Motives: Influence of track geometry quality



### Rail Maintenance & Renewal (M&R) Plans sub-project

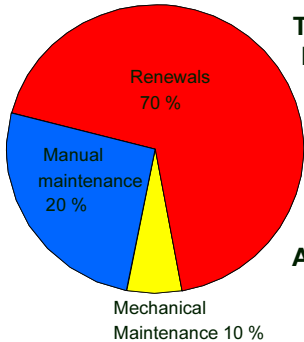
#### Motives: Influence of track geometry quality

Speed [km/h]	Vertical Track Geometry (D1) Standard Deviation Thresholds [mm]				
	A	B	C	D	E
$V < 80$	< 1.25	1.75	2.75	3.75	> 3.75
$80 < V \leq 120$	< 0.75	1.10	1.80	2.50	> 2.50
$120 < V \leq 160$	< 0.65	0.85	1.40	1.85	> 1.85
$160 < V \leq 230$	< 0.60	0.75	1.15	1.60	> 1.60
$230 < V \leq 300$	< 0.40	0.55	0.85	1.15	> 1.15
$V > 300$	N/A	N/A	N/A	N/A	N/A

The scatter in deterioration rate values is between 1 and 10 mm SD / 100 MGT, and largely depends on exerted dynamic forces.

### Rail Maintenance & Renewal (M&R) Plans sub-project

#### Motives: Costs of Track maintenance



**TOTAL MAINTENANCE AND RENEWAL COST on Dutch Railway network (ProRail)**

€ 250 million per year for 4.500 km track  
Price level 2006

**Average in Western Europe: ≈ 50,000 EUR/km/year on conventional lines**

### Rail Maintenance & Renewal (M&R) Plans sub-project

#### Scope & Components

- Scoping and analysis of maintenance & renewal (M&R) needs per Regional Participant (RP)
- Assessment of Business Plans of IMs as per 2012/34/EU compliance
- Design implementation scenario for an IM asset register as per 2012/34/EU
- Carry out financial analysis under different budget scenarios including cost breakdown per road category (corridor, route)
- Analysis of IM current contracting strategies and recommendations including comparative analysis of 2 different contracting arrangements
- Analysis and recommendations for setting up Railway Infrastructure Asset Management System (RI-AMS) in the region
- Support RPs in preparing their own M&R plans reflecting their specific development characteristics (additional TA and budget might be needed according to level of detail and Connecta engagement)

## Rail M&R Plans sub-project

### ➤ Status

- Initiated June 5, 2017 (KoM at June 26, 2017)
- IR submitted July 7, 2017 (draft) and August 2, 2017 (final)
- Initial round of missions and data collection – completed Oct 7, 2017

### ➤ Indicative Plan

- Duration 16 months (expected completion October 2018)
- Interim Reports (needs assessment - scoping) due till end 2017
- Team of 3 NKEs
- PM: Giorgos Xanthakos

## Rail M&R Plans: approach, progress status and issues

### ➤ Scoping and analysis of maintenance & renewal (M&R) needs in core/comprehensive network in WB6

- Establish current M&R practices and network condition
- Establish current situation concerning condition-monitoring (e.g. track recording vehicles)
- Establish current situation concerning **asset register & RI-AMS**
- Compare network condition and relevant indicator values
- Identified issues: condition data may be missing or significantly outdated

### ➤ Support RPs in preparing their own M&R plans for the period 2019-2023 reflecting their specific characteristics

- Establishment of M&R standards, thresholds and asset service lives
- Strategic analysis and focus on the key/costliest M&R activities, accounting for the largest part of the M&R budgets, e.g. track components renewals
- Develop five-year M&R program for the key M&R works, including analysis within different budget scenarios, & extrapolate for others works

## Rail M&R Plans: approach, progress status and issues

### ➤ Analysis of IM current M&R contracting strategies and recommendations including comparative analysis

- Analysis of past and current experiences with either PBMC, COST+, etc. concepts, including identification of challenges and recommendations of optimal concepts under the given circumstances
- Elements: description of PBMC, COST+, etc. key concepts, analyze possible performance monitoring, identify prerequisites, draft typical stages, provide instructions for eventual piloting, set recommendations for further steps following the pilot stage and instructions in performance monitoring

### ➤ Analysis and recommendations for setting RI-AMS in the region

- Propose optimal concepts and methods for condition-monitoring (e.g. acquisition of measuring services rather than acquisition of costly measuring vehicles & systems, or sharing measuring vehicles & systems, etc.)
- Definition of the optimal concept, size and level of complexity of RI-AMS for the given circumstances and technological level of IMs
- Definition of the necessary RI-AMS modules and most effective decision-rules and thresholds.

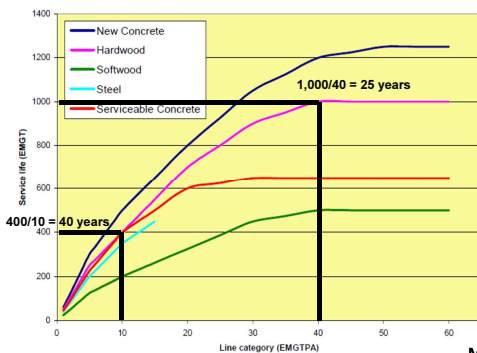
## Rail M&R Plans: approach, progress status and issues

### ➤ Asset data

Inventory Data	Operating Data	Condition Measurements	Work History
<ul style="list-style-type: none"> <li>Track Layout                             <ul style="list-style-type: none"> <li>Curves</li> <li>Gradients</li> </ul> </li> <li>Asset Inventory                             <ul style="list-style-type: none"> <li>Rails,</li> <li>Sleepers,</li> <li>Ballast,</li> <li>Switches (S&amp;C),</li> <li>Structures,</li> <li>Signalling,</li> <li>Electrical, etc.)</li> </ul> </li> <li>Asset Characteristics:                             <ul style="list-style-type: none"> <li>Types</li> <li>Installation Dates</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Speeds</li> <li>Annual Loads</li> <li>Axle Loads</li> <li>Line Categories</li> </ul>	<ul style="list-style-type: none"> <li>Track Geometry                             <ul style="list-style-type: none"> <li>Rail geometry</li> <li>Corrugation</li> <li>Wheel/Rail forces</li> <li>Ride comfort</li> <li>Ultrasonic measurements</li> <li>Rail Surface Defects</li> <li>Ballast % of "fines"</li> <li>Geotech/Petrogr. anal. of ballast</li> <li>Sleeper cracking and/or clustering</li> <li>Various (visual) inspection data</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>M&amp;R Works                             <ul style="list-style-type: none"> <li>Type</li> <li>Date</li> <li>Location</li> <li>Costs</li> </ul> </li> </ul>

## Rail M&R Plans: approach, progress status and issues

### ➤ Asset service lives



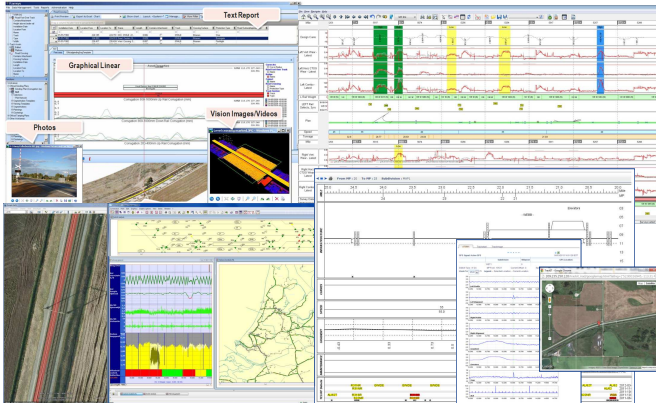
## Rail M&R Plans: approach, progress status and issues

### ➤ International best practice

- 2-5% main line track renewals, which is practically a direct consequence of the average asset service lives, which amounts from 20 years onward for rails and up to 30-50 years for sleepers and ballast
- 1-2% renewals of secondary lines and station tracks,
- 20% mechanized tamping of the entire network,
- 1-2% ballast renewal (cleaning),
- 1-2% sleeper renewal,
- 1-2% rail renewal,
- 3-5% S&C renewal,
- 10% mechanized rail grinding on the entire network,
- 10% preventive mechanized rail grinding on the entire network
- Larger volumes of regular/routine spot maintenance, mostly performed manually.

## Rail M&R Plans: approach, progress status and issues

### ➤ Railway Infrastructure Asset Management Systems – RI-AMS



**M**  
**M**  
MOTT  
MACDONALD CONSORTIUM



CONNECTA Project team

Mr Chris Germanacos, Team Leader, Transport Expert ([chris.germanacos@connecta-ta.eu](mailto:chris.germanacos@connecta-ta.eu))  
Mr. Kostas Georgiou, Transport Key Expert, Deputy Team Leader ([kostas.georgiou@connecta-ta.eu](mailto:kostas.georgiou@connecta-ta.eu))  
Mr. Georgios Xanthakos, Project Manager ([georgios.xanthakos@connecta-ta.eu](mailto:georgios.xanthakos@connecta-ta.eu))  
Mr. Stasha Jovanovic, Railway Expert ([stasha.jovanovic@gmail.com](mailto:stasha.jovanovic@gmail.com))