

MAINLINE

MAINTenance, renewal and Improvement of rail transport iNfrastructure
to reduce Economic and environmental impacts

Collaborative project (Small or medium-scale focused research project)

Theme SST.2011.5.2-6.: Cost-effective improvement of rail transport infrastructure

Deliverable D8.2:

First analysis and identification of potential
guidelines from MAINLINE R&D

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UIC

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Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Abstract of the MAINLINE Project

Growth in demand for rail transportation across Europe is predicted to continue. Much of this growth will have to be accommodated on existing lines that contain old infrastructure. This demand will increase both the rate of deterioration of these elderly assets and the need for shorter line closures for maintenance or renewal interventions. The impact of these interventions must be minimized and will also need to take into account the need for lower economic and environmental impacts. New interventions will need to be developed along with additional tools to inform decision makers about the economic and environmental consequences of different intervention options being considered.

MAINLINE proposes to address all these issues through a series of linked work packages that will target at least €300m per year savings across Europe with a reduced environmental footprint in terms of embodied carbon and other environmental benefits. It will:

- Apply new technologies to extend the life of elderly infrastructure
- Improve degradation and structural models to develop more realistic life cycle cost and safety models
- Investigate new construction methods for the replacement of obsolete infrastructure
- Investigate monitoring techniques to complement or replace existing examination techniques
- Develop management tools to assess whole life environmental and economic impact.

The consortium includes leading railways, contractors, consultants and researchers from across Europe, including from both Eastern Europe and the emerging economies. Partners also bring experience on approaches used in other industry sectors which have relevance to the rail sector. Project benefits will come from keeping existing infrastructure in service through the application of technologies and interventions based on life cycle considerations. Although MAINLINE will focus on certain asset types, the management tools developed will be applicable across a broader asset base.

Partners in the MAINLINE Project

UIC, FR; Network Rail Infrastructure Limited, UK; COWI, DK; SKM, UK; University of Surrey, UK; TWI, UK; University of Minho, PT; Luleå tekniska universitet, SE; DB Netz AG, DE; MÁV Magyar Államvasutak Zrt, HU; Universitat Politècnica de Catalunya, ES; Graz University of Technology, AT; TCDD, TR; Damill AB, SE; COMSA EMTE, ES; Trafikverket, SE; SETRA, FR; ARTTIC, FR; Skanska a.s., CZ.

WP 8 in the MAINLINE Project

D8.2 is the second deliverable in WP8.

The main objectives for WP8 are:

- To ensure governance and coordination at project level, the achievement of the project objectives. Make sure that project results can successfully be implemented into guidelines for IMs.
- To select the members of the advisory committee, coordinate their action and organize their participation in key meetings.
- To assure the liaison with other projects, e.g. SMARTRAIL.

Table of Contents

- Glossary 3**
- 1. Executive Summary 4**
- 2. Acknowledgments 5**
- 3. Introduction 6**
- 4. Guidelines identified per Work Package 7**
 - 4.1 WP1: D1.4 “Guideline to the application of new technologies to extend the life of elderly rail infrastructure” 7
 - 4.2 WP3: D3.4 “Guideline for replacement of elderly rail infrastructure” 8
 - 4.3 WP5: D5.7 “Usable Tool and Manual” 8
- 5. Conclusions 9**

Glossary

Abbreviation / acronym	Description
AC	Advisory Committee
EB	Executive Board
IM(s)	Infrastructure manager(s)
LCAT	Life Cycle Assessment Tool
PoSE	UIC Panel of Structural Experts
TEG	UIC Track Experts Group
UIC	International Union of Railways
WP	Work Package

1. Executive Summary

Deliverable 8.2 is the second deliverable of Work Package 8 (WP8) “Scientific and Technical Coordination” in MAINLINE. It is linked to Task 8.1 “Project Coordination and Governance”, Task 8.2 “Technical Advisory Committee” and Task 8.3 “Liaison with other projects”.

This report gives the first analysis and identification of potential guidelines issuing from MAINLINE R&D. The idea to promote guidelines is to make the next step of implementation easier. This has successfully been done in other EU-projects like Sustainable Bridges (www.sustainablebridges.net) and INNOTRACK (www.innotrack.net).

Based on the analysis of the work so far, three guidelines will be issued:

(1) “Guideline to the application of new technologies to extend the life of elderly rail infrastructure” (D1.4). It will focus on recommendations regarding strengthening, assessment, and monitoring of structures and track.

(2) “Guideline for replacement of elderly rail infrastructure” (D3.4). It will focus on replacement procedures for bridges and track (rail and switches and crossings).

(3) “Usable Tool and Manual” (D5.7), which is the Manual for the Life Cycle Assessment Tool (LCAT). It will give the backbone and examples of a tool that can be used for Plain Track, Soil Cuttings, Metallic Bridges, and Tunnels with Concrete Linings.

The three guidelines and supporting documents will give recommendations that provide essential added value to infrastructure managers. As an example, it can be mentioned that each bridge that can be saved/ upgraded instead of being demolished and exchanged to a new bridge, will save some 200 to 3,000 k€ (depending on bridge length and condition). In Europe there are some 4,500 bridges, where this decision has to be made during the next ten years. This adds up to a potential saving of several billions of Euros. Similar savings can be made for other types of infrastructure such as rail and switches and crossings.

2. Acknowledgments

This present report has been prepared within Work Package WP8 of the MAINLINE project by the Task leader UIC, together with LTU, based on the contributions from the other WPs and from the members of the advisory committee:

- Rosemarie Helmerich, BAM (Federal Institute for Materials Research and Testing, Germany)
- Livia Pardi, Autostrade, the Italian national system of motorways
- Kenneth Gavin, University College Dublin, Project coordinator of SMARTRAIL.
- Paul Godart, INFRABEL, the Belgian Railway Infrastructure Manager, Chairman of TEG
- Patrice Schmitt and Suzhe Yang, SNCF, the French Railway Infrastructure Manager, which is not a partner in MAINLINE.

3. Introduction

After the first 18 months of the project, the work in the different work packages has been analysed. The organization of the work is illustrated in Figure 3.1.

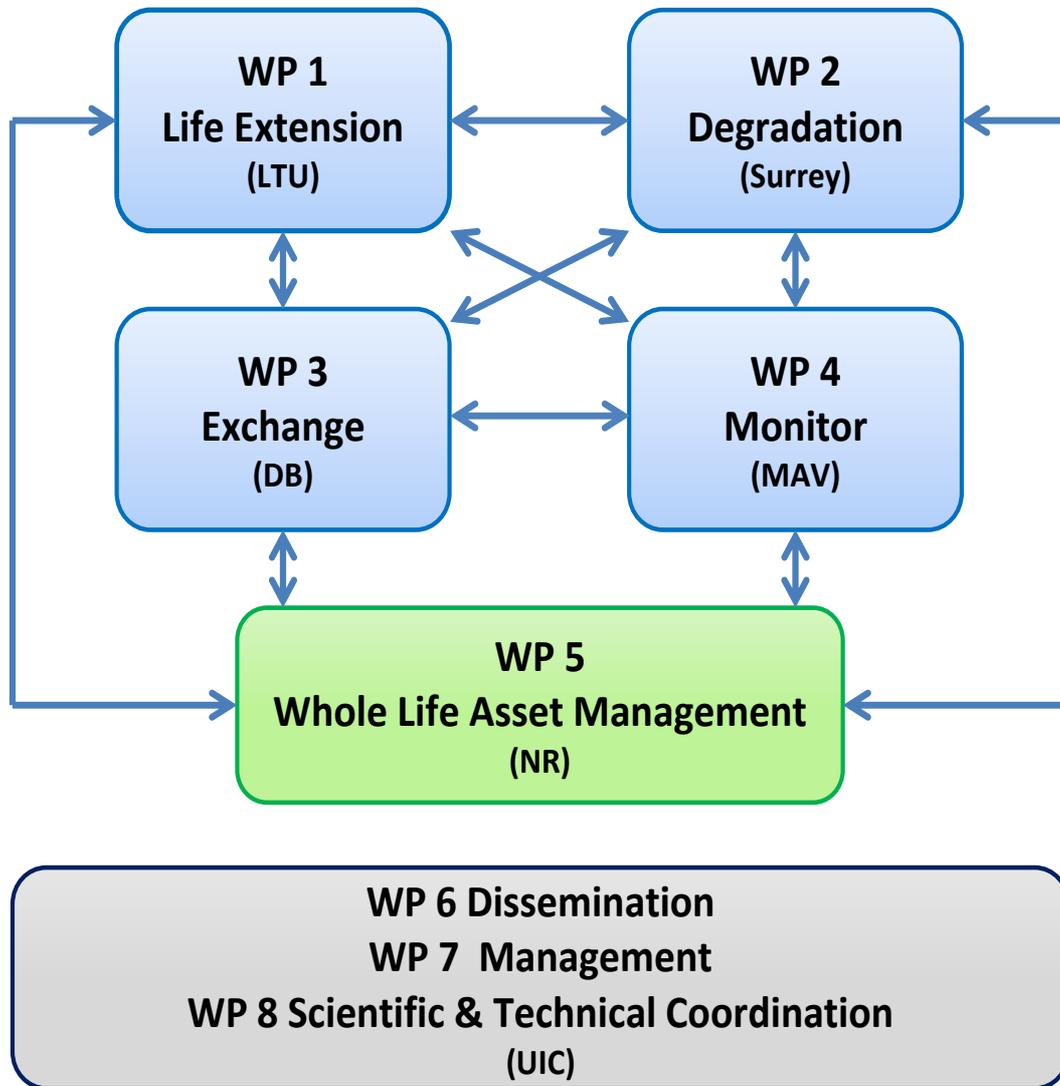


Figure 3.1 Organization of the work in MAINLINE.

Traditional research reports are often difficult to straightforwardly implement as they tend to be vague in their conclusions and are not oriented towards practical applications. The aim in MAINLINE is to produce guidelines that can be more directly implemented into codes and standards. Each guideline will use as starting point the related deliverable research report. Guidelines are more precise and therefore higher in the above-mentioned hierarchy than experts' reports. More importantly, they are directly addressed to the final users: in this case infrastructure managers of the railway sector.

4. Guidelines identified per Work Package

So far a guideline has been identified for each of the Work Packages WP1, WP3 and WP5.

Discussions have taken place to decide if guidelines should be done also in WP2 and WP4. These discussions have not led to a final result yet. A solution could be to incorporate the recommendations from these two WPs in the final guideline/manual D5.7 for the Life Cycle Assessment tool (LCAT).

The following subsections present the guidelines identified so far for WP1, WP3 and WP5.

4.1 WP1: D1.4 “Guideline to the application of new technologies to extend the life of elderly rail infrastructure”

D1.4 will be the last deliverable produced by WP1, to be delivered in M36.

Based on the work in Task 1.1 “Explore and evaluate new technologies” and T1.3 “Develop new technologies to extend life”, a guideline that can be used by infrastructure owners and their consultants and contractors will be developed.

LTU, NR, UMinho, UIC, UPC and Skanska will contribute with their expertise. The recommendations will be focused on strengthening, assessment and monitoring of structures and track.

The guideline will form input to WP6 “Dissemination, training and exploitation”. It will particularly be useful to transfer experience to Eastern Europe and developing economies, where bridge problems sometimes are more acute than in Western Europe. Besides, not all Infrastructure Managers are active in that field.

With a consortium bringing together organisations from all over Europe, MAINLINE studies the application of technologies in various contexts, notably regarding the weather, which will contribute to having a guideline applicable in all parts of Europe and represents the added value of the research. Each bridge that can be saved/upgraded instead of being demolished and exchanged to a new bridge, will save some 200 to 3,000 k€ (depending on bridge length and condition). In Europe there are some 4,500 bridges, where this decision has to be made during the next ten years. This adds up to a potential saving of several billions of Euros. Similar savings can be made for other types of infrastructure such as rail and switches and crossings.

Besides, it can be seen that not many Infrastructure Managers currently use Life Cycle Costing (i.e. financial) and/or Life Cycle Assessment (i.e. environmental) in the planning of maintenance and repair of their rail infrastructure. There is a lack of data and methods and here the MAINLINE project is intending to give guidance. There is also often a lack of economic resources for maintenance which may lead to a shorter life length and less sustainability than would otherwise be the case; results from the MAINLINE Project are also intended to give advice that may help to improve this situation.

This document has not only the purpose to support the LCAT tool but is also an important standalone document for IMs. Since it is a guideline (a document with clear recommendations), it is also easier to use practically.

4.2 WP3: D3.4 “Guideline for replacement of elderly rail infrastructure”

D3.4 will be the last deliverable produced by WP3, to be delivered in M36.

Based on the work in Task 3.1 “Benchmark New technologies for production and replacement”, T3.2 “Bridges: Development and improvement of new technologies for replacement” and T3.3 “Rail switches and crossings: Development and improvement of new technologies for replacement”, a guideline will be developed. This guideline will help the infrastructure managers to decide on when and how to rebuild parts of the network. Costs, economical factors, logistics needed and environmental impact of selected techniques will be presented. Based on this information, every infrastructure owner will be able to choose the optimal methods that fit his infrastructure strategy. Interfaces with commonly used LCC tools will be respected.

This deliverable will consist in a systematic approach to the application of new technologies to replace elderly infrastructure. It will be a tool to help infrastructure managers in their decision-making on cost effective infrastructure management that considers environmental aspects. It will be focused on replacement procedures for bridges and track (rail and switches and crossings). It will help to spread new and developed technologies that will give Infrastructure Managers in Europe better tools and examples of how to improve their cost efficiency.

This document, like D1.4, has not only the purpose to support the LCAT tool but is also an important standalone document for IMs. Since it is a guideline (a document with clear recommendations), it is also easier to use practically. The result is now so promising that there could be a specific workshop dedicated to it.

4.3 WP5: D5.7 “Usable Tool and Manual”

D5.7 will be the final deliverable of WP5, to be delivered in M35.

This deliverable will report the activities of phase 3 of Task 5.5 and will consist in the final version of the proposed Life Cycle Assessment Tool (LCAT). It could be renamed in "Guideline for a Life Cycle Assessment Tool (LCAT) for Rail Infrastructure" so as to have a more explicit title.

This version will not be a fully functioning piece of software, rather it will consist of recommendations and algorithms for inclusion in existing software by those who already have tools in use, or which can be used by commercial software houses to develop a commercial product for sale.

It will give the backbone and examples of a tool that can be used for Plain Track, Soil Cuttings, Metallic Bridges and Tunnels with Concrete Linings. As it will also give examples on how Life Cycle Assessments can be carried out, it will promote this kind of advanced analysis tools to IMs who have limited or no experience on how to use them. This will hopefully be an inspiration from all over Europe with examples also from Eastern Europe.

This document is one of the most important documents of MAINLINE. Since it will be read by many stakeholders it is important that the result is clear in its conclusions and recommendations.

5. Conclusions

To increase MAINLINE's output, we intend to produce useful guidelines based on the deliverable reports. The question of which deliverables will actually become guidelines depends on the outcome of the project. In order to give appropriate recommendations to the IMs, the final decision on which deliverables will become guidelines will be taken successively throughout the project as the expected project results become more tangible. This methodology has been tested previously in projects like INNOTRACK and Sustainable Bridges.

For now there will be three deliverables becoming guidelines: one from WP1, one from WP3 and one from WP5. It will be decided in the coming months if there should also be guidelines issuing from WP2 and WP4 or if their results should be fed into WP5.

In addition to the guidelines, the results will be disseminated to Infrastructure Managers in different ways (case studies, seminars, workshops, short courses, reports and papers).

As an example, there is already a plan to organize a special workshop for Eastern and Central European Countries in Budapest during the spring of 2014.

All these events, including the aforementioned one, will give the opportunity to the MAINLINE partners to measure what kind of information is needed in the field and how it can be transposed from what is being delivered in the project into useful, practical guidelines.