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Rail noise abatement measures addressing the existing fleet

Summary of the Impact Assessment report

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1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

The Communication on rail noise abatement measures addressing the existing fleet was part of the European Commission's 2007 work programme.

The impact assessment report has been drafted by the Directorate-General for Energy and Transport, unit for rail transport and interoperability. The impact assessment process was steered by an Inter-Service Steering Group; it was also supported by an external study[1].

In the course of the preparation of this initiative, the Commission presented several policy options in its Consultation Paper[2] issued in May 2007. Interested parties were requested to give their opinions on the solutions presented. For this purpose, an online questionnaire was made available in summer 2007. The Commission departments also convened interested parties on 23 May 2007 to obtain feedback. The results of these consultation activities served as input for the impact assessment (results are described in the consultation report[3]).

The Commission's Impact Assessment Board issued its opinion on 22 February 2008 with four main recommendations for improvement or clarification. They were considered in the final version of the impact assessment report.

2. PROBLEM DEFINITION

Noise is one of the most widespread public health threats in industrialised countries. The abatement of noise is therefore necessary not only for comfort but also to lessen its adverse effects on health, for example cardiovascular problems and cognitive impairment.

Rail is generally considered one of the most environmentally friendly transport modes. However, the contribution of rail transport to noise pollution (with freight trains as the largest source) is considerable, with about 10% of the population exposed to significant noise levels[4].

The European Community has already acted on this issue, adopting measures in the environmental (Environmental Noise Directive 2002/49/EC[5] providing for noise maps and action plans) and rail interoperability fields (TSI Noise[6], introducing noise limit values for new and renewed vehicles). However, given the long lifetime of rolling stock, it will take

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1 PriceWaterhouseCoopersAdvisory: Impact Assessment study on rail noise abatement measures addressing the existing fleet. Final report December 2007. http://ec.europa.eu/transport/rail/studies/index_en.htm.

2 Consultation document of the Commission's services: Rail noise abatement measures addressing the existing fleet. May 2007. http://ec.europa.eu/transport/rail/consultation/2007_rail_noise/doc/rail_noise_consultation_document_en.pdf.

3 Public consultation on "Rail noise abatement measures addressing the existing fleet" — Summary of the contributions received. http://ec.europa.eu/transport/rail/consultation/2007_rail_noise/doc/rail_noise_consultation_summary_071017.pdf.

4 European Environment Agency: TERM 2001. Indicators tracking transport and environment integration in the European Union.

5 Directive 2002/49/EC of 25 June 2002, OJ L 189, 18.7.2002, p. 12.

6 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, 8.2.2006, p. 1.

several years before overall noise emissions can be reduced significantly if no additional measures addressing the existing fleet are introduced.

Today, about 50% of rail freight transport is international with a large number of wagons running across national networks. Action at European level is therefore required.

3. OBJECTIVES

The aim of the Community action is to reduce the exposure of citizens to rail noise by promoting the establishment of rail noise abatement programmes to curb noise emissions of freight trains without jeopardising the competitiveness of rail freight mainly by retrofitting freight wagons with low-noise braking technology (composite brake blocks such as so-called K- and LL-blocks[7]) as the most cost-effective measure.

The retrofitting exercise should in principle include all European freight wagons with an annual mileage of more than 10 000 km and an expected remaining lifetime of at least five years, so as to limit costs without jeopardising the noise reduction objective. Priority should be given to wagons with a high yearly mileage. The target date for completing the retrofitting exercise would be 2015.

4. POLICY OPTIONS

Possible policy options and instruments are listed in Table 1.

[7] Composite brake blocks have been developed to replace conventional cast-iron blocks as the main source of noise. They are very effective in noise abatement (reduction of up to 10 dB, equivalent to 50%). K-blocks have been available since 2003. As they have different braking characteristics to conventional blocks, retrofitting requires adjustments in the braking system, leading to additional initial costs of up to €10 000. LL-blocks are composite brake blocks with the same braking characteristics as cast iron. Therefore, no major adaptation of the braking system is required and initial retrofitting costs are significantly lower. However, they are not yet fully available.

Table 1: List of policy options and instruments

Policy option	**Instrument**
A: Status quo (as baseline scenario)	
B: Voluntary commitment by the rail sector	
C: Financial incentives for retrofitting	
	C1: Differentiated track access charges
	C2: Subsidies for the use of low-noise wagons
	C3: Subsidies for retrofitting
	C4: Loans on preferential terms
	C5: Tax incentives
D: Legal measures to impose retrofitting	
	D1: Noise limit values for the existing fleet
	D2: Operating restrictions for noisy freight wagons
	D3: Noise emission ceiling
	D4: Tradable permit system

Screening of the instruments identified policy options B (voluntary commitment), C1 (differentiated track access charges), C3 (subsidies for retrofitting), D2 (operating restrictions for noisy freight wagons) and D3 (noise emission ceiling) as most suitable to meet the objectives.

As combined measures are regarded as more effective than single policy options, the detailed impact assessment focussed on the following two combinations:

(1) "SOV": **S**ubsidies for retrofitting, **O**perating restrictions and **V**oluntary commitment;

(2) "DEV": **D**ifferentiated track access charges, **E**mission ceiling and **V**oluntary commitment.

5. ANALYSIS OF IMPACTS

5.1. Basic assumptions for the impact assessment

This impact assessment is based on the following assumptions:

- The geographic scope is limited to EU Member States with a 1435 mm standard gauge system. Within these interoperable networks action is needed at EU level as national measures are of limited effectiveness.

- As LL-blocks are currently not fully available on the market two scenarios are considered: 1. LL-Blocks will never be available and retrofitting is fully based on K-blocks;

2. LL-blocks will be available on a large scale as from January 2011 (before this date, K-blocks will be used).

- A significant number of wagons were built between 1979 and 1984. As this is likely to have a strong impact on the costs and benefits of retrofitting, two scenarios are applied to the policy options:
  1. Limit birthdate 1979: all wagons built after 1979 are retrofitted;
  2. Limit birthdate 1984: all wagons built after 1984 are retrofitted.

- The duration of the retrofitting programme with the K-block solution is seven years (use of periodic maintenance intervals); whereas for LL-blocks the selected duration of the retrofitting period is three years.

For the different policy options and scenarios key characteristics of the retrofitting programmes have been elaborated:

Table 2: Characteristics of retrofitting programmes for different policy options

	Scenario	Starting date for retro-fitting	Retro-fitting time frame	Average yearly retrofitting rate	Time for 100% of silent wagons (end year)	Wagons to be retro-fitted
	Baseline	-	-	0	2030	0
K SCENARIO	**SOV (1979)**	1-2010	7 years	45 700 w/y	2016	320 000
	SOV (1984)	1-2010	7 years	27 400 w/y	2021	191 000
	DEV (1979)	1-2012	7 years	38 600 w/y	2018	270 000
	DEV (1984)	1-2012	7 years	27 100 w/y	2021	190 000
K+LL SCENARIO	**SOV (1979)**	1-2010	4 years	99 500 w/y	2013	397 400
	SOV (1984)	1-2010	4 years	50 000 w/y	2021	191 000
	DEV (1979)	1-2012	3 years	124 000 w/y	2014	372 000
	DEV (1984)	1-2012	3 years	64 000 w/y	2021	191 000

5.2. Identification of impacts and comparison of policy options

Both policy options DEV and SOV could be effective in achieving the objective of noise reduction at the earliest by 2013 for SOV and by 2014 for DEV (both in the case of LL-block retrofitting).

Tables 3 compiles the costs of retrofitting programmes, added maintenance and administrative costs as well as total noise reduction benefits expressed in monetary terms and referred to the period 2010-2024.

Table 3: Overview of monetised impacts of the policy options and scenarios

Impact	Limit birthdate	K (2009–2024)		K+LL (2009–2024)	
		SOV	DEV	SOV	DEV
Investment cost for retrofitting programme	1979	€1 847m	€1 441m	€728m	€416m
	1984	€1 102m	€1 018m	€488m	€214m
Added maintenance costs	1979	€317m	€238m	€406m	€347m
	1984	€226m	€193m	€268m	€248m
Added administrative costs for new tasks	1979	€85m	€93m	€85m	€93m
	1984				
TOTAL ADDED COST	1979	€2 249m	€1 772m	€1 219m	€856m
	1984	€1 413m	€1 304m	€841m	€555m
Added BENEFIT for affected population	1979	€7 071m	€5 762m	€9 460m	€8 428m
	1984	€4 133m	€4 385m	€4 450m	€5 208m
TOTAL NET VALUE	1979	€4 822m	€3 990m	€8 241m	€7 572m
	1984	€2 720m	€3 081m	€3 609m	€4 653m

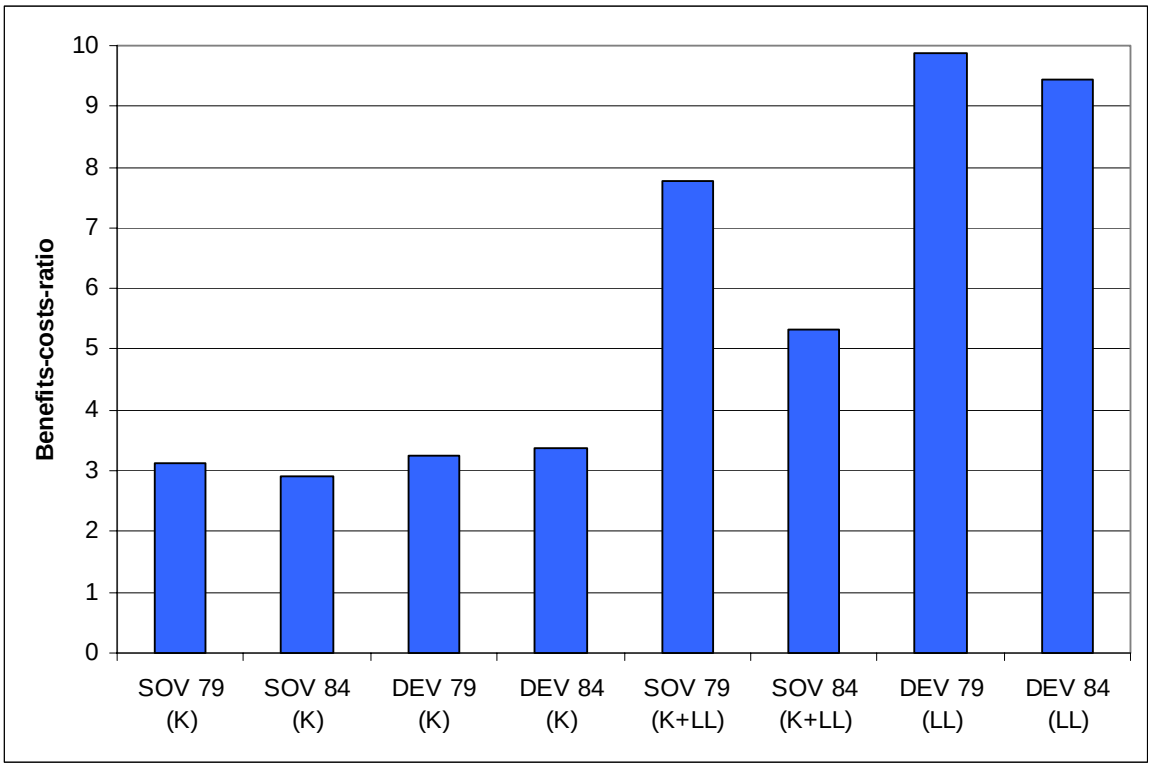

Figure 1: Benefits/costs ratios for the policy options and scenarios

The results of the cost-benefit calculation show considerable net benefits for all scenarios. It also needs to be underlined that some major benefits of retrofitting could not be quantified and monetised, such as the savings due to reduced infrastructure-related noise abatement programmes, reduced maintenance costs for the rail infrastructure and efficiency gains in fleet management. These benefits have the potential to be of the same order of magnitude as the costs of retrofitting. It can be concluded that retrofitting freight wagons with low-noise brake blocks can be an important measure to reduce the negative environmental impacts of railways and that the need for EU action in this field is confirmed.

For all policy options and scenarios assessed, significant additional costs of retrofitting can be expected in the range of 550 million to 2.25 billion euros. Analysis of the cost structure leads to the following conclusions:

- For all scenarios the investment in retrofitting is the most important cost; added maintenance costs amount to 13-16% of the total (K-blocks) and 32-45% of the total (LL-blocks); administrative costs amount to 4-7% of the total (K-blocks) and 7-16% of the total (LL-blocks).

- Added maintenance costs constitute a significant portion of the total when retrofitting is considered to be done with K- and LL-blocks.

- Added administrative costs do not appear to be decisive although they refer to essential components of the retrofitting programme.

In addition, the assessment analysed which party bears the costs and who benefits from revenues or savings. For both policy options wagon owners have to bear the costs directly related to retrofitting (investment and additional maintenance). However, at least part of the costs would be reimbursed in SOV and DEV (only in the case of a bonus system). With a cost-neutral bonus-malus system for DEV, this would not be the case. The study demonstrated that this would lead to a significant increase in transport costs resulting in a modal shift from rail to road of the order of magnitude of 0.4% of total rail freight demand.

Therefore, Member States might provide financial incentives to railway undertakings/wagon owners in the start-up of the retrofitting programmes either directly as subsidies or indirectly via the compensation paid to infrastructure managers for the noise bonus. However, it is very likely that savings in infrastructure-related noise abatement costs (e.g. for noise barriers) will at least outweigh these costs for Member States. Overall, retrofitting and providing financial support could be cost-neutral for all parties involved as significant savings are possible.

Comparison of the K-blocks and K+LL-blocks scenarios produces clear results:

- The retrofitting costs with K-blocks are significantly higher than with LL-blocks (by 750 million to 1 billion euros according to the scenario).

- The gross benefits of LL-block retrofitting due to noise reduction are higher than those of the related K-block scenario. Even if K-block retrofitting can start earlier, in the LL-block scenarios retrofitting programmes are completed earlier as the retrofitting rates with LL-blocks are much higher (brake systems do not need to be modified, no problems with restricted workshop capacities).

- Therefore, the K+LL scenarios always lead to significantly higher net benefits than the related K-block scenario and the use of K-blocks for retrofitting cannot be recommended. Earlier availability of LL-blocks would create significant additional benefit.

Based on both the quantitative and qualitative impacts, comparison of the policy options leads to the following conclusions:

- The "business as usual" option cannot compete with the other two options as these have positive benefits/costs ratios and several additional positive impacts.

- The DEV option has better benefits/costs ratios than SOV (for the K+LL-scenarios 9.9 compared to 7.8 (1979 birthdate) or 9.4 to 5.3 (1984 birthdate). This is confirmed by the qualitative assessment where DEV shows better or equal results for all impacts considered.

- However, it has been shown that the necessary incentivation margin for the DEV option to provide sufficient incentives to wagon owners for retrofitting will probably have to be higher than for the SOV option. It is therefore very important to limit the aggregated bonus for a silent wagon to the retrofitting costs.

Concerning the intended exclusion of older wagons from retrofitting, the choice of a limit birthdate of 1984 would obviously lead to less costs than the choice of 1979 given the lower number of wagons to be retrofitted; however, in all scenarios it can be seen that a reduction in net benefit ensues; it thus can be concluded that to retrofit wagons built between 1979 and 1984 leads to higher benefits than costs.

As the overall result of this impact assessment, policy option DEV consisting of differentiated track access charges with a noise bonus for silent wagons, noise emission ceilings and voluntary commitments has been identified as the most appropriate solution to achieve the objectives of rail noise reduction while maintaining the competitiveness of rail freight. The main advantages of this option are the highest benefits in terms of noise reduction/reduction of number of citizens affected by rail noise (with a benefits/costs ratio of up to 10), lower costs than for the competing SOV option, the direct link with the objectives of this initiative (to reduce noise by using silent wagons) and the wide application to wagons registered in different Member States or even outside the EU.

As this policy option also has two disadvantages, solutions need to be elaborated for passing the noise bonuses to the wagon owners bearing the costs of retrofitting (if these are not the same entity as the railway undertaking getting the bonus) and concerning intermediate measures as the implementation of differentiated track access charges requires some time. In this context voluntary commitments could play an important role.

The harmonisation of differentiated track access charges at European level is a crucial factor for the effectiveness of this instrument as solely national solutions would not provide the necessary financial incentives for retrofitting and could lead to unacceptably high administrative costs.

High priority needs to be given to the further development and homologation of LL-blocks as the most economically viable technology for retrofitting. By implementing policy option DEV providing incentives to further reduce costs of retrofitting and following the positive examples of the United Kingdom and Portugal in cost-neutral retrofitting, it should be possible to keep the additional costs of retrofitting to a minimum.

6. MONITORING AND EVALUATION

With regard to the objectives of the Communication the following indicators seem suitable for measuring progress and related costs:

(1) Total number and share of vehicles retrofitted per country

(2) Total silent fleet per country

(3) Number and share of axle-km run by low-noise wagons

(4) Costs of retrofitting per country

(5) Annual noise bonuses granted per infrastructure manager

(6) Average annual maintenance cost per wagon (per country and per wagon-km)

(7) Total average noise reduction (dB)

(8) Noise reduction for affected population

(9) Noise reduction at particular “hot spots”.