INTERNATIONAL UNION
OF RAILWAYS

unity, solidarity, universality

Sustainability of train services

London, 14 September 2016

Willy Bontinck
Environmental and energy manager SNCB (Belgian Railways)
Chairman UIC EES platform (Environment, Energy, Sustainability)

International Union of Railways

200
Members in 100 countries

3,000
Billion passenger kilometres

10,000
Billion tonne kilometres of freight

1
Million kilometres of lines

7
Million rail personnel

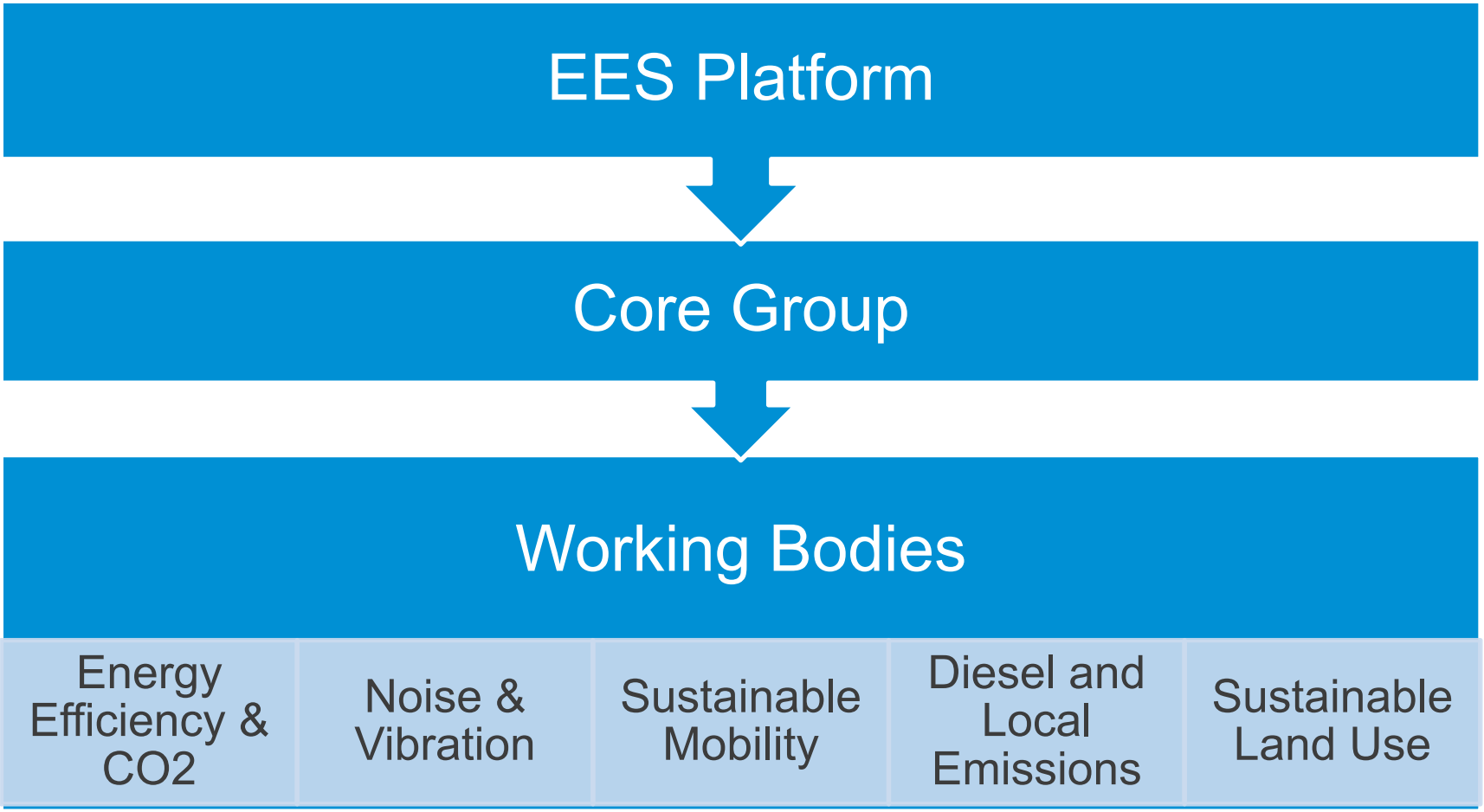
100
Cooperation with over 100 institutions

700
UIC Leaflets -
New IRSs (International Railway Solution)

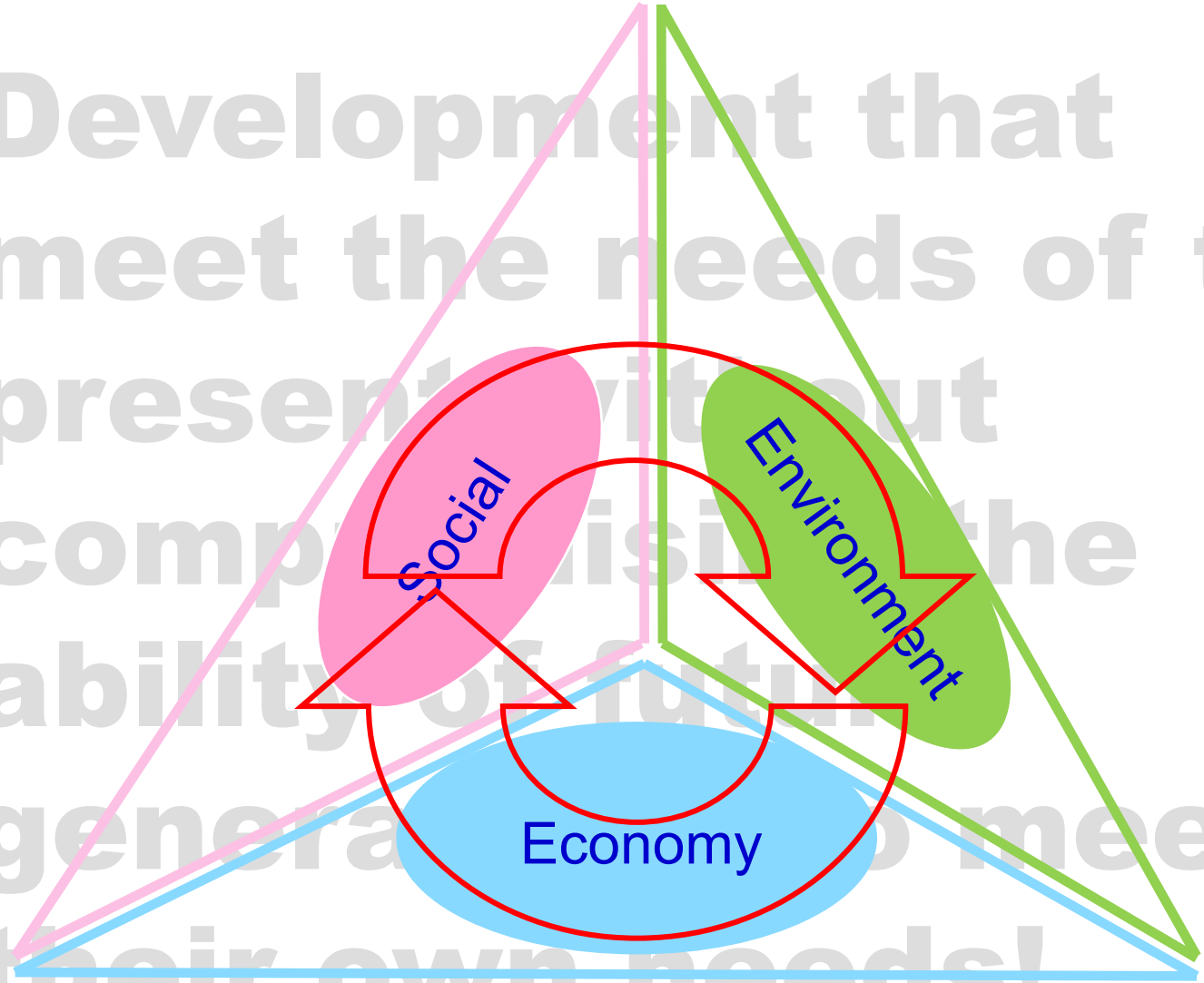
85
Congresses, conferences, workshops per year

Congresse

EES (Energy, Environment, Sustainability) activities



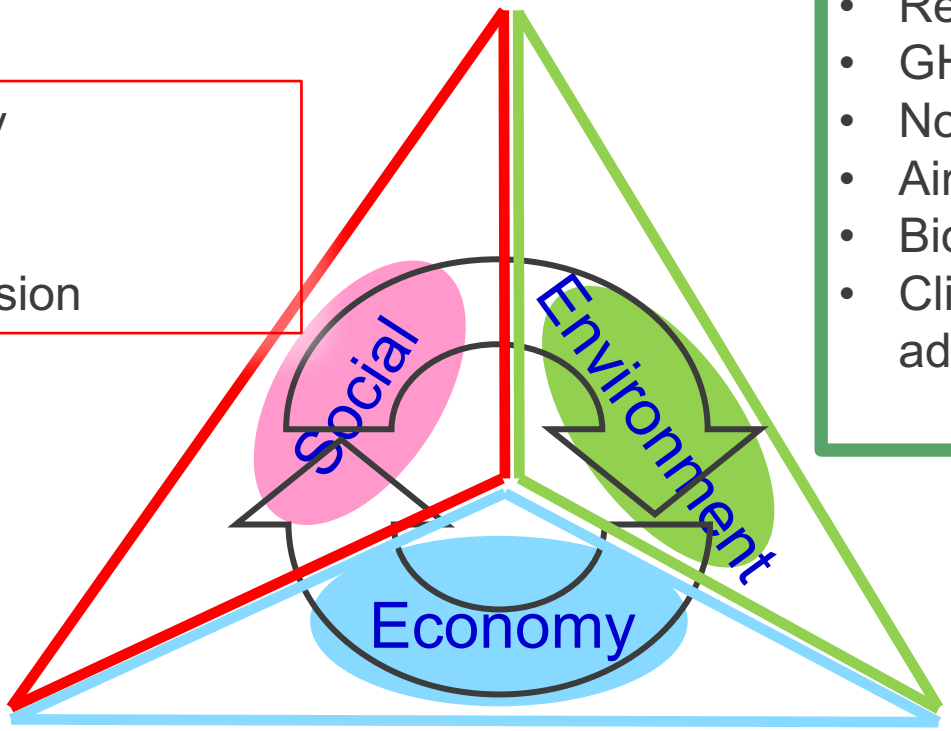
Sustainable Development
- three linked elements -



Development that meet the needs of the present without compromising the ability of future generations to meet their own needs!

Sustainable Transport
- three linked elements -

- Accessibility
- Affordability
- Safety
- Social cohesion



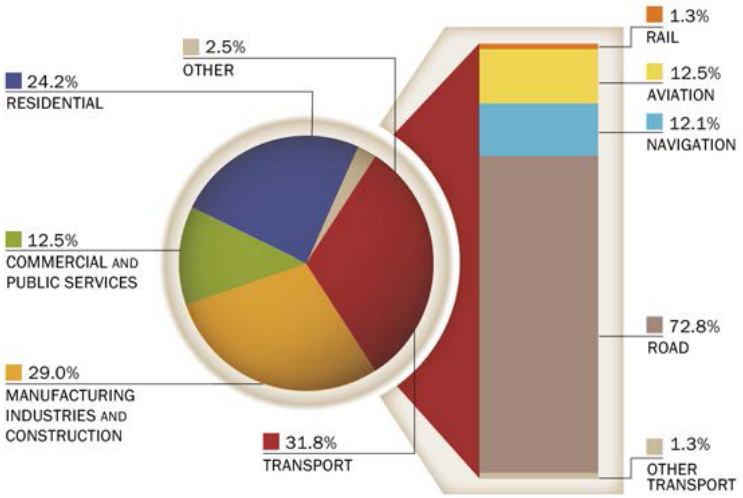
- Resource efficiency
- GHG emission
- Noise and vibrations
- Air quality
- Biodiversity
- Climate change adaptation

- Profitability
- Green jobs
- Congestion
- Energy security

Energy efficiency

1,3%

EU28 Share of final energy consumption by sector, 2013



Source: iea & UIC Railway handbook 2016

EU28 transport modal share, 2013

	Passenger PKM	Freight TKM	Total TU
ROAD	82.8%	51.1%	71.9%
AVIATION	9.0%	0.1%	5.9%
NAVIGATION	0.6%	36.9%	13.1%
RAIL	7.6%	11.9%	9.1%

9,1%

Drivers for energy efficiency

$$\frac{energy}{passengers-km} = \frac{energy}{\text{gross}-\text{tkm}} x \frac{\text{gross}-\text{tkm}}{seat-\text{km}} x \frac{\text{seat}-\text{km}}{passengers-km}$$

- On board technology: traction chain, (pre) heating, (pre) cooling, lighting, ventilation, automatic closing of doors
- Regenerative braking
- Ecodriving, DAS, ATO = more **punctual train traffic**, smoother trains, less energy
- Infrastructure: efficiency of substations, transmission and overhead contact lines, optimization of speed profiles
- Type of train service: number of stops/100km
- Type of train service: speed

Drivers for energy efficiency

$$\frac{energy}{passengers-km} = \frac{energy}{\text{gross}-\text{tkm}} \; x \; \frac{\text{gross}-\text{tkm}}{seat-\text{km}} \; x \; \frac{\text{seat}-\text{km}}{passengers-km}$$

= average mass per seat (mass of traction units included) varies from about 400 kg/seat (commuter train) to 1050 kg/seat (HST)

- design of rolling stock, (e.g: double stock, bogies between coaches)
- Material: steel, aluminium, composite

Drivers for energy efficiency

$$\frac{energy}{passengers-km} = \frac{energy}{\text{gross}-\text{tkm}} \; x \; \frac{\text{gross}-\text{tkm}}{seat-\text{km}} \; x \; \frac{\text{seat}-\text{km}}{passengers-km}$$

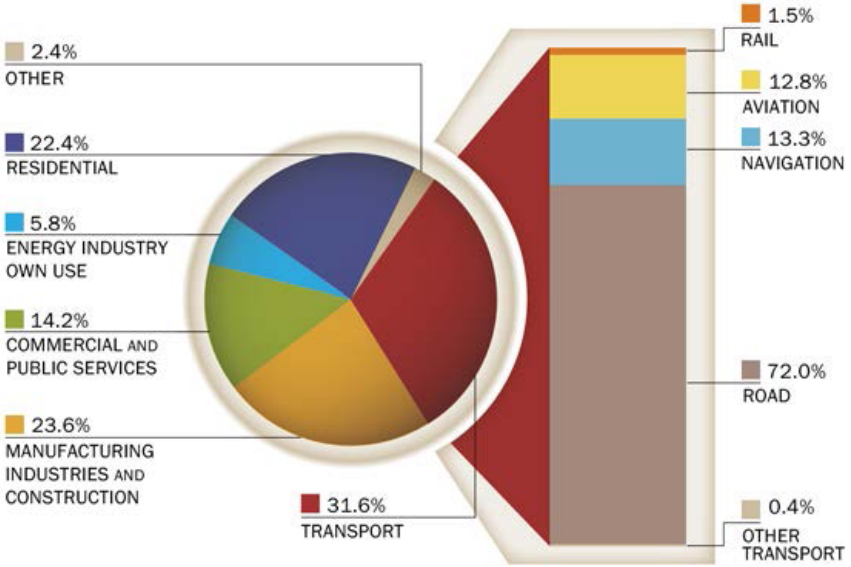
= inverse of load factor: a KPI for the efficiency of any transport service

- Punctual and qualitative train service attracts more costumers, enhances modal shift
- modular train composition
- Tariff differentiation as an incentive to travel outside the rush hours
- Automatic assessment of LF, also as a service to the costumer

CO_2 emissions (EU28)

1,5%

EU28 Share CO2 emissions by sector, 2013



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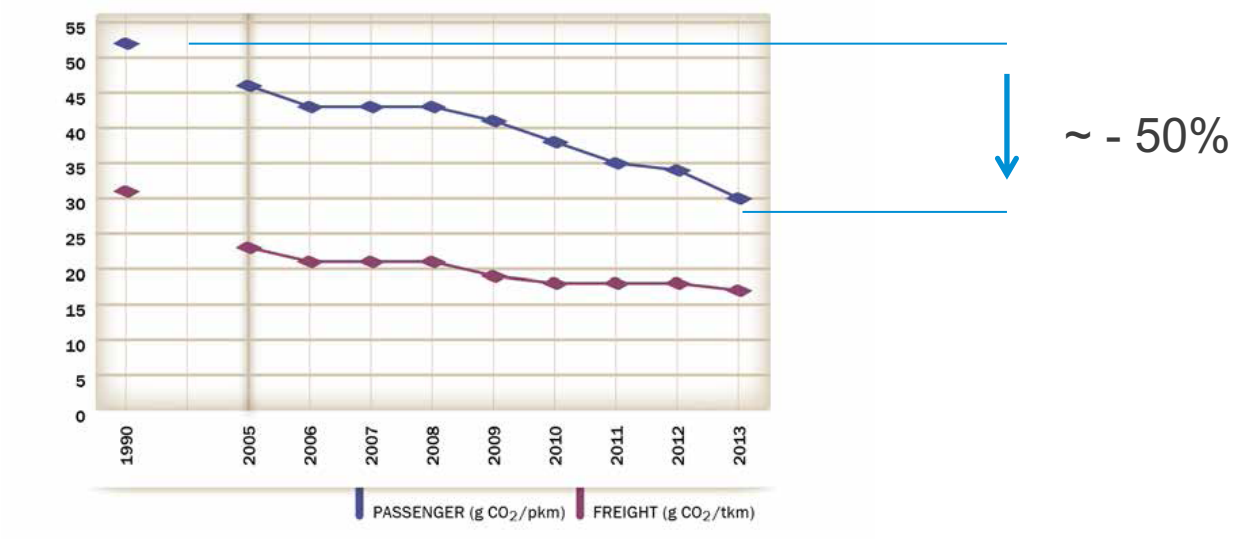
Note: Electricity and heat emissions are reallocated to the end-use sectors. In transport, all the emissions from electricity and heat production are reallocated to rail

Source: iea & UIC Railway handbook 2016

Railway specific CO_2 emissions

Source: iea & UIC Railway handbook 2016



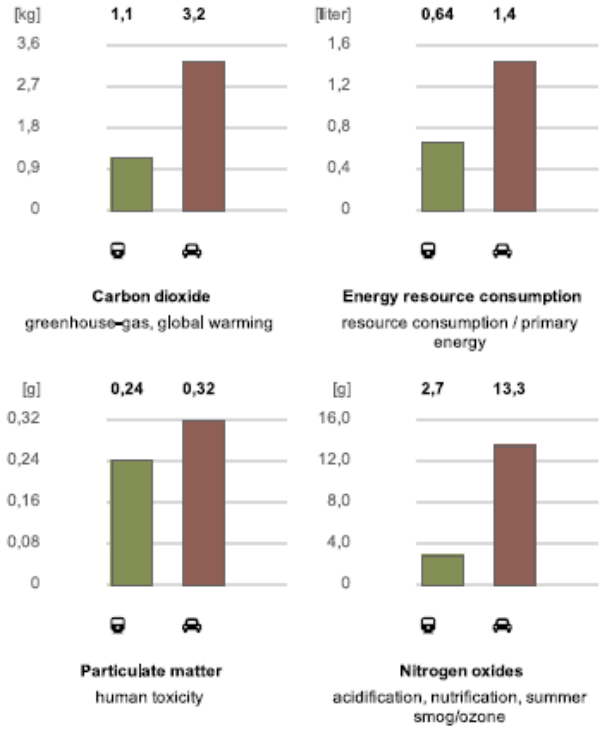
- electrical traction replacing diesel traction
- ↗ energy efficiency
- ↘ Specific CO_2 emission per kWh – national mix
- ↘ Specific CO_2 emission per kWh – railway specific mix with or without GO's

eco passenger

www.ecopassenger.org

	START/DESTINATION	DETAILS	DURATION	PRODUCTS
	Start/Destination ROMA TERMINI (Italy) [IT] CASTEL GANDOLFO (Italy) [IT]	Details from Tu, 20.09.16, 16:21 to Tu, 20.09.16, 17:05	Duration 0:44	Products RE 7361
	Start/Destination ROMA TERMINI (Italy) [IT] CASTEL GANDOLFO (Italy) [IT]	Details Middle class; Diesel EURO 4;	Duration 0:28	Products Car
	Aircraft: No reasonable air connection could be found.			

SEE YOUR INFORMATION	
	Average load factor (normally crowded)
	1,5 Passengers (european average utilization)



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TOUS ENSEMBLE POUR LE CLIMAT

TRAIN to Paris 2015

Railway Climate Responsibility Pledge

On the low carbon track

1. *reduce my company's specific energy consumption and CO2 emission,*

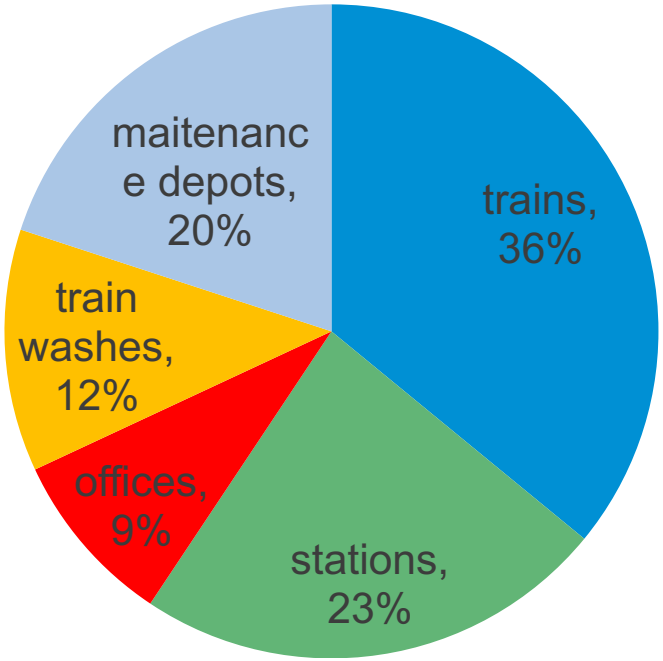
2. *stimulate modal shift to rail in national and international markets,*

3. *actively communicate climate friendly initiatives undertaken by my company during the year 2016 and beyond,*

4. *report data on my company's specific energy consumption and CO2 emissions to UIC on a regular basis.*

Resource efficiency: use of tap water

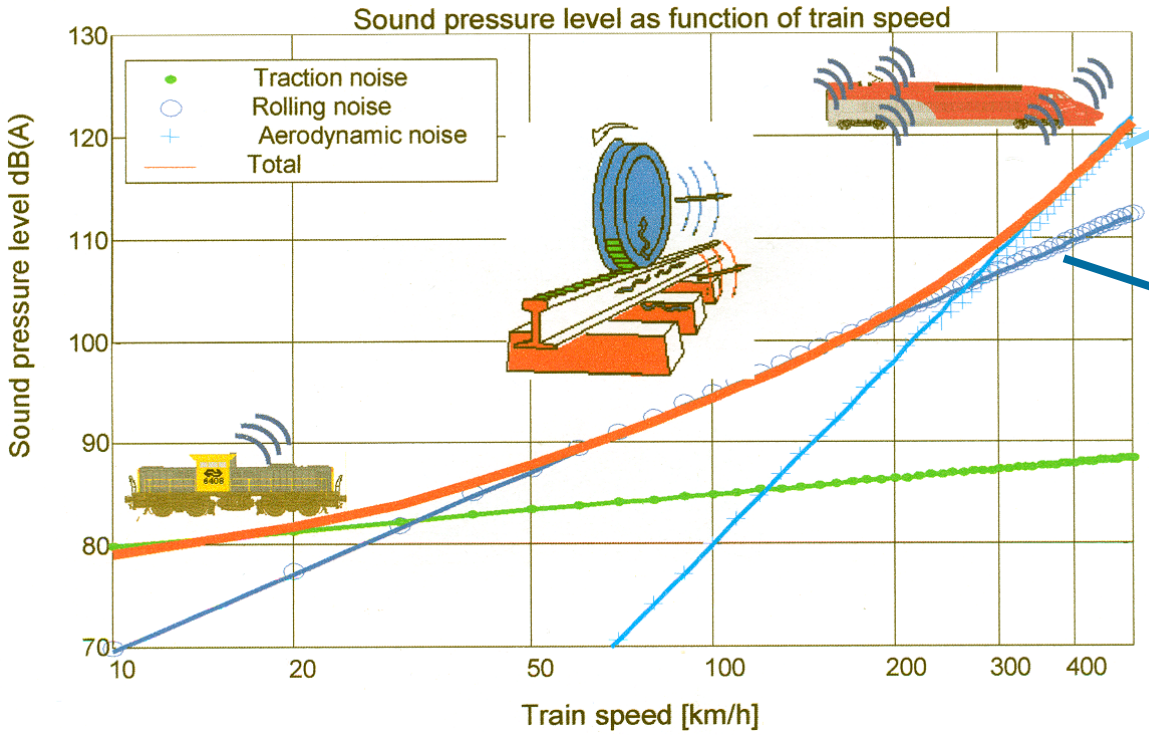
Use of tap water by SNCB (2016)



Actions

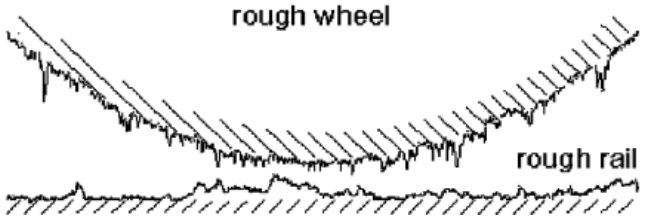
- More accurate follow-up of water consumption
- Detect leaks in water taps and water supply and fix them quickly
- Switch to rainwater where possible
- New train wash facilities= 50% less water (trains are washed every 3-4 days)

Noise



V x 2 = +18 dB(A)

V x 2 = +9 dB(A)



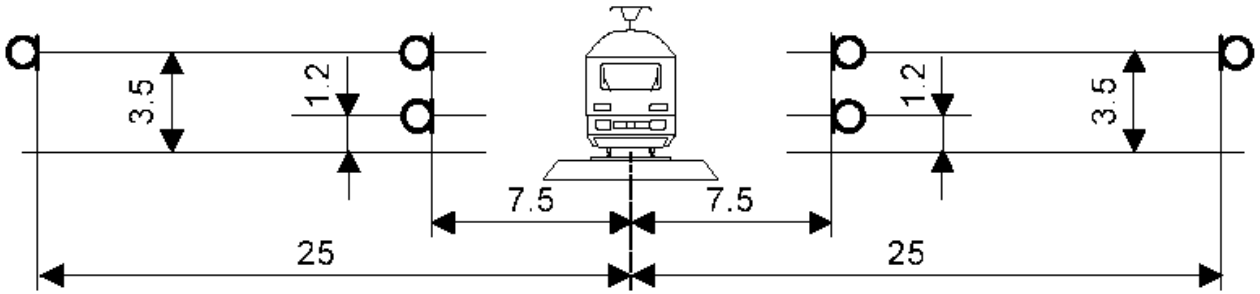
TSI noise

COMMISSION DECISION of 23 December 2005
concerning the technical specification for interoperability relating to the subsystem 'rolling stock noise' of the trans-European conventional rail system

e.g. Applicable for EMU (other values for E-locs, D-locs, DMU, coaches)

- stationary noise, $L_{pAeq,T}$: 68 dBA (1)
- starting noise, $L_{pAF,max}$: 82 dBA (1)
- pass-by noise, $L_{pAeq,Tp}$ (80 km/h): 81 dBA (2)
- driver's cab interior noise (max. speed); $L_{pAeq,T}$: 78 dBA

(1) @ 7,5m, 1,2m high
(2) @ 7,5m, 1,2 m high and 3,5 m high



Noise, rail infrastructure

EIA (Environmental Impact Assesment) mandatory when a new railway is planned or when an existing line is upgraded

- Noise is one of the most important aspects
- Noise mitigation
  - Reduce noise at source!
  - Keep distance between railway line and houses!
  - Optimisation rail infrastructure constituents (rail pad, sleeper, ballast,…)
  - Bundling with highways
  - Noise screens
  - Noise berm (earth wall)
  - Frequent grinding of rails, preventing rail corrugation

Air Quality

- Electrical traction: no exhaust emissions
- Emissions from brakes
  - No emissions with dynamic brake (regenerative braking)
  - Low emissions from pads of disk brakes

- Emissions from airco-installations on board,
  - Removal of all harmfull gases (such as R22)
  - Frequent verification of leakages R407C or R134A

Climate change adaptation

- Improved design of new railway substructure and superstructure, resistance to extreme weather conditions (heavy rain, flood, heat)
- Improved design of electrical overhead lines, resistance to heavy winds
- Storm ⟶ lower speed
- Fine snow can disrupt electronic devices on board
- Automatic flood detection ⟶ lower speed
- Storm basin to prevent flooding of railway line