



INTERNATIONAL UNION
OF RAILWAYS

UIC RAILWAY NOISE DAYS

Sustainable railways strive to be good neighbours

Day 1: Being a responsible neighbour

UIC Railway Noise Days - 28 February 2023

Introduction



Moderator : Jakob OERTLI
Swiss Federal Railways (SBB)
Chair of UIC Noise and Vibration Sector

Kara OLDHOUSER
AMTRAK, UIC Sustainability Platform Vice Chair



Lucie ANDERTON
Network Rail (UK), Head of UIC Sustainability



UIC Railway Noise Days



8:30 – 9:00	Welcome desk & networking coffee
9:00 – 9:20	Introduction and welcome remarks Moderated by Jakob Oertli, UIC Noise & Vibration Sector, SBB •Kara OLDHOUSER, UIC Sustainability Platform Vice Chair, Amtrak •Lucie ANDERTON, UIC Head of Sustainability, Network Rail
9:20 – 10:20	Hackathon (Only in-person participants)
10:30 - 10:45	Break
10:45 - 11:45	Policy <ul style="list-style-type: none"> • Pinar YILMAZER, Facilitator of the policy group, UIC Noise and Vibration Sector • Marco PAVIOTTI, EU DG ENV Policy Officer • Ethem PEKIN, CER Question and Answers



11:45 – 12:00 **Sponsor Booth**
@ Room Stephenson

12:00 - 13:00 **Lunch Break**

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 **Fimor**
POLYURETHANE



UIC Railway Noise Days

13:00 - 14:30

Supplier

- Haike BRICK, Facilitator of the supplier group, DZSF
- Joan SAPENA, Alstom

Lineside residents

- Alf EKBLAD, Facilitator of the lineside resident group, Trafikverket
- Laurent DROIN, Centre d'Information sur le Bruit (CidB)

Research

- Lorenzo FRANZONI, Facilitator of the research group, UIC
- Thomas MALY, Technical University of Vienna

Question and Answers

14:30 - 15:00

Break

15:00 - 16:00

Operators

- Jamie WILKES, Facilitator of the operators group, Network Rail
- Martijn WOLF, Nederlandse Spoorwegen (NS)

Infrastructure

- Michael DITTRICH, Facilitator of the infrastructure group, TNO
- Urs SCHOENHOLZER, SBB

Question and Answers



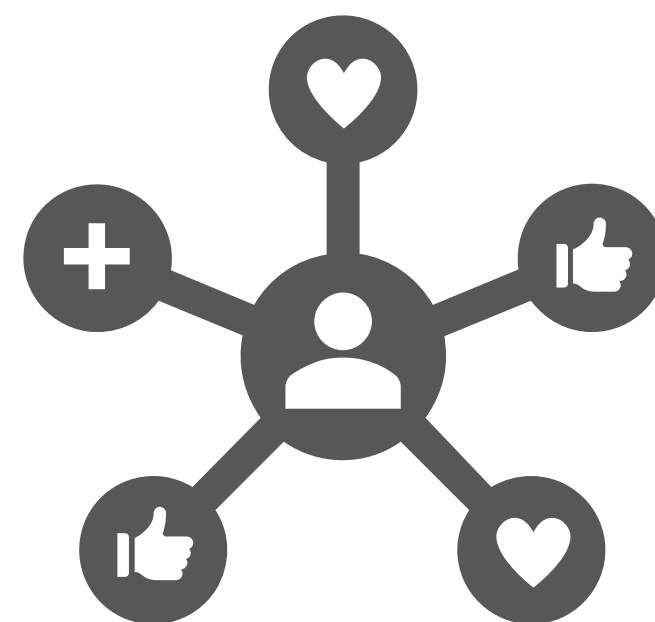
UIC Railway Noise Days

16:00 - 16:40	UIC Noise and Vibration Project <ul style="list-style-type: none">• Louise MORRIS, ATKINS UIC report on nuisance and health impacts of railway noise• Martin RISSMANN, VibraTec UIC report on management of parked and stationary trains
16:40 - 17:00	Closing Session by Jakob Oertli
17:00 - 19:00	Reception





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#UICrail



**#UICRailwayNoiseDays, #UICsustainabilityActionWeek,
#MoreTrains**



Hackathon



Pinar YILMAZER, UIC

Policy



Haike BRICK, DZSF

Supplier



Alf EKBLAD, Trafikverket

Lineside resident



Lorenzo FRANZONI, UIC

Research



Jamie WILKES, Network Rail

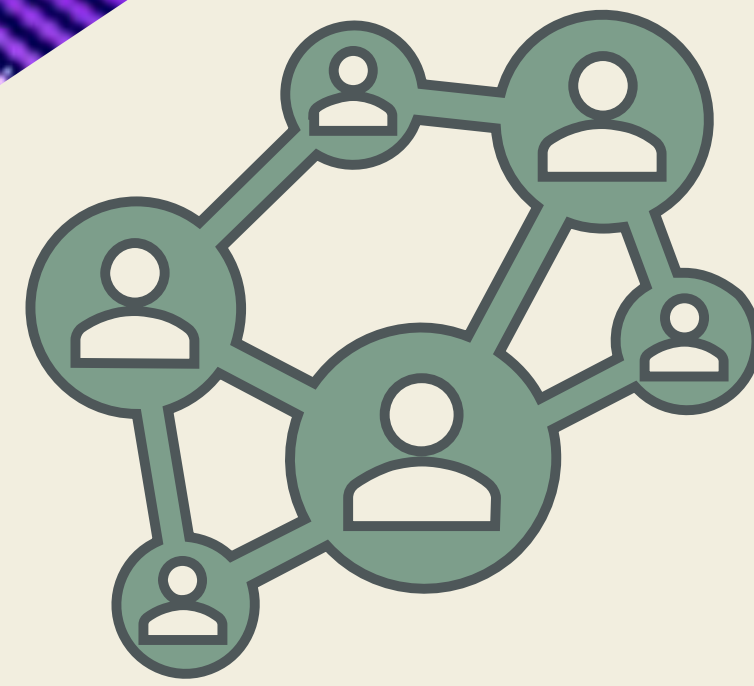
Operators



Michael DITTRICH, TNO

Infrastructure

10:30 - 10:45 Coffee Break





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Pinar Yilmazer

UIC Sustainability Programme Advisor

Noise Vibration Sector

UIC Railway Noise Days - 28 February 2023

Policy

Trend → Easy part regulated

- Annoyance Different Perspectives → Limit Values?
 - (+) Sustainability
 - Long time - Not clear Continuous Monitoring! → Local Gov.
 - Not based on Measurement Campaigns!
- Gaps = Operation & Lineside Residents + Communities need
Noise emission ceilings
Collaboration among DGs

Innovation → EU projects (NOT advanced)

Implementation is missing!

Be open!

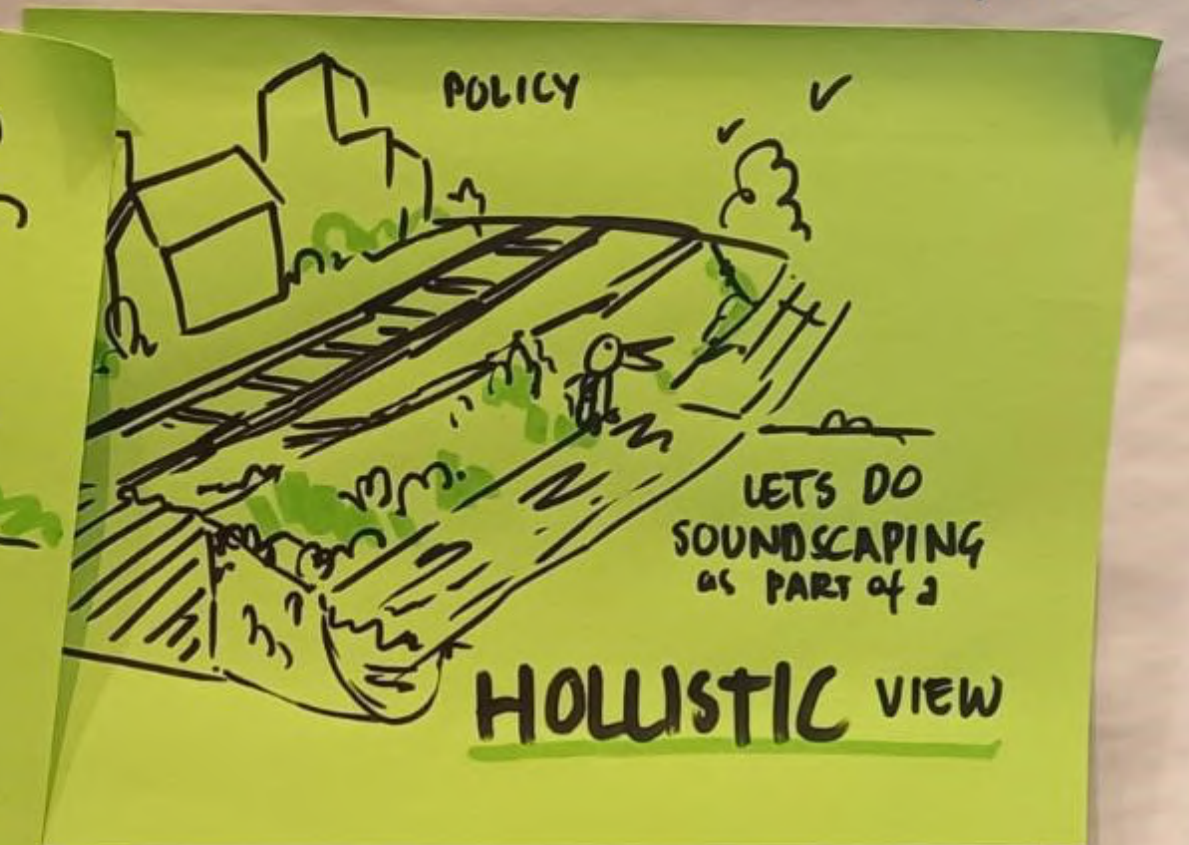
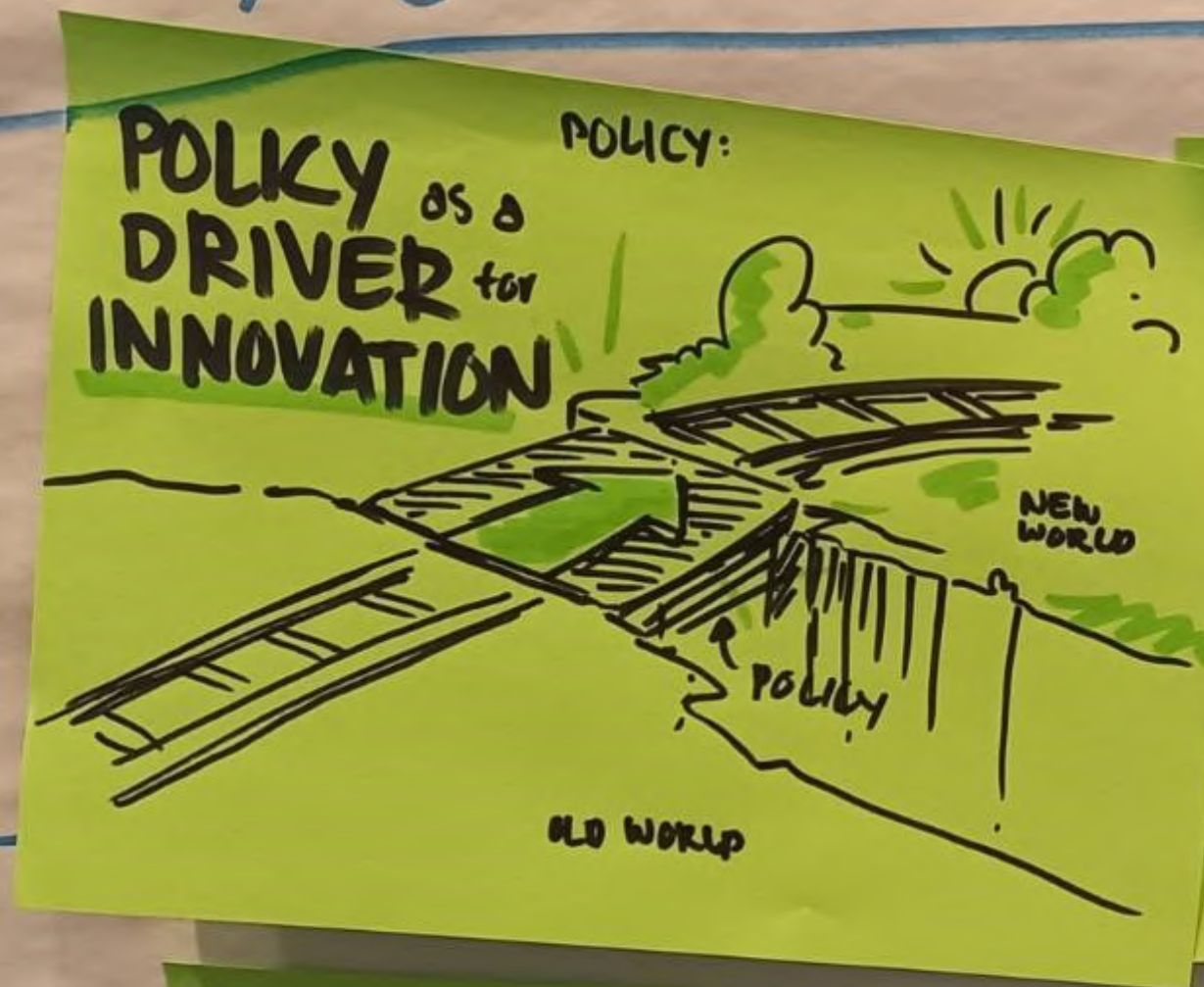
What is next after Noise Mapping?

Database!



EU projects (NOT advanced)

Implementation is missing!



Why?



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Marco PAVIOTTI

European Commission, Directorate-General for Environment (DG ENV)

Policy Officer

UIC Railway Noise Days - 28 February 2023



How the European Commission builds up the railway noise policy

Marco Paviotti, Directorate General for the Environment

Content

Making policy

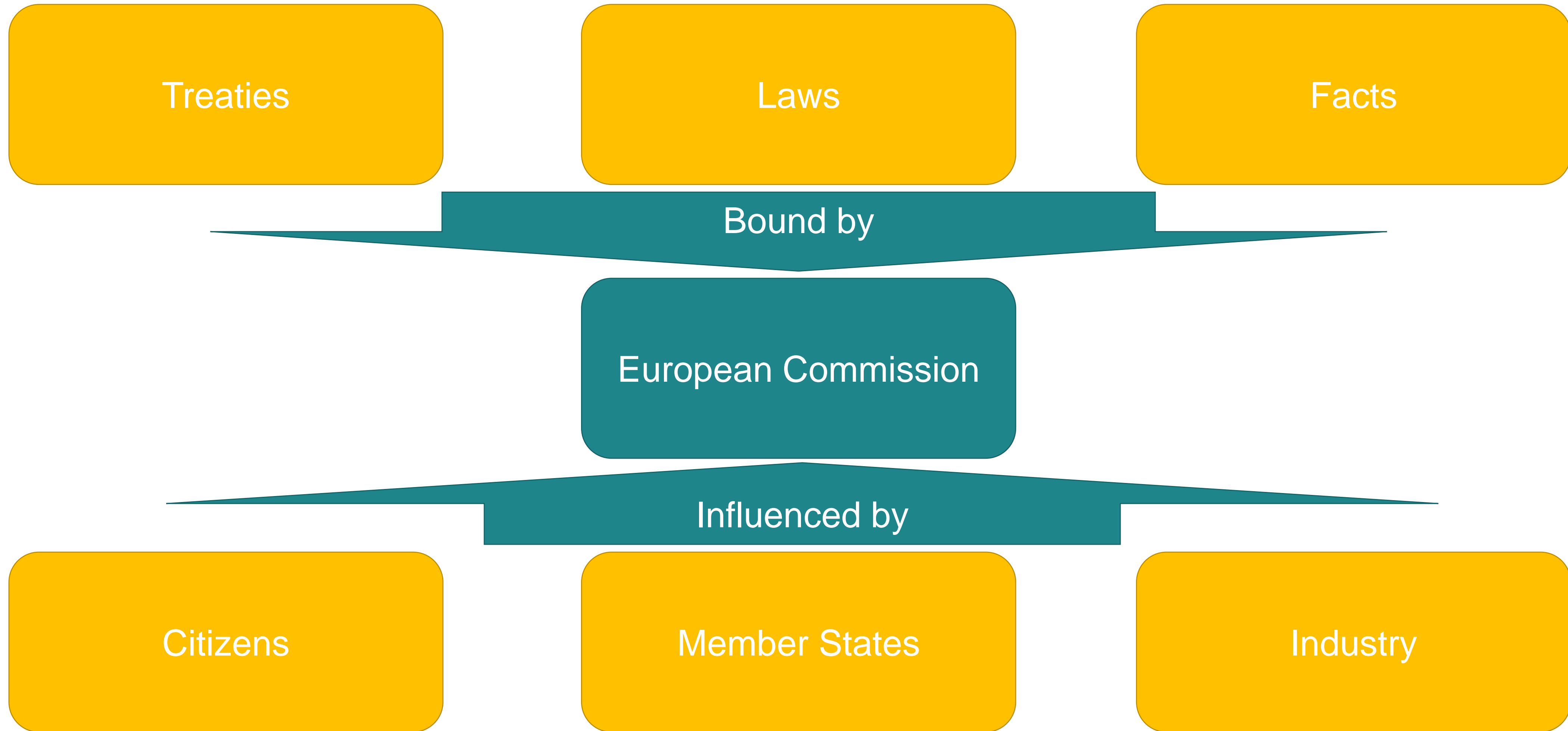
Impact on public health

The implementation of the Directive, and its achievements

The other EU legislation on railway noise

Recommendations and next steps

Before policy making

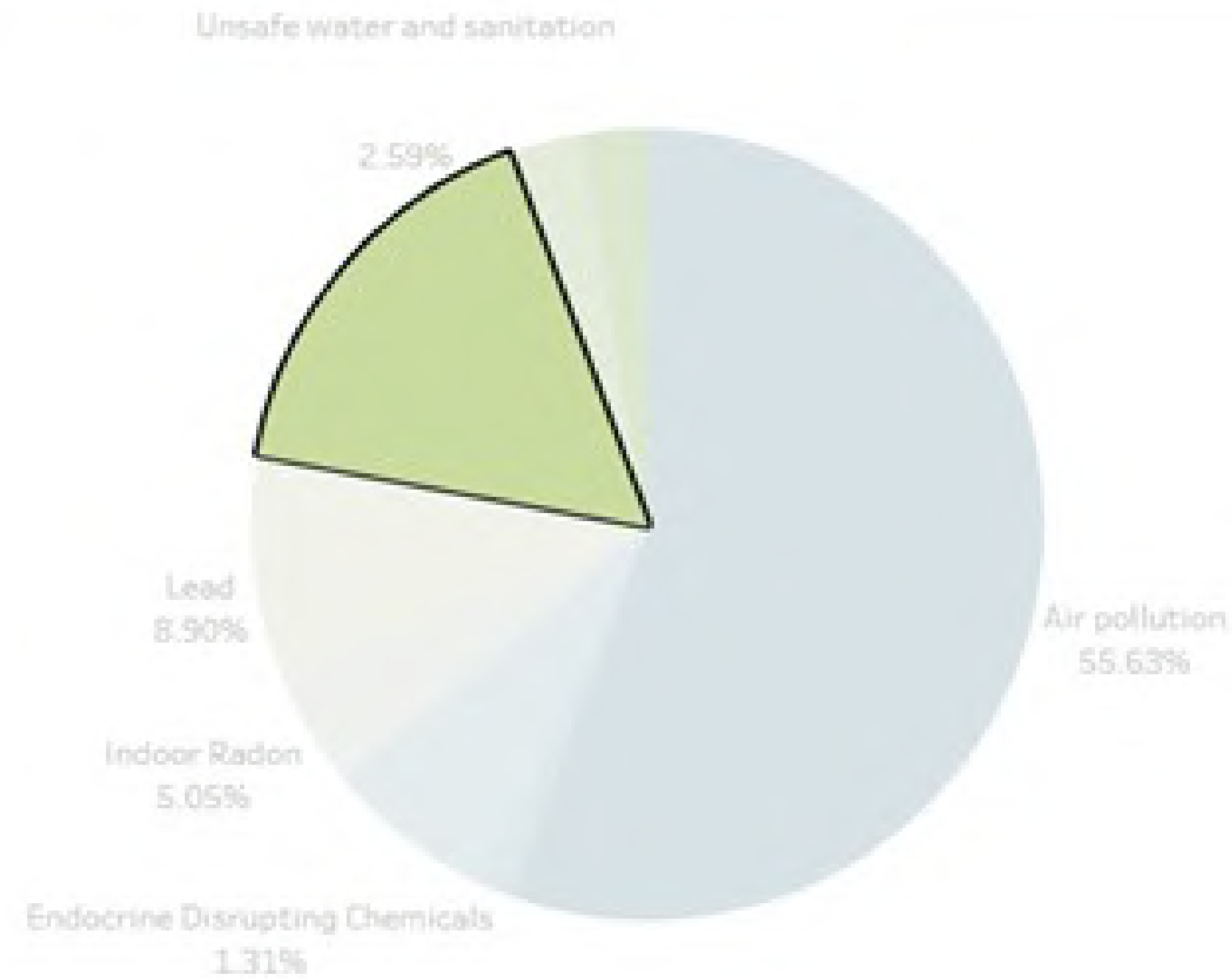
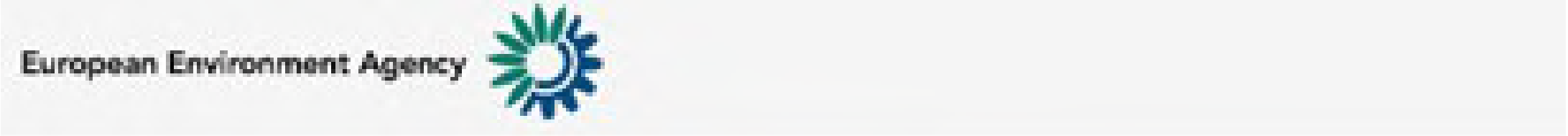


Facts

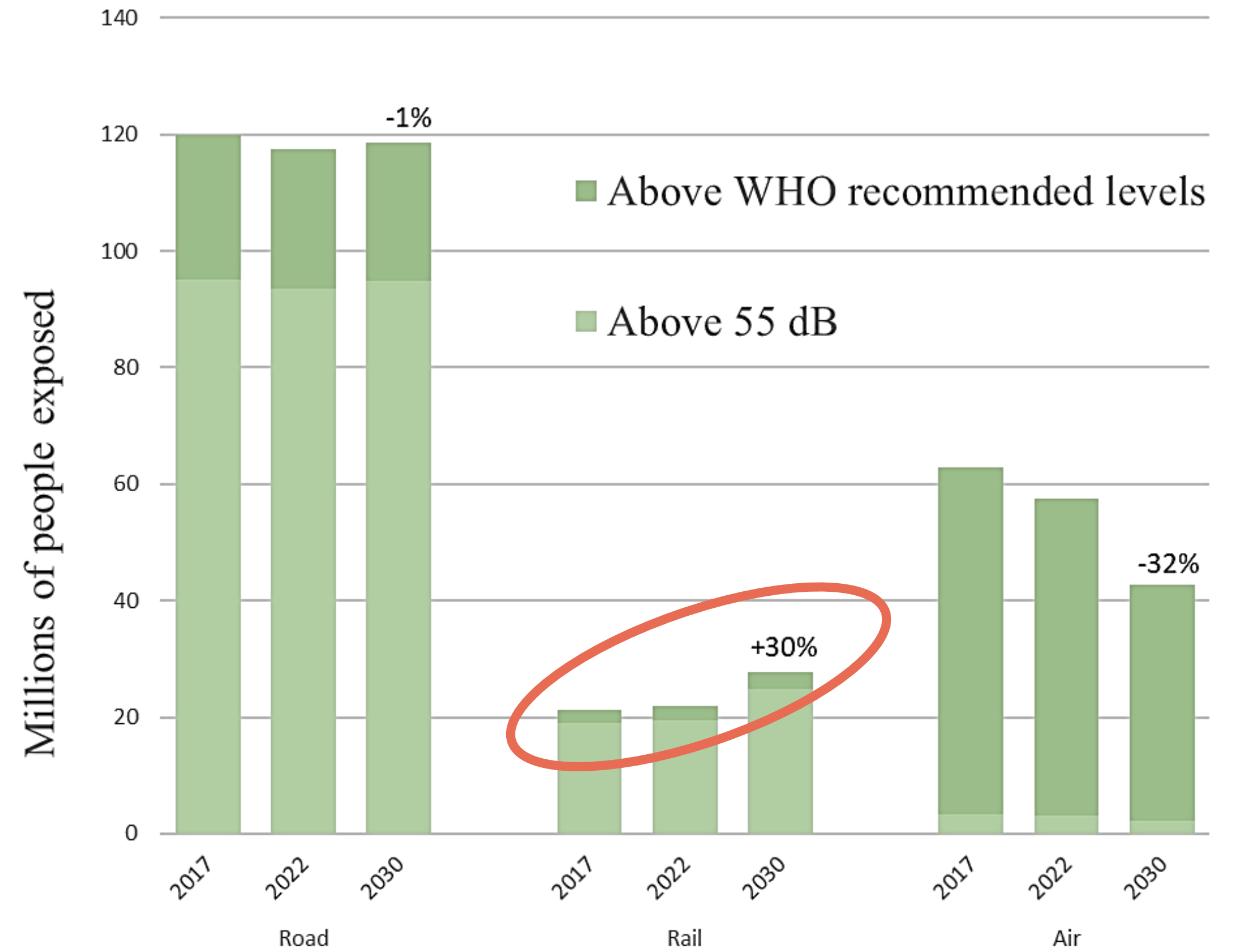
Impact on public health

	Highly annoyed	Highly sleep disturbed	Cases of ischaemic heart disease	Premature deaths
Road traffic	14 400 000	3 700 000	33 600	8 900
Rail traffic	3 100 000	1 600 000	5 600	1 500
Air traffic	900 000	200 000	2 000	200

Impact on public health



Estimated total number of people exposed to noise in the EU, with increase/decrease projections between 2017 and 2030



Laws

Legal framework

Train

- TSI-noise (limits for new trains and prohibition over specific railways)

+ Commission Regulation (EU) No 1304/2014
+ Commission Implementing Regulation (EU) 2019/774

- ~~• NDTAC (differentiated tariffs asking more to noisy and passing these to quiet ones)~~

~~+ Commission Implementing Regulation (EU) 2015/429~~

- ~~• CEF funds (fund to renew noisy trains)~~

Rail

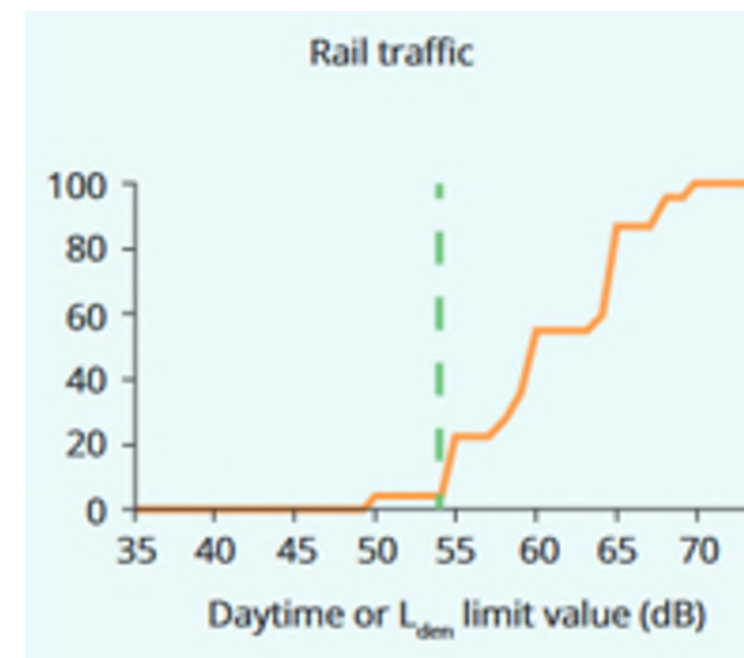
- END (action plans to renew the rail and install noise barriers)

+Directive 2002/49/EC
+Commission Implementing Regulation (EU) 2019/774

Member States

Implementation of the Noise Directive

- Maps and plans are improved thanks to 15 infringements
 - 8 remain open
- Maps and plans have to be adopted at 'whatever noise level' (ECJ C697-20)
- Despite national limits



solutions are not implemented (maybe due to distribution of responsibilities)

Achievements of the Directive

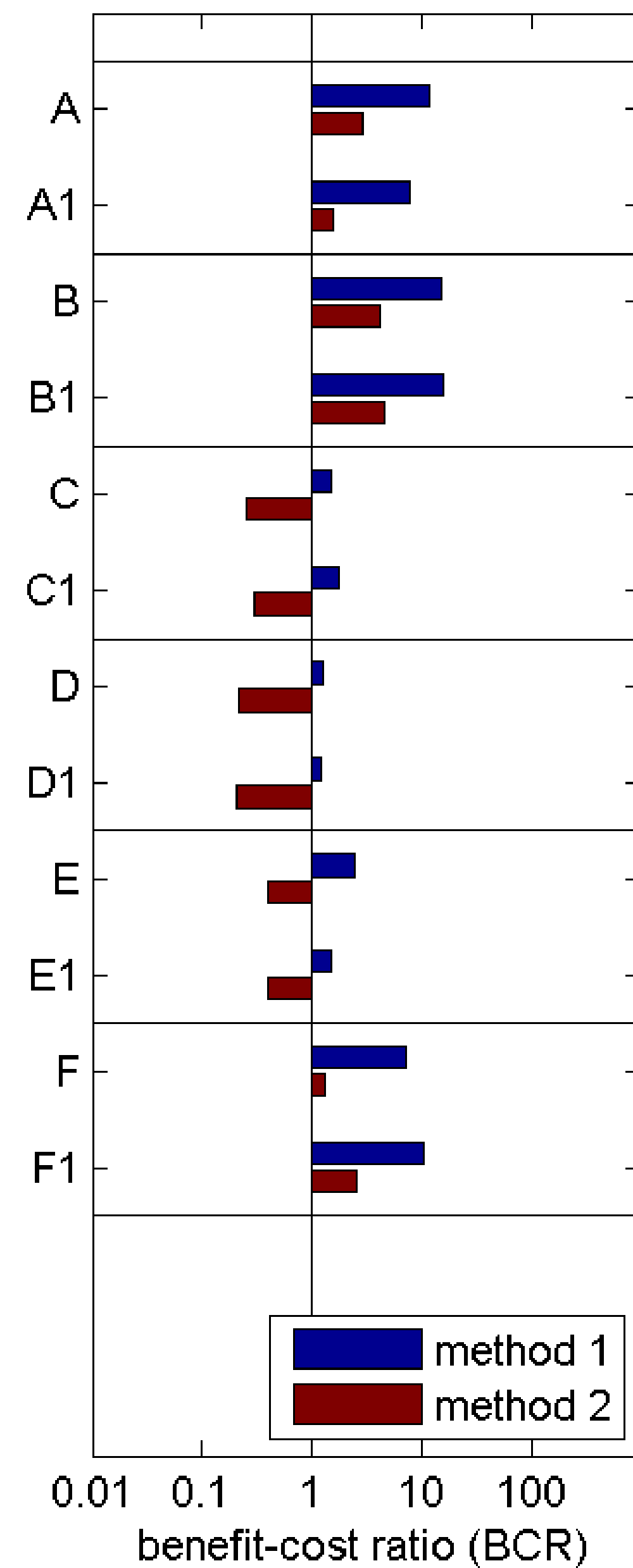
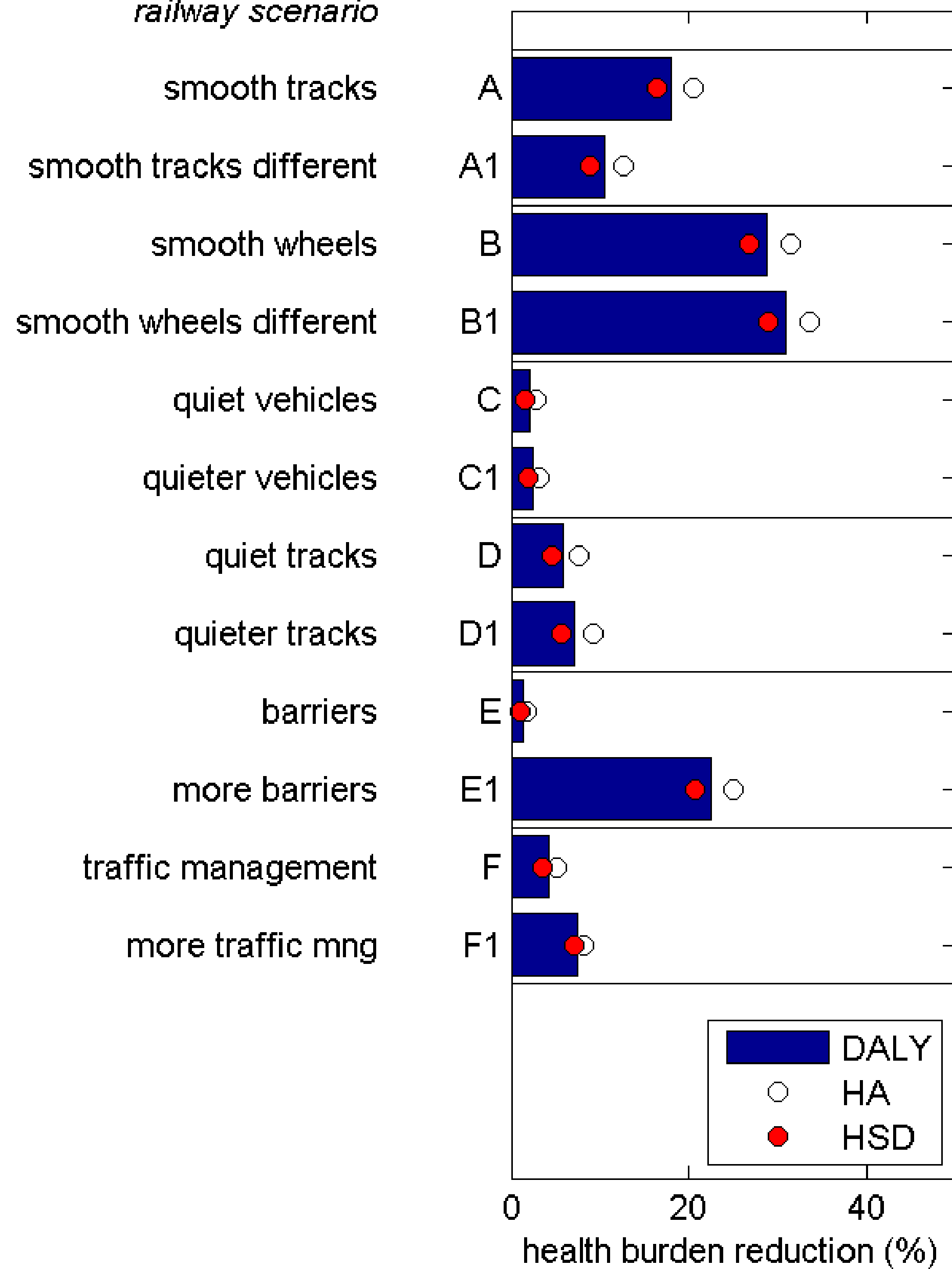
- The maximum technically feasible noise reduction between 2017 (the date of the last analysis) and the relatively close date of 2030 is approximately 45%
- Direct administrative costs are EUR 0.04 per inhabitant concerned per year
- There is a return of EUR 10 in societal benefits for every euro spent on specific measures
- **So: the (cheap) Directive harmonised approaches,
but did not trigger noise reduction**

Achievements of the TSI-Noise

- Reduce noisy trains ‘by design’
- Limit the noisy trains on EU railways since 2024!

Industry

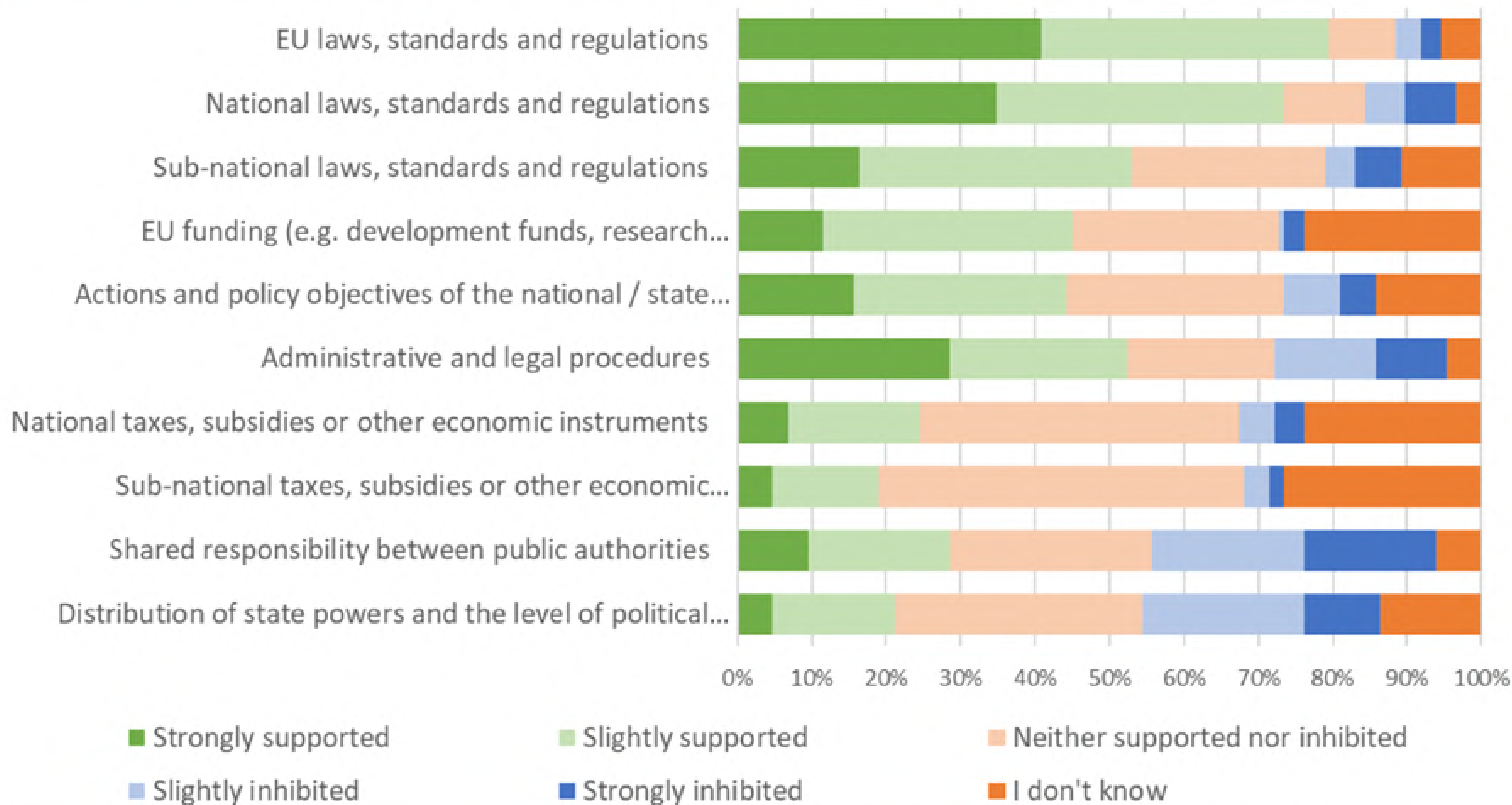
railway scenario



But...

- Who pays?
- Are there safety issues?
- Can we introduce it in the daily railway operations?
- Railways is the most environmentally friendly transport mean!

Citizens





Schallschutzwände gegen Bahnlärm im Mittelrheintal – 22.000 Anwohner sollen profitieren

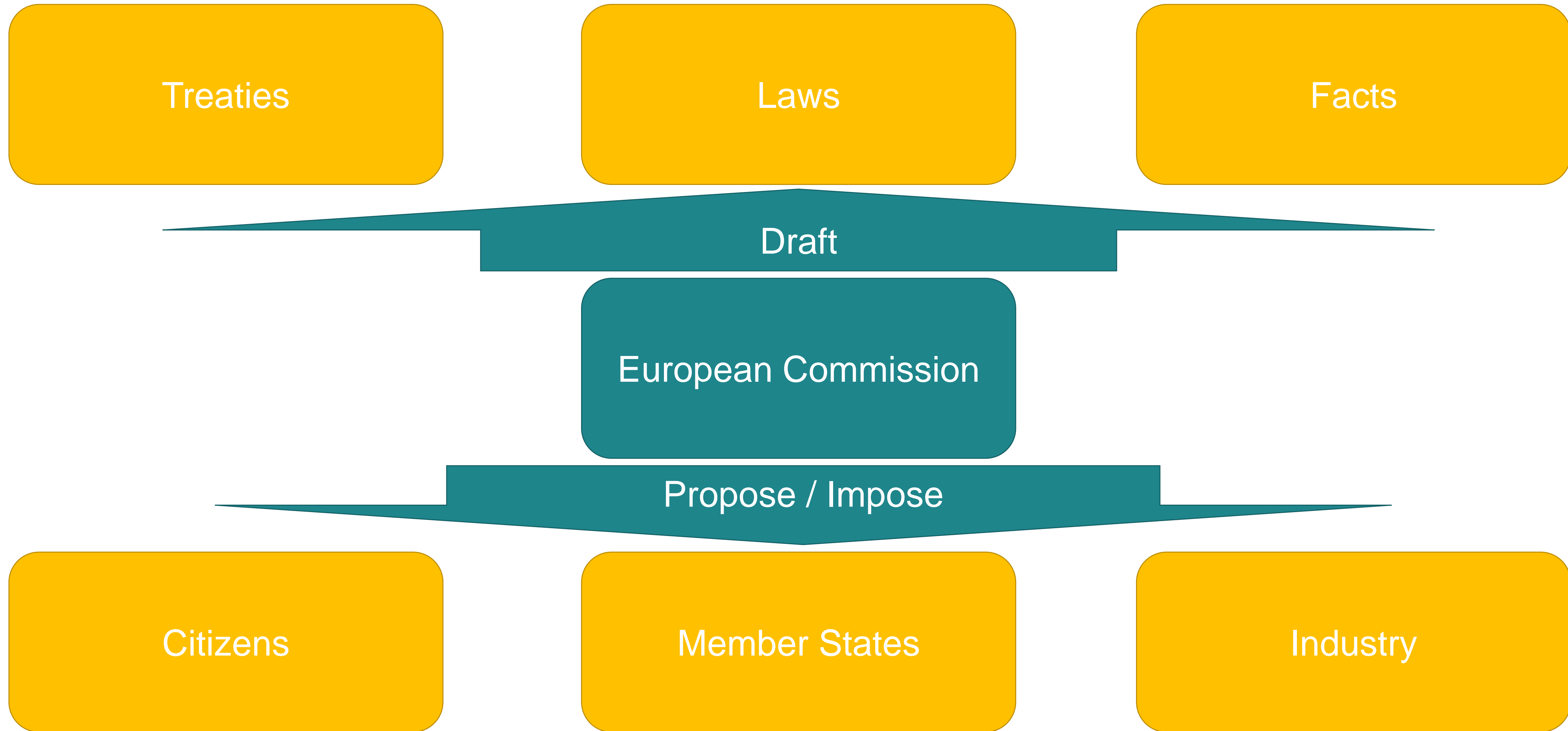
30. Januar 2023, 11:19

WEIßENHOF | Der massive Bahnlärm im Welte-Operes Mittelrheintal vergräut manche Anwohner und Touristen für immer. Bahn und Politik kündigen daher mehr Schallschutz an. Einem Bürgerverein reicht das nicht.

Im Kampf gegen den Bahnlärm im Mittelrheintal sollen 27 Kilometer neue Schallschutzwände entstehen. Für rund 22.000 Anwohner wird es laut der Deutschen Bahn längerfristig „spürbar leiser“. Dafür wollen Bahn und Bund sowie die Länder Rheinland-Pfalz und Hessen gemeinsam mehr als 130 Millionen Euro investieren. In 20 Kommunen von Leutesdorf im Norden bis Eltville im Süden sollen bis zum Jahr 2028 Lärmschutzwände entstehen.

Concluding...

Making policy



The Sustainable and Smart Mobility Strategy

- The **implementation** of European rules on rail noise will help **alleviate** related concerns

The Zero Pollution Action Plan

- Target of reducing by **30% by 2030** the number of people chronically disturbed by transport noise in respect to 2017
- Better focusing on tackling noise at source – in line with the findings of the 2016 evaluation of the Environmental Noise Directive and the 2020 evaluation of the Outdoor Noise Directive, notably by **securing proper implementation** and, where appropriate, by **improving the EU's noise-related regulatory framework** on road vehicles and their **tyres, railways, aircraft** – accompanied by parallel action at the global level;
- Following up the 2020 evaluation of the Outdoor Noise Directive by addressing **outdoor equipment** and reviewing progress in 2022; and
- Assessing the need to **set noise reduction targets** at the EU level in the Environmental Noise Directive.

Legislative options

1. Business as usual

- Improve guidelines and provide recommendations on what to do.

2. Revise Directive 2002/49/EC (END)

To introduce an European health improvement objective to be achieved through specific & mandatory targets.

3. Revise other EU legal acts

Due to the multidimensional nature of the issue (conclusion of Phenomena study): Review a series of EU legal acts (tyres, cars, buildings etc.) ... In case of railway...
TSI-Noise

Recommendations

Recommendations and next steps

- Reducing the number of people chronically disturbed by transport noise in the EU requires action at all levels (EU, national, regional and local).
- Cost-effective solutions are already available and should therefore be applied more quickly.
- A limited set of harmonised improvements to a very small number of legislative instruments would make it possible to reduce noise exposure.

Thank you



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Ethem PEKIN

Community of European Railway and Infrastructure Companies (CER)

Head of Economic Policy and Sustainability

UIC Railway Noise Days - 28 February 2023

Noise mitigation with modal shift to rail

Ethem Pekin, Head of Economic Policy and Sustainability

UIC Sustainability Action Week

27 February 2023, UIC HQ Paris



Why rail noise mitigation is still so important?

- EU Green Deal and the EU Sustainable and Smart Mobility Strategy proposes a pivotal role for rail
- Rail's external costs are excellent except for noise
- In some European regions noise is an obstacle for public acceptance for rail
- Noise is mainly generated between the wheels and rail but rail system is very complex

EU noise policy drives rail noise mitigation forward

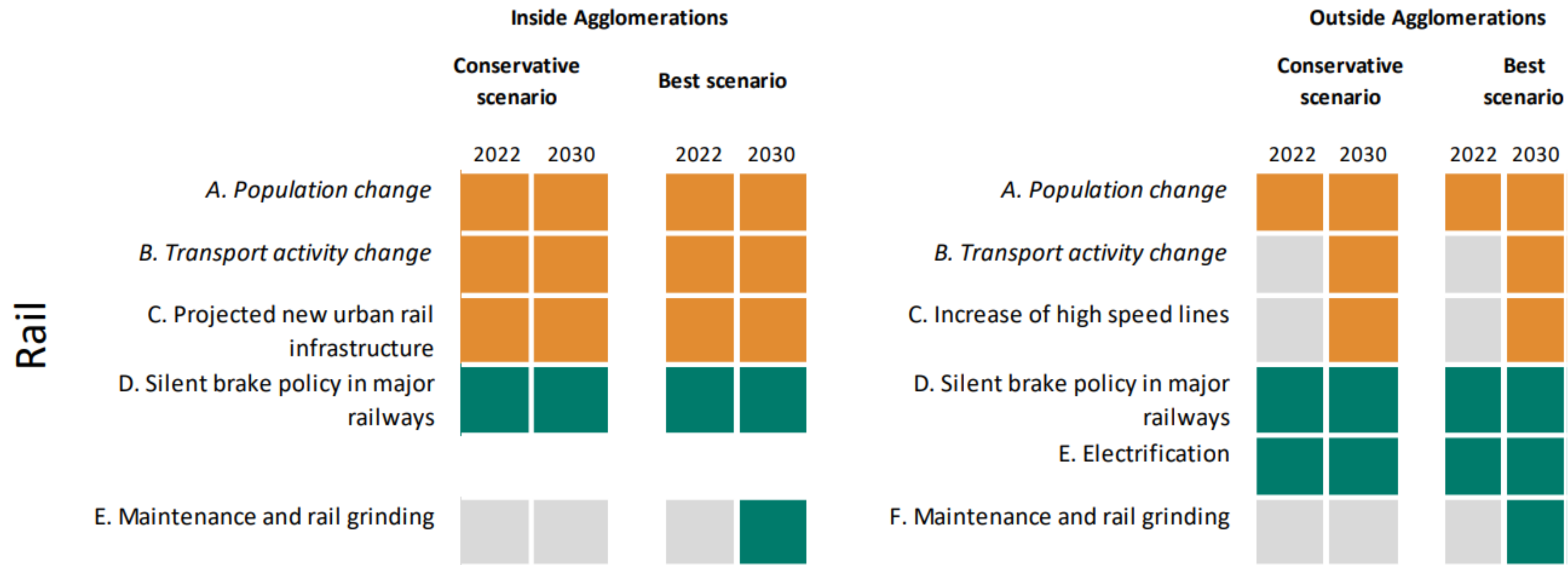
- Environmental Noise Directive provides a legal basis for rail noise legislation
- Noise limits are in place to tackle rail noise at source through technical specifications
- Focus was given to the existing noisy rail freight fleet unlike any other transport mode
- Noise abatement include infrastructure measures
- Noise is a local externality – national measures are introduced

The European approach

Silent brakes on quieter routes

- In 2019 the Commission created a legal framework on banning noisy wagons from quieter routes
- International rail freight wagons thus be running on silent brakes by end of 2024
- CEF funding and national state aids were offered for retrofitting of brake blocks
- Update on % of silent wagons needed to have an uninterrupted international rail freight services

Rail noise scenarios



Comments on noise-free future?

384. Tyres are an important consideration in road safety. Nevertheless, tyres are a significant cause of noise above 30 km/h and low performing tyres increase noise and its health effects. Regulating rolling resistance affects the energy consumption, and emissions of vehicles as well, thus again tyres are key in reducing carbon footprint. Last but not least **tyres are a main cause of the microplastics released in the environment**. Different factors influence the **abrasion rate of tyres**. **Tyre design, type of their raw materials and external parameters** such as roads, vehicle characteristics that can be regulated as well as ambient **meteorological conditions** to be taken into account, are some of these factors.

1126. Noise in the majority of the real situations depends, for road vehicles, on the tyres and road surface, for railway on the quality of wheels and rails, and for aircrafts on the engines and aircraft frame. **Electric vehicles are sometimes associated with 'no noise' pollution which is however not the case**. As a result, very little benefits are foreseen by a renewal of the fleet or changes in traffic. By 2030 an increase of noise is foreseen for all modes relative to 2015 due to the increase of the number of vehicles. By 2050 the increased number of electric vehicles could lead, for road only, to a limited benefit in terms of noise reduction. The impacts are limited unless **other specific measures** are adopted that benefit the fleet renewal and at the same time target noise, as well as CO₂ and air pollutant emissions reductions.

Comments on noise-free future?

316. In spite of technological improvements which have made aircraft less noisy, the problem of aircraft noise in the EU has continuously increased in the past years. This is due to the continuous overall growth of air traffic in Europe as well as the expansion from population affected by aviation noise, linked to demographic growth and weak land use planning. Noise from aircraft is the third largest source of noise pollution affecting EU citizens, and research shows that people perceive noise from aircraft as more annoying than noise from road or rail, at the same noise level exposure. It is estimated that in 2017, more than 2.5 million EU citizens were subject to 55 dB noise level from aircraft, an increase of 12% as compared to 2005. With the expected continued overall growth of air traffic in Europe in the next decades - generating more flights in particular at medium size airports, the total population affected by critical noise levels from aircraft will likely further increase, especially at regional airports. Aircraft noise at night time is also a growing concern. In 2017, around 1 million EU citizens were exposed to at least 50 dB aircraft noise levels at night, an increase by 13% as compared to 2005.

418. **Airport charges** are paid by airlines to airports for the use of facilities and services, which are exclusively provided by the airport managing body and which are related to landing, take-off, lighting and parking of aircraft and processing of passengers and freight. While the Directive requires that airport charges are non-discriminatory, it permits modulations for environmental issues provided that they are relevant, objective and transparent. The 2019 evaluation of the Directive showed that only 61% of airports modulate charges on account of noise and only 20% of airports do so on account of NO_x emissions. The 2019 evaluation did not find any airports that would modulate airport charges on account of CO₂ emissions. The planned revision of the Airport Charges Directive could aim to ensure the setting of airport charges is strategically aligned with the Green Deal Communication and environmental ambitions of the EU.

Solution?

- Pursue a holistic approach in noise mitigation
- Continue to invest in technology
- Cost-benefit analysis driven measures
- Smart pricing – internalise external costs
- Dialogue with public essential

For further information:

Ethem Pekin

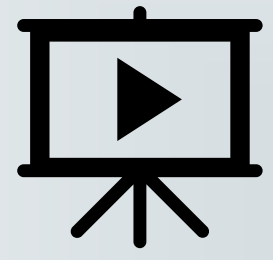
Head of Economic Policy and Sustainability

Tel: +32 496 599 316

E-mail: ethem.pekin@cer.be

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visit our website: www.cer.be

or follow [@CER_railways](https://twitter.com/CER_railways) | [CER](https://www.linkedin.com/company/cer) 



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QUESTIONS & ANSWERS



11:45 - 12:00

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@ Room Stephenson

12:00 - 13:00

Lunch Break

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13:00 - 14:30

Supplier

- Haike BRICK, Facilitator of the supplier group, DZSF
- Joan SAPENA, Alstom

Lineside residents

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Question and Answers



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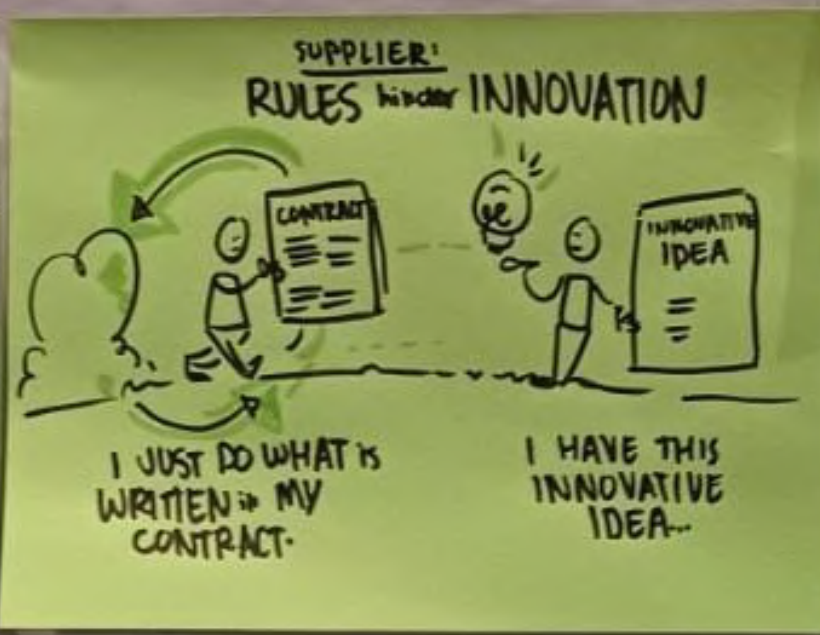
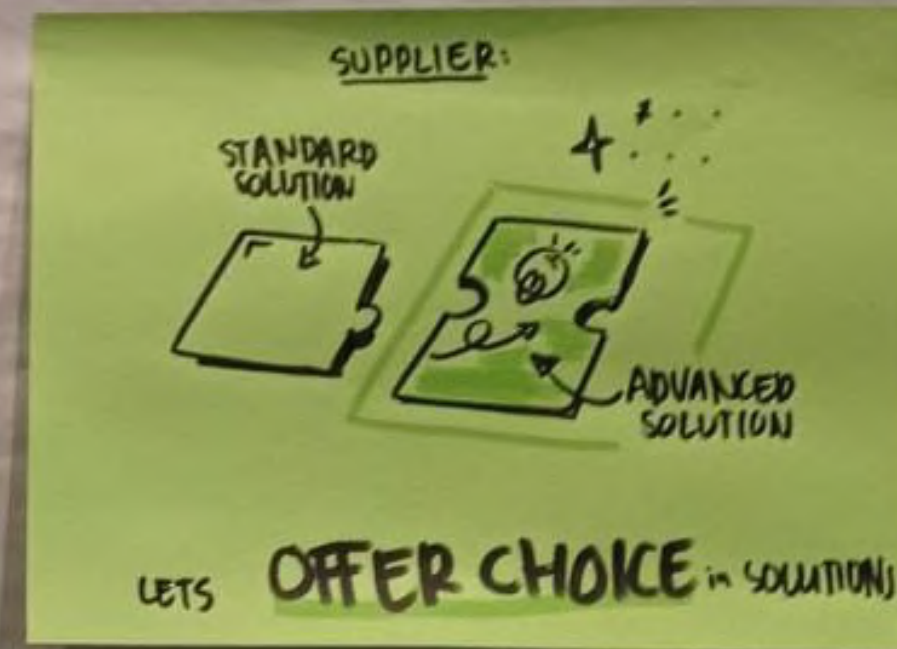
Haike BRICK

German Centre for Rail Traffic Research /
Deutsches Zentrum für Schienenverkehrsforschung (DZSF)

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Supplier

TENDER PROCESS
space for INNOVATION
SHOULD BE ASKED
FOR.



DURABILITY + STABILITY OF PERFORMANCE ?

! long-time monitoring ↑ Cooperation suppliers / IM / operators



Joint research projects
e.g. Europe's rail

FARES



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Joan SAPENA

Alstom

UIC Railway Noise Days - 28 February 2023



UIC Noise days – Supplier view

Joan Sapena

28/02/2023

Agenda

1. Good Neighbours
2. Interfaces
3. Difficulties
4. Solutions



Good Neighbours

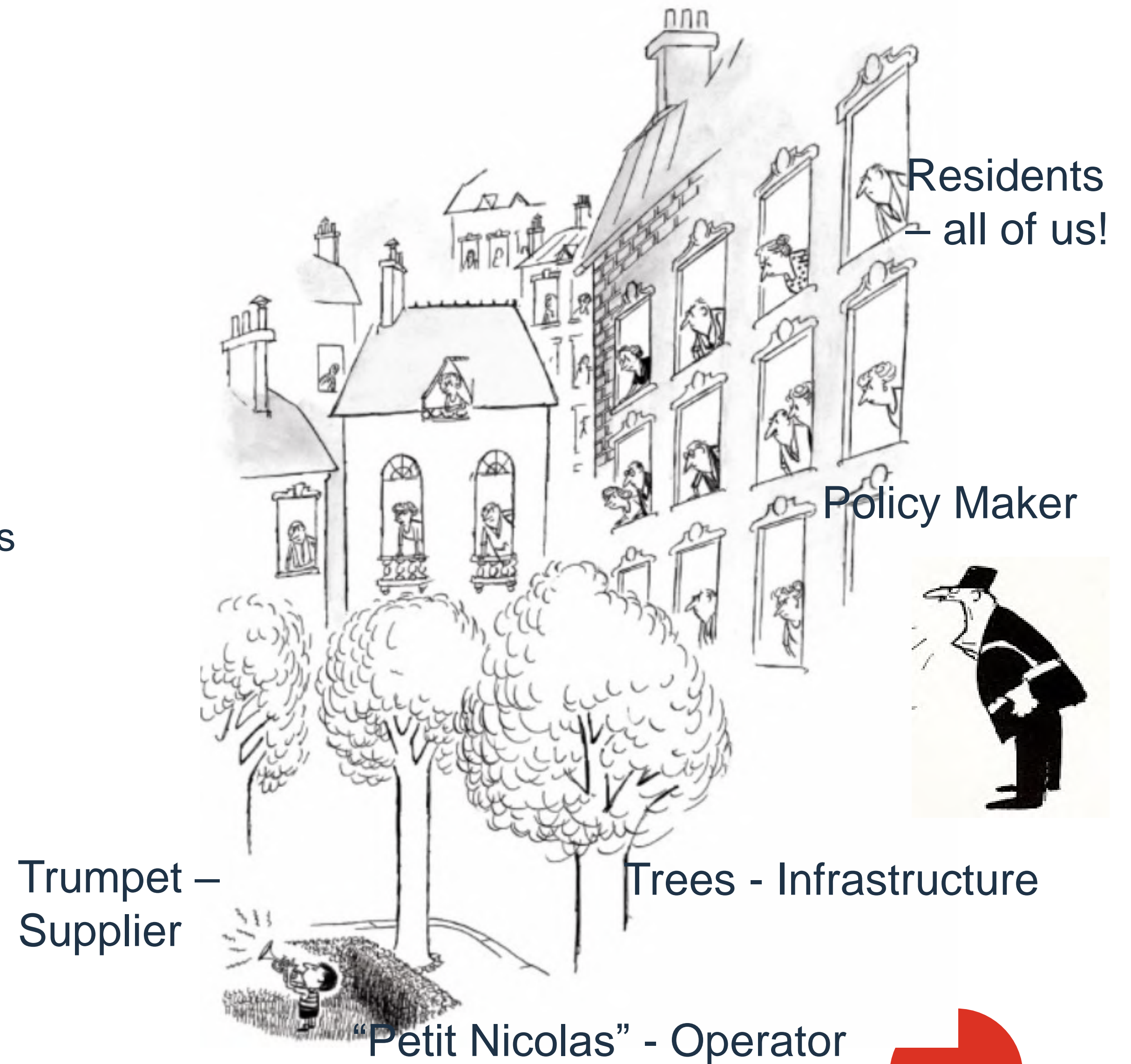


- Main relation with our main neighbours is Exterior noise performance
 - Standstill noise
 - Parking noise
 - Pass-by constant speed
 - Acceleration noise
 - Warnings (horns, doors,...)

- Our community is wide..
 - Operators
 - Infra
 - Policy Makers
 - People!

Interfaces

- We are not alone in this world!
- The final noise performance depends on the complete “community” for all of our activities
- Pass-by
 - Track is the key - Infra
 - Hauled loads are important for locomotives – Operators
- Standstill
 - Less dependent of interfaces
- Parking mode
 - Very dependent on operators needs
- Acceleration
 - Depends on operators needs
 - ▶ Acceleration rate
 - ▶ Loads



We are a community!

Difficulties to be a good neighbour

Definition of good neighbour is not always the same

- Lack of common standardization
- Difficult to develop products that fits everybody - Cost
- Multiple different requirements in function of operator
- Multiple ways of operating a train (specially in parking mode)

Good boys in front of Policy makers but..

- in real operation we are not visible enough (track is masking good performances)
- Standards don't cover all possible situations

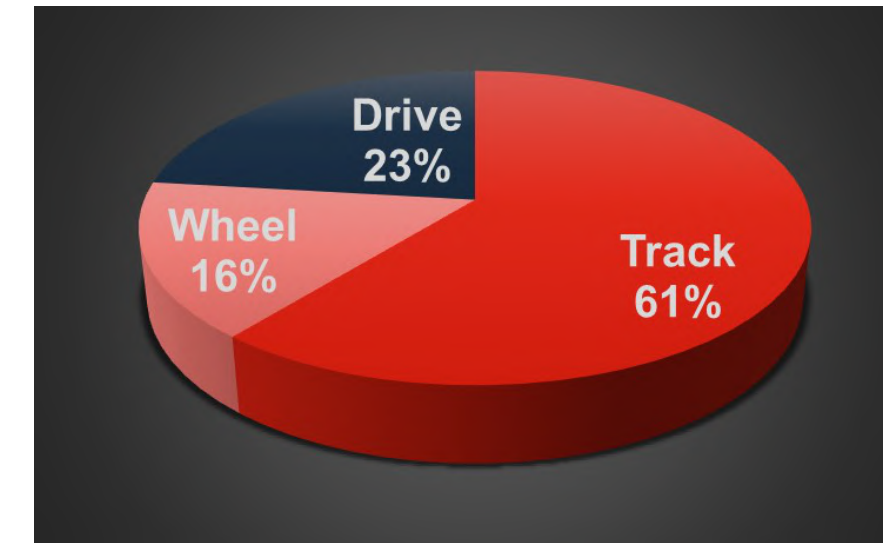
- Example of Parking Mode
 - Different operating conditions for parking mode (Eurospec, VDV 1541, operator specific requirements)
 - Lack of a current ISO standard (New ISO 3095 expected for the end of 2024) will include parking noise measurement procedure

Lack of standardization for parking mode – Quiet trains are not visible

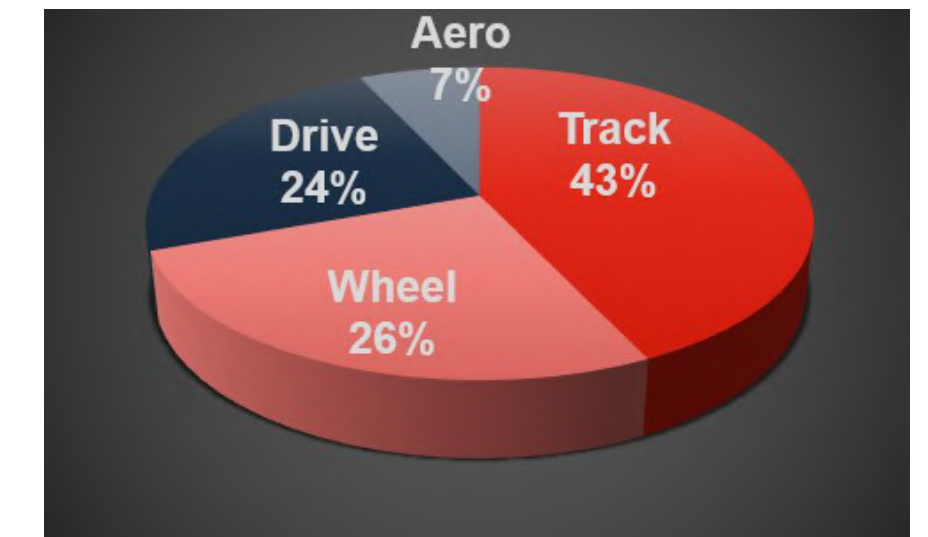
Solutions (I) – Pass-by constant speed (80 kph to 320 kph)

- We are close to technical limits up to 200 kph
 - Main contributor is track
 - Bogie skirts will not cover track contribution
- For speeds higher than 200 kph
 - Track and wheel could be at the same level of importance
 - Wheel dampers and wheel design could improve a little the overall contribution
 - Aeroacoustics is only dominant for speeds higher than 320 kph – possible to work on overall aerodynamics (panto, bogie fairings, nose shape,...)
- Current measurement standards doesn't show quiet trains...
 - Search for quietest track for testing is common practice to reduce risks
 - Results from different RS suppliers are not comparable (even if the standards used say so...)
 - Track and Vehicle noise separation (FINE2-TRANSIT Shift2Rail project) could be a future alternative for testing to separate track vs vehicle

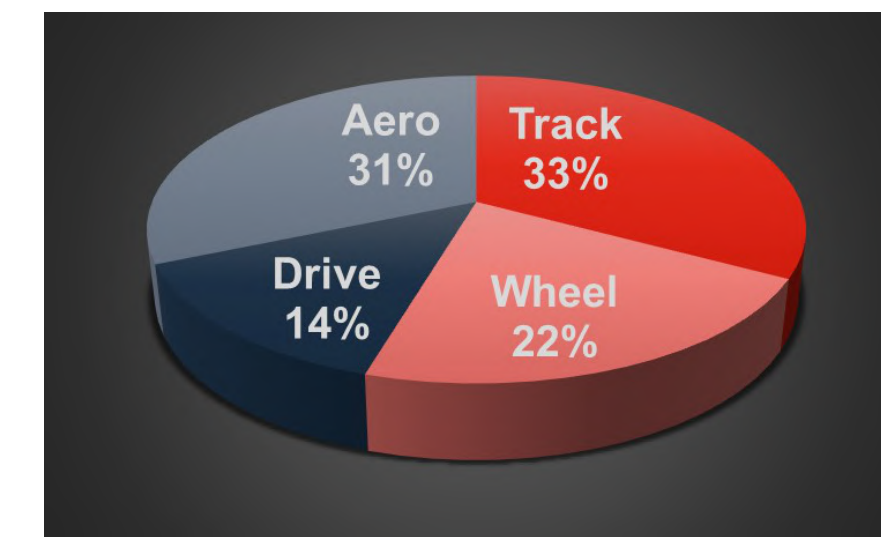
Regional RS 80 kph



Regional RS 200 kph



HS 360 kph

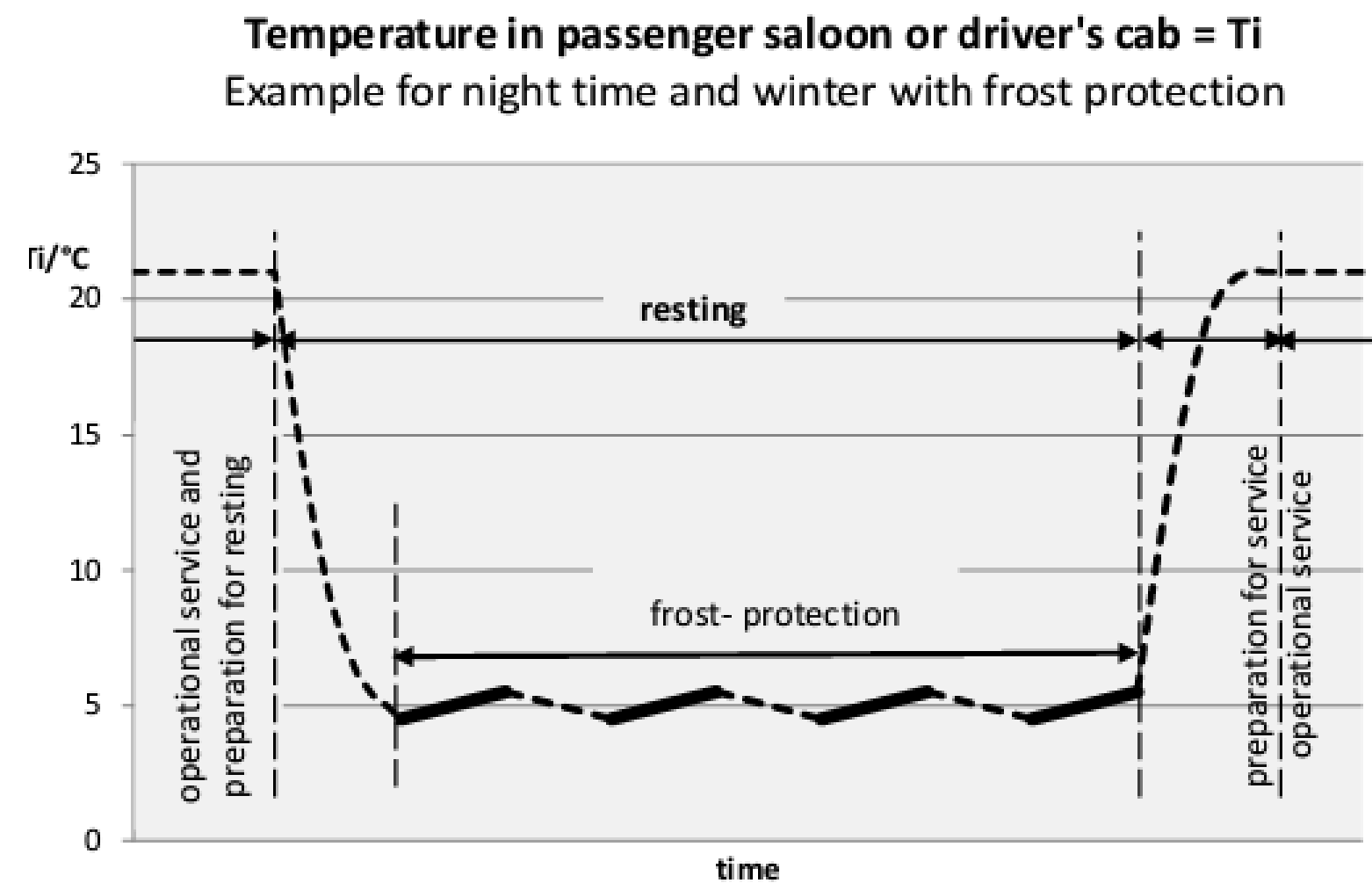


Simulation - Pass-by levels LpAeqTp	80 kph	160 kph	200 kph
Just compliant ISO3095 track (roughness and TDR)			
vs			
Typical real test track used by industry (Roll2Rail compliant ISO 3095)	-4,8	-4,8	-4,2

For pass-by constant speed – We are close to the limit of feasible performances

Solutions (II) – Parking mode

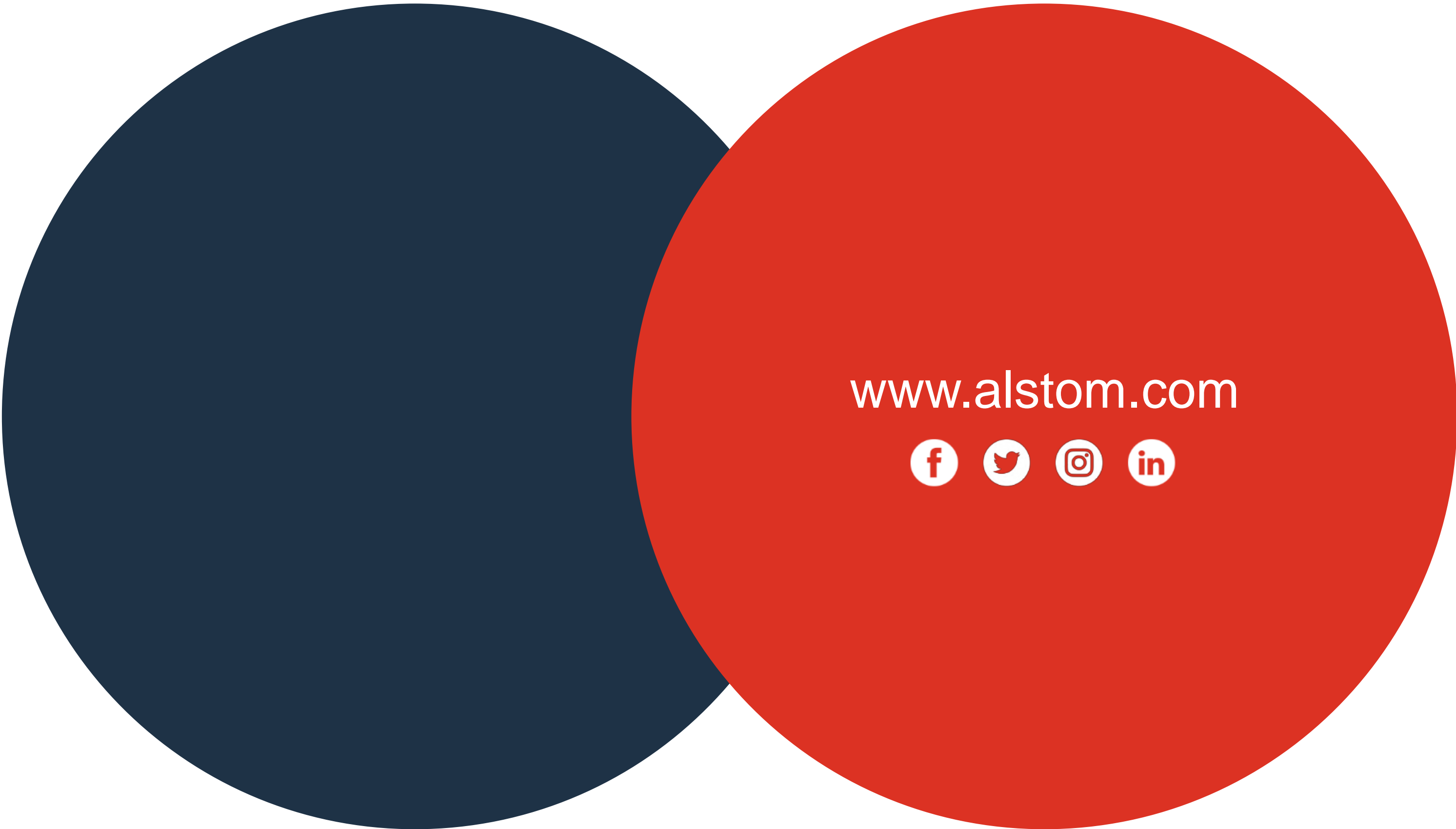
- Operating conditions in parking mode or energy saving mode are key
- Each client/country of operation could request different ways of operating and also different temperatures
- Main equipment working in an EMU: Auxiliary converter, Transformer, HVAC (to reach internal temperature targets while parking (and compressor intermittently))
- Technical solutions consist
 - optimized use of fans (EC fans)
 - EM noise improvement – High switching frequencies (SiC), Silencers, optimized cores



Example of operating conditions for parking mode

Equipment	Equipment Operating conditions		
HVAC	Condenser fan	Evaporator fan	Compressor
Rest	OFF	OFF	OFF
Rest intermittent	Low Speed	Low Speed	ON
Preparation for service	High or Low speed	High or Low speed	ON
Transformer	Cooling Fan	Pumps	Power Module
Rest	Low speed	ON	OFF
Rest intermittent	Low speed	ON	OFF
Preparation for service	Low speed	ON	OFF
Auxiliary Converter	Fan speed	Electric Load	
Rest	Low Speed	Low	
Rest intermittent	Low or High	Medium	
Preparation for service	High speed	High	
Traction Converter	Cooling		
Rest	Low / OFF		
Rest intermittent	Low / OFF		
Preparation for service	Low / OFF		
Main Compressor	Load		
Rest	Off		
Rest intermittent	Nominal		
Preparation for service	ON/OFF		

For parking mode – Solutions relies in optimizing the operating conditions of equipment



ALSTOM
• mobility by nature •



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Aif EKBLAD

Trafikverket, Chair of UIC Noise and Vibration Sector

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development of citizen groups

Lineside Resident

co-creation

equal treatment

they are @ the centre

"Nimby" → different interests and expectations

"why can't they ride slower?"

"it's gettin' better" → but: growth!

→ more complaints on vibrations... worries for the future

the experience of a train passage

keep improving
too slow never satisfied

misconception
better communication
more information
take time to listen

MANAGEMENT OF EXPERIMENT

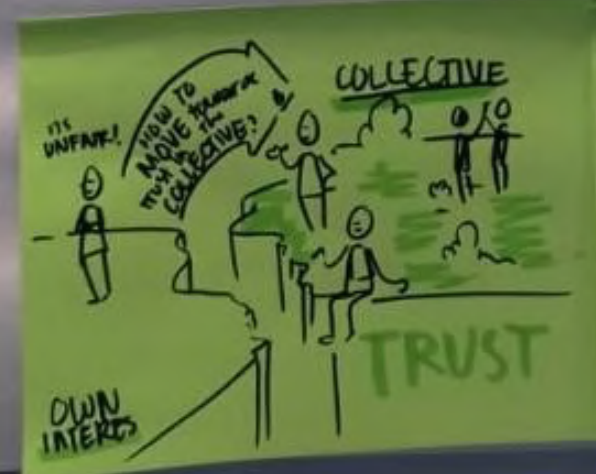
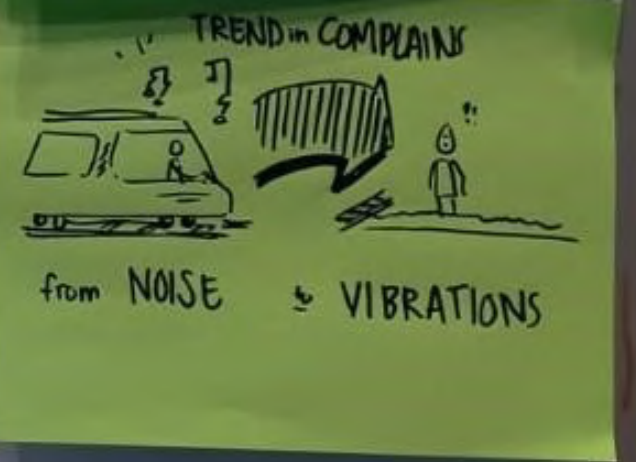
- COMMUNICATION
- ACTIONS / NO-ACTIONS

REGAIN OF TRUST

- listen
- care
- "equality" i.s.b.

KEEP IMPROVING

- new solutions





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Laurent DROIN

Centre d'Information sur le Bruit (CidB), Director

UIC Railway Noise Days - 28 February 2023

The noise information center (CidB): a tool to help manage (good) neighbourhood relations

CidB

Centre d'information
sur le **Bruit**

➔ **What is the CidB ?**

- CidB is a non-profit association created 45 years ago in France, recognised as a public utility for 16 years
- It is a reference resource centre for the general public and for all professional actors concerned by the quality of the sound environment.



Centre d'information
sur le **Bruit**

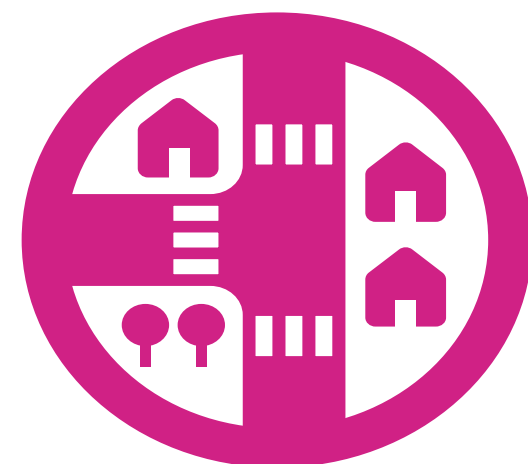
→ What is the role of CidB ?

Our job is to inform, educate, communicate on noise and its effects, transmit good practices and promote innovations.

In others words, we are trying to spread the know-how in this field, in a didactic way, to facilitate relations between stakeholders .



Transports
et mobilité



Urbanisme
et aménagement



Bâtiments
et constructions



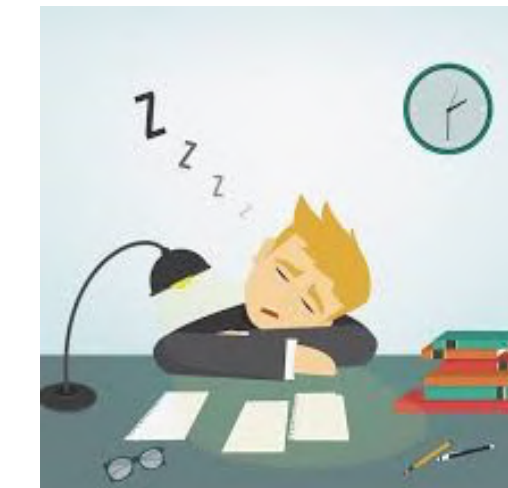
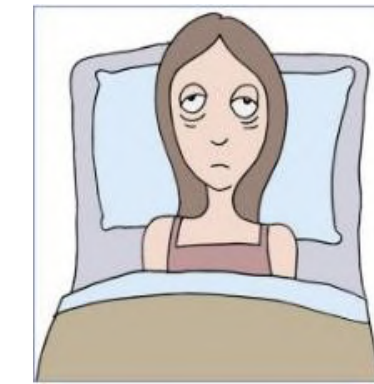
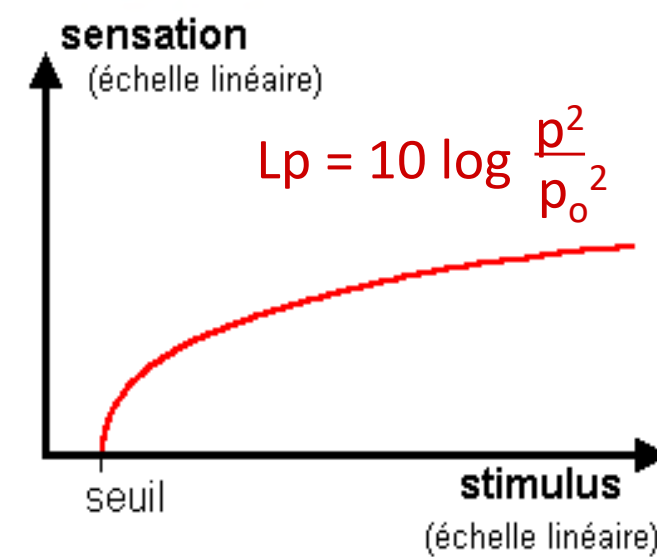
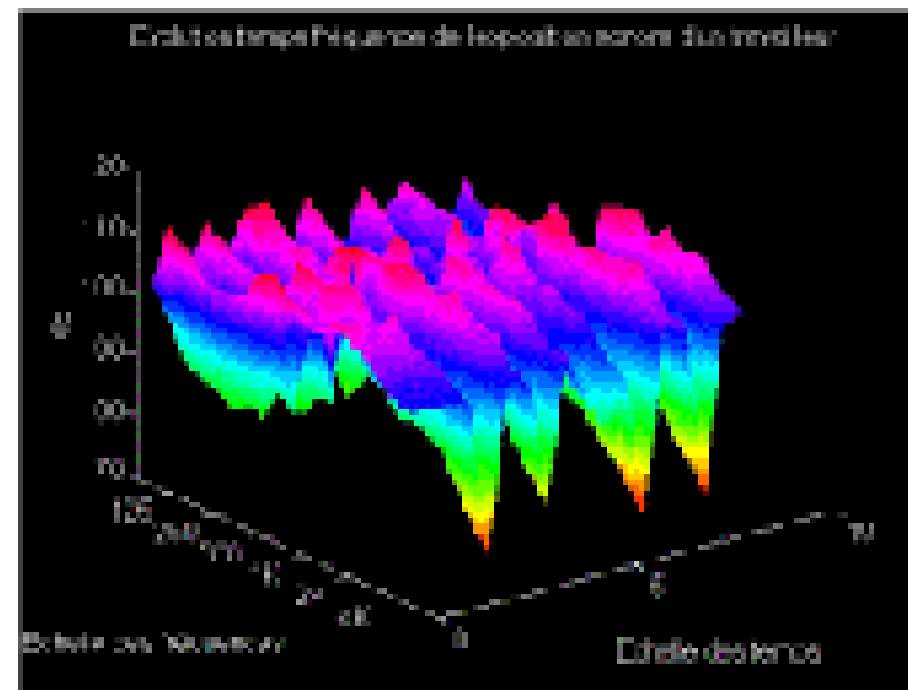
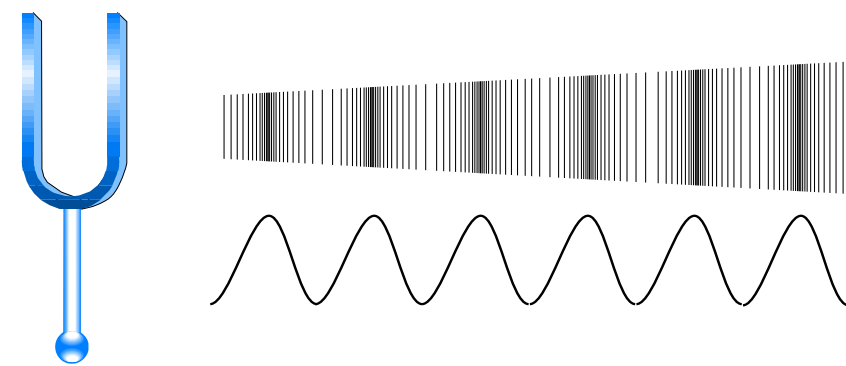
Equipements
et technologies



Santé
et société

We work on the 3 main dimensions of noise:

physical acoustics → physiology of hearing → psychosociology of perception



indicators

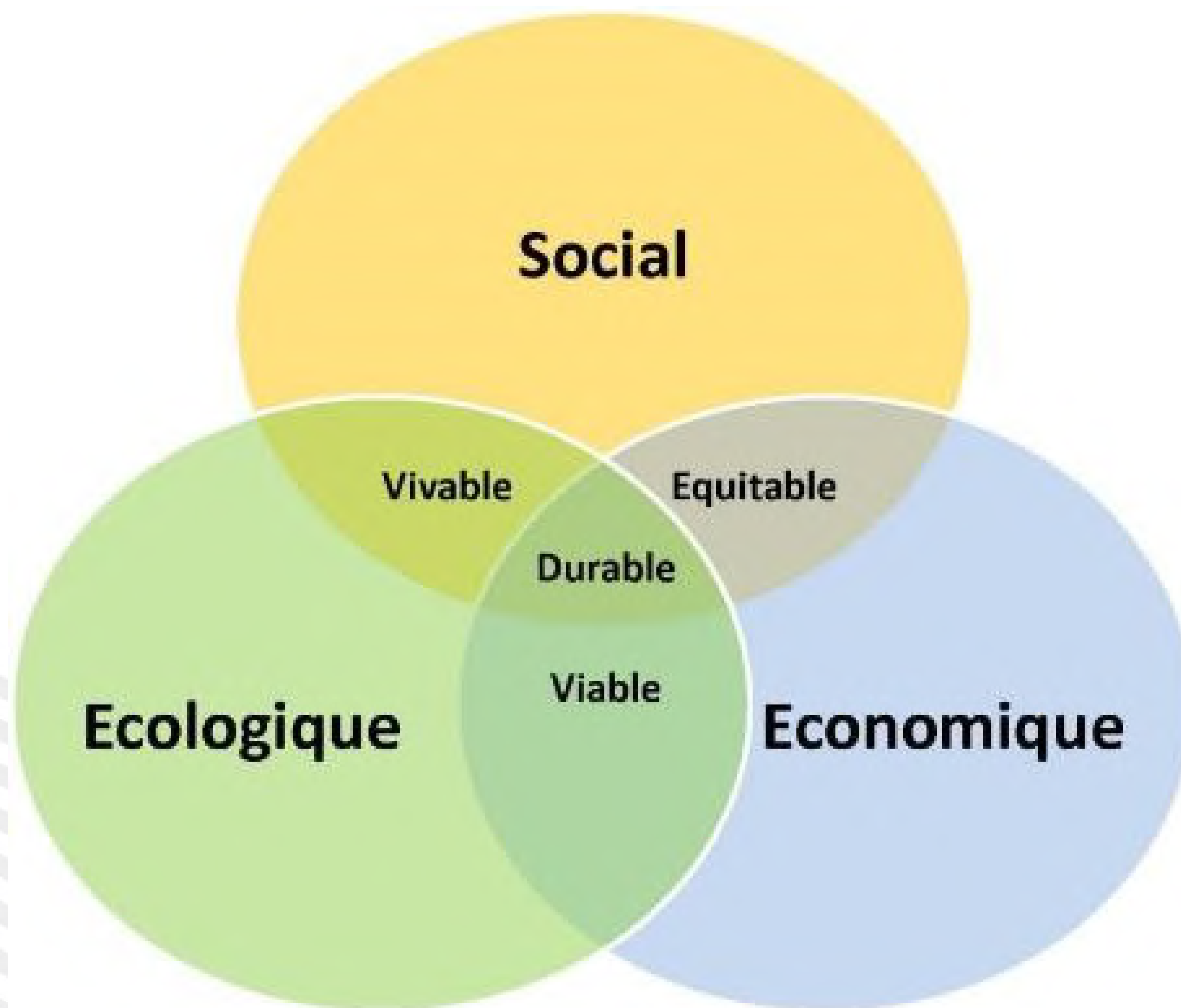
Pa - Hz - t



dB A)- Leq, etc.



And we work on the 3 main dimensions of sustainable development:



→ Here is an example of how we use the complaint data we collect via our hotline service:

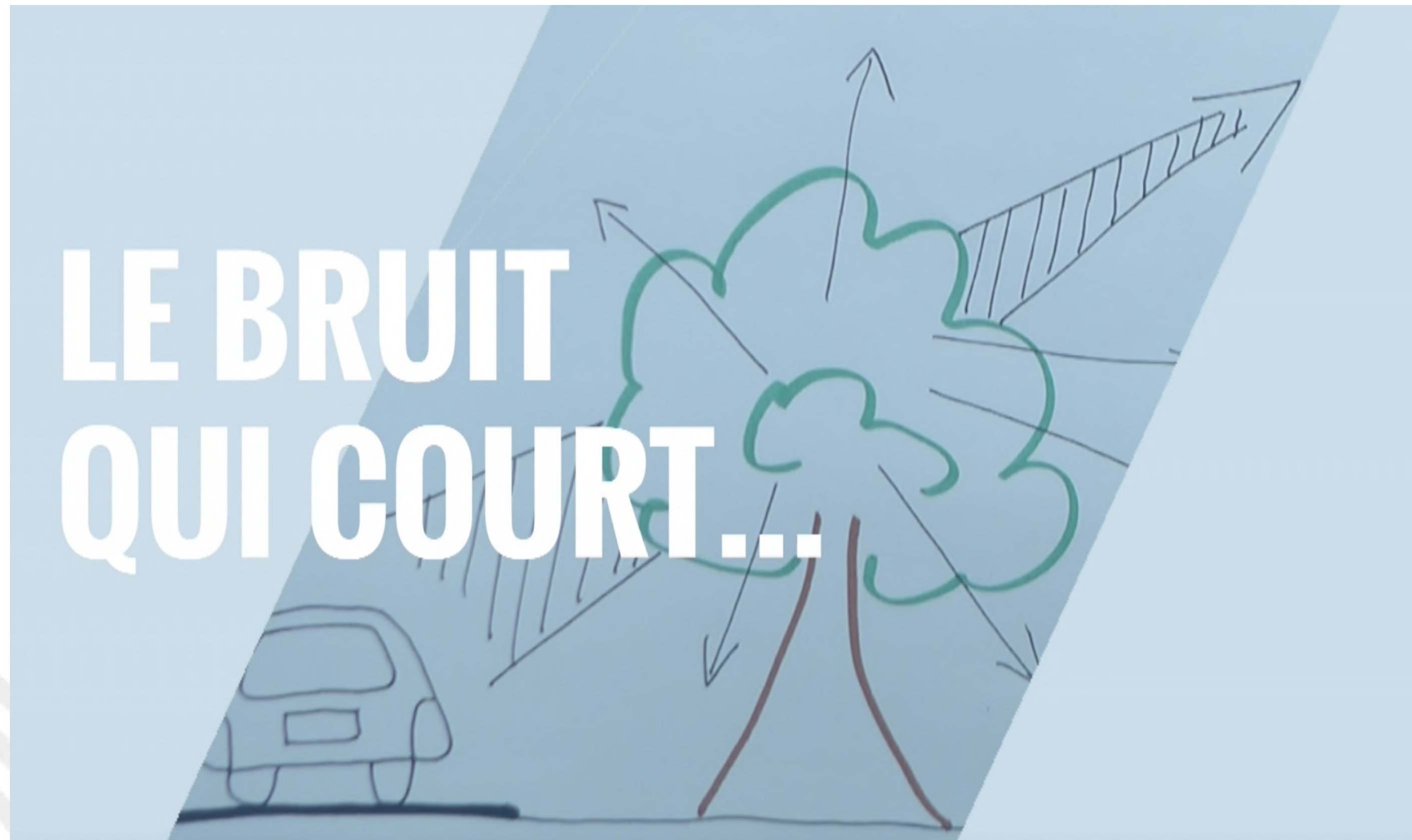
In 2022, we dealt with approximately 1700 complaints received (mainly on neighbourhood issues): an average of 7 per day

Of these, 25 complaints related to railway noise problems (train, metro, tramway)

These complaints are dealt with :

- by our team if the issues are regulatory or technically simple
- by experts from our network if they are complicated
- and sent to the operator if necessary!

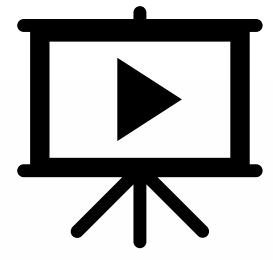
➔ Here is an example of the educational material we create for a non-expert public (e.g. town planners):





➔ More information on:

- www.cidb.org (our website)
- www.bruit.fr (the web media on noise in France)



Watch at UIC's
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Questions & Answers





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INTERNATIONAL UNION
OF RAILWAYS



Lorenzo Franzoni

UIC Noise and Vibration, Facilitator of the research group

UIC Railway Noise Days - 28 February 2023

Research Center

- Budget - ^{How much?} Who pays?
- How to get funds, what after a project?
- Small companies struggle
- Field tests are complicated
- + NDA for DATA
- Cooperation w/ other institution of Research

Research center

SAP Becoming Policy

- Need shorter innovation cycles
- Need continuity
- Involvement of suppliers + steps is complicated
- We have innovation, but safety, and complications
- Lack of Data on psychological noise perception vibration
- Doesn't come from company
- Enlarge Audience MARKETING
 - + congress, events
- Overseeing Results



DATA
Data Request and ... shall be enter

Quality Amount → Consolidate solution

Big companies → complete with many units

Research should be taken into account in the big picture

Social activities, interactions post-Covid

Heavy perspectives

Interact + communicate better

Global issues

small scale application solution

Constraints are local

Research Issue

Don't lose



NATIONAL UNION OF RAILWAYS

Hard to get a company to innovate w/o noise complaints or standards Applied only if I receive money

BIG PICTURE

ACCESS - A HUGE AMOUNT OF DATA

DIFFICULTIES RESEARCH CENTRES

SHORTER INNOVATION CYCLES



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Thomas MALY

Technical University of Vienna

UIC Railway Noise Days - 28 February 2023

Noise prediction as one way to improve the neighbourhood



UIC Railway Noise Days

Feb. 28th – Mar. 1st 2023, Paris, France

Thomas MALY

TU Wien, Institute of Transportation

Research Center for Railway Engineering, Traffic Economics and Ropeways
(from March 1st: Research Center for Track-Bound Transportation Systems)

<https://www.tuwien.at/cee/transport>

Introduction (prediction ... why?)

European prediction model

Some of our research activities

- rail roughness
- wheel defect noise
- curve squeal
- transparent noise barrier elements

Concluding remarks

Good neighbours know very well

- how loud they are
- how loud they will be, e.g.
 - in future with increased traffic or new lines
 - with new vehicles and/or changed emissions
- how disturbing, annoying or even harmful to health their noise may be

Only then appropriate measures can be taken (early enough)

Good neighbours know

- how loud they are
- how loud they will be

How can we obtain this knowledge?

Often heard answer: sound measurements!

- Example: what time will be sunset next Sunday?
 - will you really wait and measure it?
 - or will you prefer to ask Mr. Google (= simple prediction with trusted model)?
 - AND: now you are able to take measures against darkness if the sunset is surprisingly early 😊
- predictions often offer advantages, depending on the particular application

Predicting of noise enables

- consideration of **huge amount of peoples** & looking to **future situations**
- calculation of **annual averages** (→ mean values over several years!)
- estimation of the achievable **effect of mitigation measures**
- measurements are very important for model verification, but not very suitable to estimate annual mean values

Development of models as base of predictions implies

- to understand **essential mechanisms, relations and influences**
(best prerequisites to develop mitigation measures / strategies)
- to choose **meaningful result quantities** which well describe the effects under investigations

Preceding, comprehensive **research is fundamental** for modelling

- beside acoustics, also materials science, economics, civil engineering, etc.

Uniform prediction approach was introduced 2015 (CNOSSOS-EU)

- yields noise indicators L_{den} & L_{night} that can be assessed by dose-response relations
- European wide mandatory for strategic noise mapping (low accuracy)
- some countries will use the model for legally binding immission limitation
 - higher accuracy needed (e.g. even <1 dB may decide on the noise barrier heights)
 - balance between level of abstraction, applicability and accuracy

Provide default input parameters for source power determination

- national adaptations or extensions allowed, if verifiable

National research as basis of the national implementation and future adaptations

Rail roughness

Curve squeal

Transparent noise barrier elements

Wheel defect noise

Changes in energetic sum of rail & wheel roughness leads to similar changes in the sound power of rolling noise

Default roughness spectra

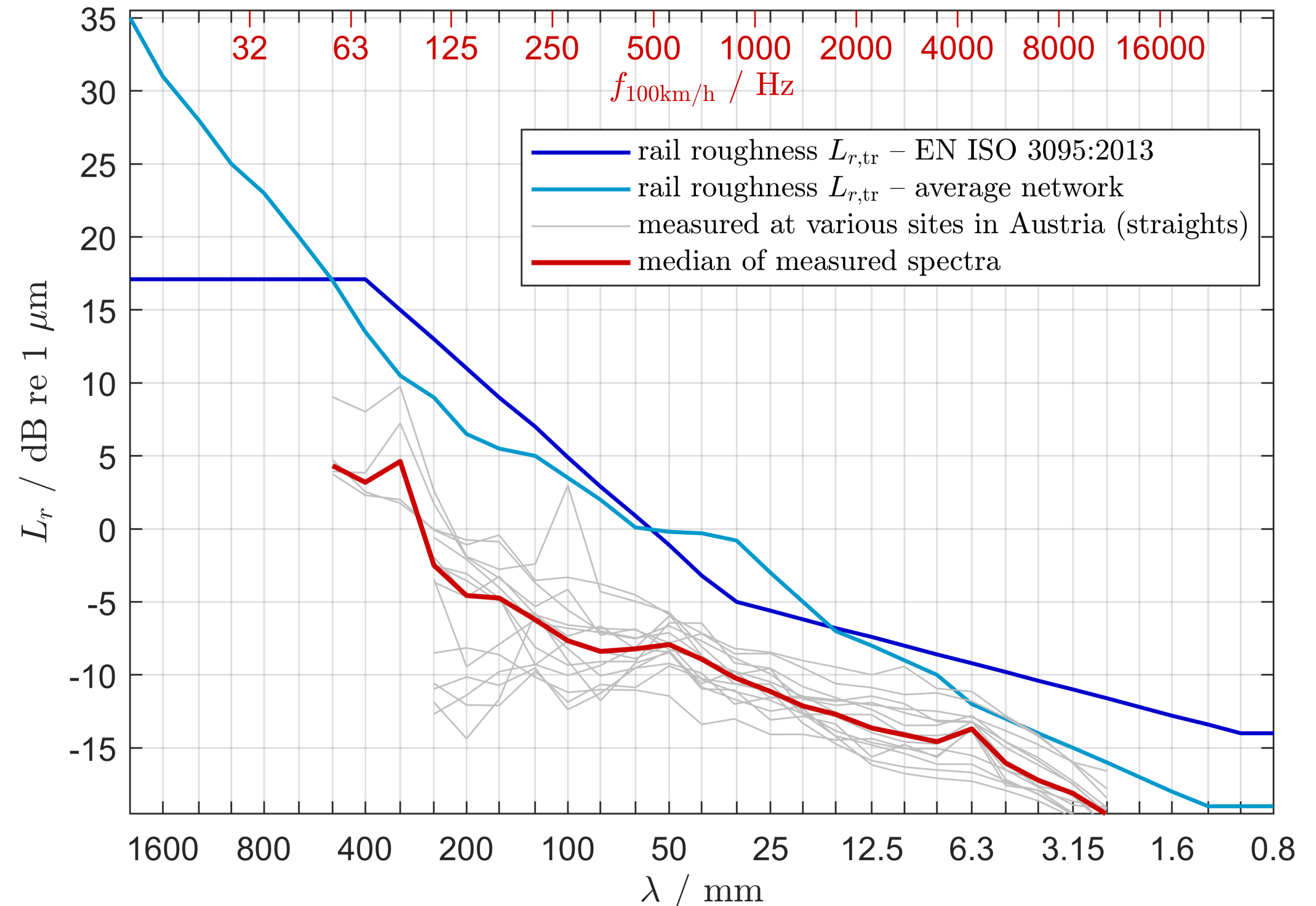
- 2 default rail roughness spectra
- 3 default wheel roughness spectra
 - silent brakes: near rail roughness

Several national research projects regarding model input parameters

- in collaboration with Christian Kirisits



- some rail roughness measurement at various sites in Austria (EN 15610)
 - **very smooth rails** although no special maintenance (e.g. acoustical grinding)
 - median clear **below all default rail (and wheel) roughnesses**

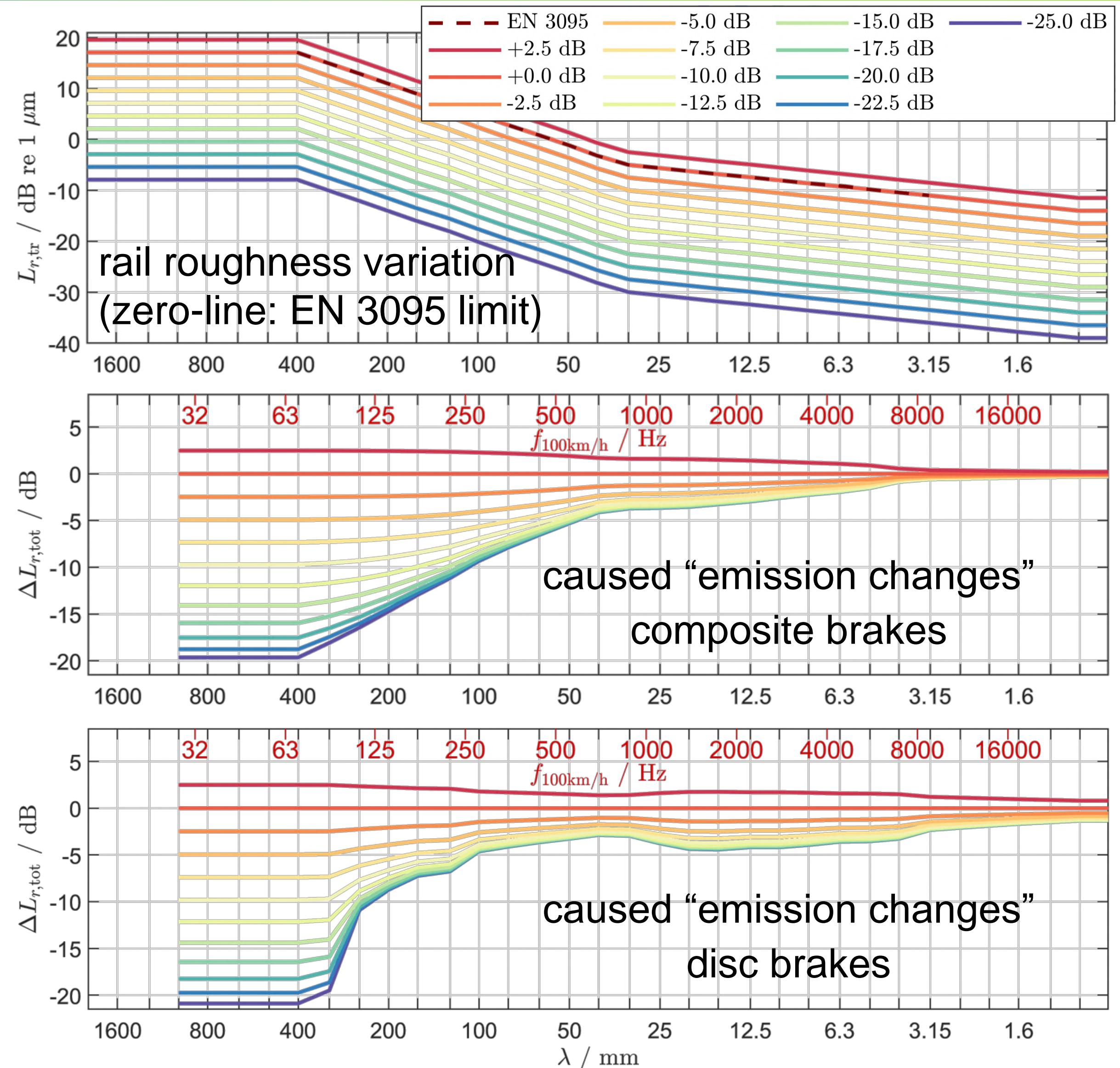


Variation analysis and calculations

- shown differences in rail roughness spectra cause changes in the **A-weighted level** for trains with **silent brakes** up to several decibels

Indicates demand of verifying default values of the model

- continuous rail roughness measurements of network preferable
- further thoughts: are other default input parameters applicable (e.g. wheel roughness)?



Rail roughness

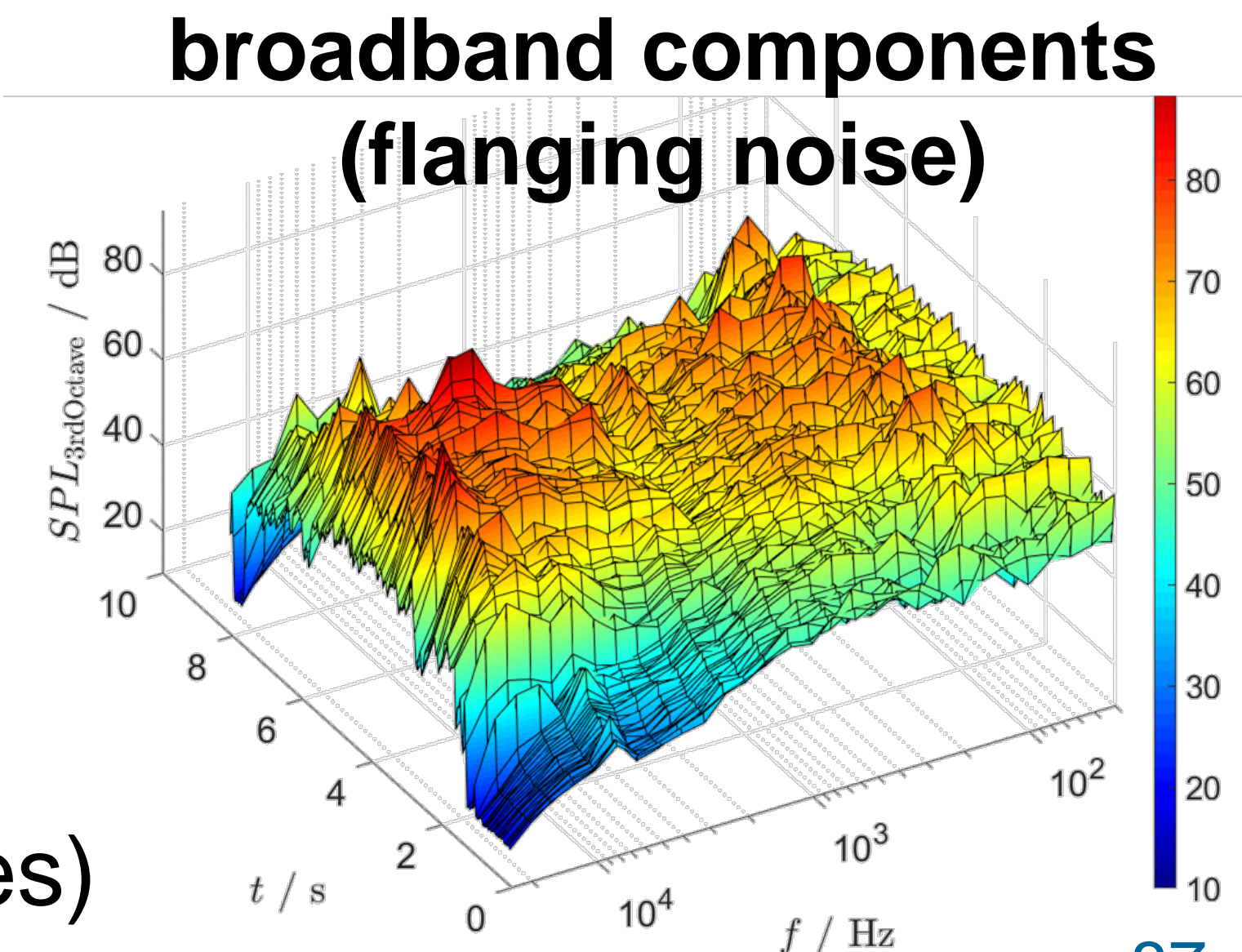
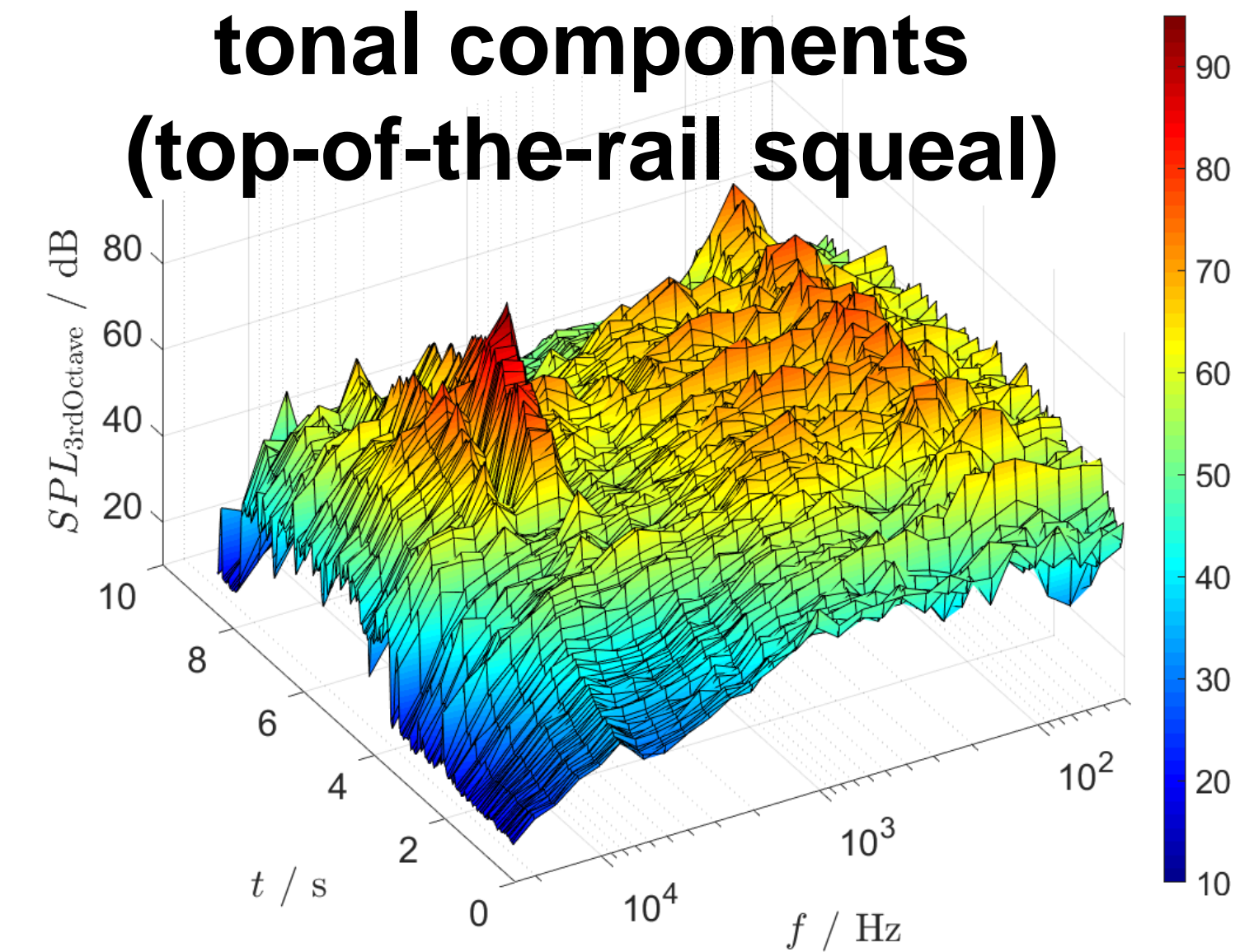
Curve squeal

Transparent noise barrier elements

Wheel defect noise

2 research projects with long-term measurements in narrow curves with different radii (2013 – 2019)

- partner: psiacoustic
- empirically developed squeal detection for automatic assessment of ~55.000 pass-bys
 - distinction between tonal and broadband components
- investigation of the influence of radius, train type, speed, weather, wheel and top-of-the-rail conditioning
- verification of default surcharges in prediction model: **+8 dB** ($r < 300$ m) / **+5 dB** ($300 \text{ m} \leq r < 500$ m)
- according to the research results: lowered surcharges in national implementation of the model for loud vehicles (e.g. **+5 dB** / **+0 dB** for **cast iron** braked vehicles)



Rail roughness

Curve squeal

Transparent noise barrier elements

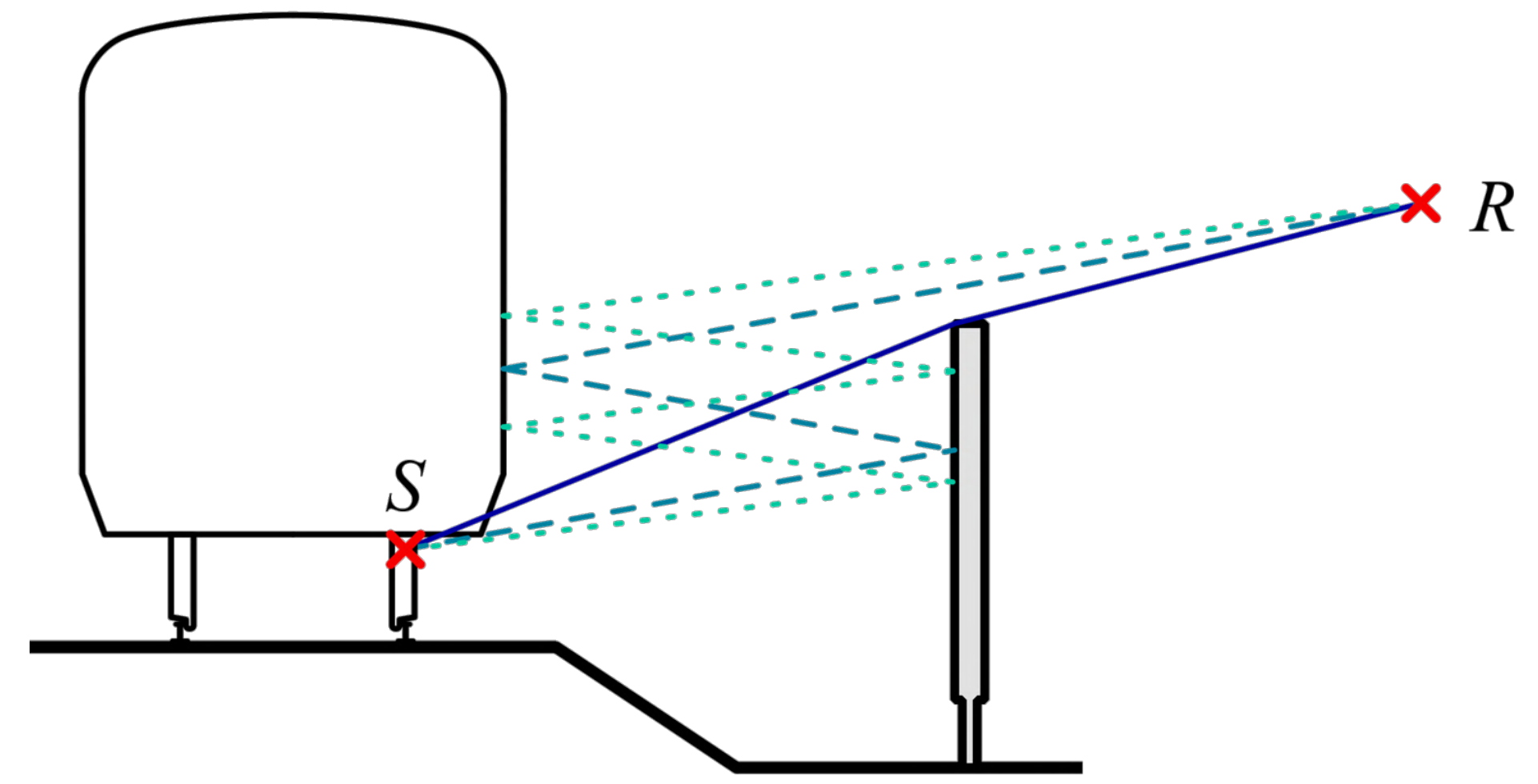
Wheel defect noise

Multiple reflections between trains and reflecting noise barrier **lower shielding effect**

- usually noise barriers with absorbing surface

Transparent barrier elements cause similar effects up to **several decibels**

- European prediction model provides calculation scheme only for completely reflecting barriers



Research project (2019 – 2022)

- Acoustic Research Institute, Austrian Academy of Science
- reference calculations with 2.5D-boundary element method (ARI)
- validated by measurements with different noise barrier configurations



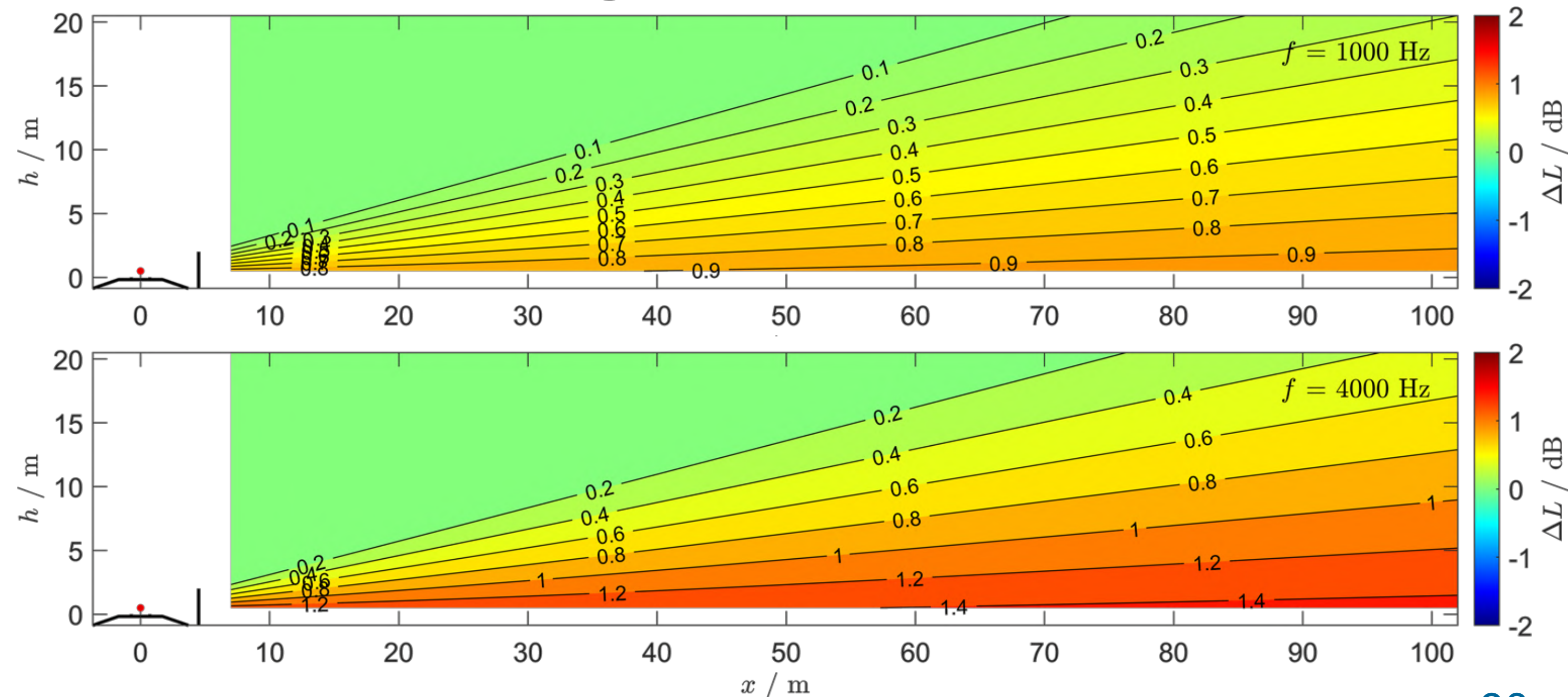
Development of a **calculation scheme for partly reflecting noise barriers**

- by comparative calculations with propagation of European prediction model
- based on current calculation scheme (extended by fresnel zones)
- prepared **for integration into national implementation of the European prediction model**

Shortcomings of current prediction model, e.g.

- no definition of vertical angle Ψ of emission in case of noise barriers
- no definition of the number of multiple reflections to be taken into account
- unfavourable position of source & vehicle wall for multiple reflections

→ **potential for improvements**



Rail roughness

Curve squeal

Transparent noise barrier elements

Wheel defect noise

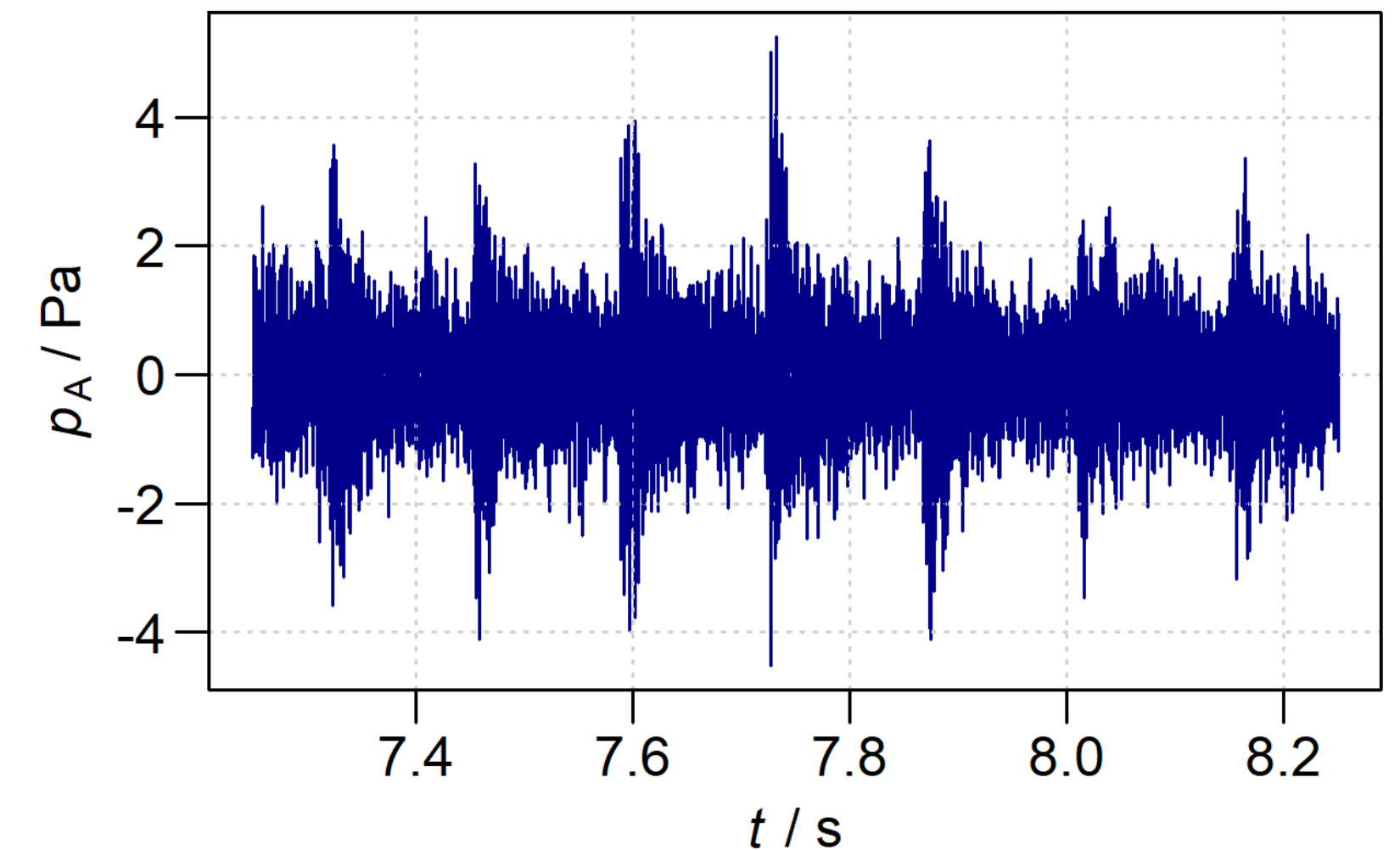
Research project to compare wheel defects with their noise (2015)

- wheel load & defects measurements (argos[®], HBK) and acoustic monitoring (acramos[®], psia acoustics) **at same site / cross section**
- 2 months with ~3.800 train pass-bys (~138.000 axles)

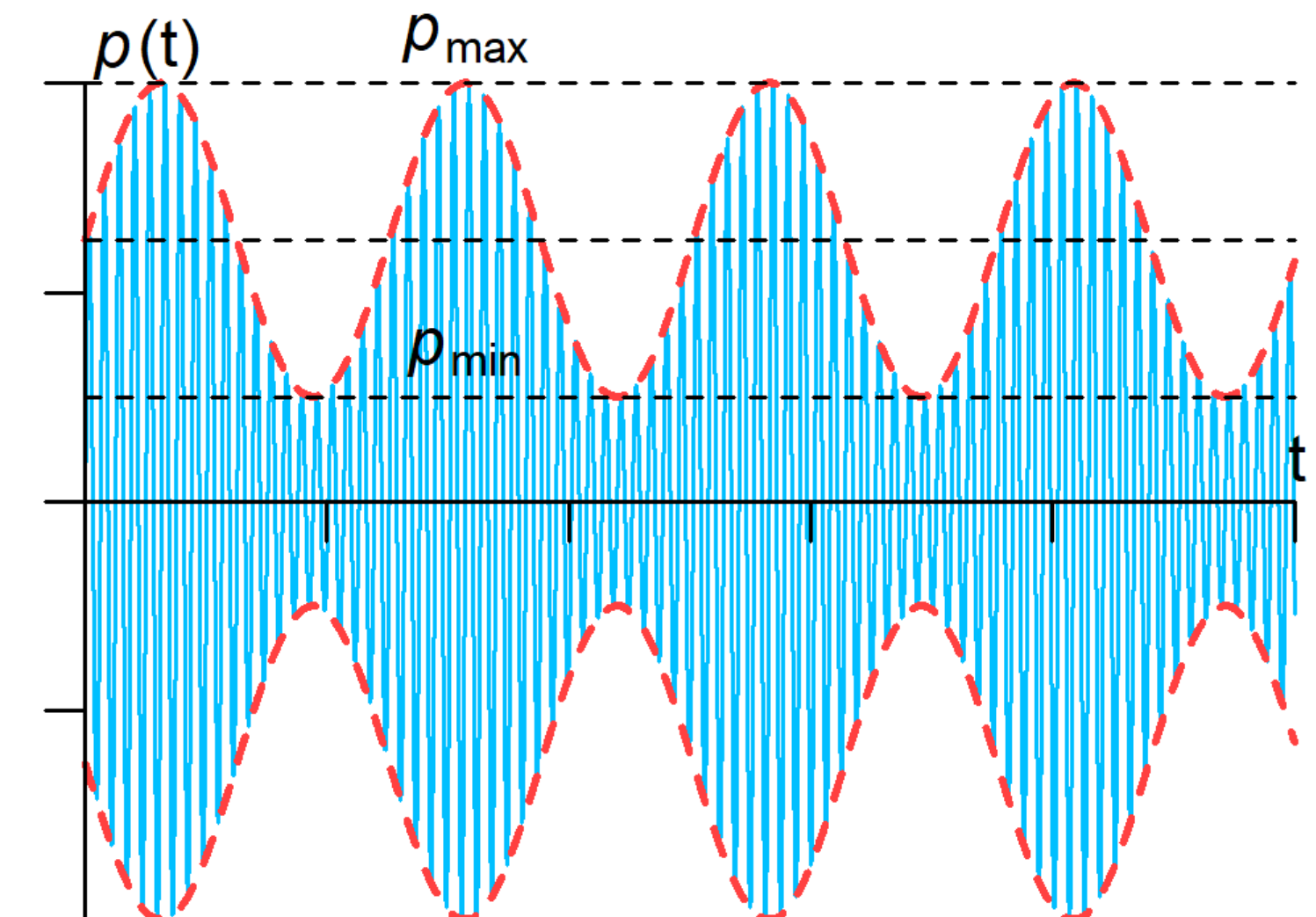
Degree of modulation found as good descriptor for periodic impact noise

$$m = \frac{p_{\max} - p_{\min}}{p_{\max} + p_{\min}}$$

- build from A-weighted sound pressure (2 kHz octave)
- modulation at fundamental frequency (singular defects)



↓ approximated by amplitude modulation



Major findings

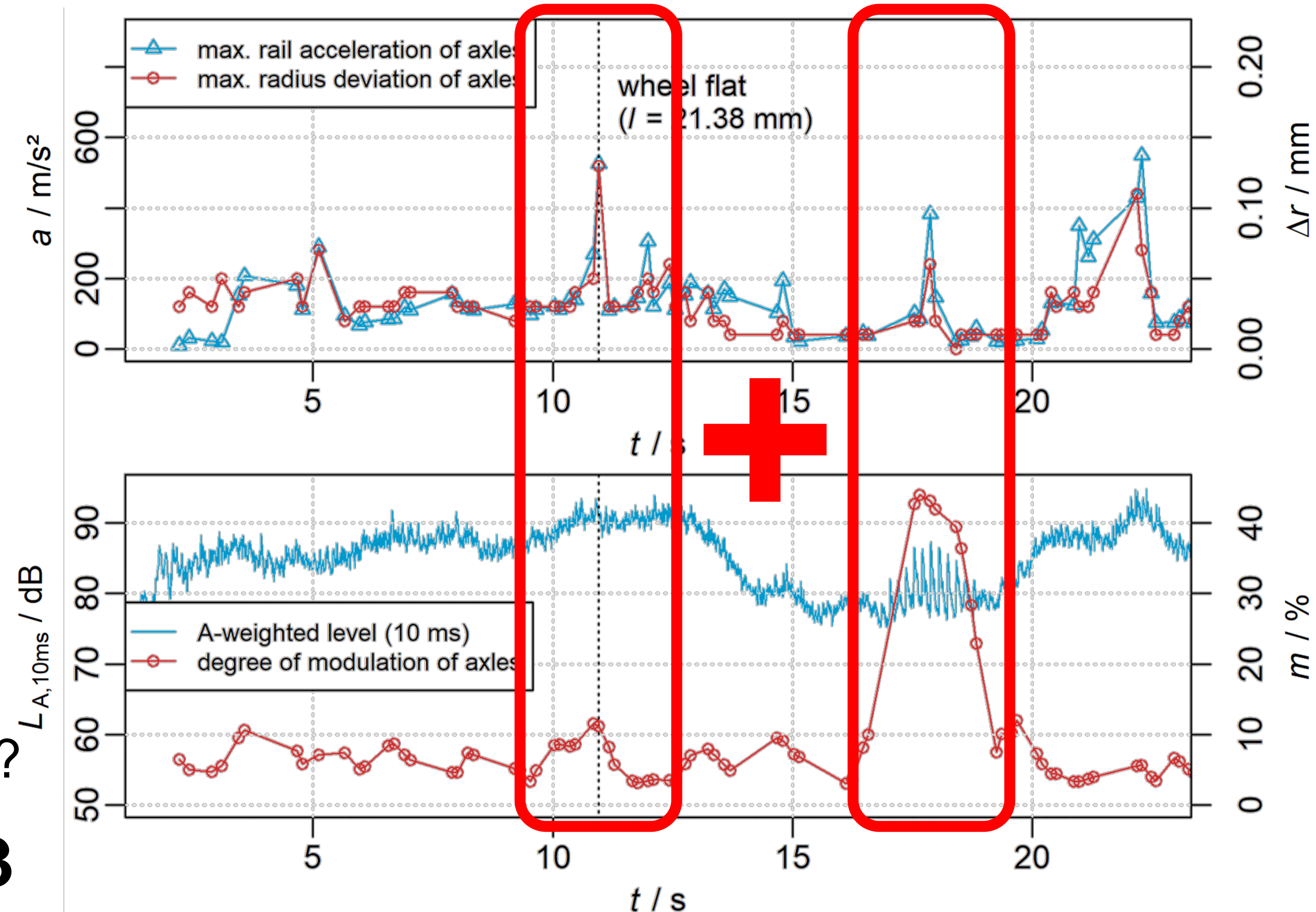
- best correlation with measured rail accelerations
- rolling noise of **loud vehicles** can **mask wheel defect noise**
- more **silent vehicles** probably lead to more frequent **occurrence of perceptible** wheel defect noise

Due to averaging L_{den} and L_{night} **almost insensitive**

- model extension for this type of noise?

Follow-up project started 2023

pass-by of a cargo train with cast iron braked and composite braked vehicles



Reliable prediction essential for reasonable and timely noise protection

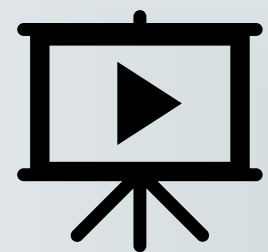
- European approach is useful, but should be seen as the **beginning of an ongoing process**
- current prediction model leads to (partly unnecessary) **national research efforts!**
 - provides too less different or inappropriate default input parameters
 - contains some shortcomings in the calculation scheme
 - does not include many **noise protection measures** (even if state-of-the-art) (TDR-influencing measures, wheel absorber, vehicle side noise protection shields, etc.)
 - no standardized procedures defined to determine input parameters

Improvements will be required (especially for legally binding predictions)

- many aspects concerns not only Austria → European initiatives preferable
- **science** can help to build the basics for improvements

Thank you for your attention!

Any questions?



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YouTube Channel](#)



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QUESTIONS & ANSWERS



14:30 - 15:00

Coffee Break





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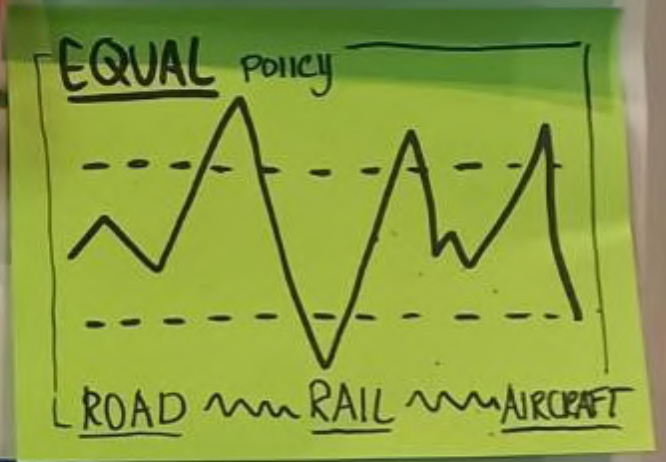
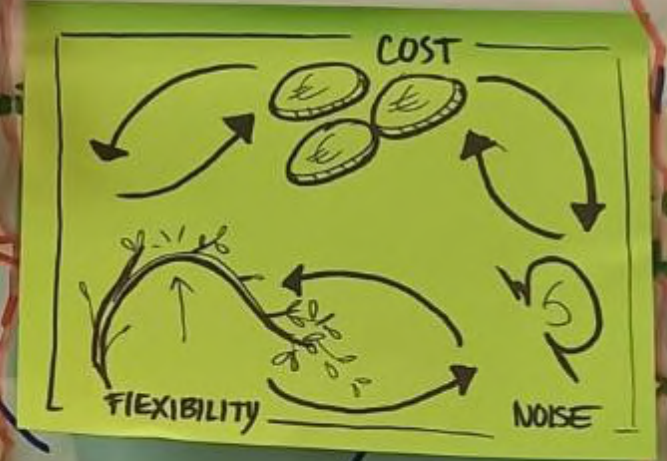
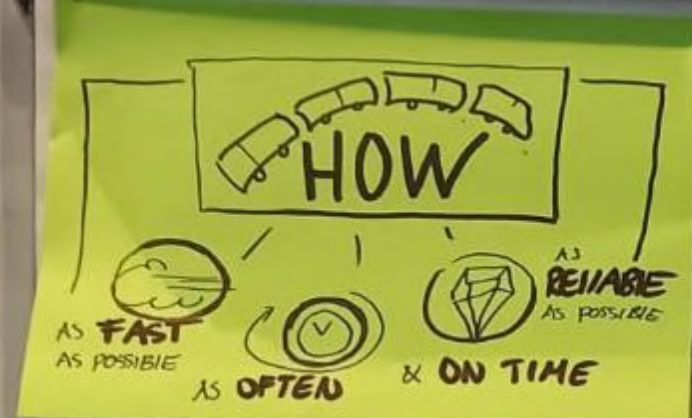
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OF RAILWAYS



Jamie WILKES

Network Rail, Principal Engineer, Facilitator of the operators group

UIC Railway Noise Days - 28 February 2023



POLICY - EQUAL POLICY FOR ROAD + RAIL + AIRCRAFT
 - EQUAL POLICY FOR QUIETER TRAINS - INTERNATIONAL
 ↳ IMPROVED CLASSIFICATION OF VEHICLES... CLASS 1, 2, 3

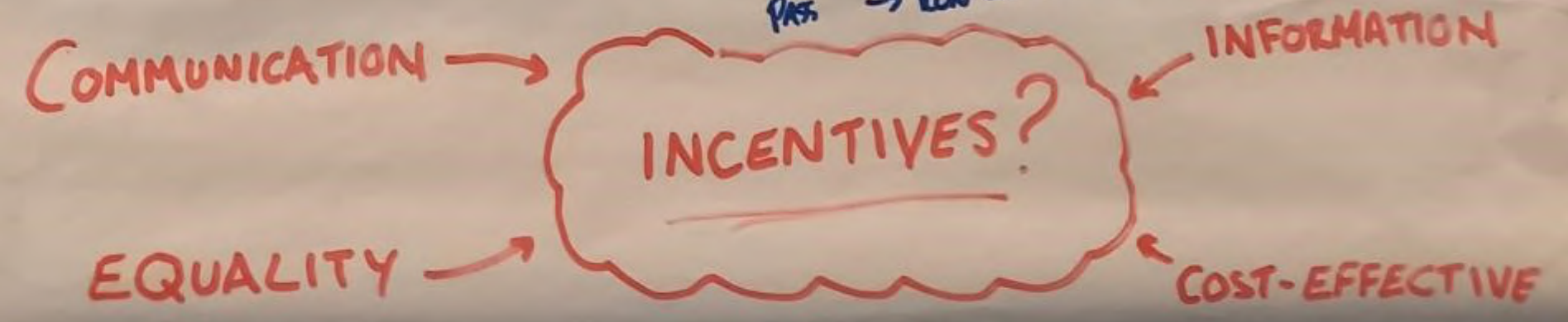
INFRA - BETTER DETECTORS
 - SHARING INFORMATION + RESPONSIBILITY SHARING
 - ALTERNATIVE NOISE REDUCTIONS - KEEP THE RAILWAY BEAUTIFUL!
 - ALTERNATIVE FREIGHT ROUTES? ↳ INNOVATIVE - LOW NOISE BARRIERS

SUPPLIERS - QUIETER TRAINS - NO EXTRA COST
 - HIGH AVAILABILITY
 - ENERGY SAVING
 - DIFFERENT REQUIREMENTS - FLIGHT / SHARPE PASSENGER
 - OPTIMISED COMPONENTS
 - OPTIMISED WHEEL-RAIL COND.

NEIGHBOUR - PASSENGER COMFORT
 - PLEASE BE PATIENT WITH US! - NOISE / SOLUTIONS
 - GOOD COMMUNICATION PROCESS
 - VEHICLE HOURS?

RESEARCH - WHAT IS NEEDED?
 - TESTING / OPENING PROCEDURES
 - EFFICIENCY IMPROVEMENTS
 - COMPARABILITY / VALIDITY OF DATA.
 - NORDIC WINTER CONDITIONS + SUMMER HEAT

OPERATOR - COMPOSITE BRAKE BLOCKS - TIME TO IMPLEMENT
 - COST IMPACT
 - ~~LOW~~ ^{MORE} FREIGHT TRAINS AT NIGHT? How?
 + ↳ COMPETE WITH AIRCRAFT - How?
 PAS → RUN AT HIGH SPEED



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Martijn WOLF

Nederlandse Spoorwegen (NS)

UIC Railway Noise Days - 28 February 2023

Being a responsible neighbour – view of NS

UIC Railway Noise days

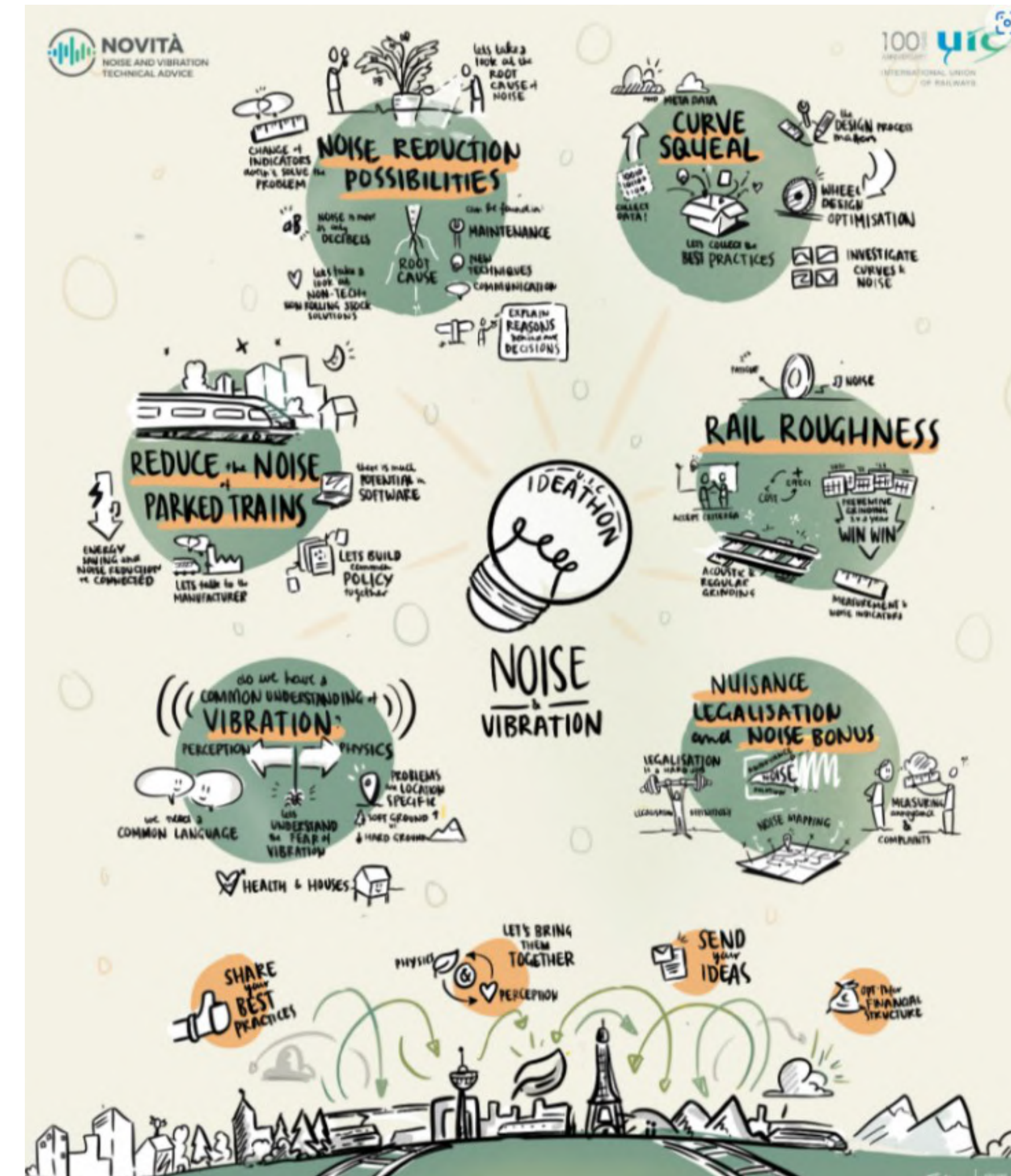
Martijn Wolf

28 February 2023, Paris



Contents

- Background noise policy being a good neighbour
- Parking noise – practical reduction examples
- Present and future actions
- Questions and Discussion



Background noise policy being a good neighbour

- NS goal is to operate trains and to be a good neighbour
- Pass-by, starting and parking noise are important.
- → additional procurement specification on noise

Pass-by noise:

Stricter limits for commuter trains than TSI limits: 76 dB(A) instead of 80 dB(A)

Starting noise:

Stricter limits for commuter trains than TSI limits: 75 dB(A) instead of 80 dB(A)

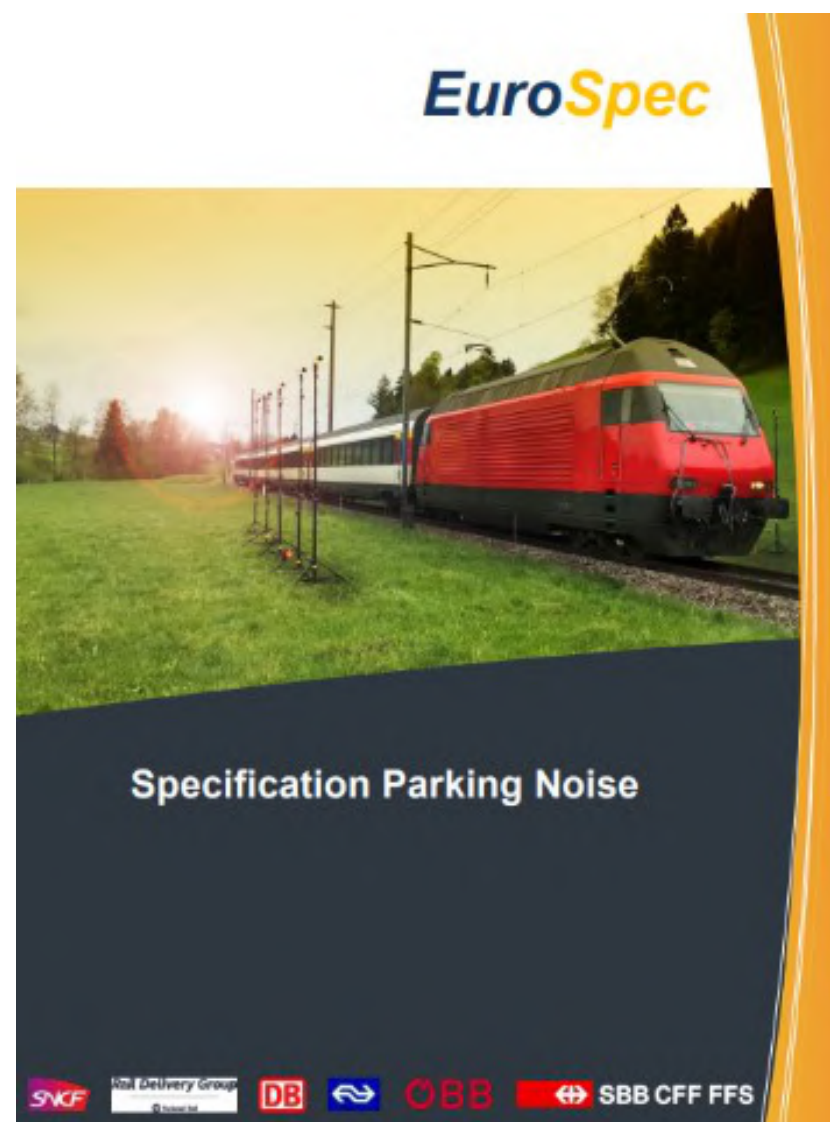


Background noise policy being a good neighbour

Parking noise

- Stricter limits than TSI stationary noise limits: 62 dB(A) instead of 65 dB(A)
- Limits set for single noise source instead of average for all noise sources
- Creation of EuroSpec Parking noise requirements together with DB, SBB, SNCF

(<https://eurospect.eu/parking-noise/>)



Parking noise

- Too much parking noise:
 - Causes nuisance for neighbours
 - Reduces parking space at railway yards due to environmental laws.



Parking noise – practical examples

HVAC Noise commuter train

- Original HVAC had a condenser fan which can only run at one speed.
- This caused many complaints from citizens when a train was parked near their houses.
- By adding a lower fan, the noise for a parked train was reduced with almost 9 dB(A). (Year 2021)

Compressor Noise commuter train

- The blow off valve of the compressor on the roof (which needs to blow off every hour for ~3 minutes) caused many complaints.
- By adding a damper, the noise was reduced with almost 6 dB(A). (Year 2021)



Parking noise – practical examples

Emergency brake venting Intercity train

- Before modification, venting was outside the train. $L_{pAF,max}$ 7.5 m was ~ 100 dB(A)
- After modification, venting was done inside the floor of the driver's cab
 - Inside noise $L_{pAF,max}$: 83 dB(A)
 - Outside noise @7.5m: $L_{pAF,max}$: 64 dB(A)



Present and future actions

- Update EuroSpec Parking noise requirements with experiences and updated EN ISO 3095:2013
- Parking noise working group in UIC NNV:
 - UIC report on management of parked and stationary train (see presentation Vibratec)
 - Ideathon on parking noise: workshops with (sub) suppliers, operators and IM on (innovative) noise reduction possibilities of single sources (planned for 2023)
- Europe's Rail – Rail4Earth: Squeal noise and Tonal noise
- Next? TSI update: include parking noise with limit values



European Commission | **CORDIS** | EU research results

English

HOME RESULTS PACKS RESEARCH EU MAGAZINES PODCASTS & NEWS PROJECTS & RESULTS ABOUT US SEARCH LOG IN

Europe's Rail Flagship Project 4 - Sustainable and green rail systems

Fact Sheet

Objective

This proposal is fully addressing the HORIZON-ER-JU-2022-FA4-01 call for project. Its scope of work is covering the Sustainable and green rail systems including rolling stocks, infrastructures, stations and all of their related sub-systems.

The objectives are to significantly progress on several families of Key Performance Indicators on different fields : technical, environmental, economical, standardisation.

The decarbonisation of Diesel trains, **noise and vibration reduction**, energy savings, circular economy, resource consumption, resilience to climate change and pandemic attack, attractiveness of passenger trains are at the heart of the proposed project.

The consortium carrying out the project is made of recognized world-class know-how partners : operators, train and sub-systems manufacturers, research and technology laboratories.

It will perfectly identify the precise needs of operators including implicitly the European public policies of sustainable transports, including Climate Neutral Europe for 2050. It will provide the needed scientific and technical solutions via the development and demonstrations (up to TRL7) of new solutions increasing drastically the environmental performances of the railway holistic system. These new solutions will be proposed while verifying that they have viable economic models ensuring a rapid commercialization for the benefit of European citizens.

Project Information

FP4 - Rail4EARTH
Grant agreement ID: 101101917

DOI
10.3030/101101917

Start date
1 December 2022

End date
30 November 2029

Funded under
Climate, Energy and Mobility

Total cost
No data

EU contribution
€ 30 309 394,04



Questions and discussion





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Michael DITTRICH

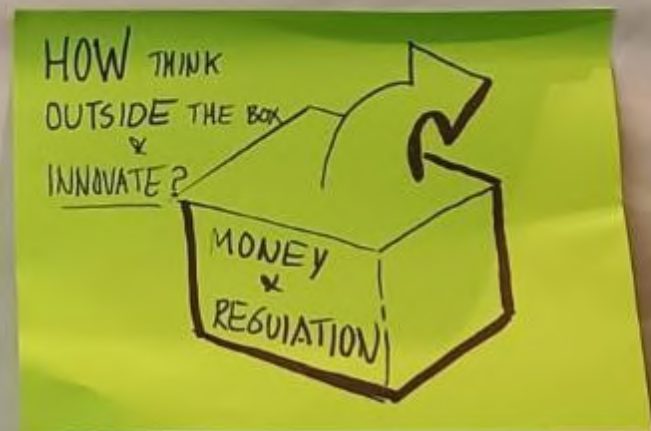
TNO, Facilitator of the infrastructure group

UIC Railway Noise Days - 28 February 2023



Infrastructure managers capacity
bottlenecks
cheaper solutions

Obstacles: Money, regulation, traffic growth
Lack of test tracks for new innovations



risks
understand physics
Supplier ideas - interfaces - fit in
Innovations that are needed and used
Streamline standards/organisation
Stakeholder management - Internal/external
Met materials for ^{Decisiveness} components/barriers
Holistic approach - all aspects/impacts
Energy synergy next to lines
Rail grinding - scheduling - coordination
optimised for noise.

How to get 10dB more noise reduction? ^{fit low cost}

Complete system ^{low noise pad + diffractors + meta materials + grinding for noise} Track/Vehicle

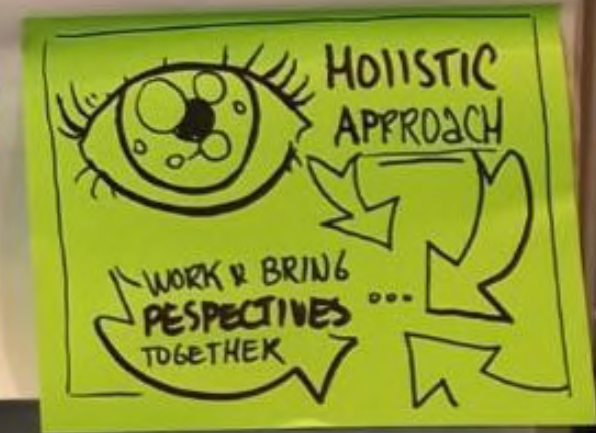
Substantial changes in design?

Doubt about effects ^{vehicles + tracks}
[monitoring/measurement]
Learn from findings

Responsible Roles for Noise
Infra/Rolling Stock

Pay per passby - As for Aircraft
Real Noise

NDTAC based on ^{meas} ^{weight}
↳ BE





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Urs SCHOENHOLZER

SBB, Head of Track system

UIC Railway Noise Days - 28 February 2023

Infrastructure Manager

Urs Schönholzer, SBB Infrastructure
UIC Noise Days, Paris 2023

Noise Sources

Traffic Noise

- Rolling noise, combined roughness of wheel and rail
- Aerodynamic noise
- Traction motors, cooling fans, air compressors
- Curve squeal
- Noise TSI defines measurement, but only for new rolling stock on smooth track
- Quieter routes will limit cast-iron brakes



Temporary Anomalies, Track Maintenance

- Insulating joints, jointed track
- Bad welds
- Corrugated rails
- Noise after track works, e.g, grinding
- Maintenance of switches and crossings
- Electrical sparks, contact line in cold weather



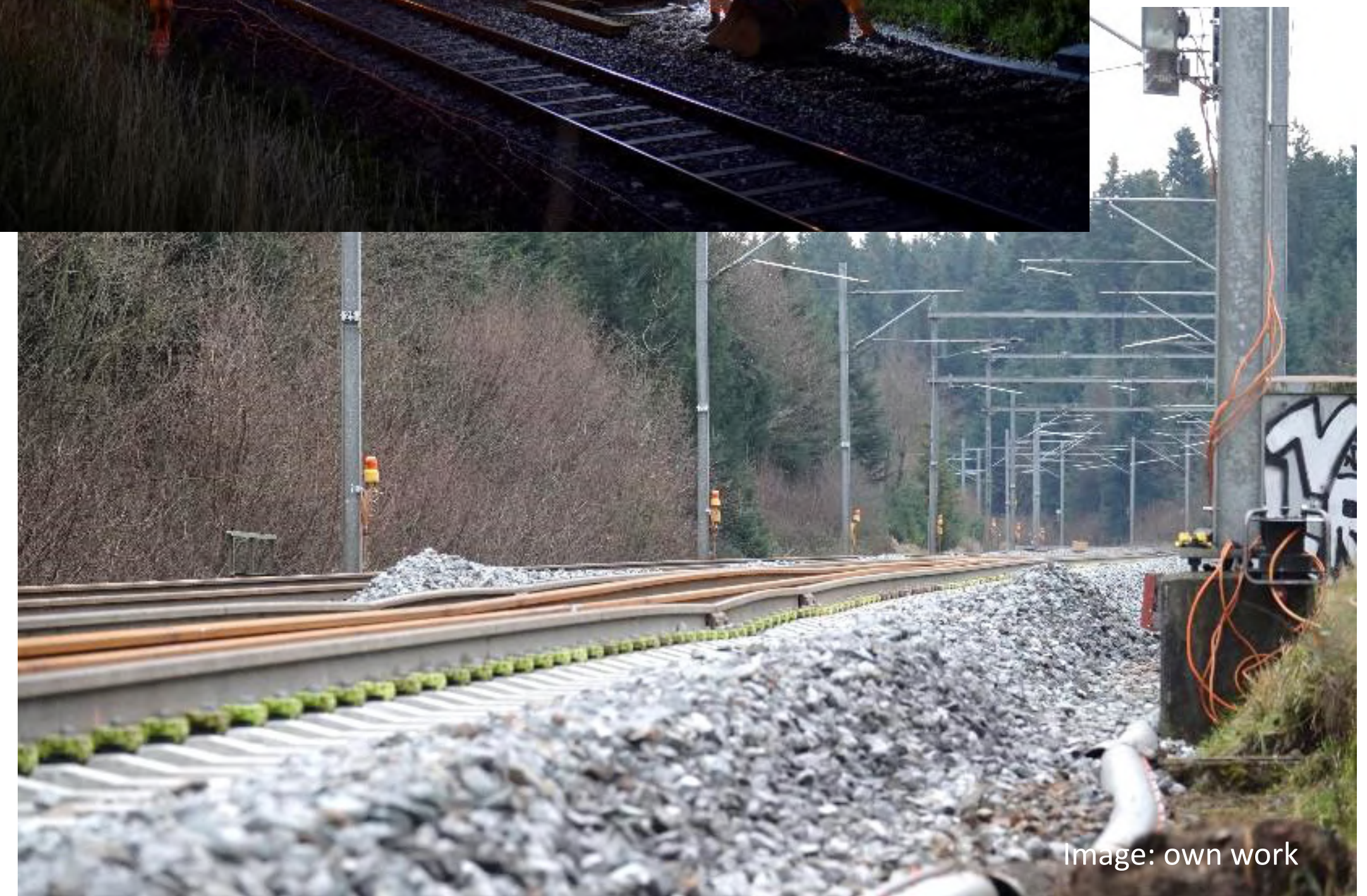
Noise Emission of Parked Trains

- Sources are motors, compressors, and other auxiliary units.
- Different regulation from rolling noise, different distinction between day and night
- Shutdown often not feasible for operational or safety reasons
- Interlocked with rail yard infrastructure, e.g. amenities for railway personnel



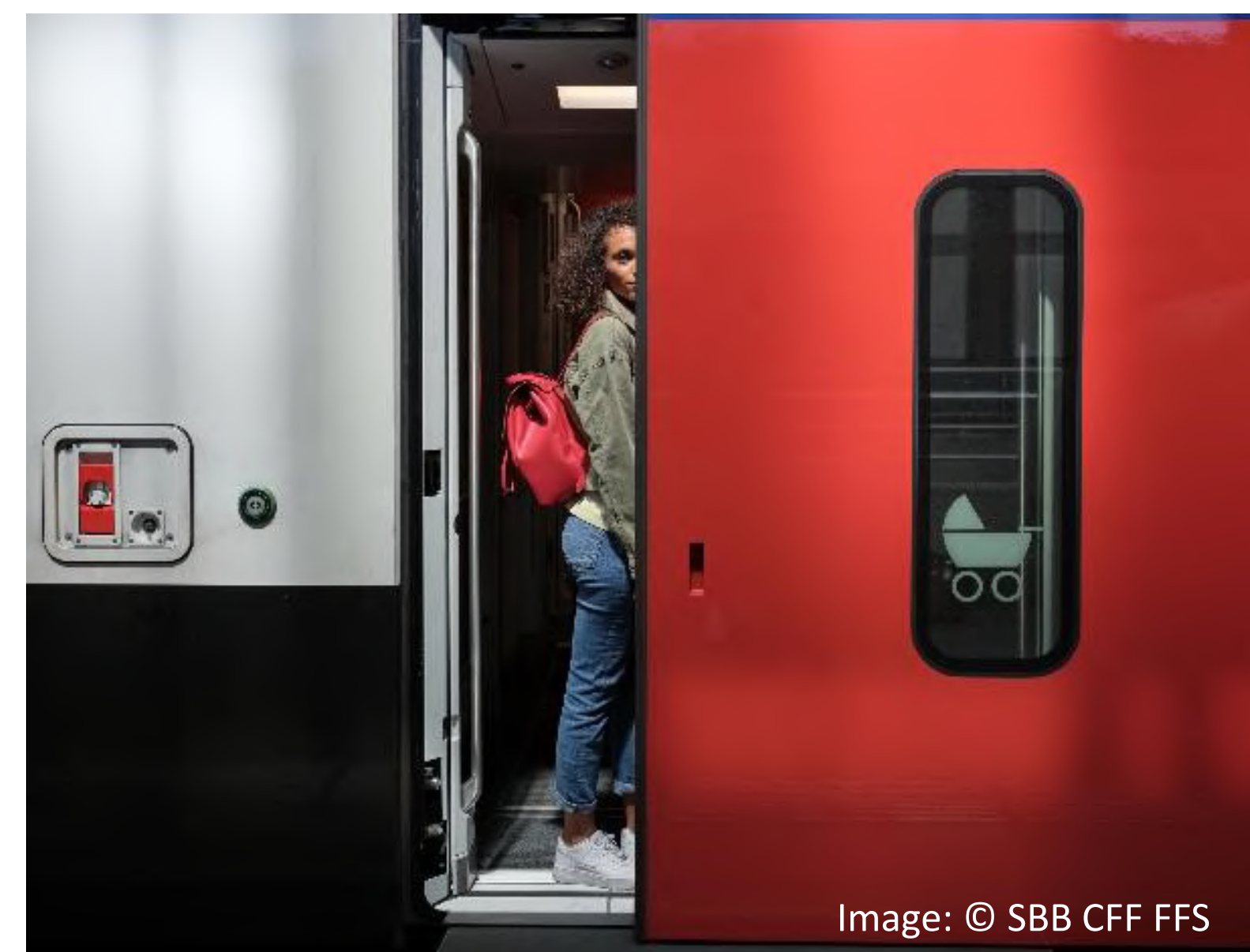
Construction Noise

- Construction often during the night
- Construction emissions during work, and during maintenance work on equipment in a siding
- Safety alerts for personnel when adjacent track is in operation
- Traffic on unfinished track in operation during the day (joints)



Other Sources

- Acoustic door signals for trains stopped at stations, mainly affect lineside residents close to small stations
- Loudspeaker announcements at stations with low background noise levels, at night



Mitigation

Established Mitigation Methods

- Noise barriers
- Effective, but
 - Vandalism, graffiti
 - High, intransparent wall
 - Different opinions of residents
 - Not suitable for higher residential buildings
 - Limited track access for maintenance crews and emergency services
 - Wildlife migration paths blocked



Other Methods, suitable for local application

- Friction modifiers, against curve squeal
 - Some effect, but noise is not entirely eliminated
- Rail dampers, increasing mass, de-tuning of the rail
 - Maintenance concern for vision-based automated detection systems
 - Effect varies with superstructure material



Ongoing Research

Reducing noise at the source:

- Novel rail pads
- Rail surface roughness optimization
- Understanding curve squeal
- Mitigation methods for vehicles: brake systems, wheel dampers
- Battery-powered construction equipment



Image: © fahrbahnlabor.ch

Reduce sound radiation:

- Sound barrier elements with diffractive effect (Helmholtz resonance)

Conflicts of Interest

- More traffic – more noise
- Higher speed – more noise
- More mitigation – higher cost, e.g. electrification of lines
- More components in track – higher complexity
 - Every new element needs to be procured, installed, maintained, renewed
- Environmental concerns of wheel/rail friction modifiers
- Deregulated markets need external incentives for noise mitigation. Infrastructure managers can not put noise requirements on rolling stock operators without legal basis





We are working on it...



Thank you!

Contact: urs.schoenholzer@sbb.ch

UIC Railway Noise Days

16:00 - 16:40	UIC Noise and Vibration Project <ul style="list-style-type: none">• Louise MORRIS, ATKINS UIC report on nuisance and health impacts of railway noise• Martin RISSMANN, VibraTec UIC report on management of parked and stationary trains
16:40 - 17:00	Closing Session by Jakob Oertli
17:00 - 19:00	Evening Reception @ UIC Mezzanine



UIC Noise Vibration Projects




SNC • LAVALIN


ATKINS
Member of the SNC-Lavalin Group

 **VibraTec**



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Louise MORRIS

ATKINS, Principal Acoustician

UIC Railway Noise Days - 28 February 2023

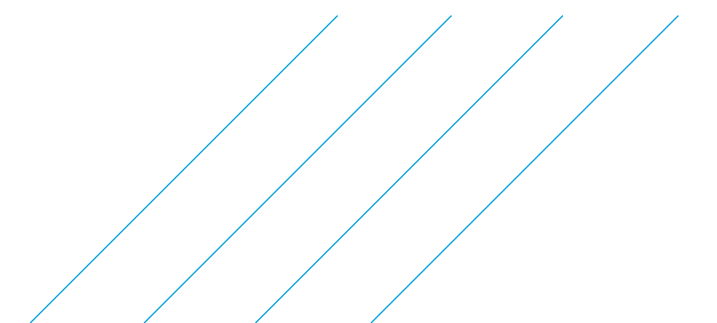


ATKINS
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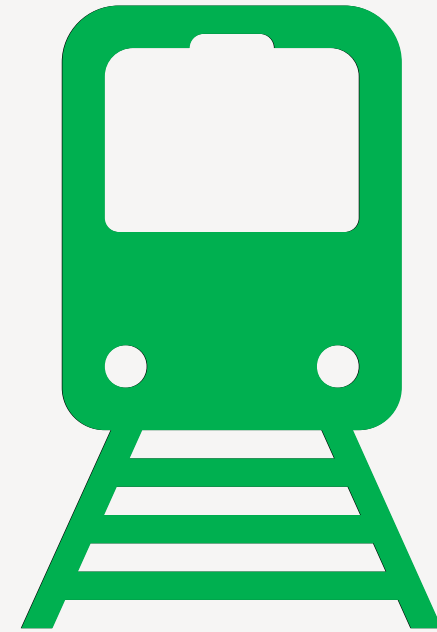
Novità Scoping Study: Nuisance and Health Impacts of Railway Noise

28 February 2023



Project context and objectives

Railway noise emissions are decreasing...



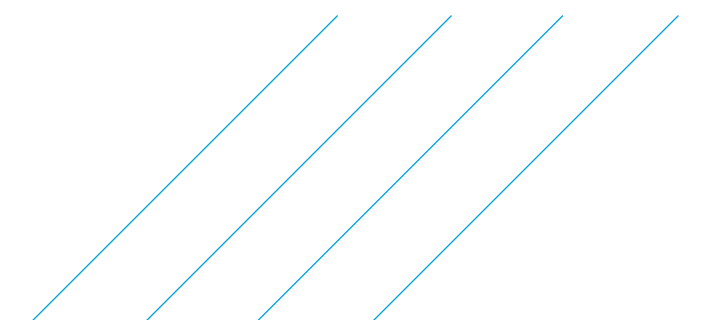
...but...



...the rate of complaints from communities living along parts of the railways remains high

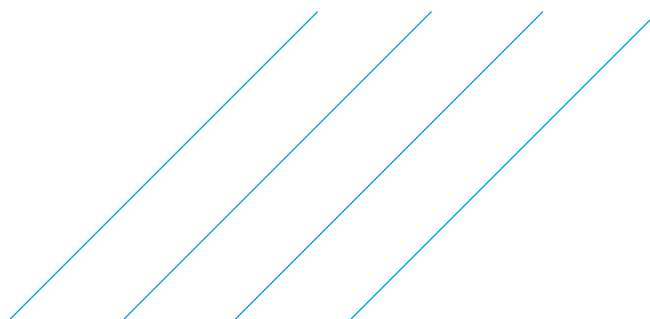
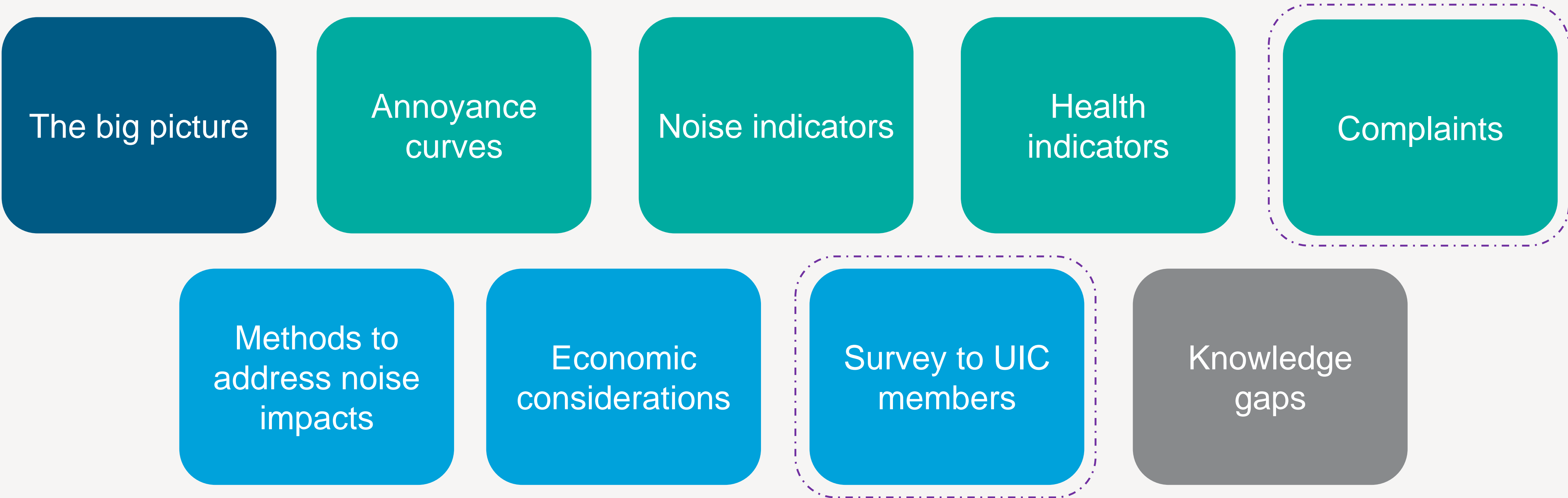
The objectives of this scoping study are:

1. To acquire a representative picture of the **nuisance** effect of rail noise and its impact on **human health** in European railways in 2022 and to prepare a proposal to determine the next steps and make suggestions for the global railway community.
2. Provide an **evidence basis** on the impact of noise nuisance on human health for UIC participation in the European Commission meetings with the aim that it will inform EU or national governments **funding** and **legislation** decisions.



Project scope

This scoping study report provides a critical assessment of the existing research covering the themes below:

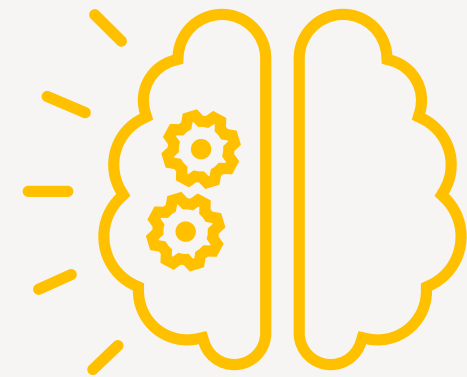


Complaint psychology

A **noise complaint** is a written or verbal expression of dissatisfaction with the noise environment



Human brain has a 'neural template'



It gathers more information when exposed to a new stimulus



If the stimulus is unusual, there is a an **arousal** – a conscious recognition of a change



This intrusion into conscious thought can be an **annoyance**, leading to actions to reduce or stop the noise

- › Annoyance is a function of average noise exposure and arousal, complaints are a function of arousal only
- › The act of complaining is a reaction and coping mechanism.
- › Complaint behaviour is influenced by a variety of factors and not all annoyed people complain.
- › Intermittent events of higher intensity or distinct character cause arousals more than steady-state conditions.
- › There are qualitative differences in complaints for different sources, linked to perceptions and fear.

Source: Luz et al 1983

Situation in European Railways

Objectives and methodology

An online questionnaire was issued to railway infrastructure managers and operators to:

- › Better understand the **underlying reasons** for continued high rates of **complaints** along railways
- › Identify **features of railway noise** which elicit adverse subjective responses.

The survey was open from 24 November 2021 to 22 March 2022.

Respondent information

- › Responses received from **18 stakeholders** from European and international railways, representing 15 countries and **64%** total railway length in Europe



Survey Outcomes – Causes of Complaint

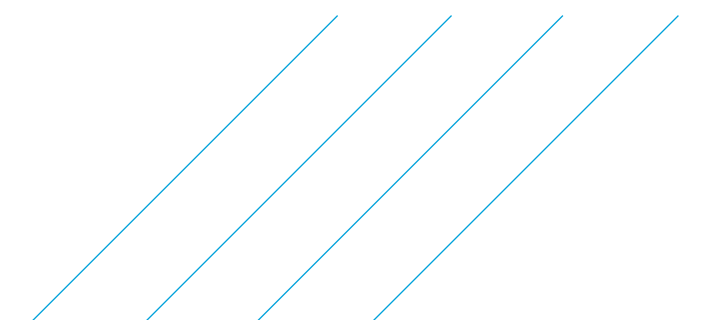
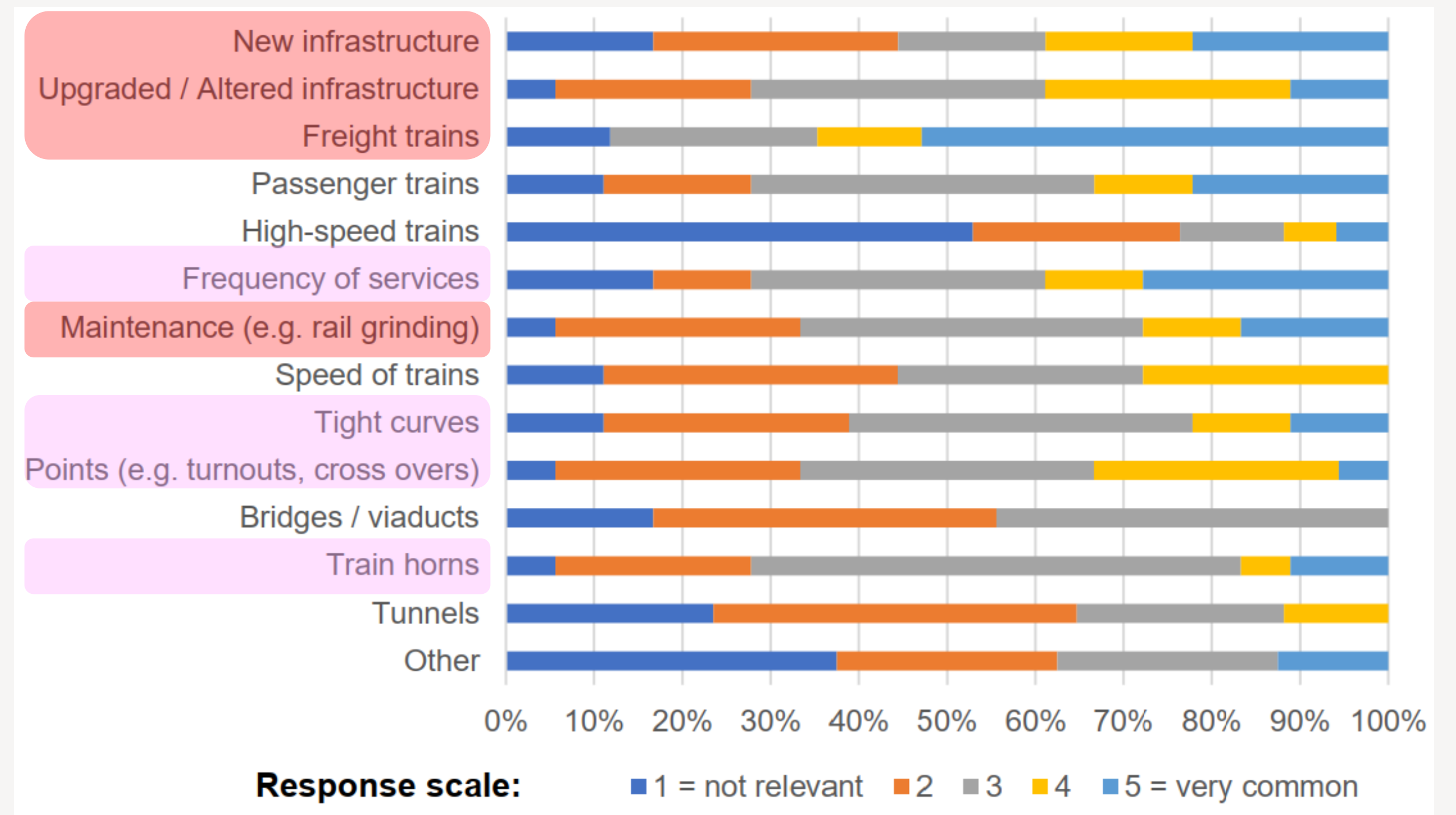
The top three railway features causing complaints were:

- 1) Freight trains
- 2) New, upgraded or altered infrastructure
- 3) Maintenance operations (e.g. rail grinding)

Other common causes were the frequency of services, turnouts and crossovers, tight curves and train horns

The biggest concern raised by complainants was **sleep disturbance**. Other key factors raised were:

- 1) Health
- 2) Real estate depreciation
- 3) Inaction



Conclusions

- › **Significant growth** expected in high-speed and freight rail transportation expected in the coming years.
- › Exposure-response relationships **no longer favour railway noise** over other transportation sources and the numbers of people annoyed by railway noise may have increased.
- › **Freight trains** operating during night-time is the most common cause for complaints.
- › Situations where there is a change in noise, “**atypical noise**”, areas of extreme sensitivity or where noise limits are exceeded are linked to complaints.
- › **Intermittent high noise events** or sounds of distinct character cause an **arousal effect** more than steady-state conditions, leading to complaints. **Short-term indicators** (e.g. L_{Amax}) capture this better than long-term indicators (e.g. L_{den} , L_{night}).
- › Future mitigation will likely need to combine the conventional mitigation efforts with **innovative** ways to more specifically address annoyance/ complaints caused by railways.
- › Infrastructure managers and operators need to **work together** to achieve cost effective mitigation to further reduce railway noise.



Potential next steps

Complaints

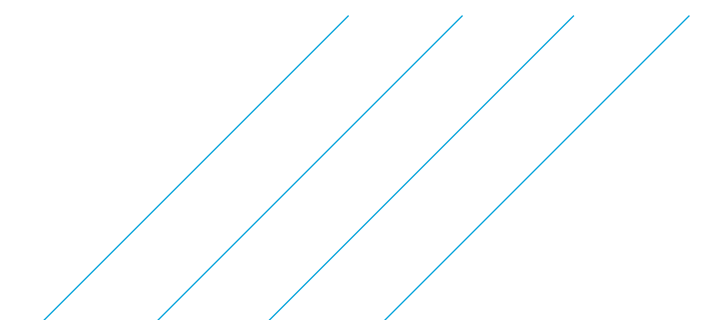
- › Further analysis of complaints data to establish the priority of rail noise sources causing disturbance.
- › Sharing of best practice.
- › High speed rail study on complaints and noise management.
- › Influence of local acoustic and non acoustic factors on exposure-response relationships and complaint generation.

Noise levels and perceptions of different railway noise sources

- › Short-term objective effects of noise to build up evidence base.
- › Exposure-response relationships for freight and passenger trains.
- › Studies linking perceptions of different types of rail service (passenger, freight, high speed) and atypical rail noise (such as curve squeal, joints) to noise indicators representing railway noise characteristics.
- › Scope of study to include noise exposure-response relationships and use of psychoacoustic indicators.

Innovative mitigation

- › Infrastructure managers and operators to work together to achieve cost-effective mitigation.
- › Combining conventional mitigation efforts with innovative ways to more specifically address annoyance/complaints.
- › The efficiency of improving health through noise could be compared with improvements in other areas of health and their cost (e.g. nutrition).



Our values are the essence of our company's identity. They represent how we act, speak and behave together, and how we engage with our clients and stakeholders.

SAFETY

We put safety at the heart of everything we do, to safeguard people, assets and the environment.

INTEGRITY

We do the right thing, no matter what, and are accountable for our actions.

COLLABORATION

We work together and embrace each other's unique contribution to deliver amazing results for all.

INNOVATION

We redefine engineering by thinking boldly, proudly and differently.



https://uic.org/IMG/pdf/nuisance&health_impacts_of_railway_noise





[Watch at UIC's
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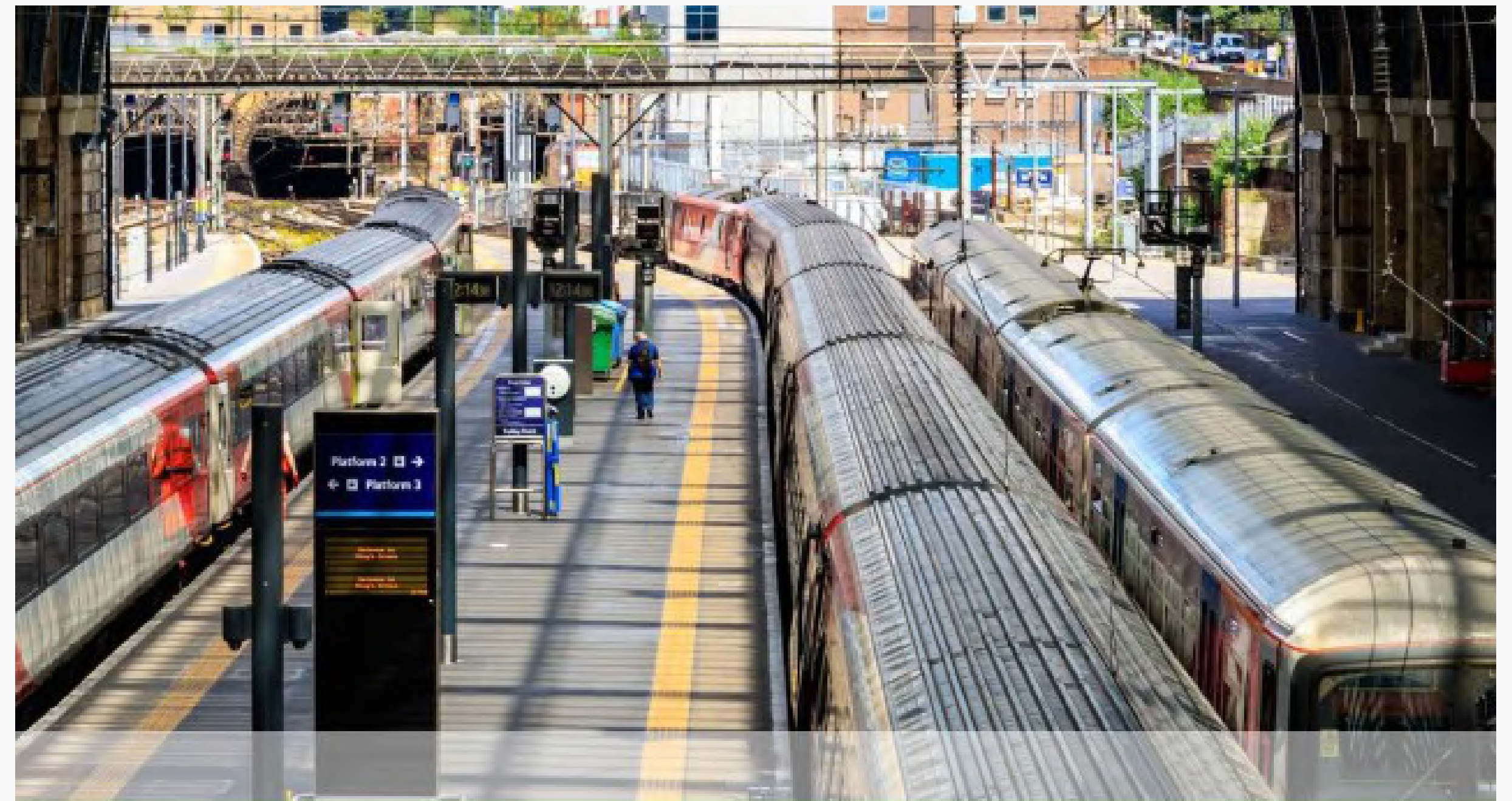
Martin RISSMANN

VibraTec

UIC Railway Noise Days - 28 February 2023



28/02/2023



UIC SUSTAINABILITY
**Noise from parked and stationary trains:
An analysis of operational and technical solutions**
Noise and Vibration Technical Advice (NOVITÀ) Project

February 2023



Why trains stand still?

Stationary = in service

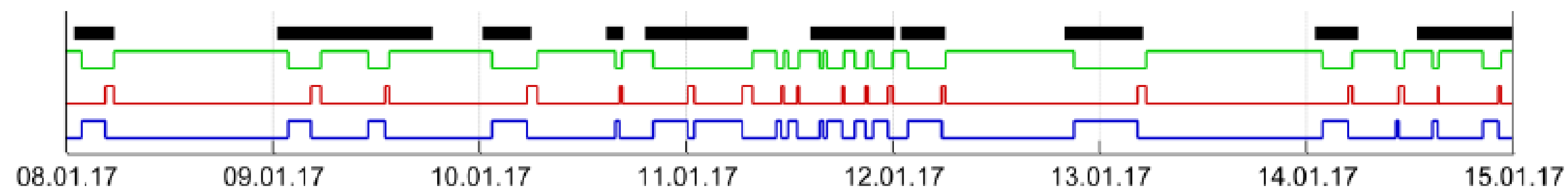


- in a station or at a signal
- technical components are running

Parked = out of commercial service



- in depots, stations, termini of secondary lines
- overnight or during week-end
- some technical components are running, e.g. to protect other components



— parked – standby — pre-heating — commercial service

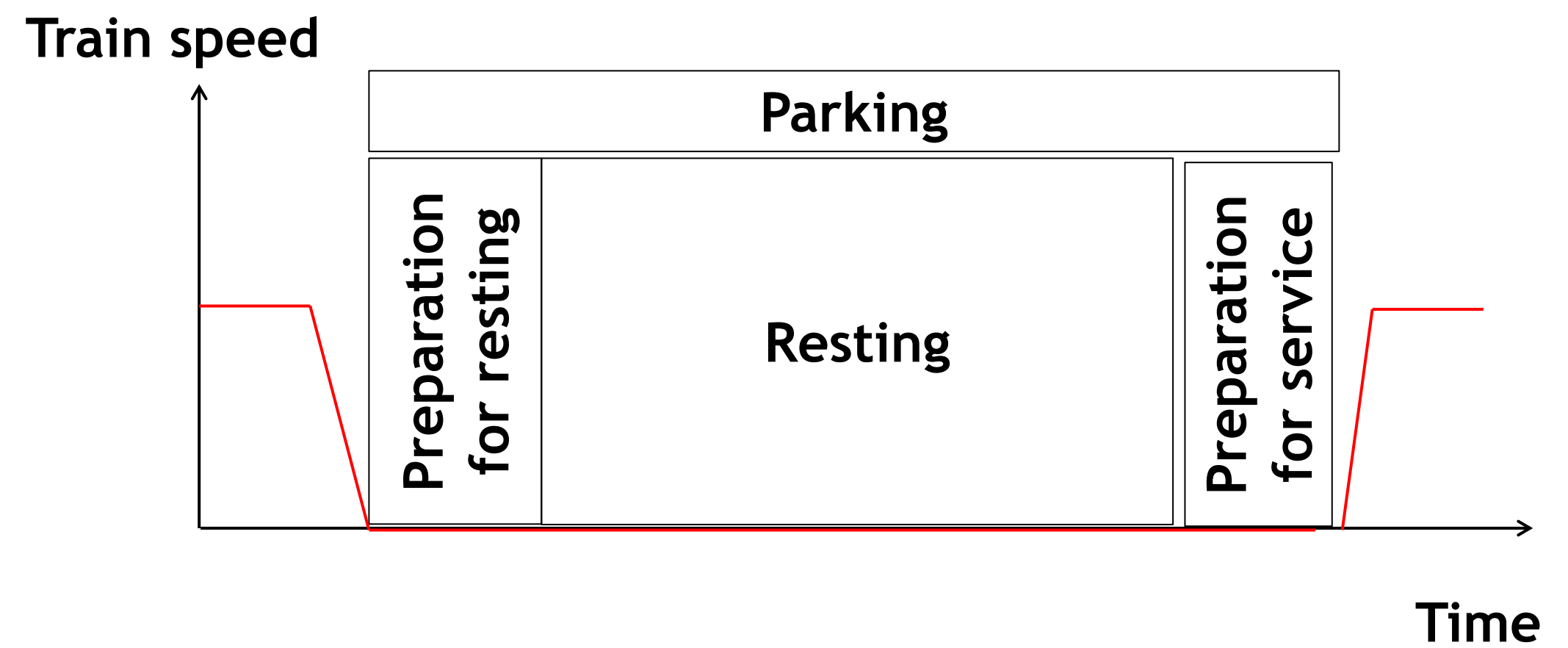
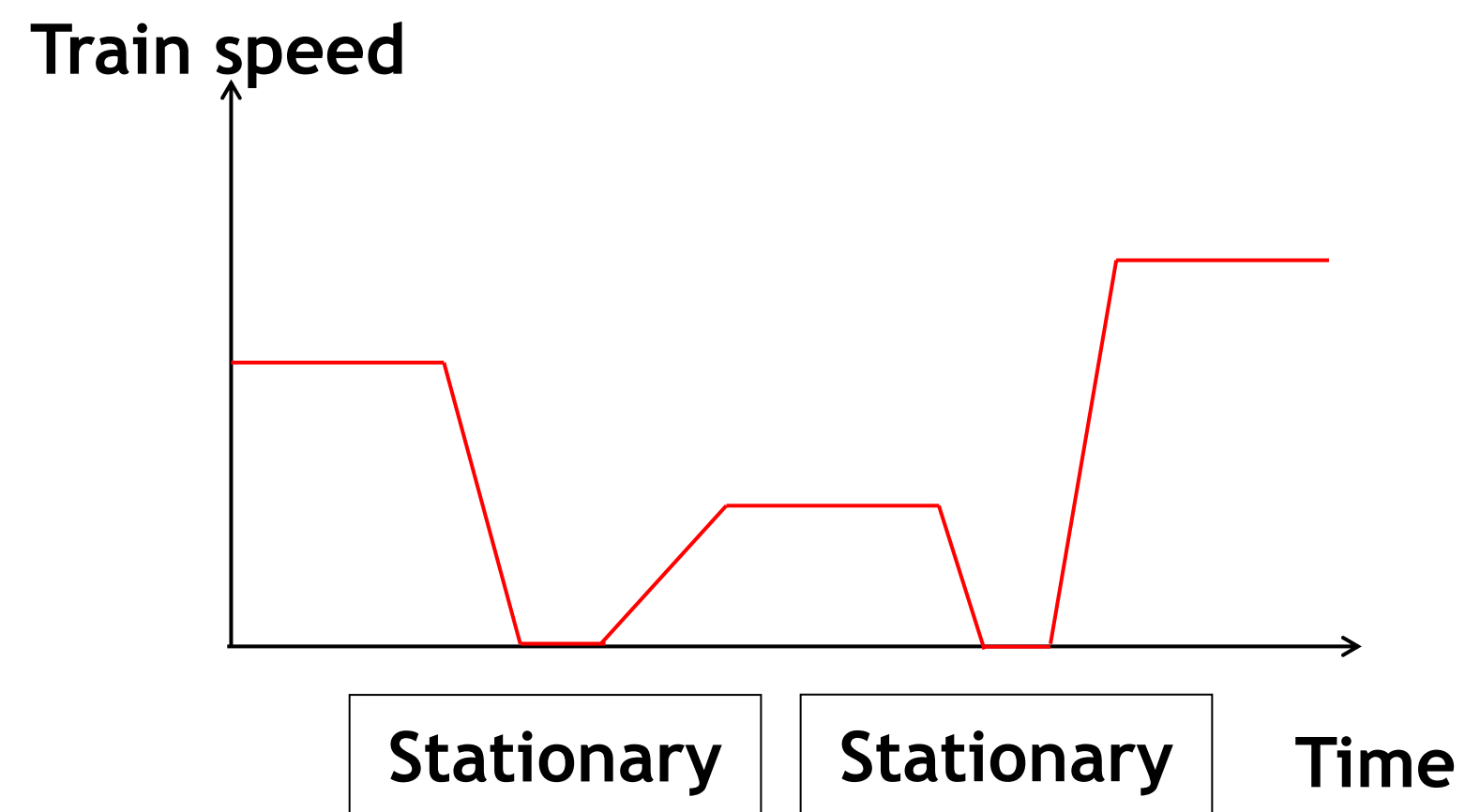
Low value = mode active

How to define a train at a standstill?

Stationary

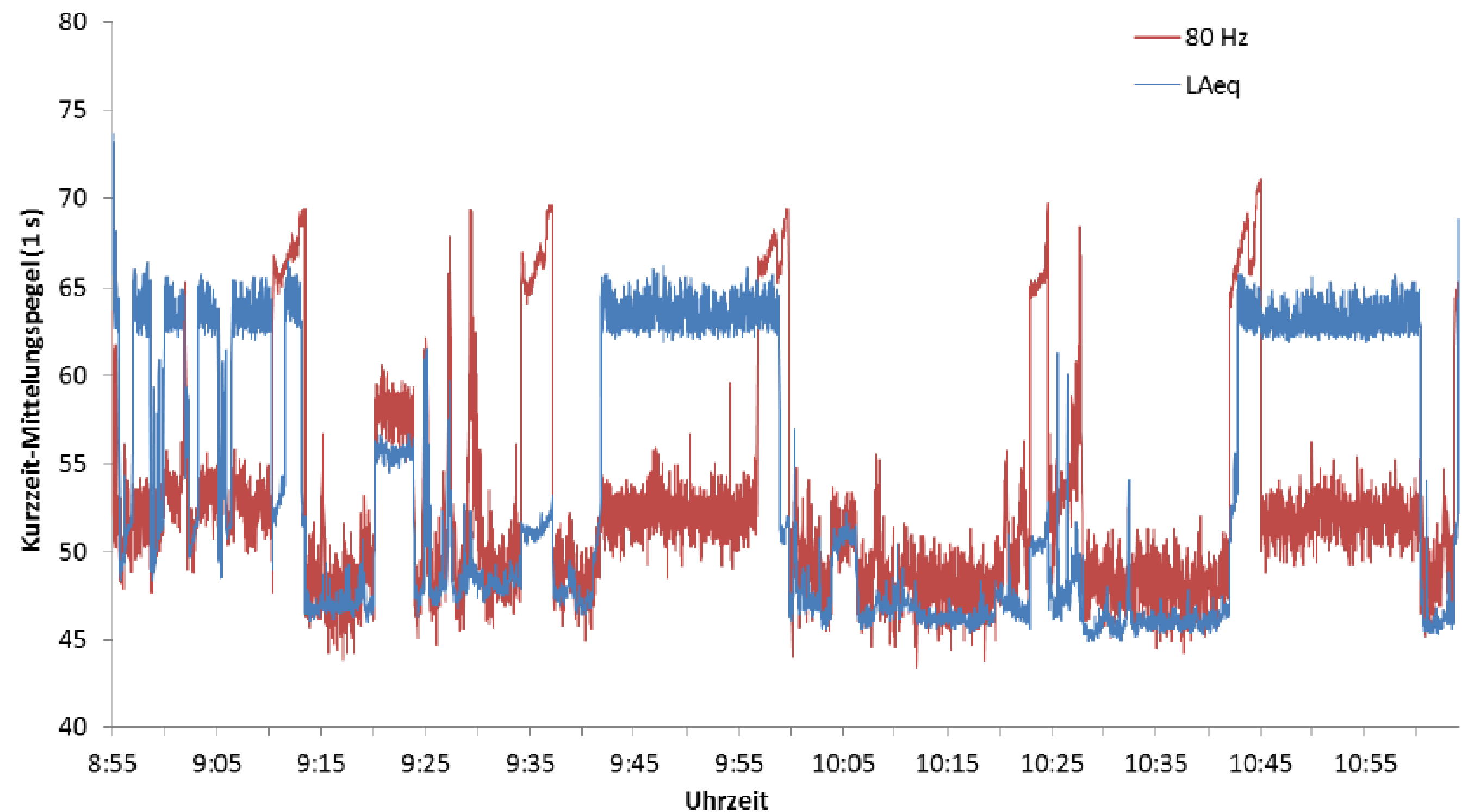


Parked



Noise emission strongly depends on activity.

- A stationary train is generally louder than parked trains since all technical components are running.
- For a parked train, the noise emitting activities depend
 - On the train operating condition:
 - Preparation for resting
 - Resting
 - Preparation for service
 - On the equipment:
 - Continuous or intermittent activity
 - Weather



Sound pressure level at the vicinity of a parked EMU

A survey was conducted with great success!

Survey with in total 29 contributions from 16 countries

→ Infrastructure managers (69 %)

→ Operators (24 %)

→ Both (7 %)

→ 11 participants provided measurement data

→ contribution from



Noise complaints increased over the last 5 years for 45% of the participants.

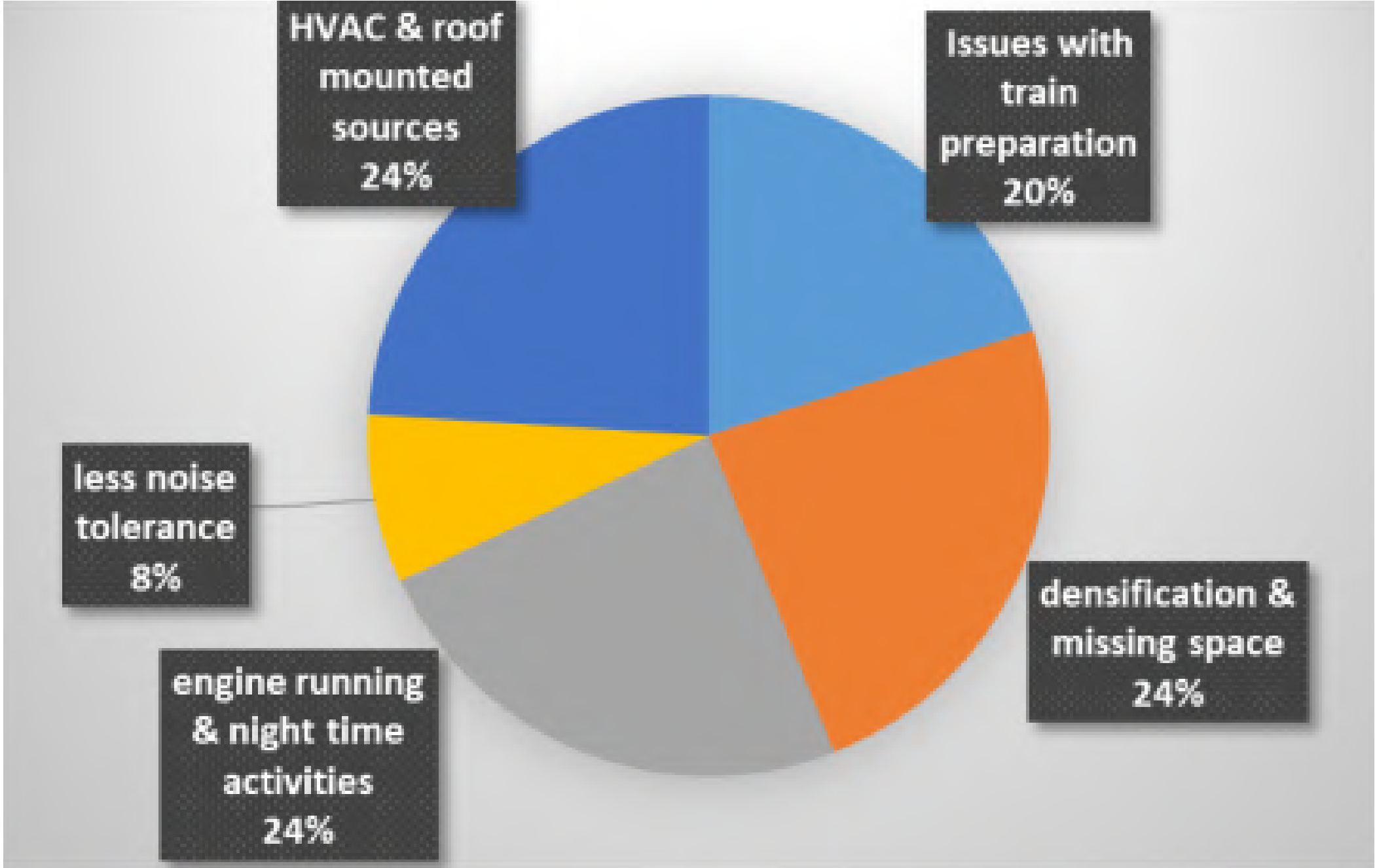
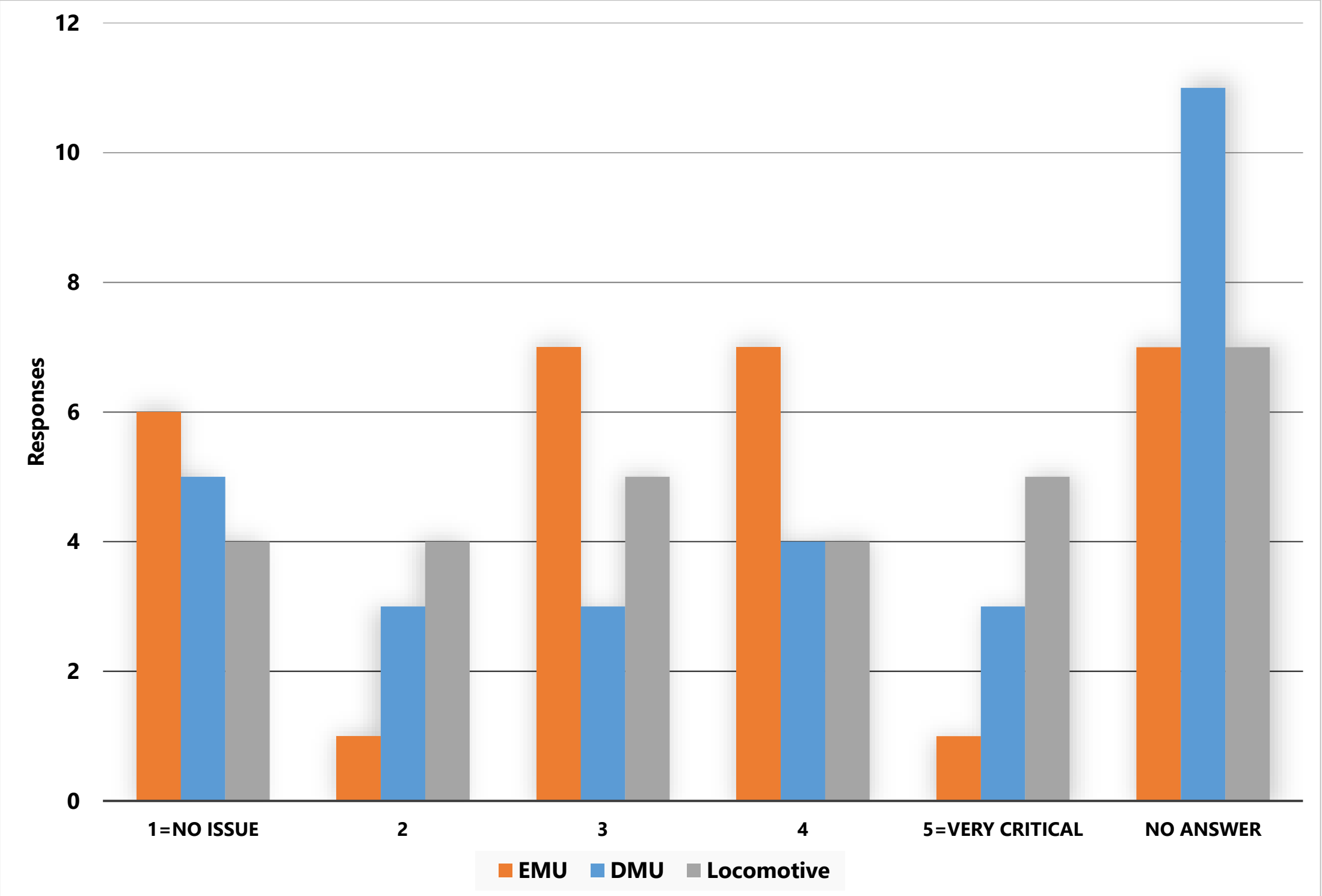
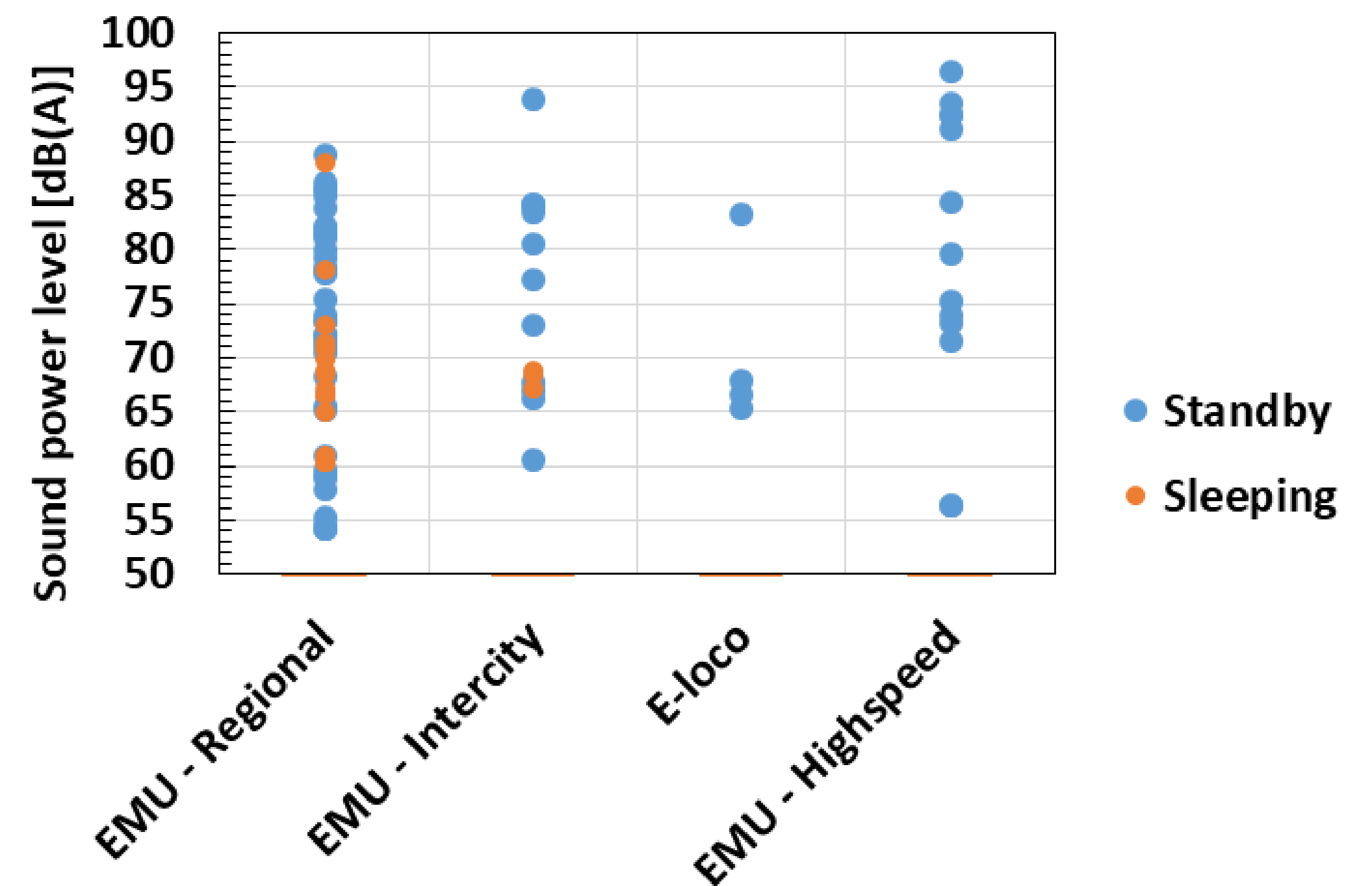
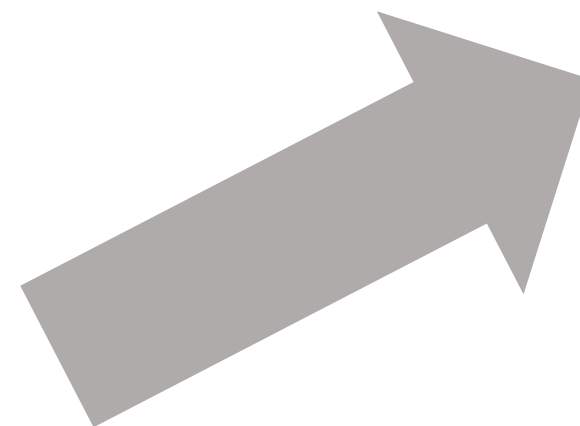


Figure 20: Reasons for noise complaints regarding parked trains – 25 answers, multiple answers possible - [7]

- Locomotives & DMUs are the most critical
- EMUs have intermediate criticality

Standstill noise measurements exists, but are difficult to compare!

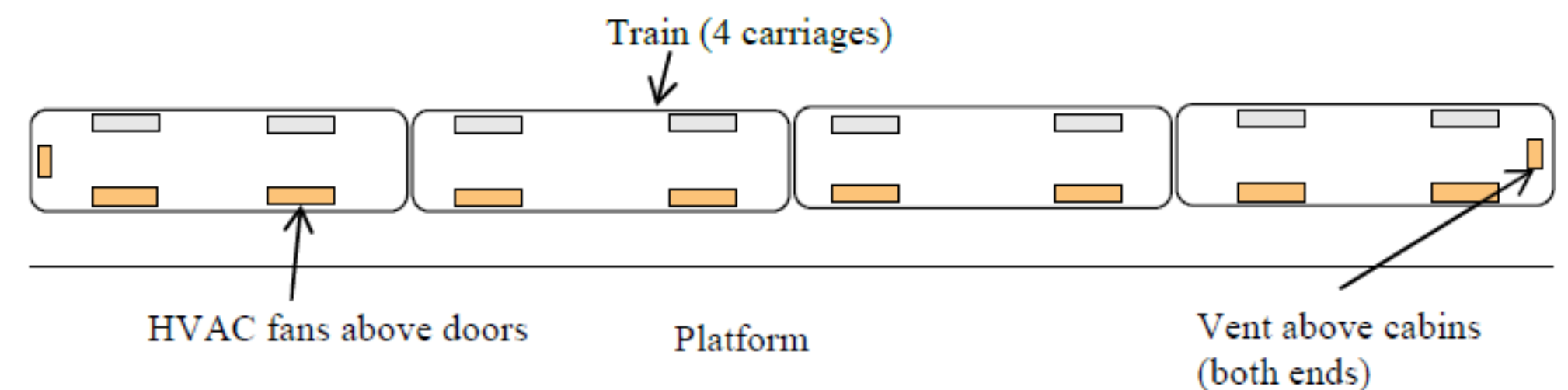
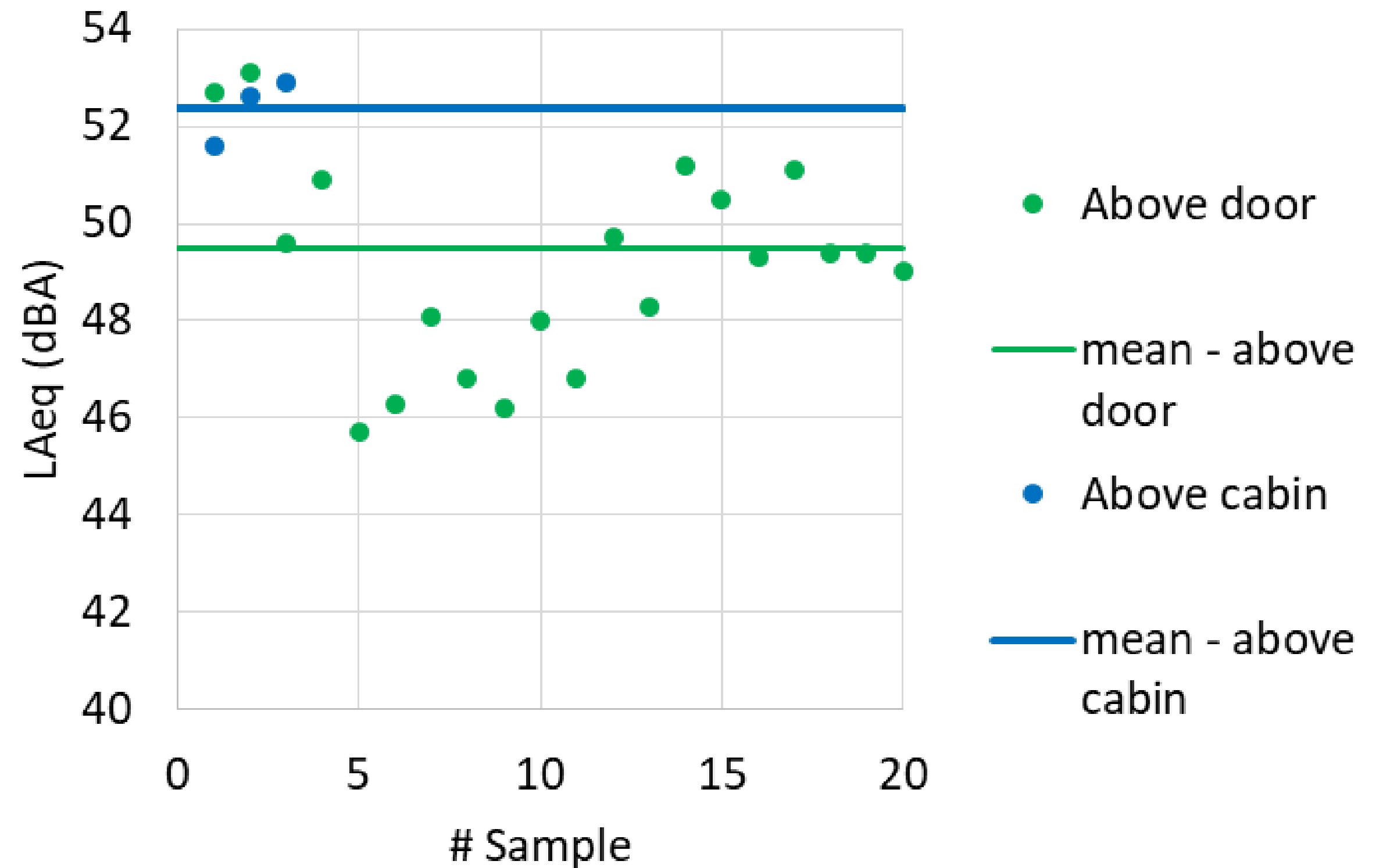
- Some countries, e.g. NL & CH, have acoustic databases, others single measurements
- Comparison difficult due to different
 - Assessed quantities
 - Operating points or missing description
 - Measurement conditions
- Example: HVAC components
 - Dispersion up to 40 dB
 - Sleeping mode has lower levels as expected
 - Highspeed tends to have higher levels



Sound power levels of HVAC components




Variability in measurements can be important!

- HVAC units measured at 1 m from the HVAC fans
- Variability of
 - 0.7 dB for driver cabin
 - 2.1 dB above the doors
- Need to specify measurement procedure, error assessment
- Operating and measurement conditions repeatable?
- Variability from on train to the other within the same type?



Data provided by ARUP, UK

Regulatory frameworks need further harmonisation!

- Future version of ISO 3095 will include parking noise
 - UIC NV sector sees this as a step forward
 -  → However, still open points, e.g. detailed description of single component measurement → environmental noise
- Some frameworks (VDV, EuroSpec, NSW) propose noise limit values
 -  → However based on different assessment conditions
- Parking noise = industrial noise  → lower limit values

INTERNATIONAL
STANDARD

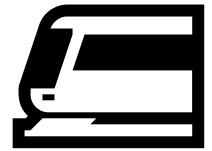
**ISO
3095**

Third edition
2013-08-01

**Acoustics — Railway applications
— Measurement of noise emitted by
railbound vehicles**

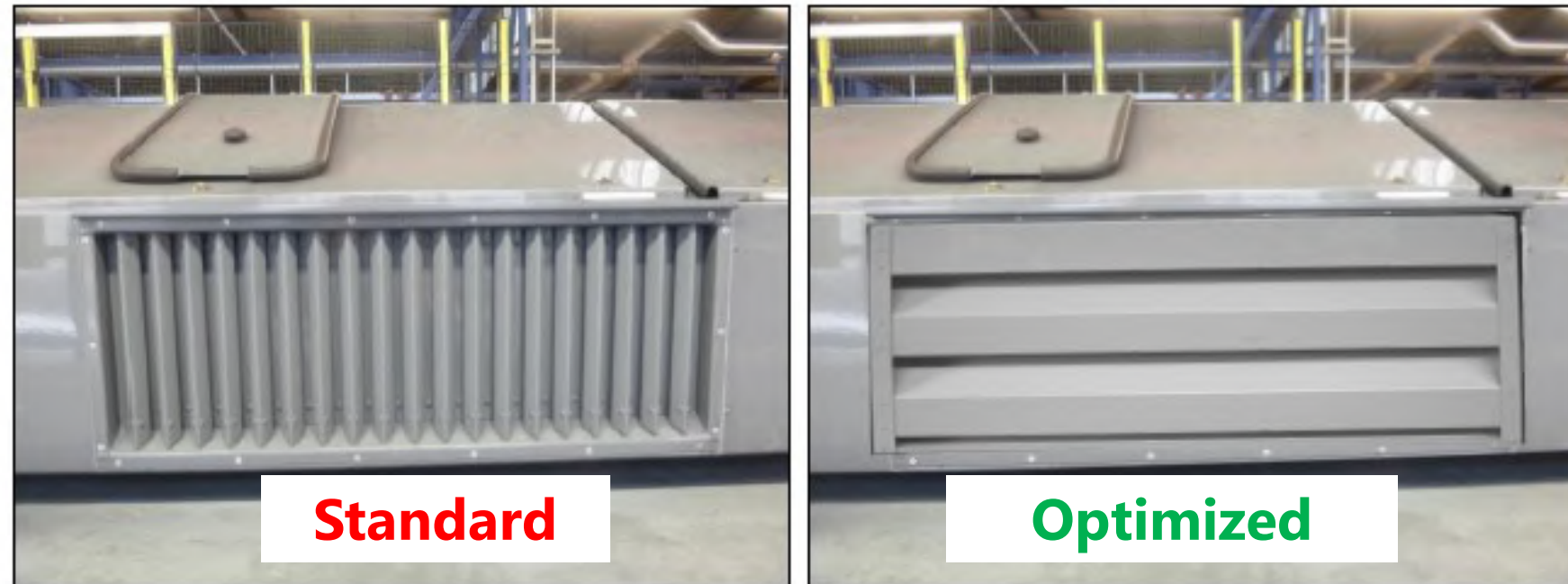
*Acoustique — Applications ferroviaires — Mesurage du bruit émis
par les véhicules circulant sur rails*

There are many ways to reduce parking noise!



Vehicle side

- Retrofit, silencers, encapsulation, etc.
- Software: demand-controlled operation, optimization of operating modes (e.g. fan speed)
- Energy-optimization = noise reduction



Fresh-air intake of a passenger HVAC



Infrastructure side

- Noise barriers → no solution for roof mounted sources
- Special parking orders
- Automated acoustic surveillance → Train in the right mode?

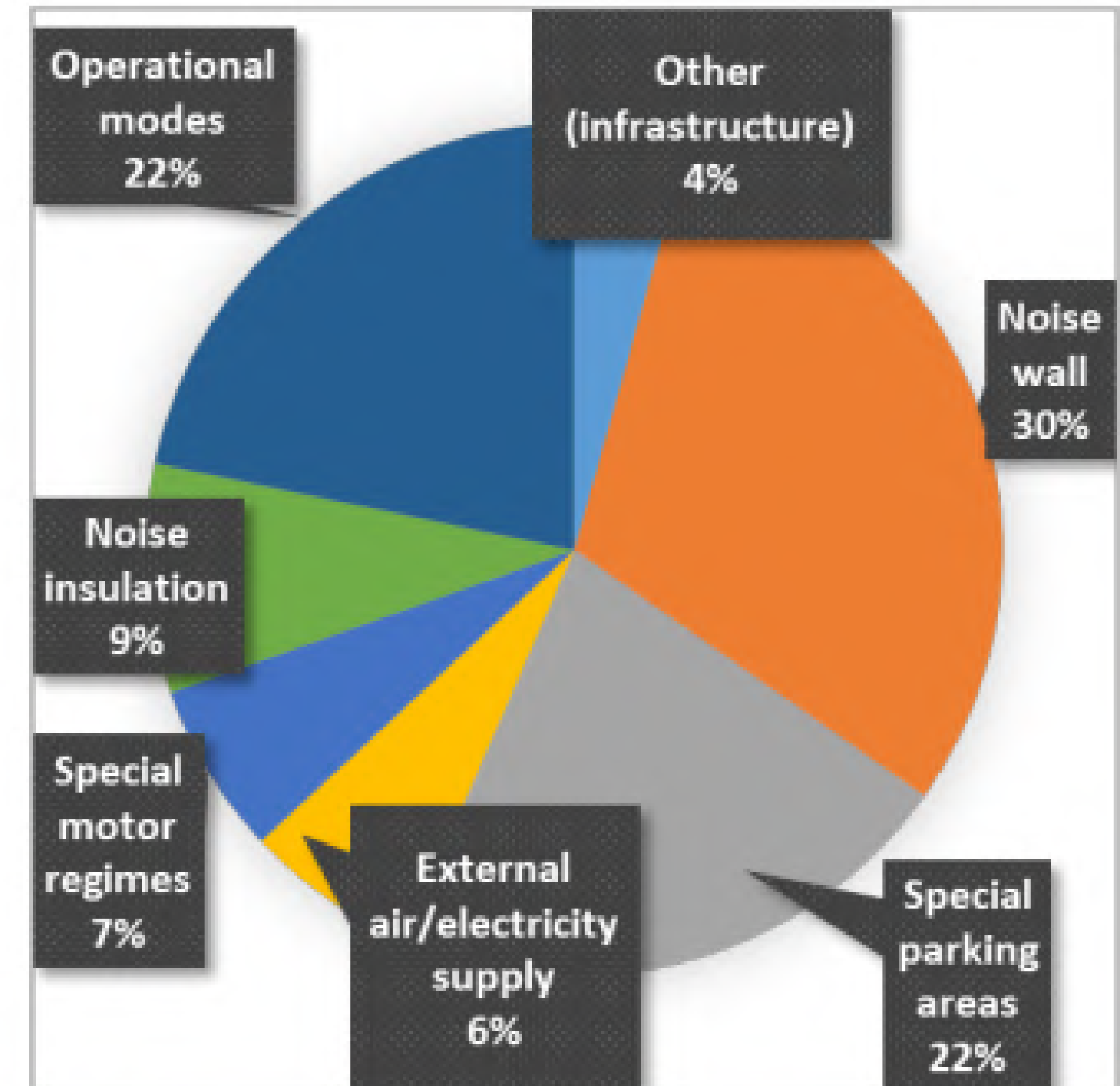


Figure 21: Parking noise mitigation measure (46 answers) – from [7]

Noise reduction is not always easy, but...



→ Reducing noise requires cooperation between stake holders!



→ Costs, modifications, homologation, etc. need to be considered!



→ But 2 simple measures are identified:

- Check correct application of the required standstill mode by the train driver!
- Rise awareness of local authorities with regard to land use planning and regional authorities defining tenders for new rolling stock

Further work is needed on the track towards noise limits!



Decreasing railway noise is a priority for UIC's NV sector

Still **no TSI NOI limit values** on parking noise



Critical analyse of the current state of noise from trains at a standstill



Diverging opinions between stakeholders, e.g.:

→ Infrastructure managers have to deal with environmental noise limits

→ Rolling stock manufacturers need clear and simple homologation procedures



Noise limit values

→ agreement has to be found on the assessment procedure including train operation modes.

→ a common shared database is required in order to define feasible, but also incentive limits

THANK YOU FOR YOUR ATTENTION

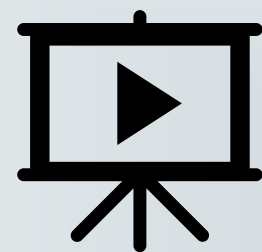
MARTIN RISSMANN

International Project Engineer

Mobile: +33 6 70 88 49 81

martin.rissmann@vibratec.fr





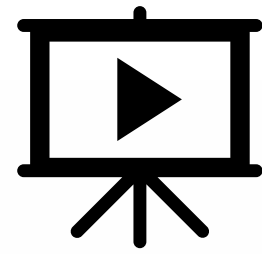
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Closing Session

Jakob OERTLI
Swiss Federal Railways (SBB)
Chair of UIC Noise and Vibration Sector





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Thank you for your attention.



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