

# **Rail noise abatement measures addressing the existing fleet**

Response to the public consultation of the European Commission on rail noise abatement measures

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European Federation for  
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## Summary

This paper is submitted within the framework of the European Commission public consultation on rail noise abatement measures, and elaborates on T&E's response to the online questionnaire in preparation for the European Commission Communication on railway noise.

T&E welcomes the European Commission's recognition of the severity and widespread nature of the rail noise problem throughout Europe, as outlined in the consultation document of May 2007.

With the primary objective to reduce the number of people (dwellings) exposed to levels of noise potentially damaging to health, progress should be demonstrated – and communicated to the public - by means of noise maps. The target should be visible improvement on the 2012 maps, and substantial reduction of exposure to potentially harmful levels of noise by 2017 at the latest.

In accordance with the Treaty, action should be based on the precautionary, preventive and polluter-pays principles, and the problem should be primarily addressed directly at the source to maximise cost-effectiveness.

### **Priorities for the Railway Noise Communication**

- The Commission should lay down a framework allowing for differentiation of track access charges based on rolling stock noise emissions.
- The charging framework must give incentives to wagon owners and operators to reduce noise emissions below the current limit values outlined in the Noise TSI, for all freight and passenger rolling stock.
- The Commission should outline a long-term plan to reach sustainable and healthy noise levels near rail tracks corresponding to the WHO guidelines.
- The Communication must outline incentives for wagon owners, operators and infrastructure managers to address both the noise emissions of rolling stock, and the tracks themselves.
- A European classification / recognition scheme should be introduced for all rolling stock including relevant environmental criteria, such as noise emissions.
- The Commission should draw up guidelines for Member States regarding designation of noise sensitive areas (densely populated, residential) where further differentiation of track charges must be permitted.
- Complementary regulatory measures, including noise emissions limits for rolling stock and rail tracks, should also be proposed.

## Background

European Union policy supports the increase of transport volumes on the railways on environmental grounds. However, to ensure the sustainability and public acceptability of this policy, noise emissions from locomotives, rolling stock and tracks must be minimised, so as to protect health and reduce annoyance.

Action must be taken to reduce the environmental impact of all modes of transport, including the negative effects of traffic noise on human health and wellbeing and on ecosystems. T&E supports the view that action is required at European level to achieve the objective to “substantially reduce the number of people regularly affected by long-term average levels of noise, particularly from traffic” as outlined in the Sixth Environmental Action Programme.

Noise is recognised as a serious threat to public health by the World Health Organisation.<sup>1</sup> Noise is also one of the most widespread health threats due to the variety of sources, of which traffic is the most prevalent. Noise has been identified in Dutch and Flemish studies as the second most important environmental cause of loss of healthy years of life.<sup>2</sup> The central objective of noise policy must therefore be to minimize the negative impacts of traffic noise on public health.

The WHO recommends maximum average long-term outdoor levels of 55dB(A) during the daytime and 45dB(A) at night to meet this objective.<sup>3</sup> In contrast, freight wagons emit up to 98dB(A), measured at a distance of 7.5m; or 75dB(A) at a distance of 25m.

In Germany alone, 16 million people feel negatively affected by railway noise, which constitutes about 20% of the population (compared to 50 million people, or 60% of the population affected by road noise).<sup>4</sup> Beyond just being an annoyance, the negative consequences of long-term noise exposure include sleep disturbance, increased stress, elevated blood pressure, and cardio-vascular disease and can potentially be fatal.<sup>5</sup>

Freight transport is the primary cause of railway noise, particularly due to the prolonged lifespan of freight rolling stock and the carriage of goods during the night.

The principle source of railway noise is rolling noise arising from the contact between the wheels and the tracks. Rolling noise is the dominant source at speeds between 60km/h and 200-250km/h. Rough wheels and rough tracks increase the noise emission. The cast iron brake blocks commonly used on freight wagons increase the

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<sup>1</sup><http://www.euro.who.int/Noise>

<sup>2</sup> RIVM (2005) (Dutch Institute for Environment and Health) as quoted by European Commission, Working Group Health and Socio-Economic Aspects of Noise (Van den Berg, M. et al) Working Paper on the Effectiveness of Noise Measures, p.7, July; Milieurapport Vlaanderen (MIRA) (2005), State of the Environment Report 2005, Flemish Environment Agency (VMM)

<sup>3</sup>World Health Organisation (2000), Berglund, B., Lindvall, T. and Schwela, D. H. (eds.) Guidelines for Community Noise, p.47, WHO, Geneva

<sup>4</sup>SRU (2005): Umwelt und Straßenverkehr. Hohe Mobilität - Umweltgerechter Verkehr. Sondergutachten, July, p.46.

<sup>5</sup>Babisch, W. (2006) “Transportation noise and cardiovascular risk, Review and synthesis of epidemiological studies, Dose-effect curve and risk estimation” WaBuLu-Hefte01/06, Umweltbundesamt, Berlin; Danish Environmental Protection Agency, quoted at <http://www.vejdirektoratet.dk/publikationer/VInot037/html/chapter07.htm>

roughness of the wheels, due to metal-on-metal contact. Brake blocks made of composite materials reduce wheel roughness and therefore noise emission.

There is a general consensus, supported by the findings for the Working Group on railway noise, that priority must be given to measures at the source (rolling stock and tracks), as these are considerably more cost-effective than remediation measures, such as noise barriers or insulation. The effectiveness of retrofitting measures to produce smoother wheels is further multiplied by measures to maintain smooth tracks. It is therefore desirable to reallocate some of the funding for remediation measures to source measures, as well as providing a further financial incentive via track access charges.

e.g. The Dutch infrastructure manager ProRail has calculated that the retrofitting of rolling stock with quiet brake blocks will result in cost savings in the order of €500million to €1 billion in the Netherlands alone. This saving will arise in large part from the reduced need for noise walls and insulation of neighbouring buildings.

e.g. Low-noise brakes are already fitted to large proportions of the freight fleet in some Member States. In the UK around 80% of the fleet is fitted with composite blocks, as they are found to be more cost-effective than standard brake blocks – even without taking costs savings for noise remediation measures into account.

#### **Quiet brake blocks:**

##### *K-blocks*

*Composite brake blocks: certified since October 2003.*

*Noise reduction potential of up to 10 db(A), perceived on polished tracks as halving the noise level.*

*No increased costs for new wagons, reduced maintenance costs compared to cast iron blocks (Ref: ApS Umweltvergleich).*

*Retrofitting costs up to €10,000 due to adaptation to braking system required.*

*Noise reduction can only be perceived when the K-blocks are fitted to at least 80-85% of all wagons in a train, i.e. the loudest wagons determine the overall noise level*

##### *LL-blocks*

*2-3dB(A) louder than K-blocks.*

*Provisional certification from UIC. Not yet formally type-approved, currently undergoing testing (notably in the Netherlands).*

*No adaptation to current braking system required for retrofitting.*

##### *Disk brakes*

*More expensive to produce than K-blocks, but lower maintenance costs.*

*Already in use for passenger wagons.*

Source: VCD (2007), *Faktenblatt Schienenlärm* (internal document)

Other sources of railway noise include: propulsion and mechanical noise from the engine and fans, aerodynamic noise (particularly at very high speeds), 'screeching' on corners, track vibration / resonance, shunting and loading noise at stations and depots, signal noise, and train horns.

The technical specification for interoperability (TSI) for rolling stock noise of the trans-European railway system applies to new and modernised vehicles, and stipulates noise emission test procedures (prEN ISO 3095:2001) and limit values<sup>6</sup>: for pass-by noise limit for rolling stock (depending on the average number of axles per unit length). New freight wagons must be equipped with low-noise K-blocks, which reduces noise by about 50%.

The TSI also recognises the need to take measures to address the existing rolling stock, with a priority for freight wagons “to foster a noticeable reduction of the perceived noise level within a reasonable time period.” The Noise TSI will need to be reviewed, and limit values tightened, in future – once composite brake blocks become increasingly the standard equipment on rolling stock.

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<sup>6</sup> Commission decision 2006/66/EC of 23 December 2005 concerning the technical specification for interoperability relating to the subsystem “rolling stock – noise” of the trans-European conventional rail system : OJ L 37, 08.02.2006, P.1.

## Consultation responses

Please find below more detailed answers to selected questions posed in the consultation.

### **Q1.) Should the number of vehicles retrofitted or the percentage of wagon-km run by low-noise wagons be used as an indicator?**

The primary indicator to judge measures should be the number of people exposed to long-term average noise levels recognised as potentially dangerous to health. Average long-term noise exposure levels should be measured and illustrated according to noise mapping guidelines in relation to the Environmental Noise Directive 2002/49/EC.

In order to judge the performance of measures to encourage the retrofitting of the existing fleet, the percentage of wagon-km run by low-noise wagons is the most appropriate indicator.

The number of vehicles retrofitted is not appropriate, due to the fact that a relatively small number of wagons carry out a large proportion of wagon-km, and clearly need to be prioritized. For the substantial number of older wagons which cover fewer wagon-km, it may be preferable to allow them to be phased out of service in due course without retrofitting. The level at which differentiation of track access charges is set will determine the economic viability of retrofitting versus paying extra charges to run relatively few wagon-km with noisier brakes.

In the case of the Swiss retrofitting programme (K-blocks), it is notable that the number of wagons to be retrofitted was initially overestimated, by almost double the number which eventually required the new brake blocks. The Swiss administration clearly forecasts that with the replacement cycle for non-retrofitted older wagons, that the maximum noise emission level for each line, will nevertheless be achievable by 2015.

Noise maps of major rail infrastructure links are required by Directive 2002/49/EC on environmental noise. The first maps are to be submitted in 2007 and reviewed every five years. The target should be visible improvement on the 2012 maps, and substantial reduction of exposure to potentially harmful levels of noise by 2017 at the latest. The first maps will illustrate the noise hot spots in residential areas, where further differentiation of charges should be permitted.

### **Q2.) What's a realistic and desirable deadline for completing the retrofitting exercise?**

For comparison, the Swiss retrofitting programme began in 2005, and should be completed by 2010 – including 11 500 wagons. It is therefore reasonable to expect an improvement to show in the noise maps due for submission to the Commission in 2012, and a substantial reduction in the number of people exposed to potentially dangerous long-term average noise levels before the subsequent round of maps in 2017.

### **Q3-4.) What should be the minimum remaining lifetime of freight wagons to be retrofitted? What should be the minimum annual mileage for freight wagons to be retrofitted?**

Market-based instruments are preferable as setting appropriate prices, in line with the objective to reduce noise exposure of neighbours/residents, would determine the optimal number of wagons, wagon/km, minimum mileage, and maximum rolling stock

age for retrofitting, in relation to total costs and benefits. Market-based instruments will also reward speedy retrofitting actions. Nevertheless, of the options proposed, T&E supports 90% of wagon/km as an operating objective for retrofitting programmes.

**Q7.) What components should a voluntary option for the rail sector include?**

Voluntary agreements alone have all too often proven to be ineffective at achieving environmental objectives, primarily because of the ‘free riders’ problem. Any voluntary agreements to tackle rail noise in the absence of financial incentives would certainly not provide the required improvements within the desired timeframe. Any voluntary initiatives should only be applied over and above regulation regarding noise emission limit values for rolling stock and tracks and financial incentives to speed up retrofitting of the existing fleet.

**Q8.) What are the preferred instruments to provide financial incentives? Should these instruments be used at national or European level?**

Outlining a framework for differentiation of current track access charges on the basis of noise emissions of rolling stock must be the key priority in the Commission Communication. The framework must apply to all railways in the European Union. Such a financial instrument offers the most equitable solution and the preferred incentive to ensure a long-term commitment to continuously reducing noise levels. The framework must include flexibility for further differentiation (stricter standards) in the medium- and long-term.

The framework should outline the basis for legislation on track access charges. In areas where recommended WHO noise levels are exceeded, infrastructure managers should be obliged to set access charges on the basis of the following components:

1. weight, length and number of axles
2. noise production, including locomotive and wagons, based on equipment (brake type), age of rolling stock, maintenance schedule, maximum speed: for this component, a noise emission certification scheme should be implemented
3. noise sensitivity of the track (residential population density within certain distance)
4. Inclusion of air emissions for diesel locomotives is certainly commendable in order to speed up renewal of the fleet of diesel locomotives

Charges must be sufficiently differentiated to give a credible financial incentive for retrofitting of rolling stock. T&E believes that such financial incentives offer the best possibility to achieve tangible reduction in noise levels within the shortest timeframe. There must also be scope for differentiation of access charges based on the noise sensitivity of track sections, and in particular higher charges for track sections in densely populated residential areas. Such an incentive (bonus-malus system) will ensure prioritization of the retrofitting programme beginning with those wagons with the highest mileage, and those running in sensitive areas.

It should be left to Member States whether the systems should be revenue neutral or not, and whether the charge differentiations should be combined with subsidies. Obviously the Commission should carefully scrutinise subsidy schemes in order to avoid market distortions.

In order to avoid ineffectual ‘token’ charge differentiations, the framework should define minimum levels of charge differentiation. These could be expressed as a

minimum percentage of current charges. The minimum differentiation levels should vary by time of the day. They could possibly vary as a function of the severity of the problem.

In order to provide an incentive for further continuous improvement, there should be at least three noise classes for rolling stock; a baseline level, a level complying with the TSI limit values, and a significantly quieter level.

Differentiated charges represent a step towards internalisation of the external costs of transport, following the user pays / polluter pays principles enshrined in the Treaties and offers a possibility to break the link between increasing transport volumes and their negative environmental impacts, as required by the Common Transport Policy (2001). This corresponds to the current work to produce a model for the internalisation of all external costs of transport. T&E also campaigns for the external costs of noise (as well as all other environmental costs) to be included in the pricing framework for other modes of transport (including the Eurovignette directive, 2006/38/EC).

Noise-based pricing would ensure that retrofitting of quieter braking systems would become financially attractive (and use of noisy rolling stock penalised). This would lead to prioritisation firstly of those wagons with the highest mileage, particularly those using track sections in noise sensitive areas, where differentiation between the loudest and quietest rolling stock should be highest. The limited financial resources for retrofitting will therefore be used in the most efficient way, guaranteeing prioritised reduction of noise levels where its external costs are highest.

The framework for differentiated track access charging must include a provision for greater differentiation in the most noise sensitive areas. For example, densely populated corridors (such as the Rhine valley) must be able to have the highest differentiation between bonus for quiet wagons and penalty for loud wagons. The Commission should offer guidelines for Member State on how to categorise areas, classified by land use, for this purpose.

A further differentiation must also be permitted for time of day – with higher differentiation for early morning, evening and the highest during the night (as outlined in 2002/49/EC). Such a provision is required on the basis that noise which disturbs sleep and rest periods is considerably more dangerous to health, and provokes greater annoyance than daytime noise.

A tradable permit system is neither a suitable nor a feasible solution, due to the fact that the value of noise (per dB) varies depending on the location of the track (proximity to residential areas, hospitals, schools, etc.) and time of day or night. It would be impractical to attempt to define an appropriate price for noise permits for each track section or route. (Emissions trading systems are appropriate where 1 unit has the same cost regardless of where or when it is emitted, e.g. CO<sub>2</sub>)

**Q9.) Are legal instruments desirable? What are the preferred instruments? Is there a need for harmonisation at European level?**

**Noise emission limits are needed for existing rolling stock.** Whilst the TSI noise for new and upgraded rolling stock is a step in the right direction it will take decades before any improvement is tangible. TSI noise limits must therefore also be set for the existing fleet.

**Daytime and night time noise emission ceilings** should be recommended, in line with noise exposure levels deemed dangerous to health by the WHO, and particularly to address noise hot spots. Under Directive 2002/49/EC, Member States are legally competent to set such limits to environmental noise. Ceilings should apply to the total emission from wheel-rail contact, and efforts made on the track and wagon sides to comply. As the fleet and tracks become quieter, ceilings should also be decreased. The noise emission ceiling leaves it to the rail sector to find optimal solutions: the railway undertaking may use vehicles with lower emissions to increase the number and/or speed of trains without exceeding the noise limits.

**Q10.) Is there a need for additional measures and action in the short term?**

As well as tackling noise emissions of rolling stock, the contribution of the tracks/rails to rolling noise emission must also be addressed. **Incentives, or obligations for infrastructure managers, need to be introduced to ensure polishing of rails and fitting of rail dampers.** These noise reduction measures are complementary to retrofitting of quiet brake blocks and further enhance the cost-effectiveness. The total noise reduction potential of track polishing and quiet brakes is up to 15dB(A)<sup>7</sup>. In addition, the contribution of rail dampers is approximately 3dB(A). Recommendations should be made in the Communication on how to monitor the noise quality of tracks.

**Certification of LL-blocks** should be seen as a priority. The European Commission should assist operating companies and testing authorities wherever possible. A thorough **analysis of total lifecycle costs of K- and LL-blocks** would also provide a much needed contribution to this debate.

Finally, more **research** is necessary: The European Commission should continue to provide financial assistance for further research and pilot schemes for quiet freight transport. Importantly, the Commission, notably the Directorate-General for Health and the Joint Research Centre should increase cooperation with the World Health Organisation on researching the health impacts of traffic noise, with a view to improving knowledge on the total external costs of traffic noise.

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<sup>7</sup>UBA-Text 61-03 "Geräuschemissionen von Eisenbahnen"

## Conclusion

Failure to effectively reduce noise levels along railway lines will result in other European Union transport policy objectives being directly undermined. Environmental regulations regarding noise levels at national and European levels may result in capacity constraints for rail links, at a time when the Union is pursuing a policy of co-modality and promotion of environmentally favourable modes of transport, supported by considerable sums from various EU budget lines.

## For further information

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