

MAINLINE

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

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

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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)	

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Glossary

Abbreviation / acronym	Description
CEN	European Committee for Standardisation
CER	The Community of European Railways
EFRTC	European Federation of Railway Trackworks Contractors
EIM	European Rail Infrastructure Managers
ERA	European Railway Agency
IABMAS	International Association on Bridge Maintenance and Safety
IM	Infrastructure Manager
PoSE	UIC Panel of Structural Experts
TEG	UIC Track Expert Group
TTIG	UIC Train Track Interaction Group
UNIFE	The Association of the European Rail Industry
UIC	Union International des Chemins de Fer (International Railways Union)

1. Executive summary

MAINLINE's work-package 6 (WP6) covers the dissemination, training and exploitation activities of the project. WP6 is coordinated by UIC with logistics supports from ARTTIC. Ten of the partners contribute specifically to the work-package activities and all nineteen partners will disseminate and implement the results in their future activities as infrastructure managers, contractors, consultants or universities/institutes. All dissemination material is approved in advance by the partners to ensure that the promised commitments have been fulfilled and that confidential information has been protected. However, MAINLINE is a very open EU-project and nearly all scientific deliverables are public.

Dissemination has been a carefully planned process. Workshops and dedicated presentations have been presented to standardisation bodies and have been targeted through groups existing under the UIC umbrella such as TEG (Track Expert Group) and PoSE (Panel of Structural Experts). Some deliverables will be transposed into practical guidelines and a manual (according to the recommendations in deliverable 8.4 – Second analysis and identification of potential guidelines from MAINLINE R&D). The intention from the coordinator is also to establish working groups that will continue working on and refining the MAINLINE results after the project ends in September 2014.

The project has organised two general public project workshops. The first one was held for the midterm of the project while the second one will take place at the end of the project in September 2014. Additionally, a specific workshop targeting an audience from Eastern Europe and beyond took place in May 2014.

Plans for the public website, leaflets, flyers and posters are following what was described in the DoW. We also plan a concluding book/booklet that will summarize the work done and make the results easier to use after MAINLINE is ended.

As a conclusion, WP6 objectives will be fulfilled and the technical and scientific results of MAINLINE will be widely disseminated to have a real impact in the railway world.

2. Acknowledgements

This report has been prepared within Work Package WP6 of the MAINLINE project with the following team of contractors as main contributors:

- Björn Paulsson, UIC/Trafikverket
- Adeline Paul, ARTTIC
- Lennart Elfgren, LTU
- Brian Bell, UIC
- Peter Veit, TUGRAZ
- Laszlo Daczi, MAV
- Sam Luke, JACOBS SKM
- Ujjwal Bharadwaj, TWI
- Poul Linneberg, COWI

3. Introduction

3.1 The Dissemination Work Package in MAINLINE

The organization of MAINLINE is summarized in Figure 3-1. The dissemination and communication activities in Work Package (WP6) are coordinated by the Project Coordinator, UIC, with logistics support from ARTTIC. All partners will contribute to the dissemination activities but the 10 partners identified below (out of the 19 which constitute the consortium) have been more deeply involved in dissemination:

Part n°	Short Name	Country
1	UIC	FR
2	NR	UK
3	COWI	DK
5	UMinho	PT
8	LTU	SE
10	MAV	HU
12	TUGraz	AT
17	TrV	SE
18	ARTTIC	FR
20	SKM	UK

The work within this WP has been carried out by

- preparing dissemination material,
- undertaking dissemination activities,
- representing the MAINLINE project at scientific events, and
- participating in training events.

The dissemination of the MAINLINE project has been a carefully planned process driven by the coordinator, the scientific leader and the project office. The results have been presented to established international working groups throughout the project and this is expected to continue after the project ends through the creation of new working groups supported by the relevant project partners, probably under the overall umbrella of UIC. At suitable times the project has been presented through workshops and trainings. By working with established UIC groups like TEG (Track Expert Group) and PoSE (Panel of Structural Experts), MAINLINE has also reached standardisation bodies.

Asset Management is defined in the International Standard ISO 55000 as “*The coordinated activities of an organisation to realise value from physical assets*”. It is important to European railways because it will help Infrastructure Managers to deal with the limited funding that is likely to be available for railways in the immediate future due to the many pressing demands from different sectors of society. Asset Management can and will help Infrastructure Managers to:

- Prioritise and justify works
- Spend efficiently
- Coordinate access/possessions
- Define levels of safety and service

Therefore MAINLINE is a very important project which will help to give:

- Value for money
- Financial sustainability
- Environmental sustainability

However, a major challenge to the MAINLINE project has been to find the correct target audience in the Infrastructure Managers' organisations. The different managers have organised themselves in diverse ways and a lot of effort has been made to identify and address the right people.

All deliverables are public except for some appendices and deliverables of a more internal character for the consortium.

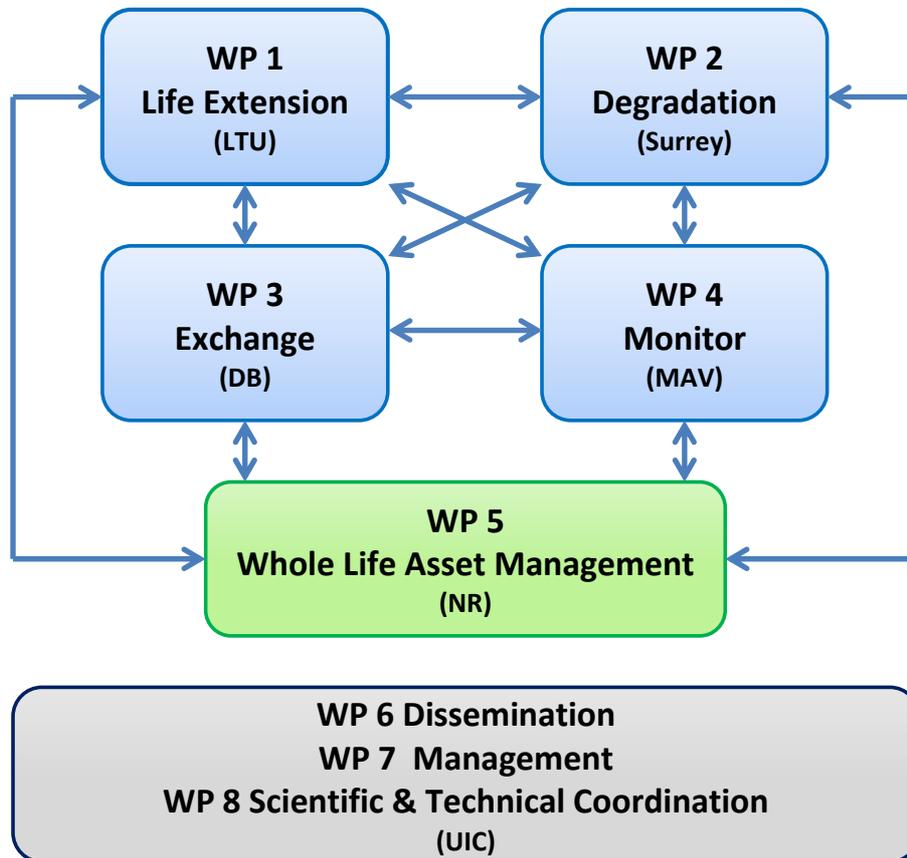


Figure 3-1 General organisation of the project

All publications and dissemination material produced by MAINLINE (constituting the foreground to the project) will include the following statement to indicate that it was generated with the assistance of financial support from the European Community:

“The research leading to these results has received funding from the European Community’s Seventh Framework Programme [FP7/2007-2013] under grant agreement n° 285121.”

3.2 Interactions with SMARTRAIL project

The MAINLINE project was asked by the EC Project Officer to work closely with the SMARTRAIL project, which had responded to the same call and was also to be funded, as it was working on a similar final output to MAINLINE but concentrating on different assets. MAINLINE had declared its focus as being metallic bridges, lined tunnels, soil cuttings and switches and crossings (in Description of Work – DoW), whilst SMARTRAIL was proposing to focus on bridge scour, embankments, transition zones, ballast rehabilitation, ballastless track and ultra-high performance fibre reinforced concrete (DoW).

Following discussions with the SMARTRAIL co-ordinator it was agreed that each project would nominate one person to sit on the advisory board for the other project and also act as the initial liaison person between complementary work packages in both projects. It was also envisaged that suitably qualified individuals in both projects would act as external reviewers for relevant deliverables. Additionally a number of joint dissemination opportunities were identified. Suitable budget provision was made within MAINLINE WP8 (Scientific and technical co-ordination), with the work being primarily allocated to Network Rail as the partner physically located closest to the SMARTRAIL co-ordinator who was based in Dublin.

Following the retirement of the Network Rail person designated to act as the main contact between the two projects it was decided by the MAINLINE executive board that the responsibility for liaison with SMARTRAIL would pass to UIC and a suitable budget transfer from Network Rail to UIC was agreed by the Project Officer. This has enabled UIC to subcontract the same individual to continue the liaison activities, although there has been some disruption due to the time necessarily taken to complete all contract formalities.

Dissemination activities

A presentation about the initial objectives of the SMARTRAIL project was made by Ken Gavin (project co-ordinator) to the MAINLINE kick off meeting held in Paris on 6/7 October 2011 and a similar presentation about MAINLINE was made by Brian Bell (Network Rail) at the SMARTRAIL kick off meeting in Dublin on 14 October 2011. On 24 April 2012 a special joint MAINLINE/SMARTRAIL session was held at the TRA conference in Athens, where two papers were presented by each project and this was followed by a joint workshop hosted by UIC in Paris on 14/15 May 2013, where papers from each project were alternated. A further joint session was held at the TRA 2014 conference in Paris.

Technical cooperation

There has been good technical co-operation between the two projects, with regular dialogue taking place between geotechnical experts from Network Rail (ML) and UCD & Irish Rail (SR) in relation to slope stability and between Jacobs/SKM (ML) and ZAG (SR) in relation to the development of Life Cycle Assessment Tools.

The MAINLINE project was represented at the SMARTRAIL final conference held in Ljubljana on 25/26/ August 2014, at which a brief outline of the links between the two projects was given and delegates reminded about the MAINLINE final conference scheduled to be hosted by UIC in Paris on 30 September 2014.

4. Main results that will be publicly available

4.1 MAINLINE Life Cycle Assessment Tool and user manual

4.1.1 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 of the final version of the proposed Life Cycle Assessment Tool (LCAT). It could be renamed to "Guideline for a Life Cycle Assessment Tool (LCAT) for Rail Infrastructure" in order 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 and Metallic Bridges. 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 all over Europe with examples also from Eastern Europe.

D5.7 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. It will be presented during different dissemination activities and in a separate training course.

4.2 Two deliverables as guidelines

4.2.1 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 is being developed.

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

The guideline will form an input to the activities of WP6 “Dissemination, training and exploitation”. It will be particularly useful for the transfer of experience to Eastern Europe and other developing economies, where bridge problems sometimes are more acute than in Western Europe.

With a consortium bringing together organisations from all over Europe, MAINLINE has studied the application of technologies in various contexts, such as the different climatic conditions that exist across Europe. This will contribute to a guideline applicable in all parts of Europe and representing 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 railway 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 few 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. The reason is a lack of data and methods. Therefore MAINLINE increased TU Graz work and resources in the project since they have unique rail input data. There is also often a lack of economic resources for maintenance which may lead to a shorter asset life which is less

sustainable 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 not only supports the LCAT tool but is also an important stand-alone document for IMs. Since it is a guideline (a document with clear recommendations), it is also easier to use practically.

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

D3.4 will be the last deliverable produced in 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”, the guideline is being developed. This guideline will help the IMs to decide how to rebuild parts of the network. Costs and other 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 present a systematic approach to the application of new technologies to replace elderly infrastructure. It will help IMs in their decision-making on cost effective infrastructure management that also 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 IMs in Europe better tools and examples of how to improve their cost efficiency.

This document, like D1.4, not only supports the LCAT tool but is also an important stand-alone document for IMs. Since it is a guideline (a document with clear recommendations), it is also easier to use practically.

5. Dissemination activities

5.1 Public website

The MAINLINE website (<http://www.mainline-project.eu/>) was established soon after the project started. It has been updated regularly during the project and will in the end be a complete site where it is easy to reach information and documents.

- Under the first headline “About MAINLINE project” you can now find for example the presentations of MAINLINE Workshop targeted to Central and Eastern Europe, Budapest, 15 May 2014.
- Under “Work Plan” you can get a short explanation about the different WPs and how they are linked together.
- Under “List of participants” you can see who participates in MAINLINE.
- Under “What’s new” you can get information related to different future and performed activities but also newsletters and brochures.
- Under “Events” you can get information about future and performed events.
- Under “Results” you can download all deliverables.
- Under “Information / Contact” you can get information about the contact persons.
- Finally under “Members Area”, there is a link to the project internal collaborative platform where all documents are stored (both administrative and technical).

The website will be kept in its present form for at least six years.

5.2 MAINLINE Presentations and papers

5.2.1 Rail System Forum information at UIC Paris, France, 27 October 2011

For the first presentation of MAINLINE at a scientific event Björn Paulsson informed the most important manager group at UIC about the project.

5.2.2 Expertise Development Platform, PKP HQ Warsaw, Poland. 17 November 2011

Björn Paulsson made an overall presentation of MAINLINE to the UIC group “Expertise Development Platform”. They have an important role among the railways since they represent the training centres of the railways. The training centres have an important role as most railways are large organisations, widely spread all over the countries.

5.2.3 TRA 2012, Athens, 24 April 2012, Special session 5

During negotiations following the submission of the MAINLINE proposal, the consortium was asked to work closely with the SMARTRAIL consortium led by University College Dublin (UCD) to ensure that no unnecessary duplication took place if both projects were successful in obtaining funding. As part of this cooperation, both projects were asked to submit a combined application for a special session at the Transport Research Arena (TRA) conference being held in Athens in April 2012.

During this session, two presentations relating to the MAINLINE project were made, namely:

- The use of fibre reinforced polymers in railway civil engineering by Brian Bell NR,
- A general presentation of MAINLINE and the idea behind the project by Björn Paulsson UIC/Trafikverket.

5.2.4 CIRIA Conference, London, 13 December 2012

A presentation was given on “Rail Infrastructure Deterioration Modelling” by Brian Bell (NR), Robert Puddicombe (SKM) and Marios Chryssanthopoulos (University of Surrey). It included:

- The MAINLINE project (Network Rail)
- Analysis of Empirical Deterioration Data (SKM)
- Modelling of Deterioration (Univ. of Surrey)
- Life-Cycle Assessment Tool MAINLINE “LCAT” (SKM).

5.2.5 CIR Meeting, Gothenburg, 29 January 2013

Lennart Elfgrén and Thomas Blanksvård, LTU, presented the MAINLINE project and its findings so far. The audience consisted of infrastructure managers, consultants and researchers. CIR is a Swedish mirror organization to CIB (International Council for Research and Innovation in Building and Construction), IABSE (International Organization for Bridge and Structural Engineering) and RILEM (International Union of Laboratories and Experts in Construction Materials, Systems and Structures).

5.2.6 FIRM 13 FEHRL Infrastructure Research Meeting Brussels, 5-6 June 2013

Björn Paulsson, UIC/Trafikverket, presented MAINLINE and the findings at that time. This was done together with SMARTRAIL. FEHRL is the “Forum of European National Highway Research Laboratories” and is a partner of the SMARTRAIL Consortium.

5.2.7 Railway Engineering, London, 10 July 2013

Robert Puddicombe, SKM presented a paper “Life Cycle Costing and Environmental Assessment” which covered:

- The MAINLINE project
- Comprehensive environmental assessment
- Comparative environmental assessment
- Combined cost and environmental assessment.

5.2.8 MAINLINE presentation on a Technical Seminar – Railway Asset Management arranged by TWI Ltd, Great Abington, Cambridge UK, 20 September 2013

At this workshop Björn Paulsson made a presentation “How MAINLINE Project is connected with other EU Projects”. Other presentations on MAINLINE were made on the following topics:

- “Asset Management and Life Extension of railway structures: An Overview” by Sam Luke, SKM
- “Lifecycle management for railway structures” by David Castlo, NR
- “Finding the Hidden Capacity in Railway Bridges”, by Lennart Elfgrén, LTU

5.2.9 Presentation at SITCE Conference and Exhibition, Singapore, 6-10 October 2013

Sam Luke of SKM gave a presentation at the Inaugural Singapore International Transport Congress and Exhibition (SITCE) 2013, organised by the Land Transport Authority (LTA) and attended by over 1000 people from across the globe. Sam Luke’s presentation entitled: Optimisation and Life Extension of Rail Assets in Europe - Project MAINLINE, was based on a paper that he had written for the conference, which primarily focused on the work that had been carried out on the MAINLINE project to date, with a summary of the achievements made in each of the Work Packages.

5.2.10 LCM 2013, Frankfurt, 12 November 2013

“LCAT, a standardised, Europe-wide available Life Cycle Assessment Tool” was presented with the following parts:

- The MAINLINE project (TU Graz)
- Life-cycle Assessment Tool (SKM)
- Degradation Profiles Track (TU Graz)

At the Life Cycle Management Conference 2013 in Frankfurt/Main it was possible to gather a very good and comprehensive overview on processes implemented throughout Europe, concerning methods used to ensure the longevity of the tracks by using both existing data and advanced data analyses. The data issue could be summed up by one final aim: not to create data graveyards. A main task for future work was found in (re-)focusing on the vehicle-track interaction, being the source for the forces to be handled by improved tracks. Another open point is the data-situation for subsoil and drainage topics, as these major cost drivers of track LCC still turn out to be comparable on a low knowledge level. The conference was organised against the background of the liberalisation of the European railway market and the increased internationalisation of passenger and freight traffic. These developments ask for a different approach of investments in rail assets taking into account whole-life and whole-system considerations as well as environmental and economic impact. Consequently the MAINLINE project was presented at this conference, as MAINLINE focuses precisely on the conference topics and their targets. The MAINLINE topics were given by TUGraz with co-authors from SKM. The respective papers are mentioned below:

- Graz University of Technology (Markus Enzi, Matthias Landgraf): Data-based research, time series are the key
- Graz University of Technology, SKM (Stefan Marschnig, Sam Luke, Robert Puddicombe): LCAT – a prognosis tool for track service life.

5.2.11 Presentation at AusRail Conference, Sydney Australia, 26-28 November 2013

Sam Luke of SKM gave a presentation at the AusRail Conference in Sydney Australia on “Strategic Management and Life Extension of Rail Assets in Europe”. This presentation was based on the paper that he had written for the conference and focused on the work that has been carried out to date on the MAINLINE Project.

5.2.12 MAINLINE presentation during the PoSE/TEG meeting at UIC, Paris on 29 January 2014

Three WPs were presented in depth, namely:

- WP1 – Life extension – application of new technologies to elderly infrastructure, by Björn Paulsson, TRV,
- WP3 – Replacement of obsolete infrastructure – New construction methods and logistics, by Britta Schewe, DB and
- WP5 – Whole life environmental and economic asset management, by David Castlo, NR.

The flyer produced to promote MAINLINE events in 2014 was distributed during this event.

5.2.13 TRA in Paris, 24 April 2014

David Castlo NR presented MAINLINE with a focus on the LCAT.

5.2.14 MAINLINE presentation to Track Department at Trafikverket, Sweden, 23 June 2014

Björn Paulsson gave a presentation of outcome and findings from MAINLINE

5.2.15 Mini Symposium, IABMAS 2014 Conference, Shanghai, 7-10 July 2014

IABMAS stands for International Association for Bridge Maintenance and Safety and was founded in 1999. The association encompasses all aspects of bridge maintenance, safety and management. Specifically, it deals with: bridge repair and rehabilitation issues; bridge management systems; needs of bridge owners; financial planning, whole life costing and investment for the future; bridge and related safety and risk issues and economic and other implications.

IABMAS arranges conferences every two years; in 2014 it was in Shanghai. The conference this time gathered over 700 participants from about 40 countries. During this conference about 400 presentations were carried out in common keynote sessions and in 6 parallel sessions.

The MAINLINE Project fits very well with IABMAS' area of interest. As 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 the rate of deterioration of these elderly assets and is likely to lead to shorter line closures for maintenance or renewal interventions. However, interventions on elderly infrastructure will also need to take account of the need for lower economic and environmental impacts. This means that new interventions will need to be developed. In addition, tools will need to be developed to inform decision makers about the economic and environmental consequences of different intervention options being considered.

In the Mini Symposium the following papers were presented:

- Paper 1: MAINLINE – MAINTenance, renewaL and Improvement of rail transport iNfrastructure to reduce Economic and environmental impacts – J.S. Jensen et al (COWI)
- Paper 2: Extending the life of elderly infrastructure by strengthening – J. Nilimaa et al. (LTU)
- Paper 3: Influence of advanced assessment methods on the LCA of Elderly Bridges – M. Soriano and J.R Casas (UPC)
- Paper 4: Performance profiles of ageing steel railway bridges affected by atmospheric corrosion – A.N Kallias, M.K. Chryssanthopoulos (UoS)
- Paper 5: Life-Cycle Assessment tool for railway infrastructure – D. Castlo (NR) et al.
- Paper 6: Lifetime analysis of infrastructures – P. Cruz (UoM) et al.
- Paper 7: Challenges within Life Cycle Cost (LCC) studies and Life Cycle Assessment (LCA) – P. Linneberg et al (COWI)
- Paper 8: Test to failure of a steel truss bridge – Calibration of assessment methods – A. Carolin (TRV) et al (TRV & LTU)

5.2.16 XXII Concrete Research Symposium in Reykjavik, Iceland, 13-15 August 2014

At the XXII Concrete Research Symposium in Reykjavik, Lennart Elfgren (LTU) presented a paper with the title: "Maintenance and Renewal of Concrete Railway Bridges – Results from EC Project MAINLINE" and Jonny Nilima presented a paper entitled: "Upgrading the Haparanda Bridge – Unbonded Post tensioning".

5.2.17 MAINLINE presentation to Track Expert Group in Delft 6-7 October 2014

Björn Paulsson will present the outcome and findings from MAINLINE. Also coming activities will be discussed.

5.3 MAINLINE workshops

More detailed information is available on the website <http://www.mainline-project.eu/>.

5.3.1 Midterm workshop at UIC in Paris, 14-15 May 2013

In this workshop the interim findings were presented. It was a common workshop with SMARTRAIL, with alternating presentations being given from the two projects on related topics. The agenda was:

- MAINLINE WP 1: “Life Extension - Application of new technologies to elderly infrastructure”
- SMARTRAIL WP1: “Monitoring and Inspection”.
- MAINLINE WP 2: “Degradation and structural models to develop realistic life cycle cost and safety models”
- SMARTRAIL WP2: “Assessment and Methods”
- MAINLINE WP3: “Replacement of obsolete infrastructure – New construction methods and logistics”
- SMARTRAIL WP3: “New rehabilitation techniques to extend the service life of existing infrastructure”
- MAINLINE WP4: “Monitoring and examination techniques”
- SMARTRAIL WP4: “Whole Life Cycle Cost Calculation Tools”
- MAINLINE WP5: Whole life environmental and economic asset management”.
- SMARTRAIL WP5; “Dissemination and Exploitation”
- MAINLINE WP 6: “Dissemination, training & exploitation”..

This approach was very good for both projects and resulted in a good understanding of what all colleagues were trying to accomplish.

As the event took place only 1.5 years after the beginning of the two projects, mainly preliminary or intermediate results were presented. This was of limited interest outside the partners in both projects, consequently only few external IMs participated.

5.3.2 Workshop targeted to Central and Eastern Europe, Budapest, 15 May 2014

This workshop was targeted to Central and Eastern Europe and held in Budapest 15 May 2014.

The workshop started with the role of LCAT in asset management and was followed by the topics that are treated in the project. The “RED THREAD” of MAINLINE was now clarified. Whilst the content was impressive not many representatives from countries in Eastern and Central Europe outside the project participated. Still, all presentations have been made available on the Project website (<http://www.mainline-project.eu/>). The participants included 10 persons from MAV not directly involved in the project.

5.3.3 Final workshop at UIC in Paris, 30 September 2014

This event still has to take place.

The final programme is an enhanced version of that produced for the Budapest workshop. All the final results – tools and guidelines – will be presented and distributed, a discussion about the proposed activities after September 2014 will be held and activities that will promote market take-up will be introduced.

Like for the previous workshops, the UIC groups PoSE, TEG and the Rail System Forum have been invited, while all contacts in the railways participating in the project are promoting the event internally. Further communication through UIC has been performed with the publication of a press release on 25 July 2014.

5.4 LCAT Training Sessions

Two sessions have been arranged for training in the use of the MAINLINE Life Cycle Assessment Tool (LCAT). The first was held on 11-12 June at Jacobs/SKM, London, UK, and the second on 11-12 September, at UIC, Paris, France. The two seminars were well linked together with homework in between. The project participants have used feedback and data from the attendees to update the models prior to delivering the final versions at the second training session.

The three models currently developed in the project – for metallic bridges, plain track and soil cuttings – have been presented in detail. Their aim is to reduce whole life cycle costs thanks to better planning and maintenance.

Since the LCAT is one of the core results of MAINLINE, this dissemination activity is crucial for implementing the results. Facts from the first training session:

- Fully booked with 24 participants, out of which 12 from organisations not involved in MAINLINE. 11 railways participated in total.
- The general feedback was positive; participants were very interested in the tools but regretted not to be able to use them straight away.
- From MAV side the attendees were satisfied with the training but the tools seemed to them hard to use.
- The lecturers will send homework to be provided by 25 August.

More details about the first step of the training were given in the aforementioned press release published on 25 July 2014.

5.5 General comment on WP6 activities

It can be seen from the preceding parts of this chapter that many dissemination and training events have been held throughout the MAINLINE project, a number of which have been undertaken in collaboration with the sister project SMARTRAIL. Whilst MAINLINE, like many other research projects, will not deliver its most important results until the completion of the project, the dissemination and training activities described above have been fundamental in ensuring that the project has not lost sight of the objectives set out in the DoW and the feedback received has ensured that the final results reflect actual experiences in the field that will be of value to the target audience. The final workshop in Paris will be the most important dissemination activity as only then will it be possible to present all the results in a logical and comprehensive manner.

6. Specific audiences

6.1 Audiences within the railways

In the railways two target audiences were identified:

- First there is the top management (both business and technical) who will be reached with high-level summary material produced at the end of the project.
- The second and most important audience is the managers (including high level engineers), who make decisions about what to use on the railway. This audience is the main target for MAINLINE, as they are the ones who need to believe that the outputs from MAINLINE can be useful in their day to day activities and can be trusted to give reliable information on which to base decisions.

How has this worked? It was a bit slow in the beginning. But during the last year the attitude to asset management has changed. The big change occurred when the LCAT was presented at the first training session held at SKM, London in June 2014.

6.2 UIC Track Expert Group (TEG) and Panel of Structural Experts (PoSE)

During the project both groups have been well informed and they have also in return provided good feedback.

6.3 Consortium partners from industry

The target audience for the results from MAINLINE is Infrastructure managers, asset management consultants, railway consulting organisations, universities and research organisations and learned institutions. It is important that the key findings of the project, including the LCAT tools, are disseminated as widely as possible to these organisations. The Industrial Consortium Partners from MAINLINE are already interfacing with a number of these groups to gain acceptance of life cycle modelling within these organisations, with a view to these techniques becoming common place in the near future.

For example, TWI is one of Europe's largest membership-based, independent, research and technology organisation with a staff of more than 700 persons. Based near Cambridge, UK, since 1946, TWI provides industry with technical support in engineering, materials, joining and associated technologies such as structural integrity and asset management. Its services include advice, technology transfer, consultancy, project support, contract R&D, training, qualification and personal membership. With over 60 years' experience in delivering structural integrity services globally, TWI has gained a world class reputation for supplying high calibre design, consultancy and risk management services to clients in the oil and gas, power generation, transportation, shipbuilding, petrochemical, construction and other sectors. TWI has a membership base of more than 700 members across the globe, and its participation in MAINLINE will enable the results from the project to be disseminated by being adapted and used in a variety of industry situations.

Since the beginning of the project, COWI has provided information about MAINLINE to the main Infrastructure Managers of Denmark such as Rail Net Denmark, Danish Road Administration and Great Belt Link. They have all shown great interest in the MAINLINE project and provided good feedback as well case studies for bridges and tunnels. In addition, COWI has presented the MAINLINE project during various client meetings on a European and worldwide scale. COWI has also shared project results through their entire organisation.

6.4 Related organisations

MAINLINE will also target the following related organisations:

- UIC will cooperate with UNIFE;
- ERA will be informed of results;
- COMSA will be the link to EFRTC;
- Asset management teams through existing channels at UIC, CER and EIM;
- IABMAS, IABSE and FIB through conferences.

All organisations have been invited to the MAINLINE final workshop. Newsletters and press releases have been sent.

Among the industrial partners, TWI will disseminate the results of MAINLINE through its association with the Institute of Rail Welding.

7. Dissemination and implementation of results after project end

7.1 Participation in events

- Presentation at TEG meeting on 6-7/10/14
- Presentations on other upcoming conferences of IABSE and IABMAS
- Results will also be included in and presented at courses on Infrastructure Management in Sweden and elsewhere
- Workshops and presentations will be given by the Industrial partners to client organisations and at seminars and conferences in the UK, Europe, Asia and Australia over the next few years
- Meetings will be held with research organisations and learned institutions to get them fully bought into the benefits of MAINLINE.

7.2 Other activities

The results of MAINLINE form a sound base for further research activities in the field of railway infrastructure. It is especially the case within switches and crossings, as these assets show complex behaviour and cause high costs.

Examples of activities that will be carried out by universities are described hereafter.

At LTU, results will be presented in PhD thesis by Jonny Nilimaa (strengthening of bridges) and Jens Häggström (influence of fatigue and life cycle costs on the management of old steel truss bridges).

TUGraz will use the increased knowledge resulting from MAINLINE to educate the future generation of railway engineers targeting to highlight sustainability of railway infrastructure. Sustainability requires a high level of quality and it is proven that this quality level allows increasing availability and thus is economically justified. Further arguments regarding environmental costs are taken into consideration in order to underline these arguments and thus to reduce the ecological footprint of railway infrastructure. Furthermore, seminars for railway infrastructure companies and track industry held by TUGraz ensure dissemination of the basic understanding required for a proper use of LCAT track.

Regarding the railways, MAV is spreading information from MAINLINE internally thanks to the translation of documents. For most of the domestic experts the full understanding of the information is indeed possible only after their translation into Hungarian language. In addition, 2 articles were published in World of Rails professional journal.

Translated and English documents can be found in MÁV Co's intranet service. Interested experts can thus reach the documents and learn about innovative processes and methods which are not used at MÁV and they can urge their spreading.

MAV partners in MAINLINE will continue the dissemination of the results after the project end, translating works into Hungarian and spreading the documents via the intranet.

As for the industrial partners, Jacobs/SKM will use the results of MAINLINE to disseminate fully to their clients across the world, and will look to get consultancy services from these clients in developing and increasing their asset management competency and operations and providing whole life cost models that are appropriate to each user's needs.

COWI will also use the information from MAINLINE when providing consultancy services for Infrastructure Managers on a European as well as worldwide scale. MAINLINE information will be used in relation to operation and maintenance of rail- and roadway infrastructure including bridges. In addition, COWI will continue to disseminate the results at client meetings as well as relevant conferences.

TWI will adapt the results from MAINLINE to provide LCA related consultancy to its members. The organisation is using its own funding to build on work done in MAINLINE to develop techniques to, for example, assess the LCA of new materials to be used in ship building, or to assess the LCA of wind farms. TWI will disseminate the results from MAINLINE in the next Institute of Rail Welding meeting.

8. Conclusion

The dissemination platform has worked well and will help to exploit the results of the project. The results will give Infrastructure Managers, Constructors and Consultants methods to:

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