Railway Noise
State of the Art

10th UIC Noise Workshop

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The State of the Art Report

> Aware of a great number of stakeholders involved in the discussion on railway noise

> Communication on noise issues can be challenging, technically complex & emotive subject
The State of the Art Report

It is important that noise discussions are well informed & the sector can demonstrate a proactive technical program to manage the issue;
- alleviate unnecessary worry / frustration
- to build understanding & constructive dialogue
demonstrate progress (including modernisation)
- show what is possible / practical
Context

> Rail is the most environmentally friendly major mode of transport with very low external costs (safety / congestion)

> Railway noise remains an important issue

> Political sensitivity to noise varies between countries, with particular concern along the Rhine-Alpine corridor

> Greater acceptance of rail transport is a necessary prerequisite for expanding modal share and through this reducing the overall environmental impact of transport
Current noise exposure

Graph 4. Reported (green) and extrapolated (grey) numbers of people (in millions) exposed to noise over 55 dB $L_{den}$, for roads, railways, airports and industry, within and outside urban areas (from: Noise in Europe, EEA, 2014)
The impacts of noise & WHO guidance

WHO recommends Member States to gradually reduce the proportion of the population exposed to levels over the interim target ($55 \text{ dB } L_{\text{night}}$) within the context of meeting wider sustainable development objectives.

- WHO Night Noise Guidelines
Exposure – response Road vs Rail

Graph 5 - Percentage of highly sleep disturbed persons against $L_{night}$ (from “Night Noise Guidelines” page 78)

Graph 3. Dose effect relations: percentage of highly annoyed residents against exposure level, for road and rail noise [from EU Position Paper on dose response relationships for transportation noise]. Example: at 60 dB(A) $L_{den}$ of railway noise about 4% of the exposed people are expected to be highly annoyed. Similar annoyance is established by only 52 dB(A) $L_{den}$ of road traffic noise. The difference represents the correction factor erroneously called the “railway bonus”
Structure of the rail sector & regulators

> operating companies (running the trains)
> vehicle owners (often leasing companies)
> infrastructure managers

Regulatory bodies:

> European Commission (DG MOVE) (financial incentives)
> European Rail Agency (ERA) (vehicle noise limits)
> National governments (reception limits / financial support)
> Local authorities (hot spots / compliance)
Overview of European Policy

> Transport White paper sets ambitious targets for growth of the sector

> TSI sets noise limits for rolling stock (ERA)

> END requires mapping & action plans (DG ENV)

> NDTAC sets a framework for incentivising retrofitting (DG MOV)

> CEF offers limited financial support for retrofitting (INEA)

> Switzerland will ban noisy wagons from 2022

> CER strategy on rail freight noise
Noise mapping & indicators

> Care is needed to explain the use of long term indicators & calculation rather than measurement

> Points to consider re the new common assessment method:

1) Rail roughness is required as an input parameter (use of default values is discouraged)

2) Changes to curve correction factors may have a big impact

3) Users are required build their source term (Lw) for each type of train
Research (funded by the sector & also EU)

> Long history of research ERRI / UIC / Europe Train

> UIC Rail Technical Strategy Europe

> European Rail Research Advisory Council (ERRAC)

> The Shift2Rail program will include N&V work packages
The Noise Action Plan

> STAIRRS project (late 90-ies & re-confirmed in 2013) concluded that the most cost effective solutions would include retrofitting, i.e. replacement of the cast iron blocks, of the existing freight fleet.

> Railway Noise Action Plan, agreed by UIC, UIP and, CER focused efforts on the following objectives:

  a) Cost neutral equipping and retrofitting of wagons with cast-iron brake blocks to composite brake blocks (K/LL)

  b) Gradual introduction of “Low Noise Technology”
Established technical solutions: rolling noise

- System approach required to manage rolling noise (vehicle & track)
- Passenger trains: use of disk brakes
- New freight vehicles should meet TSI limits (composite or disk brakes)
- Existing freight vehicles can be retrofitted with composite blocks
- New track: optimized rail pads can be selected
- Existing track: surface roughness controlled by good maintenance (grinding)
Railway noise control: other than rolling noise

- Stationary noise
- Aerodynamic noise
- Curve squeal
- Brake screech
- Depots
- Shunting yards
- Steel bridges
- Ground borne vibrations
Transmission path & receiver

- Noise barriers are the most commonly used mitigation measure; in only 7 networks overall more than 3,000 km of barriers with average height of 2 to 3 meters have been installed. Another 500 km are expected to be installed in the next 10 years.

- Low height noise barriers is rare, with only 10 km having been installed in Germany, the Czech Republic and the UK.

- Sound proof glazing and ventilation is often the chosen solution in cases where barriers are not cost efficient or not sufficiently effective.