WORKING PAPER ON THE EFFECTIVENESS OF NOISE MEASURES

-July-2005-

Working Group Health & Socio-Economic Aspects

Disclaimer

This working paper was prepared by a working group of noise experts set up by the European Commission in order to provide guidance on cost-effectiveness of noise reduction measures. The European Commission and the Dutch Ministry of the Environment made a financial contribution towards its achievement, on the basis of terms of reference of the working group.

The positions expressed into this paper should not be considered as official statements of the position of the European Commission or the government of the Netherlands.

Due to lack of time and sufficient resources the working group was unable to address all aspects of the assignment and is thus incomplete.

Members of the Working Group

Name		Organisation	Country
Van den Berg *Chairman*	Martin	Ministerie van VROM DGM	Netherlands
Worsley *Cochairman*	Tom	DfT (Department for Transport)	UK
Paikkala	Sirkka-Liisa	Ministry of the Environment	Finland
Kihlman	Tor	Chalmers University of Technology Department of Applied Acoustics	Sweden
Palma	Jose M.	QUERCUS Faculdade de Psicologia Universidade de Lisboa	Portugal
Ohm	Anne	COWI A/S Department of Environmental Economics	Denmark
Paque *Observer*	Gilles	European Commission DG ENV.C.1	EU
Lambert	Jacques	INRETS, Laboratory for Transport and Environment.	France
Berglund	Birgitta	University of Stockholm Department of Psychology Gösta Ekman Laboratory	Sweden
Guski	Rainer	Ruhr-Universität Bochum Fakultät für Psychologie	Germany
Licitra	Gaetano	ARPAT Dipartimento provinciale di Pisa	Italy
Mather	Matthias	Bahn Umwelt Zentrum. Leiter Umweltmanagement	Germany
Volkmar	Henning	Volkswagen AG/Konzern-Forschung Forschungsfeld Umwelt und Verkehr	Germany

1 Introduction

The terms of reference of WG-HSEA from December 2001 ask to prepare the outline for a study....

> *..relating to the evaluation of the effectiveness of different noise mitigation measures, and the interaction between measures taken to tackle noise at the source and measures taken at the local level, so as to help the Commission and Member States to prioritise solutions*

The outline document was delivered as required in June 2002 and in the beginning of 2003 the study was let to Lärmkontor of Hamburg. The study was carried out largely in agreement with the design laid down by the WG, and delivered in the August 2004. During the study there were frequent contacts between the contractor and the WG, as to ensure an optimal result.

The study - to be referred to as Effnoise and to be described in more detail later on- is the basis for this Position Paper as it gives detailed information on the effectiveness of measures and their interaction. In the light of the strong interactions between measures at Community level and measures at the local level shown by the study, the WG looked at additional information in order to advise the Commission, the Member States and the local Authorities properly on how to *"prioritise solutions"*.
In the first part of this Paper therefore some attention is given to the latest data with respect to the impact of noise on EU-level, the second to the discussion of the outcomes of the Effectiveness study and the third to the synthesis.

2 Health effects of environmental noise

Noise is an environmental stressor. It can interfere with daily activities in school or work, in people's homes and also during their leisure time. Considerable part of the population exposed to noise will experience all kinds of biological effects: from perception to an - taken by itself- innocuous rise in heart rate or vasoconstriction. A number will experience also higher order effects: annoyance, sleep disturbance, rise in blood pressure. In a smaller number of people these effects may under unfavourable conditions (other stressors, personal characteristics) develop into clinical effects. This makes also clear why it has been so difficult to demonstrate the direct relationship between clinical health effects and noise exposure. Clinical health effects are determined by a great number of factors, and noise is only one of them, and usually a relatively modest one (however an association between noise and hypertension is statistically relevant).

The strongest effects of noise are outcomes that, like annoyance, can be classified under 'quality of life' rather than illness; however what they lack in severity is made up for in numbers of people affected, as these responses are very common among people exposed. If even a small reduction of noise is achieved, general well being is improved, and one may expect a beneficial effect of higher order health effects. For example, sufficient evidence exists, for children, that adverse effects in children learning and cognitive development exposed to high levels of noise can be reversed if noise is considerably reduced (Munich airport study).

3 Impact on the European population

The picture that emerges from recent studies is rather worrying. Not only it has been confirmed that large proportions of the population suffer, but this number has not decreased.

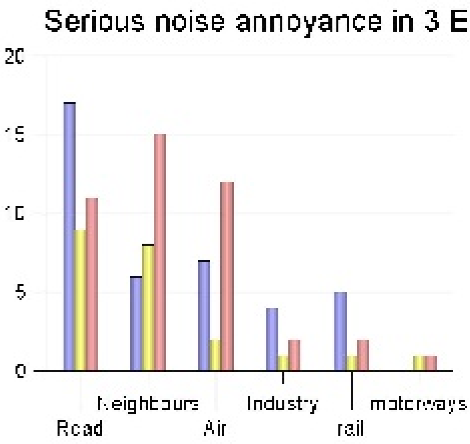

Figure 1. *Percentage of population highly annoyed by noise in Germany[12], UK[13] and the Netherlands[14].*

The impressive efforts some national authorities put in reducing noise pollution (see text box) succeed only to stabilize the situation over the past 25 years as repeated surveys in some countries show[12, 13,14]. Although a reliable EU-overview is still missing, the data of smaller and larger countries all point in the same direction: around a quarter of the population find their daily lives impaired because of noise exposure at home, at work and in schools (figure 1). Over 20% of the population report severe sleep disturbance because of noise during night time[13, 14]. Calculations by the Dutch Institute for Environment and Health (figure 2) indicate that noise is one of the larger environmental contribution to loss of healthy life years nowadays, second only after particulate matter in air.

> ***Expenditures on noise***
> ***France***
> *Total as provided by national statistics: 881 million €; (50% of this by industry)*
> *National improvement program: 50 M€ /year*
> ***Netherlands:***
> *Total as provided by national statistics: 341 M €*
> *Improvement program 43 M /year*
> ***Germany:***
> *improvement program road and rail traffic: 50M€/year each.*
> ***Switzerland***
> *Road improvement program 1.472 M€*
> *(total amount, end ~2018)*
> *Railways 1.789 M€ (includes source measures)*
> ***Austria (2000):***
> *Active measures national roads: 11.4 M€*
> *Passive measures: 2.8 M€*
> ***Italy***
> *Railway noise Improvement program region Tuscany: 70 M€ /Year. Total for Italy is estimated at 5 billion € over 15 year. 9 million € is marked for improvement of schools.*

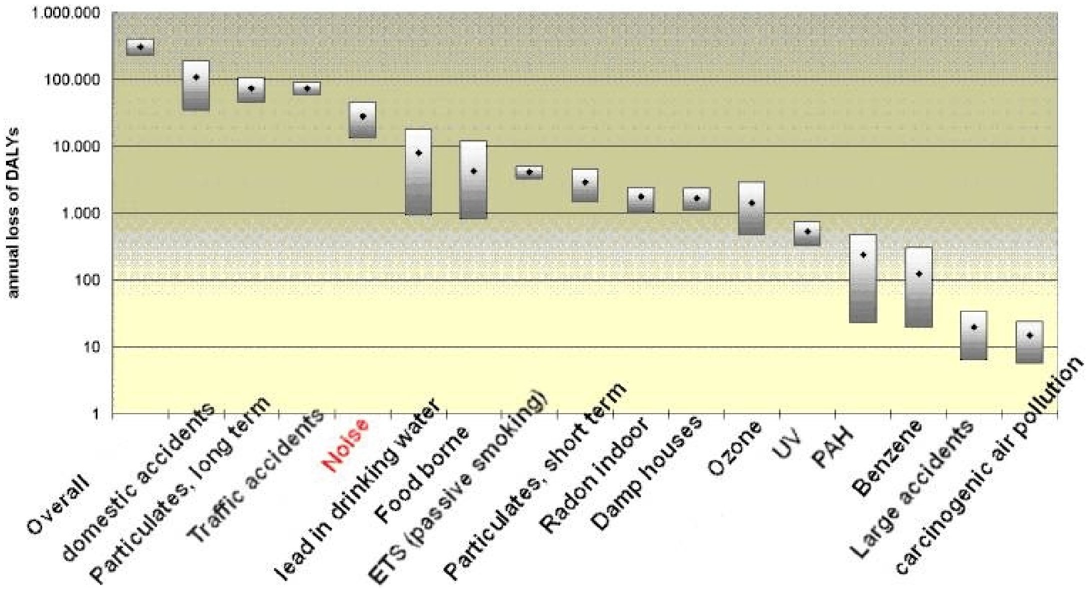

Figure 2. *Loss in healthy life years for environmental factors according to RIVM, Netherlands, 2002*

The ranking in this type of studies is dependent of the exposure to the various environmental factors but also on the weight-factor attributed to the health end points. In the Netherlands very high levels of population density and activities lead to high levels of air and noise pollution, but that may be different in other countries. Other societies may attribute more or less importance to health outcomes, and that can influence the overall picture dramatically. In [8] an in depth discussion of methods and choices may be found.

What is the DALY-method?
DALY is the well sounding abbreviation of Disability Adjusted Life Year. Originally coined by Murray working for WHO, it is now an accepted method to allocate health resources. The basic principle is that to different health impairments weighting factors are assigned, corrected for the time the disability lasts. High ranking are therefore ailments that have a high weighting factor (cancer, invalidity) or that last long. Noise annoyance has a low weighting factor (typically around 0,01), but is present all the time. Cardiac diseases may lead to untimely death (weighting factor 1), but that occurs usually at an advanced age, leading to less life years lost then if it would occur at an average age.

4 Predicting effects of noise abatement measures

4.1 Design of the study into effectiveness of noise measures

4.1.1 General setup

The study consisted of 2 distinct parts:

- an overview of existing EU and national regulations and of existing noise reduction practices
- a model study in which the effectiveness of a selection of measures could be tested.

The aim of the model study was to rank noise abatement packages in order of effectiveness. To be able to give the results a general validity, dependencies on model and location had to be reduced as far as possible. Therefore an average site was chosen, the calculations were performed with 2 or even 3 different GIS-based calculation models and in the case of road traffic 2 different vehicle fleet compositions were used.

Between the vast number of possible ways to tackle the noise problem, it may be hard to make a choice. By means of model studies it is however possible to demonstrate what constitutes an effective mix of noise measures for different sources.

For each of the sources road traffic, railway traffic and air traffic 3 scenarios[1] are calculated:

I. Extension & implementation of current practice: extended current practice like speed reduction on urban roads and new brake blocks for freight trains
II. policy in place and pipeline: extensive application of current practices and modest source measures
III. best available technologies

In the following paragraphs a short summary of the scenarios is presented.

4.1.2 Scenario ingredients road traffic

The scenarios for road traffic are calculated separately for:
- agglomerations and rural areas;
- Central European and Mediterranean vehicle fleets;
- 3 different ratios of private car to public transport in agglomerations *(the modal split-issue*)
- 2 ratios of local traffic/through traffic in rural areas.

The main characteristics of the scenarios are:.

I. The current practice scenario takes into account only speed reduction (30 km in residential areas and speed control on through roads) and slight modifications (better maintenance) of road surface. Tyre noise is taken to be 1.5 dB lower.
II. In the policy-in-place scenario (II) extensive local measures are thought to take place to reduce traffic intensity and percentage of heavy duty vehicles in agglomerations.

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[1] In Effnoise the 3 scenarios are distinguished as: medium realistic, maximum realistic and maximum fantastic

All main road surface are replaced by stone/mastic asphalt. On the source side tyre noise is 3 dB lower and propulsion noise between 1 and 2 dB lower.

III. In scenario III no further speed reduction is possible over scenario II, and other local measures also are limited with the exception of road surfaces: all main roads are now covered with 2-layered drainage asphalt (on a 5 year replacement cycle in order to keep the reduction on -6 for cars and -4.5 for trucks). Further reduction on propulsion noise -3 dB and tyre noise -4.5 dB.

In total 30 model calculations were carried out (plus the reference situations).

It wasn't within the terms of the Effnoise study to go into detail how these improvements in source emission are to be achieved. The WG found in that the literature ([3, 5, 9]) provides detailed background on this important issue. In the analysis of the results this will be further discussed.

4.1.3 Scenarios for railway noise

The railway scenario's are calculated separately for passenger lines, freight lines, mixed lines and tramways.
The three scenarios are largely based on the Position Paper of WG-Rail[7]

I. current practice: intensifying track grinding, better brake blocks

II. Policy-in-place: extensive track grinding, low track-side barrier, wheel absorbers on some trains

III. Best technology: extensive track grinding, medium track side barriers, wheel absorbers, new brake blocks, bogie shrouds

Overall 21 model calculations were carried out, plus the reference situations.
The measures considered are almost exclusively source oriented, although the track side barriers are sometimes installed - and paid for- by local initiatives.

4.1.4 Scenarios for aircraft noise

The aircraft scenario's were calculated in a high and a low density area. This was done to show the difference in impact of operational measures: the hypothesis being that in low density areas it is easier to optimize flight corridors and approach procedures then in a high density area.

Again the main elements of the three scenarios

I. Current practice: ban on all non-chapter 3 compliant aircraft; preferential runways; noise dependant charges; insulation

II. Policy-in-place and in pipeline: as I, plus night flying restrictions; narrow flight corridors; noise quota; relocation of residents

III. Best available technology: further restrictions within chapter 3; incentives to implement noise abatement procedures.

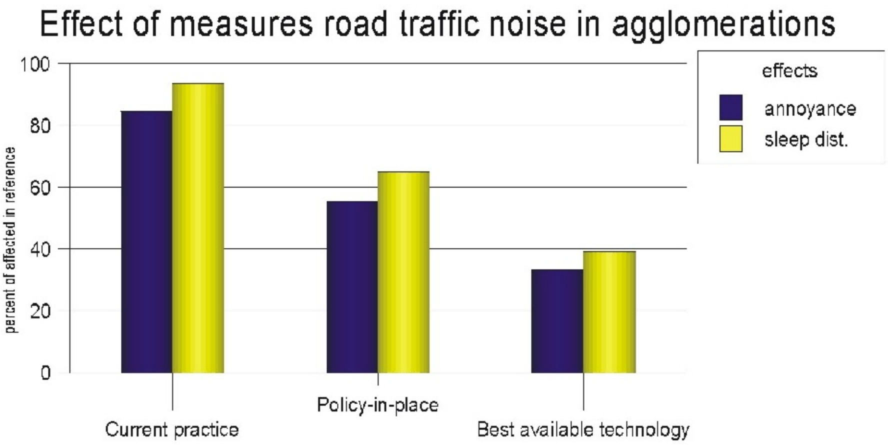
Although some local measures (like land use planning) are considered, these are essentially source oriented measures.

In total 8 calculations were carried out.

4.2 Results

4.2.1 road traffic noise

The results of the scenario calculation for road traffic are variations on figures 3 and 5. The current practice package gives only a small improvement. With maximum local effort and the modest amount of emission reduction of scenario II the improvement is substantial, but still



Reference situation:
Annoyance: 24% of the population higly annoyed;
Sleep: 12% of the population highly sleep disturbed.

Figure 3. *Effectiveness of scenario's in agglomerations*

60% of the highly annoyed and sleep disturbed remain. It really takes the combined effort of local measures and source measures to reduce the effects to a level in which in most cases the number of people exposed to levels > 65 dB(A) will be negligible, although even then the reduction of overall annoyance is limited to 70%.

Further observations with respect to the results are:

- the 2 GIS-models agree on the most important outcomes
- measures are less efficient for the Mediterranean car fleet because of the high number of motorised 2 wheelers.
- the modal split in car use is an input parameter for the model-calculations, and as such it has a large impact on the outcomes. Moving from 50% to 35% improves the situation more then the step from is a 35% to 20%. In the Effnoise study it is assumed that improvements in public transport (and other modes like cycling and walking) serve mostly other purposes and so the investments cannot be considered as noise mitigation. The noise reduction is more an added bonus.

Figure 4. *Mediterranean vehicle fleet*

- in rural areas the overall noise levels are lower, so the numbers of annoyed and sleep disturbed in the reference situation are also lower. The higher shares of heavy duty vehicles

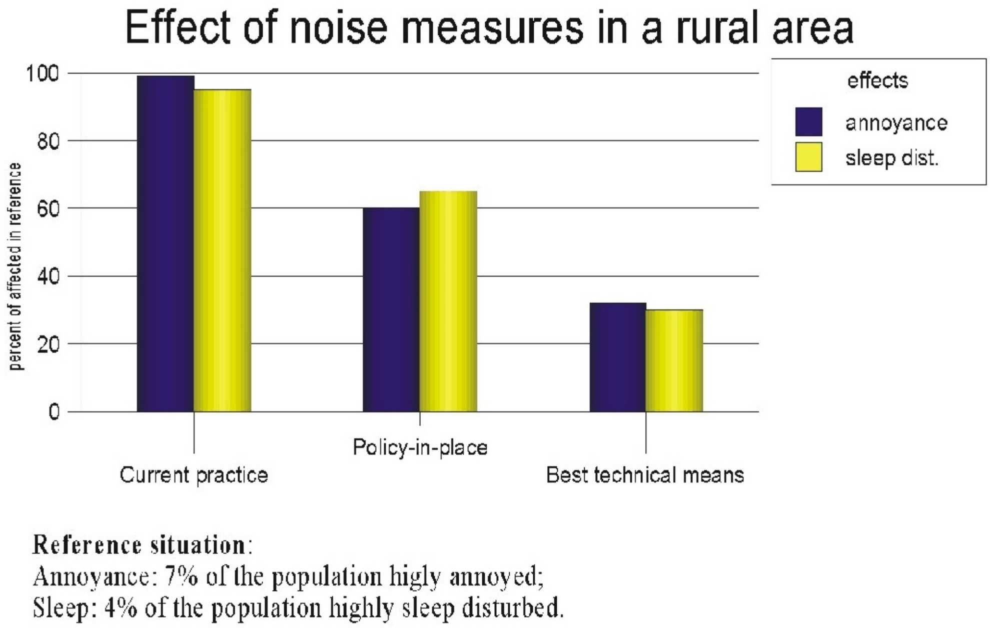


Figure 5. *Effects for 3 scenario's in rural area. Impact lower then in agglomerations, but annoyance is harder to reduce*

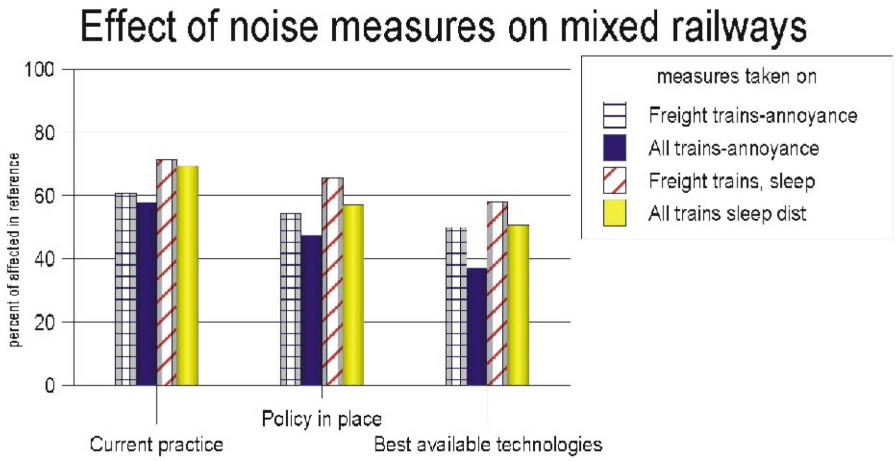
limit the effect of measures like draining asphalt and tyres. An important measure is a night ban of heavy vehicles. At the end the percentage of highly annoyed in the population is much lower then in the agglomeration.

Furthermore, it must be concluded then even though a transfer of experience is desirable, it will not be possible to simply transfer proven Northern/Central European Road Traffic Noise Mitigation Measures to Mediterranean Member States.

4.2.2 Railway noise

In this case the outcomes of the scenarios showed a distinct calculation model-effect. Although the ranking of the different measures remained essentially the same, the absolute levels differ significantly. It should be noted that the model which calculated the higher levels also gave the higher reductions, so in the end after the measures were taken, the outcome in number of annoyed or sleep disturbed was less different.

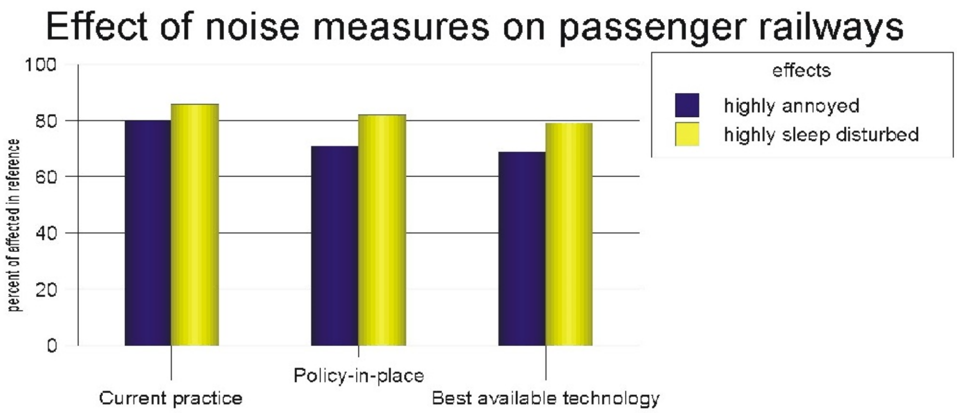
Figure 6 and 7 show that on a mixed line the best strategy is to take measures on as well passenger trains as freight trains. Reducing the noise production of passenger trains gives some benefit (about 20%), but much less then the reduction of freight train noise (40-50%). In combination however a reduction of over 60% is achievable.



Reference situation:
Annoyance: 16% of the population higly annoyed;
Sleep: 7% of the population highly sleep disturbed.

Figure 6 *Effectiveness of measures on a mixed railway line: on all trains or only on freight vehicles*

This shows however that it pays to be careful when designing these model studies. The technically well founded conclusion of WG-Railway Noise, is that emission measures are to



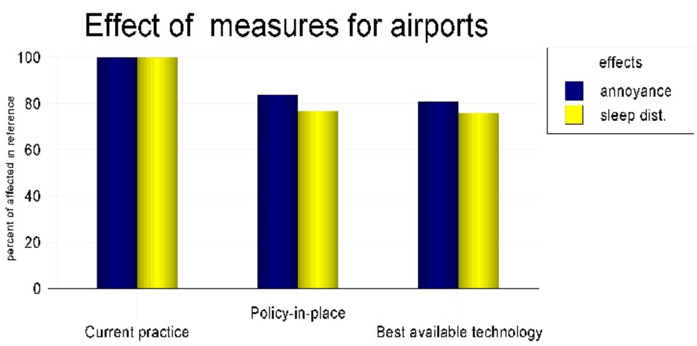
Reference situation:
Annoyance: 13% of the population higly annoyed;
Sleep: 7% of the population highly sleep disturbed.

Figure 7 *Effect when only measures on passenger trains are taking on a mixed line* be preferred to measures at the receiver. It now appears that his has also a sound basis when it comes to effects. In addition the model shows that on mixed lines (freight as well as passengers) a combined approach is required

4.2.3 Aircraft noise

The most significant step in reducing the number of people exposed is obtained with the policy-in-place scenario, while from extending the current practice no furhter improvment is to be expected (figure 8) . The determining measure is the restriction of operation of marginally compliant Chapter 3 aircraft. The main measures differentiating policy-in-place from extended current practice are the flight restrictions for non Chapter 4 aircraft (end of a phase-out period), the night-flying ban and the selection of preferred runways and routes. The low effectiveness of a night flying ban covering a certain “core” period of the night comes to no surprise: in order to be effective a reduction of movements must result in a significant reduction in Lnight levels, which will not be the case if only little used hours are exempted from traffic. The combination of Chapter 4 and preferred runways and routes helps to reduce the number of people exposed to the highest noise levels. However, in the high population density scenario neither these nor the additional best technology measures are sufficient to completely reduce exposure to high noise levels. This effect may well be the result of a combination of several of the following elements:

- Influence of the actual initial air fleet composition use.
- Influence of the geometry of the site used for the modelling (i.e. position and size of residential buildings relative to flight routes).
- A significant proportion of aircraft currently operated at Community airports already complies with or even exceeds Chapter 4 specifications



Reference situation
Annoyance: 19% of the population higly annoyed;
Sleep: 9% of the population highly sleep disturbed

Figure 8. *Results for the aircraft noise scenario’s*

An analysis of the total fleet of aircraft registered in Germany showed that 80% of the 1162 different types of jet propulsion aircraft registered in Germany are already compliant with Chapter 4 requirements. This situation may not be typical as some variation between individual airports, Member Sates (especially the new Member Sates that joined the EU in 2004) is likely to exist.

In the best available technology the effect of an imaginary marginally compliant Chapter 4 Directive is tested. The selected margin is more ambitious (-8 dB) as the one of the current Directive 2002/30/EC for marginally compliant Chapter 3 aircraft. The low further improvement for the best available technology package is surprising. One reason seems to be that new low noise aircraft fly lower, thereby partly losing their advantage.
The effectiveness of the packages is similar for the two different population densities, i.e. there is no package that seems more appropriate for either of the two population densities. Packages of measures should be designed to reflect local situations more closely (without infringement of international agreements) than in this general-purpose study.
Planning, economic, passive and soft measures are all suitable for local adaptation. The measure of relocation of residents deserves special attention. Even though in the cases studied a certain number of residents remains exposed to high noise levels (especially inside the agglomeration, i.e. with a high population density) their absolute number is significantly smaller than the initial figure. This in turn means less social problems and a significantly reduced need for compensation payments, which may make this measure worth considering in this situation while in the initial phase (before reduction measures) it will have to be rejected on cost-effectiveness considerations.
Land-use planning can be used to great effect by avoiding the settlement in the vicinity of the airport. Also land use planning comes at a cost, however.

5 Analysis and discussion

5.1 Subsidiarity and shared responsibilities

The principal of subsidiarity is now well fixed in the minds of European politicians and policy makers. It is however not often stressed that this should be accompanied by a sense of shared responsibility, to avoid that different administrative level point to each other when it comes to the question who should start to work on a problem. An obvious "after you" reaction could result in a stall.
Probably this is just what happened with noise. Although some nations took up their share with considerable enthusiasm, the results were limited because it was not complemented by an equal effort of the international bodies like ECE, ICAO and EU.

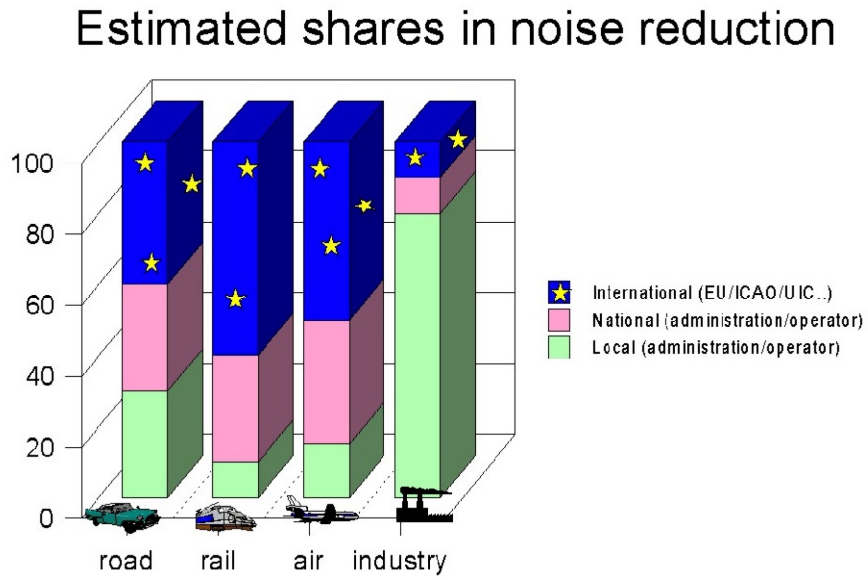


Figure 9 *shares in reducing noise exposure by different levels of responsibilities (expert judgment).*

Figure 9 shows a qualitative estimate based on the contribution to the potential reduction of annoyance for each level of responsibilities. The division between "national" and "local" is to some extent arbitrary, because it also depends on per nation varying powers per administrative level. The international level is easier to define: there is a limited number of noise related Directives, mostly source oriented. For road vehicles the limit values are set in close cooperation with ECE, and the limits for aircraft are competence of ICAO.

The potential impact is large: source oriented measures are by far the most effective because they exert their effects everywhere and so are more likely to be cost effective. Local authorities and operators a limited influence on the noise impact once a railway line or airport is there, apart from operational measures, land use planning and screening.
Figure 10 shows in more detail how this works out for road traffic noise, based on the

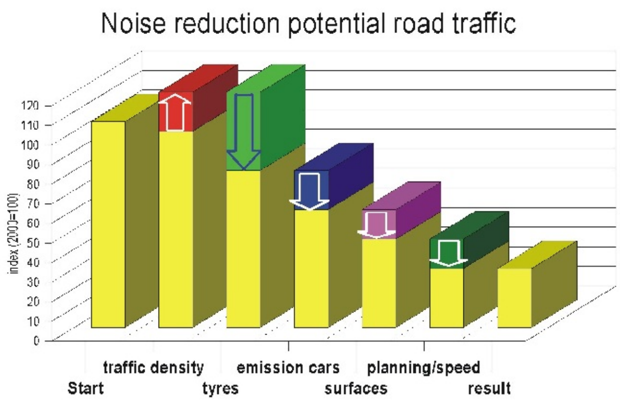


Figure 10. *Impact of noise measures. Although shown separately, there is a high level of interaction between measures.*

scenarios from the Effnoise study. While the increase in volume pushes the overall noise impact up, this is not a major effect (a doubling of traffic is an increase of 3 dB). The figure also shows that although the impact of source measures is significant, local measures contribute as well. The Effnoise study shows that a considerable reduction is possible; other studies[16] show that the optimal composition of the package of measures depends on the geographical layout of the area under study.

Knowing to what extent a decrease of emissions due to EU policy can be counted upon, national and local governments can formulate additional policies to fill the gap with their targets. The extent in which they are able to do so will depend on political commitment, their economic strength, cultural differences and so on. Thus individual circumstances in countries may justify a different effort to reduce noise impact.

5.2 Time frames

The time frame of noise reduction deserves special attention. There are short term measures that are easy to implement (like screens, barriers) and give a substantial relief. On the other hand, replacing all freight trains by quieter ones through natural replacement may take a very long time.

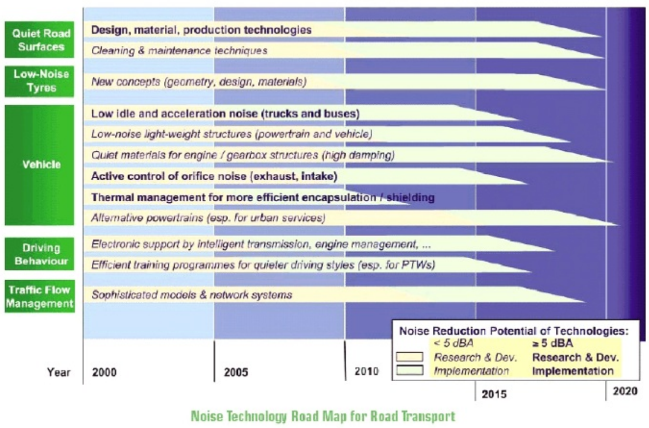


Figure 11. *CALM network: road map for reduction road traffic noise*

Directly connected to this is the cost aspect. Screens, barriers, quiet road surfaces are effective, but relatively costly. Enforcing the replacement of noisy equipment before the end of their economic life time may lead to high cost also. As an example, the CALM-network produced a time scale for the reduction of road traffic noise

The CALM-networks'mission is to coordinate research, so the emphasis of figure 11 is on this aspect, but it can be seen that for most actions some lead time is needed to implement the measures. This may also mean that in order to achieve the implementation schedule of figure 11, important decisions must be taken now. As this scheme was produced together with, and with a substantial input from the industry, the commitment of the industry is clear, but political backing is needed to ensure them of marketing possibilities of quiet products.

5.3 Efforts on national and local level

In the paragraphs before it was made clear that:
- a major effort is already taken at the national/local level. This consists mainly in the form of sound insulation schemes and barrier construction grants.
- for railway and aircraft noise the possibilities for the local authorities are rather limited and in any case not always cost-effective in the long run.
- for road traffic noise a substantial improvement can only be achieved by a combined effort.

The general approach for an effective approach of noise at the local/national level ideally takes into account the following steps:

1) assessing the impact on the population
2) evaluation of impact
3) assessing options to avoid or reduce impact considered undesirable.
4) cost-benefit analysis of the options or of mix of options
5) assessment of the preferred option
6) implementation

The END kick starts this process by demanding the production of noise maps which permit - together with the dose-effect relations provided by Annex III- to assess the impact on the population. Evaluation of the impact is a national/local affair, and much dependent on local styles and preferences. From the current practice it can be noted that already great effort is put in reducing noise.
The forthcoming EU-action plans for noise will structure step 3). In some cases it may mean a rethinking and rationalizing of the existing efforts. The issue of investing (in many cases continue to invest) in local measures or in source measures then plays a role in step 4) and 5). Although it is not easy to say which particular measure is most effective in resolving noise issues in one city or another, information on the progress of noise mitigation at the source will be necessary to make a valid choice for the measure package. The Effnoise scenarios provide various examples of situations where without source measures very little progress can be made.
Important EU-research projects however (ROTRANOMO, SILENCE and QCITY) will be able to give workable solutions in a few years time. In the meanwhile, the distribution of knowledge about best practice in cities remains the best way to avoid repeating mistakes or reinventing wheels.

5.4 Efforts on EU-level

The report from the Commission concerning existing Community measures relating to sources of environmental noise (COM(2004), 160) concludes that a wide range of instruments is available to control noise at the community level and "*will regularly assess the need for making new legislative proposals on sources of noise and, where appropriate, make such proposals*.

First a few improvements of systematic nature are discussed, then per source the possible short term and long term improvements are given.

5.4.1 Legislative system

The type approval limits in force have their origin in the internal market or common transport policy sections of the Treaty. This type of legislation (one single limit per category of vehicles) leaves relatively little room for more subtle approaches like tax advantages[2] or other differentiated strategies. This could be amended by introducing a 2 stage approach: the first level remains the limit that allows free trade and reflects a technical status quo. The second level is the limit that comes into force in, for example, 10 years and reflects the best technical means. This approach is already standard for tyres, aeroplanes, and outdoor machinery. The advantage is that it gives manufacturers the time to adjust and avoid excessive adaptation costs, but also gives national and local authorities a hold to base differentiated strategies on.

5.4.2 Road traffic: vehicles

The Effnoise study assumes for the 2 scenario's much quieter vehicles. The question remains if and how this can be achieved. The Commission is aware [2] that little improvement has been made regarding the overall exposure due to road traffic notwithstanding the considerable tightening of type approval limits. This is partly due to increases in traffic volume, but more important is that *the introduction and regular tightening of these limits allowed for a harmonization of the road vehicle fleet regarding noise emission characteristics, but did not prove to be a strong technical drive towards quieter vehicles, particularly in the case of delivery vans and trucks. Efforts should therefore be pursued in the future to assess the possibility of introducing tighter limits ensuring that quieter vehicles are actually being put on the market and recommending ways of removing noisier vehicles from the existing fleets.[2]*

To elaborate on this statement, figure 12 provides an analysis of type approval results.

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[2] Tax is a matter for Member States, but differentiation needs EU-assistance to avoid free market conflicts.

The data show that cars with a production of 7 dB below the limit of 74 are technically

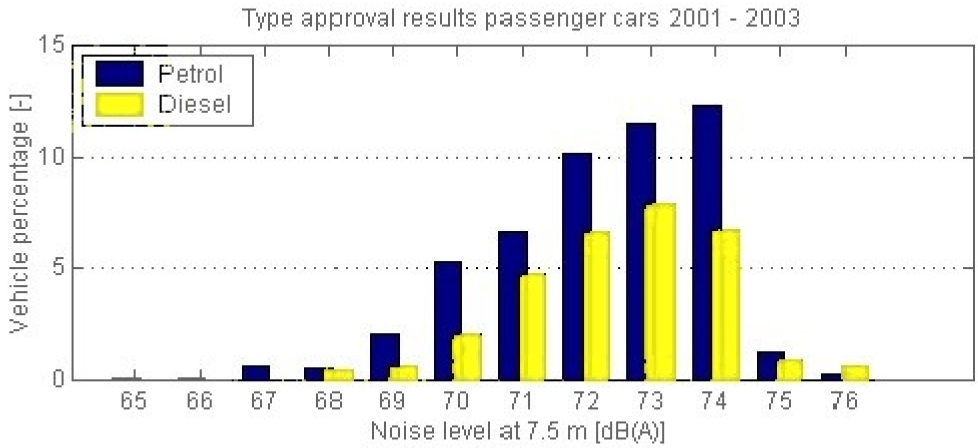

Figure 12 *Statistical distribution of the type approval results(in LAmax) for passenger cars with petrol (av. 72.2 dB(A)) and Diesel engines (av. 72.4 dB(A)) in the period 2001 – 2003 in the EU* [9]

producible -while already on the market-, and > 10% is 3 dB or more below the limit. Although the distribution differs, there is on the average little difference between petrol and diesel engines. The range shows that already very quiet cars are on the market. In fact in [15] it is argued that these cars are quiet enough to meet high environmental quality standards.
Delivery vans are technically based on car designs, but have a much higher limit (77 dB). The WG couldn't find technical reasons why they shouldn't be able to follow the same specifications as for cars. As delivery vans are making up an ever increasing share of the traffic in urban situations, the need for improvement here is urgent.
For heavy goods vehicles the room for improvement is less obvious: most trucks are close to their limit value.
It is clear from the data that a 2 stage approach as described in 5.4.1 is in this case a sensible approach. The lead time for the first step – around 3 dB seems an attainable target- can be short, as apparently no novel techniques are required. The second step should be brought inline with the CALM-road map (figure 11).

5.4.3 Road traffic vehicles: test method issues

The discussion about the limit values tends to be blurred by proposals to change the testing methods. The WG is concerned that discussions about test methods will lead to unacceptable delay to any changes of the real noise emission. The above mentioned tightening suggestions refer to the existing test methods, which therefore should remain in force until it is clear that the new test method gives comparable results (and preferably much better, the point of changing method).
That the relation between the present test methods and actual levels is complicated is demonstrated by the fact that the discussion is going on for over 10 years, and it doesn't seem to end any time soon. Analysis shows that the actual simple acceleration test predicts propulsion noise in city situations. Quiet cars according to this method therefore are quiet also

in daily use, if fitted with quiet tyres.

5.4.4 Road traffic: tyres

Also in the case of tyre noise a wealth of research results and measurements were made available in the past years[6,9].

Figure 13 shows, not unlike figure 12 with regard to passenger cars, that the quietest car tyres are some 7 dB below the limit, and the average around 4. It is most remarkable that there seems to be only little differentiation between tyres of different width.
For truck tyres the range is less and room for short term improvement limited.

In the tyre noise Directive (2001/43) it is stated that the Commission provides before 27 June 2004 a report on the further strengthening of tyre noise limits. This Wg looks forward with anticipation to its conclusions, and in the meanwhile offers what evidence it came across. From the literature already available[6,9] it seems that there is no relation between safety parameters and noise production. Assuming that no manufacturer markets unsafe tyres, the fact that some tyres now on the market have low noise production leads to the conclusion that there is room for improvement without penalties for other characteristics other perhaps than a temporary small reduction in consumer choice. WG-HSEA invites WG-8 to take this into consideration.

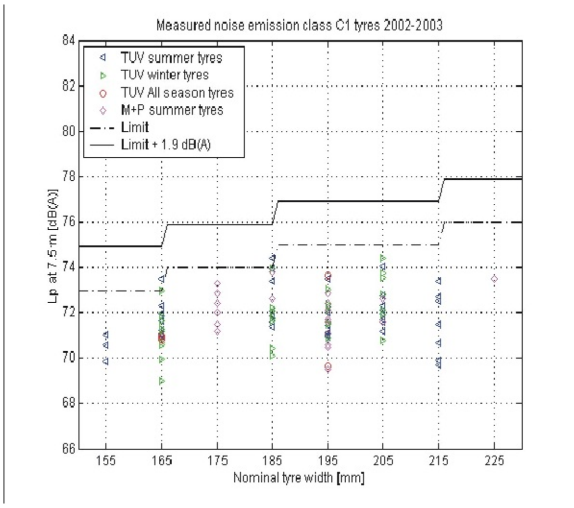

Figure 13 *TUV and M+P measurement[9] results of new class C1 summer, winter and all-season tyres, performed in 2002 and 2003 according to 2001/43/EC, together with the currently existing limit and the extra allowance*

5.4.5 Railway vehicles

Depending on country, railway noise may be a medium sized problem. In view of the policy to shift more freight transport to rail, this balance may change in the future. An unfortunate consequence of this policy is the likely increase in noise from freight trains. There is a reasonable consensus about the recommendations made by the EU-Working Group on railway noise. Also the Commission's report on existing noise measures takes this position paper as a starting point. From these and other documents it appears that the main issue is the retrofitting of existing freight wagons.
To restate these recommendations:

1. Improve the acoustic quality of the European fleet of freight wagons:
   a. redefine TSI-levels (based on LAmax at 25 meter) such that they reflect "state-of-the-art". A 4 to 6 dB lower level is considered feasible, certainly when composite brake blocks are applied;
   b. extend the working area of TSI's also to freight wagons with retrofitted brake blocks.

2. Develop schemes to phase out noisy freight rolling stock. Apparently there is a relatively large share of infrequently used vehicles which lowers the cost/benefit ratio of generally applied measures.
3. Start pre-competitive research into 2nd generation of low noise rolling stock technology and program next step in TSI values.

5.4.6 Airplanes

From the Effnoise report (Annex 9) and the CALM-brochure[11] it appears that on the one side great (research) effort is put in achieving quieter airplanes, on the other hand the European airplane fleet is relatively young, so it may take a long time before reductions are noticeable. This doesn't mean that nothing can be done in the meanwhile. Quiet airplanes are already available, and by applying policies on an airport by airport bases (like foreseen by Directive 2002/30) much can be achieved. An obvious example is inducing transporters to use the quietest possible planes at night, for instance by regulatory charges.

6 Cost effectiveness

The Effnoise-report describes options and packages of measures and their effectiveness in reducing noise. Chapter 4 goes further than this and provides some estimates of the certain of the costs and some of the benefits of measures to reduce rail and road traffic noise. The analysis presented is not intended to represent a full cost benefit analysis.

The impacts included in the cost estimates presented in chapter 4 of the Cost Effectiveness Study are restricted to expenditure directly related to reducing noise. Likewise, the benefits are concerned only with the reduction in noise levels and the number of households benefiting from this reduction. All second round effects are omitted.

The benefits of the reductions in noise levels are estimated from noise models as applied to the study areas described in section 2.3.4 in volume 1 of the Effectiveness Report. GIS mapping of these areas makes it possible to estimate the number of houses affected by reductions in noise levels and the extent of this reduction. Application of the values recommended in the WG H&SEA's Position Paper on Valuation provides an estimate of the benefits of these rail noise reduction packages in the study areas.

This assessment is not a complete cost benefit analysis although it could be considered as a first step in working towards a complete evaluation. Indeed, the further impacts of the measures proposed for reducing railway noise may be negligible. Hence the analysis of the measures to reduce railway noise as set out in section 4.2.2 might be taken as providing firm support for such measures so long as the rail corridors analysed in the STAIRRS study, from which the estimates of benefits are derived, are typical of other rail routes on which noise is perceived as a problem.

The issue is however more complicated for road traffic noise. Especially the costs for local measures are high (bypasses ranking highest), and could have a considerable impact on secondary costs (eg speed reduction or important modal split changes). For the source measures (vehicles, tyres and road surfaces) there is good evidence that the benefits substantially exceed the costs and so there can be little doubt to its effectiveness[10].

For aircraft noise passive measures are presented as 'last resort' in situations where no other active measure can be used. Even though relocation of households and insulation are common practice they do not lead to a reduction of noise levels in the surroundings of the airport and there is doubt about the cost-effectiveness.
Source orientated or linked to flight procedures measures seem not to imply any costs that can be imputed to noise mitigation: The considerable investments in improved state-of-the-art technology at the ground and on aircraft are needed anyway to ensure security and capacity at congested airports (Effnoise, page 97).
Different authors have assessed the cost of stringency measures and new certification beyond chapter 3. These costs seem important but are more likely to look acceptable if put in context with typical investment costs in the industry (airlines).
SOURDINE's[17] conclusion about the difficulty of evaluating the benefit of individual aircraft noise mitigation measures could be confirmed in the Effnoise study.

As already remarked in section 5.2, the time frame of the measures may have important cost consequences. If manufactures or operators are forced to comply in the sort term with new noise requirements, the cost may be substantial. If those measures are phased in with replacement programmes or safety updates, these costs can be a relatively small addition to the cost of replacement. Furthermore, in many cases the actual additional cost of low noise equipment may be negligible.

7 Prioritising solutions

Ranking solutions to noise problems, is principally guided by 2 – sometimes competing-criteria: effect reduction and cost-benefit ratio. Other considerations are equity (who pays the costs and who gets the benefits), the polluter pays principle and the time frame. Some measures have important consequences on other areas like air quality, safety, and energy, sometime reinforcing the effect on noise, sometimes going in the wrong direction.
This is a common enough problem, that is often neglected because it takes too much time to carry out the detailed analysis or the basic input is just not available.

Taken all this in consideration, it appears that the source measures for road and rail vehicles and aircraft are cost-effective and lead to a partial result in an acceptable time. Side effects are relatively modest and do not push the balance too much to the other side. This is mainly an EU-activity.
In addition to that, the problem cannot be solved by these source related measures alone. Especially for road traffic noise and to some extent for rail noise, measures at the local level remain necessary. At this point, a general priority order cannot be given easily, as it depends on local circumstances. For road traffic noise measures like speed reduction, barriers, drainage asphalt, traffic control, modal split changes must be balanced against other local priorities. For example, speed reduction is effective for noise reduction, but has side effects in air quality, travel time and road safety. Practical experience in the Netherlands shows that lowering the speed on a highway from 100 to 80 km improves air quality and safety as well noise level, while only modestly increases travel time.
For rail traffic noise barriers can be an efficient solution in very crowded and urgent

situations, or where source measures may take a very long time to become effective.
The EffNoise study gives indications of the costs of solutions and the methods of drawing up cost-effective solutions.

8 Recommendations

1. The WG advises the Commission to:
Develop an ambitious strategy to achieve further noise reduction for road, rail and aircraft noise. A 2 stage approach is desirable to allow manufacturers and consumers to adapt. In this way excessive costs can be avoided. In the long run these measures are cost effective according to most experts. This strategy should be outlined at the earliest opportunity in order to affect the END-action plans (see recommendation 2).

2. The WG advises Member States:
To carry out detailed analysis in the course of developing noise action plans into the most cost-effective solution in their particular case. The source reduction (and the time frames) resulting from the Commission strategy (see recommendation 1) is used in a stepwise approach to arrive at an effective mix of local and global measures. Import factors in the analysis are noise-effect effectiveness, cost-effectiveness, and effects on other policy areas like air quality, safety, travel time and energy.

3. The WG recommends all responsible parties:
To raise awareness of noise as a public health issue and to disseminate the knowledge of effective noise abatement. On the technical side the issue of the motorized two-wheelers needs special attention.

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ANNEX: Comments by ACEA

Page 7 / Page 8, 4.1.2 Scenario ingredients road traffic

The assumed scenarios are vague and do not allow an understanding of the conclusions made in 4.2. Dependent of the local situation very different initial scenarios have to be considered. The traffic composition is also very different. Measures at the source are very source dependent. Some measures on local level, like sound barriers and bypass roads, provide a much higher noise reduction than any technical feasible measure at the source at the moment.

The outlined scenarios seem to deal only with measures at the source, where the source must be understood as the vehicle including the road and the traffic volume. It is already known that on such a basis an efficient noise reduction is not achievable.

ACEA recommends applying results of European Research Programmes, especially of ROTRANOMO to better evaluate the quality of measures for noise reduction.

Page 14, 5.1 Subsidiary and shared responsibilities

Following the above-mentioned impact of measures, it is not understandable, why non-local shares shall make 70% of the road noise reduction at a spot. Providing action plans and guidelines, supported by stricter regulations for noise emission of the source are important but do not replace effective local measures.

A typical hindrance in Germany is for example the problem that streets belong to different sovereign responsibilities, as there are federal, state or local roads. That means that for efficient measures all authorities need to be involved, which causes a lot of bureaucracy and large time delays.

Page 15, 5.2 Time frames

The given table of time frames for various work topics is very misleading, because it seduces to the conclusion that quiet road traffic is possible until 2020. It must be clear to everybody, that dependent on a local situation a reduction up to 20 dB has to be achieved and a global traffic volume reduction is not in vision. From ACEA point of view this seems not to be realistic scenario.

Page 16, 5.3 Efforts on national and local level

ACEA supports the given general approach for an effective approach for noise reduction. It is the key to consider all measures and to evaluate the cost-effectiveness. Most parts of this document are in contrary to this approach, because of a misleading quantification of the efficiency of measures.
A TRL-Study (see CRP-098 GRB Informal Group Granada 2005) concludes that actually a real -2 dB noise reduction of an average vehicles (71.5 dB according to today's type approval) will result in a -0.2 dB noise reduction on real roads in UK. Obviously others measures, like repaving the UK roads have much higher priority.

Page 17, 5.4.1 Legislative system/5.4.2 Road traffic: vehicles
The automotive industry is interested in an efficient reduction of noise in the environment, but the approach is different to the one, which is described in the working paper in hand.
One of the most important aspects to realise future reductions of noise supported by noise reduction measures at motorised vehicles is to replace the existing type approval procedure with a new procedure that meets the driving behaviour in urban area much better. Efforts, which would be spent on the reduction of the existing limit values, wouldn't have the intended effect.
Industry supports the approach of a long-term scenario for noise reduction, which give the advantage of better planning future vehicles. However introducing more and more multiple stage limit enforcement models an efficient synchronizing of different regulations (exhaust emission, pedestrian protection, etc…) is needed, otherwise vehicle development becomes impossible.

Page 18, 5.4.2 Road traffic vehicles / 5.4.3 Road traffic vehicles: test method issues
Actually a new test method for vehicle type approval is under development in UN-ECE GRB, the work is close to be finished.

It is already proven that the efficiency of the new test method is much better than the existing test method. Additionally it has to be kept in mind that it becomes more and more difficult to realize a type approval with modern technologies, for which the current test was not foreseen. For future scenarios all thoughts shall be made on the base of the new test method.
Passenger cars serve a big variety of customer demands which consequently result in a wide spread of noise emission. Best available technology does not necessary mean to meet the lowest possible noise emission. Compromising all regulatory requirements according to their importance is a big challenge for a manufacturer.

Page 21, 7 Prioritising solutions

The typical speed range in urban area where noise related hot spot situations occur is in the range of about 30kph to 70kph. Within this speed range target conflicts between reduction of exhaust emissions and reduction of noise emissions occur. Further information can be read in:
Volkmar et al., Calculation and prediction of urban air quality on the base of a microscopic traffic simulation model, 2004, Boulder/USA

With all respect to the polluter pays principle:

Road traffic is such close related to the live of the citizens that it is obvious that the polluter is the society itself. In Germany more than 40 Mio vehicles are registered, which means 1 vehicle per two persons. Any person living in Germany benefits from goods which are carried by trucks or they use public transportation systems, which are significant noise polluter. Any costs spent for noise reduction measures, either on industry side or governmental side will by paid by the citizens and influences the gross domestic product. Costs need to be considered with regard to their efficiency within a time frame of all necessary measures regardless what source the initial money is coming from.