

# EffNoise

Service contract relating to the effectiveness of noise mitigation measures



## Executive Report

**Project:** **EffNoise** – Service contract relating to the effectiveness of noise mitigation measures

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### **1. Executive Report**

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The present Executive Report summarises the results and findings of the EC DG Environment "Service contract relating to the effectiveness of noise mitigation measures" (EffNoise) in summary. Comprehensive reports – including a description of the project and research methods - are available in two separate volumes.

#### **1.1. Introduction**

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In 1996, EC DG XI (now EC DG Environment) published the Green Paper on the future European noise policy. Several hundred remarks were collected during a public consultation. Both the Green Paper and these remarks formed the basis of the official EC communications during the 1998 invitational Copenhagen Conference where the work of preparing of what would ultimately be published on 18 July 2002 as "Directive 2002/49/EC relating to the assessment and management of environmental noise" (in the following also referred to as either the Environmental Noise Directive or the END) was started.

During the implementation and transposition phase, Working Groups (WG) provide technical advice to DG Environment. One of these is WG "Health and Socio-Economic Aspects" (WG HSEA) responsible for suggestions on noise mitigation measures and the evaluation of their effectiveness. The project EffNoise was carried out in close cooperation with WG HSEA.

#### **1.2. Scope**

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The terms of reference of the contract defines two stages:

- STAGE 1 is a review of noise mitigation measures (technical, legal and socio-economic aspects) and in particular, those taken at EU level.
- STAGE 2 is an assessment of the effectiveness (expressed in numbers of people exposed to noise level bands as defined in ANNEX VI of the END) of different noise mitigation packages for transportation noise as agreed with WG HSEA in STAGE 1.

#### **1.3. Definitions and limits**

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The report provides an assessment of the effectiveness of transport noise mitigation measures. "Noise mitigation measures" refer to either or all of the following: Source related measures, organisational measures, source management and measures on the propagation pathway.

### **2. STAGE 1 REPORT**

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The EU should use the competence conferred by the Treaty to take all possible actions as soon as possible. Especially source-orientated measures for transportation sources will help to both counter negative future developments, e.g. traffic growth, and support the efficiency of local measures such as traffic management in a city.

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### 2.1. Technical instruments

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A comprehensive review of noise mitigation for the four sound sources referred to in Directive 2002/49/EC was produced. It was decided at the end of this stage to concentrate on transportation noise sources.

Roughly, 75 % of all measures identified in the reviews had been implemented in Northern and Central Europe, where individual M.S. have an experience of several decades in noise abatement planning. It must be noted that this particular experience cannot be transposed to the South and the South-East of Europe without adaptation to local conditions. The vast majority of measures were implemented for congestion/safety reasons with noise reduction a secondary effect.

At this stage of the report, it was concluded that for all transportation noise sources the best technical measure to ensure overall noise mitigation, equal treatment of EU citizen and avoid distortion of the internal market would be more stringent noise certification procedures for motor-driven vehicles, railways and aircraft enforced at the EU level.

Further noise mitigation measures were identified for the different transportation noise source types. It must be noted however that their overall effect is less than the effect expected from noise certification standards. The need for certification standards that reflect more closely the actual operating conditions was underpinned.

Other measures identified include but are not limited to Road traffic noise: It was observed that individual measures must be found for at least three categories of motor-driven vehicles: Cars, heavy goods vehicles (HGV) and motorcycles.

- Source-orientated measures.
- Traffic management.
- Measures on the propagation path (screens, dams, cuttings and embankments).
- Socio-economic measures

Railways: Measures identified are congruent with the findings of EC WG 6 Position Paper<sup>1</sup>, best results are achieved with source-related measures complemented by measures acting on the propagation path.

- Source-related measures
- Measures on the propagation path
- Measures regarding changes of operating conditions

Aircraft: The international dimension of the aircraft business and the subsequent difficulties to take unilateral noise mitigation measures noise was emphasised, as was the power of the EC as a big economic area to act in this field.

- Source-orientated measures (i.e. certification standards)
- Operational measures (i.e. night flight restrictions),

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<sup>1</sup> [http://www.europa.eu.int/comm/environment/noise/railway\\_noise\\_en.pdf](http://www.europa.eu.int/comm/environment/noise/railway_noise_en.pdf)

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- Flight procedures (i.e. narrowing of the flight corridor),
- Planning measures (i.e. new runways far from residents), and
- Interdisciplinary packages combining selected measures from the above with socio-economic measures (i.e. penalties and incentives).

### **2.2. Legal instruments**

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With the publication of Directive 2002/49/EC, 'noise' finally becomes an environmental pollution in its own right, i.e. noise is considered an environmental pollution, as are air pollution, water and ground pollution. EU Directives dealing with air pollution define limit values. No reason could be found that would prevent the definition of EU noise limit values for noise impacts on people in the framework of existing EU legislation. Objections to define binding EU-wide noise limit values are of political rather than legal order.

In summary, the review produces the following results:

- EC's most powerful instrument to reduce noise is in limiting noise at the source. Future noise certification standards must pursue ambitious goals to push industry to make efforts in reaching them. The right to act on sources was conferred to the EC by means of the Treaty.
- The EU has no mandate to develop legislation concerning traffic regulation or traffic management/planning of a local level nature.

Article 175 of the EC Treaty opens a possibility to prepare EU noise regulations using the concept of spatial planning.

The existing legal basis for the promotion of i.e. action planning as described in Annex VI of Directive 2002/49/EC has to be enforced. Product-related instruments, such as product certification with noise limit values, are the most promising noise mitigation measures, tackling the problem at the source.

### **2.3. Socio-economic instruments**

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The review reveals that in most cases, noise reduction is a side effect of a socio-economic measure primarily implemented for other purposes such as control of air pollution or traffic safety (exceptions are noise fees for aircraft on airports). Typical socio-economic measures are: Noise awareness raising (incl. Information on noise exposure and its effects), training and education, control and behavioural sanctions (e.g. restrained access), economic incentives and stimulation, and eco-taxation.

Both Member States and municipalities (local level) are well suited to implement most socio-economic measures. Finally, the EU can play an important role by means of its research programmes and funding mechanisms for pilot studies and demonstration projects. Furthermore, in the field of aircraft noise, the EC can achieve noise reduction by relying on its significant economic power to lobby for more stringent certification standards at the international level.

### 3. STAGE 2 REPORT

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The aim of the final stage of this study was the description of the effectiveness of noise mitigation measures. GIS-based models were used to study the effect of the packages.

#### 3.1. Road traffic noise

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A clear decrease in the number of people affected by high noise levels can be observed. The number of people exposed gradually decreases from the reference situation to the maximum fantastic package. Packages of measures may have a series of collateral effects, which are difficult to predict. This is especially true inside agglomerations where the density of the road network is an important factor.

##### 3.1.1. Road traffic noise in agglomerations

The measures studied are more effective for a typical traffic fleet composition of Northern/Central EU M.S., for which they were originally designed. Specific of source-orientated measures for two-wheelers, especially for scooters, is needed in Southern EU M.S. to achieve comparable results.

Optimising the modal split (e.g. in the sense of increasing the share of public transport) is a measure of high efficiency. Source-orientated regulations help show good results independent of the fleet composition.

##### 3.1.2. Road traffic noise in rural area

The effectiveness of measures is linked neither to fleet composition nor to traffic ratio. The determining parameter is the type of major road cutting through the rural area: National roads linking nearby agglomerations and motorways show high reduction potential. But, only significant reduction of through traffic results in significant noise mitigation.

#### 3.2. Railway noise

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Measures are manifold. However, it turns out that especially measures acting on either the braking system (retrofitting with and future installation of new brake types), harmonised certification standards and optimised wheels and wheel absorbers are the best solutions to achieve overall noise mitigation. Interesting local noise mitigation effects can only be achieved by measures acting on the propagation path. Here the disadvantage is the very local effect.

#### 3.3. Aircraft Noise

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The results show that the most effective measure is to reduce noise at the source by means of more stringent certification standards for aircraft. Furthermore, the introduction of flight restrictions during the night period is very effective.

The further narrowing of flight corridors does not have the expected effect if other mitigation measures are already in place. The narrowing of the flight path is a measure that can help to reduce the footprint of noise contours if coupled with other measures.

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The effect of Chapter 3 certification has been illustrated. In 2006 another step at more stringent certification standards will be taken with the entry into force of Chapter 4, which turns out to be less than satisfactory. In the meantime, European commission restricts the use of marginally compliant aircraft with Directive 2002/30/EC. An analysis of available national aircraft statistic data showed, that in existing Member States a majority of the fleet currently operated is already compliant with Directive 2002/30/EC and a significant share even with Chapter 4. The effect of both will be rather small.

## 4. Cost and benefit estimates for the implementation of measures

### 4.1. Cost estimates

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It must be emphasised that an in-depth cost estimate for the different packages described in this report is difficult to achieve within the framework of the available budget. Especially when it comes to planning costs only estimates either on the basis of past experiences or expert knowledge can be provided. However, a series of interesting sources were discovered that help estimate prices. Costs to maintain the proposed measures as well as operating costs are not included in the estimates.

#### 4.1.1. Road traffic noise

Total costs include two shares: Local authorities pay for one share and vehicle-owners actually pay the other one (measures against vehicle- or tyre-induced noise). In general, either of the following measures dominates the overall costs of all packages implemented at a municipality level:

- By-pass roads.
- Replacement of road surfaces.
- Pedestrian crossings (only “medium” for rural areas).

#### 4.1.2. Railway noise packages

- Costs for grinding of rails and measures on freight trains dominate the overall cost.
- Costs for bogie shrouds and barriers are high (compared with other measures).
- The most expensive measures are: Grinding, barriers and bogie shrouds
- The costs are dominated by freight train related measures.

#### 4.1.3. Aircraft noise packages

Especially for aircraft noise passive measures (relocation of citizen and insulation measures of buildings) are not recommended: They do not enhance the overall noise situation. The remaining measures are either source orientated or linked to flight procedures. SOURDINE comes to the conclusion that these measures do not imply any costs that can be imputed to noise mitigation. It must therefore be concluded that the benefits by far outweigh costs that can be imputed to noise mitigation.

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### 4.2. Benefit estimates

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Rough cost estimates and benefit estimates based on the WG's own approach to attribute a value to noise reductions expressed in decibel (published in WG HSEA's position paper of March 2003<sup>2</sup>) has been carried out. In this study, the equation used for all noise sources is the same:

$$\text{Benefit (€)} = 50 \% \text{ of number of affected inhabitants} \times \text{noise reduction in dB(A)} \times 25 \text{ €}$$

The basis for the calculation is the number of people exposed to certain noise levels. To determine the number of households concerned an average number of people constituting "one household" is set equal to 2.

## 5. Summary/Conclusions

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The best noise mitigations measures are those that reduce noise at the source. Here, the EU is competent and is urged to undertake efforts to enforce more stringent noise certification standards reflecting the actual using conditions of transportation noise sources.

Local measures have a local effect only. Nevertheless, these measures are of importance: Noise mitigation must be adapted to local needs. More important than the relative ranking of noise mitigation packages is their categorisation as either Strategic or Tactical.

- **Strategic measures or packages**

All measures that must be implemented at the highest possible level inside the European Union. They are typically source-orientated. Implementation at a high level of authority inside the EU helps to avoid distortion of the internal market and ensure equal treatment of all EU citizens.

Planning measures are typical examples of strategic measures that can be implemented at different levels. An action plan must take into account the local conditions.

- **Tactical measures or packages**

All measures that must be taken at a local level. They include all measures on the propagation pathway (screens, embankments etc.), source-orientated measures on the parts of the noise source that are tight to a fixed location in space (i.e. grinding rails, replacing road surfaces). These measures cannot be decided on at a remote level of authority. They are adapted to the needs of local hot spots.

For road traffic noise, the study shows that all measures can be optimised if supported by regulations that enforce source-orientated noise reduction measures.

For railway noise, the study reveals the need for a common rolling stock certification standard to ensure overall noise reduction and equal treatment of citizen living along railway lines in all EU Member States. The highest potential still is at the source with the highest priority given to retrofitting of existing freight trains.

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<sup>2</sup> see [8]

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For aircraft noise, the study reveals the need for more stringent noise certification standards. It also emphasises that Chapter 4 is by no means ambitious. Night flight restrictions are a close second but their effect is limited to (part of) the night. Benefits of noise mitigation measures by far outweigh the costs.

As to socio-economic effects of noise mitigation, the reviewed measures showed very positive secondary effects. Yet, it turned out that it is quite impossible to evaluate the effects of socio-economic measures on a quantitative basis. Nevertheless, these measures have specific and unique advantages that are of importance to enhance noise mitigation.