

D4.3 – Dissemination and Exploitation activities

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REPORT CONTRIBUTORS

Name	Company	Details of Contribution
Andrea Demadonna	UNIFE	Structure, finalisation and submission
Maria Marsilla	STAV	
Mats Berg	KTH	
Simon Iwnicki	HUD	
Markus Hecht	TUB	
Stefano Bruni	POLIMI	
Visakh Krishna	KTH	

Carlo Vaghi	FIT	
Jose Conrado Martinez	ADIF	

EXECUTIVE SUMMARY

This document provides a description of the DYNAFREIGHT dissemination and communication activities carried out during the whole duration of the project. The aim of this report is to provide a detailed description of the dissemination strategy and how this was implemented during the 30 months of project implementation, including the materials and strategies that have been used to facilitate the wide-spread of information and knowledge of the results created by the project. The dissemination of DYNAFREIGHT is essential throughout the project's life and need to be carried out with the cooperation of all Work Packages.

First, materials and strategies for communicating and disseminating DYNAFREIGHT to railway stakeholders, the scientific community and the general public are presented. Those include: the creation of a project identity; the creation of a website; the production of two newsletters; the creation of a project brochure; the organization of dissemination events; the participation to conferences; and the publication of results in relevant journals. Moreover, this report describes how expert groups will interact with the technical Work Packages and how the results have been disseminated to the Shift2Rail public-private partnership. Finally, a calendar of events is presented.

The dissemination of the project's research activities and results are fundamental components of the DYNAFREIGHT project. The dissemination objectives of this project are:

- to ensure that the outputs of the project are delivered in a form which makes them immediately available for use by the IP5 and Cross-Cutting activities within Shift2Rail;
- to ensure that all important actors in the European railway sector are informed about DYNAFREIGHT;
- to facilitate acceptance of the project outcomes by the standards and regulatory bodies as well as by the main actors of the EU rail sector.
- to disseminate, engage and promote the project and its research activities to relevant audiences.

ABBREVIATIONS AND ACRONYMS

CCA: Cross-Cutting Activities

CDV: Committee Draft for Voting

CEN: European Committee for Standardisation

CENELEC: European Committee for Electrotechnical Standardisation

CSM: Common Safety Methods

DX.x : Deliverable

EN: European Standard

ERA: European Railway Agency

EU: European Union

IP: Innovation Programme

KPI: Key Performance Indicator

LCF: Life Cycle Cost

MAAP: Multi-Annual Action Plan

S2R: Shift2Rail

TRL: Technology readiness levels

TSI: Technical Specification for Interoperability

WP: Work Package

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1. INTRODUCTION

DYNAREIGHT is a twenty-month project, funded by Shift2Rail. DYNAREIGHT aims to provide the necessary input for the development of the next railway freight propulsion concepts within the Shift2Rail Innovation Programme 5 in order to overcome operational and technical issues that affect the overall capacity, performance and competitiveness of the EU rail freight industry.

The project focused on two main areas: 1) Freight running gear for locomotives and 2) Operation of long freight trains of up to 1,500m. DYNAREIGHT reached the following objectives:

- Improved performances: traction, speed, running dynamics and wheel/rail efficiency;
- Reduced rail freight noise by tackling the issue at its source
- Enhance capacity/traffic throughput with the operation of longer trains (up to 1,500m);
- Reduced operation and maintenance costs.

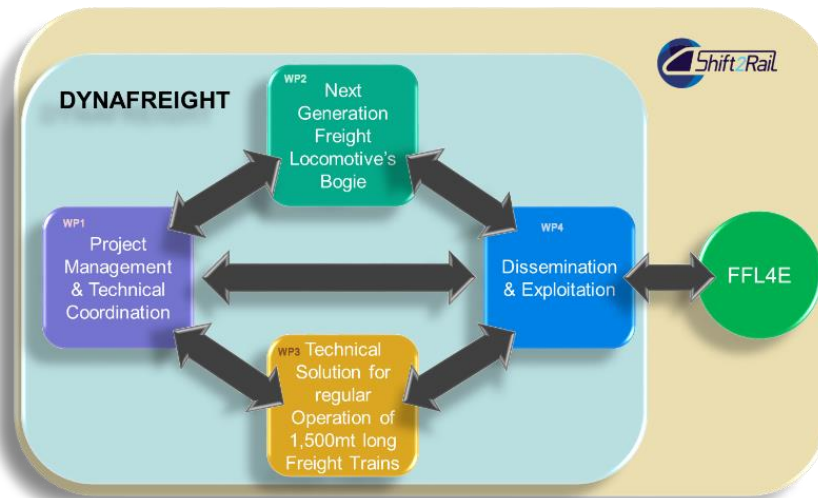


Figure 1: Project structure

The research carried out in DYNAREIGHT has provided valuable input for the work planned in Innovation Programme 5 'Technologies for Sustainable & Attractive European Rail Freight' and it contributed in particular to the work of its corresponding CFM Project FFL4E, mainly in the part related to the operation of long freight trains up to 1,500m.

Given the importance of this project for the success of Shift2Rail, the widespread and targeted dissemination of project outputs was vital to the acceptance and implementation of the achievements developed. The implementation of solutions aims at generating business for industries (SME and large) and at contributing to the R&D activities of Shift2Rail.

DYNAREIGHT established a detailed and clear strategy to reach the wide public and raise awareness of its main results. This report illustrates how this strategy was successfully implemented.

1.1 SHIFT2RAIL

The DYNAREIGHT communication and dissemination strategy has been designed to provide the most extensive coverage, meeting the limitation of the scale of the project and ensuring an efficient and co-ordinated take-up by the Joint Undertaking with their future R&D activities. The activities are also designed to ensure a solid communication of the project with actors outside of the Shift2Rail JU. The approach consists of three elements:

1. Interaction with the Shift2Rail JU of the DYNAREIGHT results;
2. Public dissemination, outside of the JU but very much aligned with the Shift2Rail dissemination objectives and strategy; and
3. Focus on Users/reference/advisory groups.

The first task focused on the link with and dissemination of appropriate results to the future Shift2Rail Research and Development activities. For this purpose, a detailed description of the input delivered by Shift2Rail for the success of its projects has been provided in D4.4 Report on the contribution of DYNAREIGHT to Shift2Rail objectives.

The 2nd element focused on the wide dissemination of project results through several tools: events, publications, the public website etc. This element will be the main focus of this Deliverable. The 3rd element was also very much developed an Advisory Groups was created and a dedicated meeting on WP2 and WP3 was organised towards the end of the project.

2. EXTERNAL COMMUNICATION

External communication was of key importance for maximizing DYNAREIGHT's impact and for disseminating the project results. Communication of the project research activities involved reaching relevant railway stakeholders, the scientific community and creating awareness among the general public. This has been achieved through creating a project identity and a public website, attending to conferences and relevant events and publishing articles in relevant journals.

2.1 PROJECT IDENTITY

A project identity has been set in M3 and it includes templates for presentations and reports, a project brochure as well as the DYNAREIGHT logo. The project identity considerably helped dissemination activities and ensured a consistent communication of the project concept, objectives and results. The brochure has been distributed at project workshops and conferences, where project partners have participated.

Main objectives and outcomes of the project

The project will contribute to the next generation of freight propulsion concepts addressing two main areas: freight running gear for locomotives and operation of long freight trains, with the following high-level objectives:

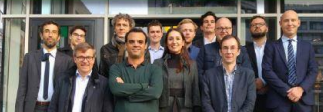
1. Improved performances: traction, speed, running dynamics and wheel/rail efforts;
2. Reduced rail freight noise at the source;
3. Enhance capacity/throughput with the operation of longer trains (up to 1,500m);
4. Reduced operation and maintenance costs (reduced wheel and rail wear, smarter maintenance, etc.).

Two main technical Work Packages will focus on the main areas of intervention identified by the project under the leadership of Stadler and KTH:


WP2 - Next Generation Freight Bogie	
Task	Planned activity
Light materials assessment for rail freight bogie application	Research into transferability of new materials (TRL 3)
Noise reduction	Research, simulations and testing on noise solutions (TRL 4)
Passive and mechatronic steering systems	Research and simulations improved steering systems (TRL 4)
Monitoring systems	Research and assessment of monitoring solutions (TRL 3)
Bogie Model Integration and Implementation	Simulations and implementation on new concepts into a virtual model for final assessment (TRL 4)

WP3 - Operation of 1,500m long Freight Trains	
Task	Planned activity
Functional requirements of radio communication	Research into the reliability of radio communication (TRL 4)
Safety precautions in train configuration and brake application	Research into and simulations on brake pressures, longitudinal buffer forces and derailment risk (TRL 3)
Adaptions in the rail infrastructure	Definition of demands and requests on the infrastructure for long-train operation (TRL 3)


Partners, Facts & Figures







PROJECT COORDINATOR






TECHNICAL LEADER



BENEFICIARIES

Total Budget:

€1 million

Partners:


10 Partners

Duration:



20 Months

Contact us:

Andrea Demadonna - Project Coordinator
UNIFE
Andrea.demadonna@unife.org
www.dynafreight-rail.eu



Innovative technical solutions for improved train **DYNAmics** and operation of longer **FREIGHT** Trains

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Figure 2: Extract from DYNAREIGHT brochure

2.2 WEBSITE

A dedicated website was set up at the beginning of the project. The website (<http://www.dynafreight-rail.eu>) was open and it was divided in two parts: the public portal and the private portal.

The public portal displays the key project information, partners, Deliverables, news/events and links to the partners' institutions. All the public deliverables have been published on the website and are available for download.

The webpage also lists all related projects including links to them. The webpage also offers links to the Shift2Rail website as well as to the websites of other projects such as It2Rail and In2Rail.

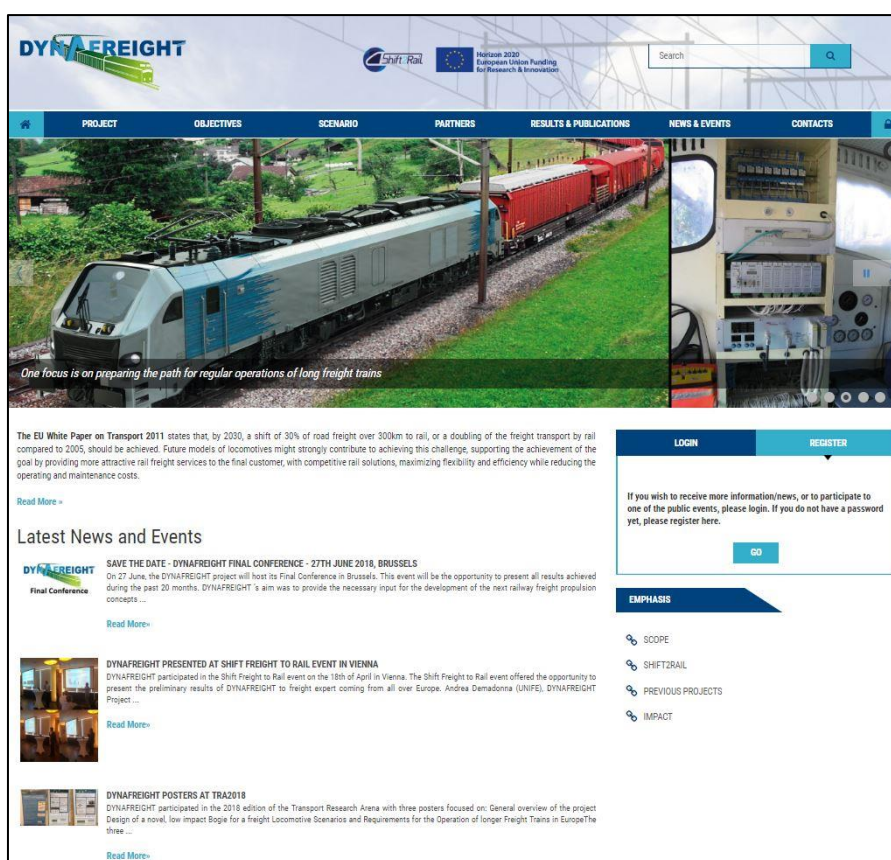


Figure 3: Extract from DYNAREIGHT website

2.3 NEWSLETTER

The project has produced two newsletters in M18 and M30 which provided up-to-date information on the status and achievements of the project.

The first newsletter was released in conjunction with the Mid-term event which took place in November 2016 in Brussels.

The second newsletter was produced in time to be distributed during the Final Conference taking place on the 17th of October 2017 in Munich. A copy was included in each delegate's bag and distributed at the beginning of the event.

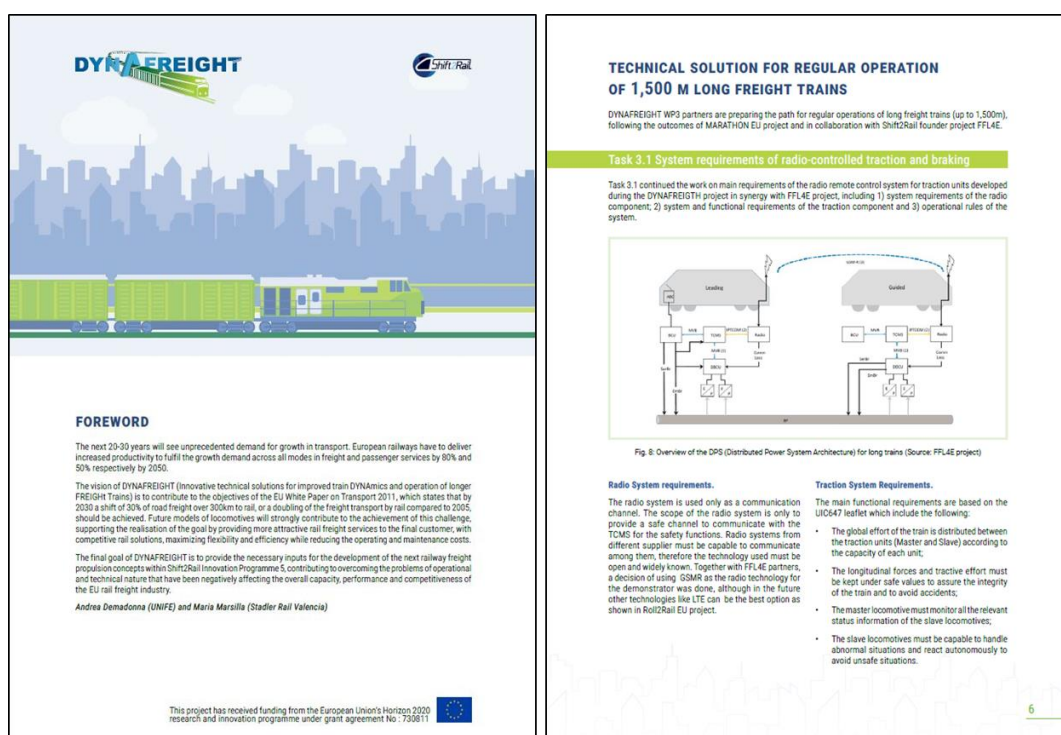


Figure 4: two pages from the 1st and 2nd DYNAREIGHT Newsletters

2.4 EVENTS

The DYNAREIGHT consortium has organised one major project event: a Final Conference on the 27th of June 2018 in Brussels.

The DYNAREIGHT Final Conference took place on the 27th of June 2018 at the Thon Hotel Bristol Stephanie in Brussels with the participation of around 30 experts from all around Europe. The event was the occasion for Work Package Leaders to present the main results of the project and their important links to Shift2Rail. FFL4E Project Coordinator was also invited and he

highlighted some of the most relevant links between FFL4E and DYNAREIGHT, highlighting the spirit of cooperation between the two projects which was established since the beginning.

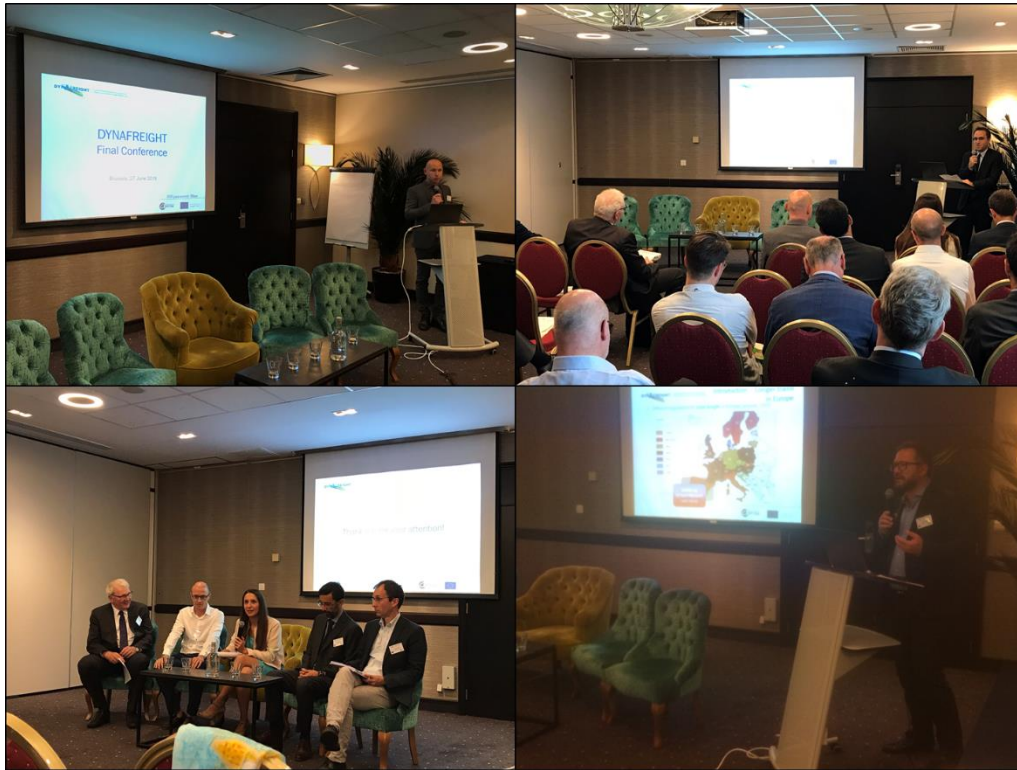


Figure 5: Extracts from DYNAREIGHT Final Conference

2.5 PRESENTATIONS & PUBLICATIONS

Project results have been published on several specialized magazines, scientific journals and in relevant national and international conferences and workshops. DYNAREIGHT has actively looked-out for high profile academic and industrial events that are within the domain of interest of the project. At the end of the project, DYNAREIGHT has been presented/published in the following events and press (an exhaustive list will be included in the Final Report):

Event/Publication	Title	Authors	Type of audience
Non-scientific and non-peer reviewed publications (popularized publications)			
DYNAREIGHT included in Spanish Government's Strategic Freight Plan		ADIF	Industry
Global Railway Review	Long freight trains in Europe: Assessing the requirements and safety issues	C. Vaghi (FIT), M. Berg (KTH)	General Public
Scientific publications			
TRA2018 paper	Design of a novel, low impact Bogie for a freight Locomotive	M. Marsilla (STAV), S. Iwnicki (HUD), S. Bruni (POLIMI), M. Berg (KTH), S. Cervello (LRS), M. Hecht (TUB), A. Demadonna (UNIFE), S. Hawksbee (HUD), Y. Baumgartel (TUB)	Scientific Community, Industry, Policy Makers
TRA2018 paper	Scenarios and Requirements for the Operation of longer Freight Trains in Europe	C. Vaghi (FIT), M. Berg (KTH), J.C. Martinez (ADIF), V. Boeckenholt (LAIRD), A Demadonna (UNIFE)	Scientific Community, Industry, Policy Makers
Participation to a conference			
DYNAREIGHT presentation at 20 th Nordic Seminar on Railway Technology, Gothenburg, 12-13 June 2018	KTH	V. Khrishna (KTH)	General public

Task 2.3 results will be presented at Railways2018 + STECH 2018 in September 2018	Assessment of benefits for passive and mechatronic steering systems for 3-axle powered bogies by means of multi-body simulation	S. Bruni, E. Di Gialleonardo, B. Liu, M. Palinko, J. Muñoz	Scientific Community, Industry
Freight to rail event, April 2018, Vienna	Presentation of DYNAREIGHT together with all other S2R IP5 projects	UNIFE, HUD, KTH, FIT	Scientific Community, Industry, Policy Makers
Participation to an event other than a conference or workshop			
Presentation of three posters at TRA2018	<ul style="list-style-type: none"> General overview of the project Design of a novel, low impact Bogie for a freight Locomotive Scenarios and Requirements for the Operation of longer Freight Trains in Europe 	A. Demadonna (UNIFE), S. Iwnicki (HUD), V. Krishna (KTH), C. Vaghi (FIT)	Scientific Community, Industry, Policy Makers
Participation to a workshop			
FFL4E/DYNAREIGHT Joint Workshop, 1 February 2018, Frankfurt		KTH, LAIRD	Projects' members
FFL4E/DYNAREIGHT Joint Workshop, 29 June 2018, Frankfurt		KTH, LAIRD	Projects' members
Seminar on Railway Technology, Berlin	'Dyna freight' - Innovative technische Lösungen für die Verbesserung der Zugdynamik und den Betrieb der längeren Güterzüge	TUB	Scientific Community

Table 1: Targeted Publications and Conferences

2.6 ADVISORY GROUPS

An Advisory Group was established at the beginning of 2018 in order to share some of the preliminary results of the project with key external stakeholders and a dedicated confcall was organised in the afternoon of the 8th of May. In fact, the consortium had originally planned to organise a physical meeting at UNIFE premises in Brussels but due to the last-minute unavailability of some of the members to attend, the group opted for a conference call instead.

The Advisory Group conference call was participated by experts coming from the following companies: Trafikverket, Siemens, CAF and Schaeffler. Other members (Faiveley, BT, UIRR, AnsaldoSTS and Indra) were not available.

After an introduction by the Project Coordinator (UNIFE) and Technical Leader (STAV), the conference call focused on the results of WP2 and WP3.

HUD illustrated the work done in Task 2.1, which focused on 1) the use of different steels but same basic design and construction methods, 2) different construction methods and 3) more radical redesign including hydroforming or composite materials. Finite Element models were set up to allow stress analysis for the bogie frame (ANSYS) and the assessment of the Vehicle Dynamics (VAMPIRE). Results were assessed against relevant standards (mainly EN15827 and EN13749).

TUB illustrated the work done in Task 2.2, focused on two very important aspects: 1) to give an overview of locomotive-related noise abatement measures and 2) to examine two chosen solutions in simulations/tests and give their mitigation potential. Two solutions were considered: 1) Lateral skirt – measurements with and without and 2) Brake discs on wheels – simulations with and without.

POLIMI illustrated the work done in Task 2.3, focused on investigation of concepts for steering bogies (both passive and mechatronic) to be implemented in freight locomotives and quantification of the improvements in the curving behaviour in terms of wheel-rail forces, wear and wheel-track damage.

STAV illustrated the work done in Task 2.4, focused on developing concepts for monitoring the bogie components with the highest maintenance costs, in order to contribute to reduce the bogie LCC.

Two questions were raised by the external members. SIEMENS asked whether the additional space and modifications to the layout required to host on the bogie the additional sensors and steering equipment were also considered. POLIMI answered that the work in Task 2.3 was mainly intended to demonstrate the benefits of active/passive steering solutions, so the modifications in the layout of the bogie required were not studied in detail. However, the EMD concept has been already applied to real bogies for CoCo locomotives, so it is certainly feasible, whilst the

passive/active hydraulic steering systems should be even easier to implement because hydraulic actuation allows for more flexibility with the layout of the pipes compared to mechanical linkages in the EMD concept.

Schaeffler asked why DYNAREIGHT did not consider the axlebox bearings in the analysis carried out in Task 2.4. STAV replied that axlebox bearings were also considered. The most promising monitoring solution (in addition of using a wayside wheel profile measurement system) was to use accelerometers for monitoring both components, the rubber-based elements and the axle bearings.

STAV illustrated the work done in Task 3.1, focused on delivering main requirements of the radio remote control system for traction units developed during DYNAREIGHT project in synergy with FFL4E project, including 1) system and functional requirements of the radio component; 2) system and functional requirements of the traction component and 3) operational rules of the system.

KTH illustrated the work done in Task 3.2, focused on delivering guidelines on how to reduce the risk for derailment of long freight trains according to the Marathon concept through simulations and analysis applied not only to different train configurations and brake applications but also on different initial speeds and track layouts.

ADIF illustrated the work done in Task 3.3, focused on the adaptations in the rail infrastructure for long-train operation. The sections of the Spanish infrastructure which are currently analysed as well as the operational aspects to be considered during the adaptations were shown. Some of the most relevant aspects which restrict the operation (and thus must be properly addressed) concern the length of the sidings, the ramps and DC System power supply. In fact, the use of trains of this tonnage with standard electric locomotives in certain points of the network (15-23%) will have important technical restrictions (considering other trains in the route). The DC system may be insufficient.

2.7 INTERACTION WITH SHIFT2RAIL

A detailed analysis of the contribution of DYNAREIGHT towards the success of Shift2Rail was included in D4.4.

3. EXPLOITATION PLAN OF PARTNERS

#	Partner	Exploitation strategy
1	UNIFE	UNIFE will disseminate the results of DYNAREIGHT through its internal Working Groups, raising awareness of the relevance of the outcomes of the projects among its members and promoting the continuation of the work done in DYNAREIGHT in future R&D activities.
2	STAV	<p>Stadler plans to use DYNAREIGHT results as input for future activities:</p> <ul style="list-style-type: none"> • Light Materials: the use of higher strength steel in bogie frames can be applied in next bogie designs. This could be exploited in the near future in next locomotives. For the use of other radical manufacturing techniques deeper feasibility studies are required (in the production plants) and for use of radical materials such as composites further studies are needed and special work in standards is required (as no standard exists for the use of composites in rail structural components). Stadler plans to contribute to this possible new standard through the national committees (CEN/CENELEC). Note: STAV expects that the use of composite materials in rail is led by the passenger rail sector (high speed trains, as it is one of the TDs in S2R), and after the passenger application this can be applied to freight. • Noise concepts: the use of wheels with brake discs is already exploited by Stadler in its locomotive products. For the use of lateral bogie skirts, further design optimization is required in order to reduce the weight. This solution can be offered as an option in future locomotives. • Steering systems: results will be used for further analysis in order to find the optimum settings for the steering system components to improve the curving behavior without decreasing the stability performance. The solutions can be included in locomotives offers as options. • Monitoring systems: the most promising solution (axlebox bearing and rubber based elements monitoring) can be applied in the next bogie designs, or in retrofitting. A soon exploitation in next locomotives is foreseen, and they can be included in locomotives offers as options. <p>In general, before the concepts can be introduced into the market in the near future the mentioned activities have to be done.</p> <p>These additional activities can be done in Shift2Rail too. (Apart from Stadler activities)</p> <ul style="list-style-type: none"> • On the long train parts, Stadler has already contributed together with WP3 partners to transfer the results to FFL4E complementary project. In addition, contribution to new standards for the operation of Long Freight Trains is needed. The results of DYNAREIGHT have to be translated into a standard. Stadler is in contact to CER working group on longer and heavier trains

		(though some of the members) and will be willing to contribute to this standard when required.
3	LRS	<ul style="list-style-type: none"> Noise emission: The results obtained during the DYNAREIGHT project will be useful to future design of wheels, considering the presence of brake disc and its influence on the damping. Monitoring system: this was a good chance to see if the LRS Smartset® system can be a good solution for different customer. Re-profiling of the wheel: this activity will be used by LRS to promote the wheel profile analysis with the customer showing its utility in order to optimizing the maintenance intervals.
4	TUB	<p>The results of DYNAREIGHT regarding noise mitigation complement the long term research of TU Berlin Department of Rail Vehicles in the field of noise mitigation with shielding and wheel damping. The application is not only applicable for locomotives but also for EMUs and freight wagons. TU Berlin is in an advisory position for wagon keepers of the European production industry for freight wagons, EMUs and locomotives.</p> <p>The DYNAREIGHT results regarding longitudinal train dynamics will be used for comparison with trains that make use of innovative components. These are especially automatic central buffer couplers and electro-pneumatic brakes. The tools created in DYNAREIGHT will be further developed in order to create a universal simulation environment for freight train operation.</p>
5	POLIMI	POLIMI plans to use the know-how gained in the DYNAREIGHT project in courses and other teaching activities at the graduate and PhD level (such as course "Rail Vehicle Dynamics and Train Track Interaction") and additionally in seminars and workshops related to railway systems. The steering bogie concepts and models developed in the project will be exploited in a new PhD thesis work.
6	HUD	<p>The main exploitation activities are related to the work on reduced bogies mass in Task 2.1. The improved understanding of how higher strength steels can be used in the design of railway bogies will be explored further and we anticipate further publications in this area. The work on novel materials is already being used in two ongoing projects:</p> <p>Run2Rail (Shift2Rail): where the improved understanding and quantification is being used to inform the expected impact of the adoption of new materials in railway running gear.</p> <p>CaFiBo (RSSB): where the potential use of composite materials is being further explored and there are plans to produce a prototype carbon fibre bogie frame later this year.</p> <p>There are also general impacts through the use of examples and case studies for teaching material at undergraduate and postgraduate level.</p>

7	KTH	<p>For Task 2.3: KTH aims to use the track friendliness evaluation methods to further refine the engineering model over the course of a present PhD work. The know-how obtained during the comparison of different models along with other project partners will in turn help further bring clarity to KTH's objective of coming up with a 'grading system' for different types of running gear with special attention to the damage caused to the track.</p> <p>For Task 2.4: KTH is starting a PhD project on vehicle-based condition monitoring. D2.4 is one important input to this project.</p> <p>For Task 3.2: The present work on longitudinal train dynamics in the three-dimensional simulation environment will be extended further to include different types of wagons and help in providing an operation-based Tolerable LCF after accounting different heterogeneities. Eventually such an evaluation in combination with the work done by other partners should provide guidelines to pave way for even longer trains in the future.</p>
8	ADIF	<p>On the part of ADIF, the results obtained will be used to promote new internal analyzes. For ADIF it is very interesting to have the information of the rest of the deliverables so that specific analyzes on the most detailed infrastructure could be carried out. ADIF will celebrate a workshop with the public/privates RUs, where the main conclusions will be explained. Although it is not currently planned to operate trains of 1,500 meters, with the results of this project it will be possible to analyze possible length increases to 850 meters. All the results obtained will be very useful in the technical and normative documents. For ADIF part, it will continue working in the CER working group and these results will also be presented in this group.</p>
9	FIT	<p>FIT will exploit the expertise in rail market and industry analysis, started in S2R DYNAREIGHT and SMARTE projects, allowing the capitalisation of background research expertise in rail and intermodal transport topics achieved by FIT's staff members also in past working experiences.</p>
10	LAIRD	<p>The decision of FFL4E of terminating the cooperation in Task 3.1 in terms of development of the radio system did not give LAIRD the opportunity of having results to be exploited.</p>

4. CONCLUSIONS

This report has provided an exhaustive list of all dissemination/communication activities carried out during the 20 months of project implementation. A large audience has been reached by DYNAREIGHT messages and the project has at the same time ensured proper dissemination



Innovative technical solutions for improved train
DYNAmics and operation of longer FREIGHt Trains

towards the Shift2Rail Joint Undertaking to ensure a smooth and effective transfer of results into the Shift2Rail projects.