

## DESTINATE - a Shift2Rail project on railway noise reduction methodologies

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### Introduction

The European research and innovation project DESTINATE aims at supporting informed decisions on rail noise mitigation alternatives through improving methodologies for the identification of cost-effective mitigation measures. Noise is a major environmental issue of the railway sector that can decrease the public acceptance of railway transport and affect travelling comfort. DESTINATE deals with exterior as well as interior railway noise.

DESTINATE stands for “Decision supporting tools for implementation of cost-efficient railway noise abatement measures”. It is funded by the Shift2Rail Joint Undertaking, a Horizon 2020 initiative. The most important facts on the project are listed below.

- Topic: S2R-OC-CCA-03-2015
- Duration: 1 Nov. 16 – 31 Oct. 18
- Total cost: 1 271 812,50 EUR
- EU contribution: 999 312,50 EUR

The Shift2Rail Joint Undertaking is a public-private partnership. It was established in 2014 to coordinate all railway research under Horizon 2020 in order to improve the efficiency of EU funding [1]. The Shift2Rail initiative aims at increasing rail freight and passenger transport in the European Union to approach the challenge of climate change and rising traffic demand [2].

DESTINATE is an open call project as the partner organisations are no Shift2Rail members. The member project complementary to DESTINATE is FINE1 (Future Improvement for Energy and Noise, S2R-CFM-CCA-02-2015) coordinated by Bombardier Transportation.

DESTINATE started in November 2016 and is still at the beginning. This paper aims to give an overview on the project consortium, main research areas and expected outcomes.

### Project consortium

The DESTINATE consortium consists of eight partner organisations from six different European countries that are listed below, see also Figure 1. It is coordinated by the Technical University of Berlin.

TUB: Technical University of Berlin, Institute of Land and Sea Transportation Systems, Chair of Rail Vehicles, DE

PUT: Poznan University of Technology, Institute of Combustion Engines and Transport, Division of Rail Vehicles, PL

UNEW: University of Newcastle upon Tyne, NewRail Centre for Railway Research, GB

MBBM: Müller-BBM, DE  
Müller-BBM Rail Technologies (DE) shall be added soon as a new beneficiary

EMPA: Swiss Federal Laboratories for Materials, Science and Technology, Laboratory for Acoustics / Noise Control, CH

SATIS: Sound Advice in Technology, Innovation and Strategy, NL

STAV: Stadler Rail Valencia, Design & Development Engineering, ES

NLR: Netherlands Aerospace Centre, NL



Figure 1: DESTINATE consortium

### Project objectives and main research areas

DESTINATE aims to improve methodologies for railway interior noise simulation, railway sound source characterisation, railway noise auralisation and visualisation (A&V) and assessment of cost-effectiveness of railway noise mitigation measures. Furthermore, the feasibility of active noise control technologies for windows shall be analysed by UNEW.

The details given below are the result of the work of all consortium members during the proposal preparation and the ongoing WP2.

#### Railway interior noise simulation & source characterisation

DESTINATE aims to develop a time-domain model for interior railway noise simulation based on OTPA

measurements at a light rail vehicle provided by STAV. The interior noise model shall be able to accurately rank sources and transmission paths. The main research work in this area will be carried out by MBBM.

Source characterisation methodologies suitable for this model will be researched within the project. In addition to MBBM and STAV this task will be carried out by TUB, PUT and UNEW.

**Rail noise auralisation & visualisation**

Auralisation and visualisation (A&V) of railway noise is researched for exterior as well as interior noise. A&V is a useful tool to demonstrate and communicate the effects of different railway noise mitigation measures and design alternatives to non-experts. A&V could also be used to carry out listening tests to rank different mitigation solutions.

DESTINATE aims to base the auralisation of exterior train pass-by noise on a physical model that allows for the consideration of the essential influencing factors. The main research work will be carried out by EMPA. PUT will support with measurements where necessary.

Interior railway noise A&V will be researched by NLR. As time-domain data can be used directly for auralisation it is planned to use data from the OPA measurements.

**Identification of cost-effective railway noise mitigation**

DESTINATE aims to develop a methodology to rank railway noise mitigation options and assess their cost-effectiveness. This methodology shall be based on life cycle costs. It is targeted to look into exterior rail noise mitigation as well as interior acoustic design. A further ambition is to include human perception in the methodology, e.g. through perception indicators.

The main research will be carried out by SATIS supported by TUB. Furthermore UNEW, PUT, NLR, EMPA and STAV will contribute to this task.

**Project timeline and structure**

The project is split in four work packages (WP), see Figure 2.

WP1 Project management and dissemination	<b>WP2</b> Requirement analysis and assessment	Nov. 16 - May 17
	<b>WP3</b> Development of methodologies, tools and technologies for noise prediction and mitigation	Feb. 17 - Apr. 18
	<b>WP4</b> Validation and integration of proposed solutions	Dec. 18 - Aug. 18

Figure 2: DESTINATE timeline and structure of work packages

WP1 covers project management and dissemination activities and runs throughout the whole project duration. WP2 – WP4 are ordered chronologically and cover requirement analysis, methodology development and validation. The outcome of WP2 – WP4 will be presented in public deliverables in the form of reports towards the end of each WP.

**Outlook**

The first public deliverable presenting an overview of the state-of-the-art and requirements set in preparation of the methodology development in WP3 is expected towards June 2017.

It is targeted to develop an A&V demonstrator for exterior rail pass-by noise. The demonstrator is expected towards the end of WP3 around May 2018.

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The positions expressed within this paper reflect the authors’ opinion and not necessarily the official opinion of Shift2Rail or the European Commission. Shift2Rail, the European Commission or any person acting on behalf of these organisations have no responsibility towards the use the information in this document might be put to.



Figure 3: Acknowledgement

**Literature**

- [1] Shift2Rail Joint Undertaking: Multi-Annual Action Plan. Brussels, November 2015
- [2] Shift2Rail Homepage, URL: <http://shift2rail.org/>