



# FUTURE OF THE ENVIRONMENTAL NOISE POLICY IN THE EU

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## ABSTRACT

Recent studies identified which measures are needed to achieve a cost-effective reduction of the exposure of EU citizens to harmful noise levels. The main need is to address noise from road transport by additional measures and practical interventions. For roads, the use of quiet tyres, low-noise road surfaces and reduced road speed limits needs to be considered, as electrification of vehicles will bring no benefits. In particular, legislation on tyres needs strengthening in order to achieve the maximum benefit because this is the most cost-effective noise reduction measure. Measures for other transport modes should include quiet and smooth rails together with quiet wagons for the railways, and improved flight procedures together with nighttime measures for aircraft operations. This article explains what the benefits are from different interventions are, and how the Commission linked a comprehensive approach across the three transport sectors into its programmes, so as to bring down harmful noise levels.

**Keywords:** *environmental, action plans, policy, solutions.*

## 1. INTRODUCTION

At the EU level, Directive 2002/49/EC on the assessment and management of environmental noise (further referred to as ‘the Directive’) [1] is the key legislative instrument for protecting people’s health and well-being from excessive noise pollution caused by road, rail and airport traffic, and large industrial installations. It does this by (1) setting a common approach in order to avoid, prevent and reduce the

harmful effects of environmental noise and (2) providing a basis for developing measures to reduce noise emitted by the major sources. Overall, it is the EU’s legal instrument for linking assessment and actions at the local and global levels.

The European Environment Agency (EEA) has indicated that noise is the second most important environmental disease factor in the EU (after air pollution). Prolonged exposure to high levels of noise pollution can have a serious health impact (including high blood pressure, cardiovascular disease and premature mortality) and significantly affect physical health, mental health and well-being (including chronic disturbance, such as a high level of sleep disturbance, stress and/or annoyance). 20% of the EU’s population - one in five people of all age groups - live in areas where noise levels harm health [2].

In this context, the European Commission delivered a whole analysis of the noise policy in its recent report to the European Parliament and the Council of March 2023 [3]. That report was substantially based on findings from the PHENOMENA project [4], and this article presents some of the key findings.

## 2. THE PHENOMENA STUDY

The PHENOMENA study selected a number of noise abatement measures for each transport mode to assess their overall potential impact in terms of health benefits, using the year 2017 as a baseline.

Measures which are not yet available or require further research were not included as, in general, they would not have significant impact before 2030. This is because approval and market introduction can take several years, after which several more years are required before implementation over the whole fleet or infrastructure takes place.

Noise abatement solutions for road, rail and aviation are applicable to noise both inside and outside agglomerations, which were therefore not treated separately in terms of noise solutions. Application and

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implementation levels of noise abatement solutions differ substantially between member states and regions, which in turn depends on policy priority, traffic, fleet and infrastructure characteristics, and available funding. Solutions related to land use, urban planning and traffic control are wider in scope than technical solutions at source or receiver, as there are many factors well beyond the question of noise exposure in terms of  $L_{den}/L_{night}$  levels, such as safety, mobility, air quality, and social-economic issues.

The study derived health burden reduction as a combination of decreased risk of ischaemic heart diseases, decreased number of highly annoyed people and decreased number of highly sleep disturbed people. The study monetised these decreased health burden by two methods, leading to different benefit to costs estimates. The first method was using costs figures directly taken from the 'Handbook on the external costs of transport' edited for the Commission in 2019, and is based on a table of values for the costs of environmental noise, reflecting the welfare loss per decibel increase, contained in that handbook.

For the second method the health effects are expressed in DALYs, or 'healthy life years lost'. The DALYs are calculated from the numbers of people that are highly annoyed, highly sleep disturbed, and people affected by myocardial infarction. A DALY weight of 0.02 is used for 'high annoyance' and 0.07 for 'high sleep disturbance'. For myocardial infarction, the definition  $DALY = YLL + YLD$  is used. Here the number of life years lost, YLL, is equal to the number of fatal cases (25% of the total number) multiplied by the mean number of life years lost per case (8 years). The years lost due to disability, YLD, is equal to the number of non-fatal cases multiplied by the DALY weight of 0.405. The second method values the costs by, for annoyance, a fixed cost of 85 Euro per annoyed person per year; for sleep disturbance, the costs are calculated in terms of productivity loss caused by high sleep disturbance, with a value of 2% of GDP per employee; the total costs for myocardial infarction are finally calculated from the morbidity costs (7 300 Euro per case) and the costs of life years lost with 40 000 euro per life year.

### 3. FINDINGS FOR ROAD MEASURES

Based on the combinations of solutions/scenarios found and the good practices derived from the noise action plans, reduction of road traffic noise is mostly achievable by reducing tyre-road noise and powertrain

noise of vehicles at the source, including increased electrification. Noise barriers are not feasible along many urban roads and always have a significant visual impact besides being relatively costly. In order to achieve significant reductions, quieter road surfaces in combination with quieter vehicles and tyres is considered the most viable solution. At local level, traffic measures such as speed and access restriction are considered effective.

For these reasons, the most effective scenarios combining set of complementary measures are:

1) more quiet roads, quieter tyres and specific lower vehicle sound limits

- Health burden reduction in 2030: 16-22%
- Benefit to cost ratio over 2020-2035: 0.8-4.6

2) is as 1) including more electrification than in the baseline scenario

- Health burden reduction in 2030: 18-24%
- Benefit to cost ratio over 2020-2035: 0.9-5.1

3) speed restriction, car-free zones, quiet facades, and dwelling insulation

- Health burden reduction in 2030: 16-20%
- Benefit to cost ratio over 2020-2035: 0.04-0.2

These do not exclude other solutions, but they are considered to be most effective at EU level in the context of this study.

Scenarios 2) and 3) may be associated with effective noise reduction strategies at EU level (as these measures are governed by EU legislation), and therefore these scenarios are most relevant for noise regulation and actions by the European Commission.

Scenario 3) is focused more at local level, and therefore less suitable for direct action at EU level.

Nevertheless, EU guidance related to scenario 3) may be useful to stimulate effective noise reduction strategies at local level. An example of such guidance is the recommendation in the Directive that quiet areas should be protected from noise.

To achieve a health burden reduction in the range 20-50%, options 2) together with 3) are therefore recommended. This entails both EU source regulations for rolling noise, tighter vehicle limits including increased electrification, together with national actions including speed and access restrictions together with more quiet facades and dwelling insulation.

### 4. FINDINGS FOR RAILWAY MEASURES

Based on the combinations of solutions/scenarios found and the good practices derived from the noise action

plans, on top of stakeholder inputs, several combined scenarios are recommended, which are set out here in terms of the required policy options. Reduction of railway noise as in the baseline is best achievable by reducing wheel/rail rolling noise, which is the most dominant source for the current major lines and in agglomerations. This can be done by management of wheel and rail roughness and quiet design of wheels and tracks including noise control devices. Traction noise and aerodynamic noise are also important, but less so in terms of overall impact and exposed population at EU level. Where traction noise is an issue, sometimes quieter rolling stock can be a solution, for example switching from diesel to electric traction, such as demonstrated in Grenoble Metropole where the section of the Sillon Alpin train that crosses the city of Grenoble was modernised and became electric.

Although relatively costly, barriers are a next best solution as they can be positioned near the source and are somewhat easier to apply in an urban environment than for roads. They can also function as a perimeter wall and options such as low barriers or barriers between tracks are more feasible.

Traffic management is also an option either by rerouting or adjusting timetables, if this space is available.

Urban reconstruction including tunnelling, screening by buildings and integrated noise abatement, combined with increased facade and building insulation, also have large potential at local level, especially when included in future projects. There are many examples of new or reconstructed city lines underground, but these tend to be long-term projects whose impact, while lasting, is mainly local.

Based on their type (source/path/receiver), legislation and responsible authorities, the following combined scenarios are recommended:

- 1) smoother wheels and smoother rails
  - Health burden reduction in 2030: 30-42%
  - Benefit to cost ratio over 2020-2035: 2-9
- 2) quieter vehicles and quieter tracks
  - Health burden reduction in 2030: 7-15%
  - Benefit to cost ratio over 2020-2035: 0.24-1.3
- 3) smoother and quieter vehicles and tracks
  - Health burden reduction in 2030: 37-52%
  - Benefit to cost ratio over 2020-2035: 0.9-3.1
- 4) more barriers and traffic management
  - Health burden reduction in 2030: 5-10%
  - Benefit to cost ratio over 2020-2035: 0.9-4.5
- 5) urban planning and reconstruction, and more facade insulation

- Health burden reduction in 2030: 7.8%
- Benefit to cost ratio over 2020-2035: 0.2-0.4

In the policy options below the combined scenarios 1) to 5) are split into their components where separate legislation or implementation aspects are addressed.

Scenario 1) would seem to offer by far the best potential for health burden reduction, which should be augmented by scenario 3) and/or 4), which are relevant for control at local level.

## 5. FINDINGS FOR AIRPORT MEASURES

Based on the combinations of solutions/scenarios found and the good practices derived from the noise action plans, solutions to reduce aircraft noise are mainly related to air traffic management and aircraft innovation. Nevertheless, it should be considered that the management of different environmental policies, in the case of aircraft operations, must inevitably take into account interdependencies between environmental noise, CO<sub>2</sub> emissions/fuel consumption and NO<sub>x</sub> emissions (air quality). This includes recent policy developments such as the Sustainable and Smart Mobility Strategy [5], and Zero pollution Action Plan [6].

The main policy instrument currently for limiting aircraft noise is EU Regulation 598/2014 on the introduction of noise-related operating restrictions at Union airports, also called the Balanced Approach Regulation (acronym: BAR). The BAR sets the framework for the development of the noise action plans for airports, covering all available noise reduction solutions. However, the analysis performed in the study highlighted that there is room for improvement in the way the BAR is applied and how noise solutions are selected. Stakeholder consultation should also be considered here. A review of the BAR is in process and could potentially end up in alignment with the policy options developed in this study.

In order to avoid future noise issues at small, but fast-growing airports, often situated close to residential areas, changing the definition of airports to be included in the Directive from 50,000 down to 30,000 movements a year was suggested by the study.

The study found that the best single solution with respect to health burden reduction is:

- 1) the introduction of a night curfew at all airports – i.e. an EU-wide ban on night flights. Although such a move leads to a large reduction in health burden, it would potentially put some carriers out of business

- Health burden reduction in 2030: 37-60%
- Benefit to cost ratio over 2020-2035: 0.1-0.2

The selected other combined scenarios moreover are:

2) 3D optimisation: improved take-off procedures and dispersion or concentration of flights

- Health burden reduction in 2030: 25-26%
- Benefit to cost ratio over 2020-2035: -2.4 to -1.8 (cost saving)

3) Quietest fleet: phase out of noisiest aircraft and accelerated fleet replacement with quiet aircraft

- Health burden reduction in 2030: 26-28%
- Benefit to cost ratio over 2020-2035: -0.1 (cost saving)

4) Best possible on 'aircraft side' ( 2) + 3) ): improved take-off procedures, dispersion or concentration of flights, phase out of noisiest aircraft and accelerated fleet replacement with quiet aircraft

- Health burden reduction in 2030: 44-46%
- Benefit to cost ratio over 2020-2035: -0.2 to -0.1 (cost saving)

Scenario 4) would seem to offer by far the best potential for health burden, if apart for the special case of 1).

## 6. CONCLUSIONS

The European Commission set up a legislative framework complementing the national one to induce a concrete shift towards lower noise levels from transport, thus reducing the number of people chronically disturbed by transport noise. Thanks to PHENOMENA study, the Commission could assess all solutions existing and all legislation and drivers, including financial ones, that would push to implement such existing solutions. Based on this assessment, the Commission will continue working towards the reduction of exposure to noise in the coming years, as explained in its recent report to the European Parliament and the Council of March 2023 [3].

## 7. REFERENCES

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