

# **VALUATION OF NOISE**



**POSITION PAPER of the  
WORKING GROUP on HEALTH and SOCIO-ECONOMIC ASPECTS**

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## Notes

This document reflects the opinions of the majority of the members of the Working Group.

It should not be considered as an official statement of the position of the European Commission.

*front page: statue in Boboli gardens, Florence*



## Introduction

- i. Directive 2002/49/EC on environmental noise requires action plans to be drawn up by competent authorities within EU member states. It is important to ensure that the noise reduction measures included in the noise action plans and any pan-EU measures are good value for money, taking advantage of any synergies, and minimising any adverse consequences.
- ii. Cost Benefit Analysis (CBA) will provide a useful framework and tool in drawing up and developing action plans and policies which are good value for money.  
Briefly, CBA usually requires all major impacts of a policy or scheme to be represented in a single unit so that they are comparable. Usually the common denominator is money.
- iii. The costs of noise mitigation or reduction can be measured, in terms of money, either directly or through use of cost benefit analysis. Money can be used as a measure to represent changes in goods/services or welfare changes forgone in order to reduce noise. By providing decision-makers with a money value to measure the benefits of reducing noise, the impacts - positive and negative - can be compared readily to reach a decision on the overall merit of the noise reduction policy or action under consideration.
- iv. This paper;
  - Summarises current understanding of the benefits of noise reduction;
  - Recommends an interim money value which could be used to represent the benefits of reducing noise exposure; and
  - Recognises the need for further research and studies if more robust guidance is to be provided – including on differences between transport modes.
- v. The monetary value (representing changes in noise levels) contained within this document may be used by the Commission in carrying out cost benefit analysis of noise reduction measures. Many member states already make use of values which reflect local conditions which are often above the value given in this paper. The value given in this paper is not intended to replace these local values. But in the absence of such values or for other purposes, member states may, at their discretion, use the value in this position paper in drawing up their action plans in the context of the Directive.

## Background

1. Noise affects people in a number of ways. There are effects which people perceive, such as the impact on conversation, listening and the enjoyment of outside space. There are effects which are not easily perceived such as the impact of noise on certain aspects of health. A distinction between the perceived and other benefits is necessary because studies based on analysis of people's willingness to pay as a means of valuing noise reductions must be assumed to exclude effects that are not directly perceived. So a money value based on willingness to pay for the benefits which people perceive is not a complete measure of the benefits to society of noise reduction.
2. Noise research across EU Member States in the field of economics has sought to quantify the potential benefits of reducing noise. A number of these were analysed in the paper by Prof. Ståle Navrud which reviewed economic valuation studies from Europe and USA, and discussed the issues of variation in the values across areas/regions.
3. This research has largely focused on the reduction in perceived effects of noise exposure. Two main methods have been used to understand the benefits to individuals of noise reduction. The benefits are usually expressed in terms of willingness to pay for/accept improvements/deterioration in the noise environment.

Stated Preference - People are asked to state how much they are willing to pay (or forego in terms of other goods and services) to reduce their noise exposure by a given amount. The payment vehicle might be an increase in specific charges (e.g. rent), local taxes, compensation payments to local businesses etc. This research is conducted in ways which avoid respondents' natural tendency to bias results. Money values are generated which represent changes in noise levels.

Hedonic Pricing - While there is no (direct) market for noise, different noise levels have an affect on prices in other markets, in particular on the price for housing. As people are willing to pay for quiet, they trade money for noise 'indirectly' through the housing market (rental, and sales). Take two otherwise identical properties that differ only in the amount of noise. Since people experience the adverse effects of excessive noise, the noisy house/apartment will attract a lower rental payment or lower sale price than the quiet one. The difference revealed in such transactions between the prices of the noisy and quiet place can be used, after controlling for other effects, to calculate per decibel value of noise.

4. There are few studies which directly value, in monetary terms, the imperceived costs of high levels of environmental noise. Moreover,

these are not directly relevant as the analysis for action plans is concerned with the relationship between changes in noise levels and human health, a relationship which is complex and uncertain in its extent. In addition there is uncertainty surrounding economic estimates of the social costs of these health related effects. No monetary values were presented in Navrud (2002)<sup>1</sup> which could be used to represent such health impacts of changes in noise levels.

### **How would money values help decision makers?**

5. Policy makers need to balance the costs of reducing noise exposure (constructing noise barriers, the cost to consumers of quieter vehicles etc) with the benefits of noise reduction. A value to represent the benefits provides a basis for making this comparison. With a well-conducted cost-benefit analysis, it is possible to develop a noise action plan where the benefits of noise reduction are clearly higher than the costs of noise mitigation. Cost benefit analysis can also help to prioritise between options so as to ensure that limited funds are spent to the best effect.
6. The value recommended in this paper is concerned with the benefits of reductions (or, where relevant, the costs of increases) in noise levels. No advice is given on the overall cost of noise to society. Action plans are concerned with measures which result in changes in noise levels. Decision-makers need advice on the benefits of those changes.
7. In addition to the direct benefits to society of reducing perceived effects of noise, many noise reduction measures might have additional wider impacts. Some of these impacts might be positive and improve the quality of life of society, some might be negative.
8. For example, in the case of road traffic, low noise vehicle technology might reduce noise levels but also;
  - increase or decrease greenhouse gases (CO<sub>2</sub> etc) depending on any vehicle weight increases or decreases; and
  - affect local air quality – i.e. the impacts on individuals' health through particulate emissions.
9. Road traffic management policies to reduce noise might have a number of other impacts. These might be;
  - Journey times - traffic calming would reduce noise levels but might increase travel times; and
  - Safety -less traffic/lower speeds reduces noise levels, improves safety, but quieter vehicles might initially be less noticeable to pedestrians.

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<sup>1</sup> The State-Of-The-Art on Economic Valuation of Noise, S Navrud, Department of Economics and Social Sciences, Agricultural University Norway

10. Depending on the policy, the impacts of the costs and benefits might fall on individuals, businesses, local authorities, national governments, taxpayers among other groups.
11. An economically optimal noise reduction policy would reduce the level of noise exposure at lowest net monetary cost, whilst trying to capture as many other benefits, and keeping to a minimum any potentially adverse impacts. This means that resources saved could be used elsewhere, and potential conflicts with other policy areas - air quality, health etc. are kept to minimum so as to avoid undoing the work of other strategies.
12. Since the money value reflects changes in noise experienced by people, then the value should be applied to the expected noise change that people may experience and not simply the change in noise at the source (e.g. tyres).
13. This is important because in the case of low noise tyres for example, there may be a difference between the change in the level of noise emitted at tyre/road interface and the change experienced by people living alongside the road. In the case of physical noise barriers it is important not to apply the values to the properties of the barrier but to come to a view on the level of noise reduction that will be experienced by people. Noise mapping techniques will help in estimating changes in noise levels at property facades.

### **Valuation of the benefits of noise reduction**

14. Research using information on individual's preferences, both stated and revealed, has generated a range of values which purport to provide a monetary representation of the benefits of noise reduction.
15. Navrud (2002) looked at studies using both valuation methods referred to earlier. One of the aims of that paper was to generate monetary values for noise reductions which could be used in evaluation of noise reduction policies. The most useful form for the value would be per dB, per household, per year.
16. The results from Stated Preference (SP) studies could readily be translated into this willingness-to-pay format. However the Hedonic Pricing (HP) studies (most of which generate results in the form of % of property value per dB) could not easily be translated into this value per dB/ household/ year. This was due to lack of data and other information on the prices of the houses included in the studies and on other local housing market conditions.
17. Navrud (2002) focused on generating values from the SP studies. The paper reviewed a range of USA and European studies. That paper included a range of values from stated preference between 2 and 99



per decibel/household/year (dB/hh/year) above 50  $L_{den}$  or 55  $L_{den}$  up to 70 or 75  $L_{den}$ . This range is obviously large, and to a certain extent is likely to reflect the variety of circumstances in which the studies took place.

18. Taking a representative value from each European country the average value for the benefit of outdoor noise reduction is 25,8 € per household/decibel/year and the median value is 23,5 € per household/decibel/year. In order to avoid those responsible for using the value attaching unwarranted accuracy to it and to reflect the uncertainty in the studies from which it is derived, **we recommend a value of the perceived benefit of noise reduction of 25 € per household/decibel/year.**
19. In the absence of robust information on whether the money value representation of a 1 dB ( $L_{den}$ ) change in noise is the same regardless of the initial (base) level of noise, we have assumed that the money value is constant across the range of noise levels. So, across all noise levels we assume that people value each dB ( $L_{den}$ ) reduction in the same way - i.e. the reduction in annoyance by 1dB ( $L_{den}$ ) is the same.
20. The money values from the studies quoted in the Navrud (2002) paper are based on a variety of noise scales (none of which are  $L_{den}$ ). In spite of this, we make the simplifying assumption that the value of 25 € per household/decibel/year can be applied to the changes in noise level measured on the Lden scale. In theory it is not so simple, but we make this assumption for practical reasons.
21. Average household willingness to pay values from SP and HP studies are likely to represent a reasonable valuation of the effects of noise that these households perceive. These values might therefore represent a lower bound to the benefits from noise reduction. An extra element for imperceived impacts therefore needs to be added to those values, in order to represent the full benefits of noise reduction measures. However Navrud (2002) does not present any monetary valuations of the imperceived impacts of noise reduction.
22. It is proposed in the absence of better information, that the health impact should be valued in a qualitative manner, after the completion of the cost-benefit or other analysis. In this manner these other impacts are covered in a transparent manner. The working group suggests that further valuation studies be undertaken on this important subject.

### **How the point estimate might vary in practice**

23. It is likely that the amount that households are willing to pay to reduce noise will be influenced by a number of factors, such as their incomes and the typical noise level they experience.

24. Those with lower incomes are more restricted in their ability to trade money for other goods (including noise reduction). They might therefore place a lower value on the benefits of reduced noise levels, compared with other goods which they might have to forgo. The range presented in the paper includes results from a variety of countries with different income (and price) levels and might adequately reflect these different circumstances. No adjustment to the median value (or range) is therefore proposed for use across EU member states.

However, PPP (purchasing power parity) indices could be used to adjust the values for use in accession states. These are published indices which adjust the exchange rates between countries by differences in the cost of living.

25. It might be expected that those who experience relatively high **initial levels of noise** would be willing to trade more money (see paragraph 19) for a given reduction in the level of noise, than those in lower noise areas. However, there is no evidence on which to make a link between the value of a given reduction in noise and the levels of noise experienced. It is therefore proposed to recommend the same value irrespective of the level at which the reduction takes place.

26. Evidence on annoyance from different transport modes suggests that at a given noise level, a greater portion of the population is annoyed by aircraft noise. However, Navrud's analysis of willingness to pay found no evidence of any difference in the per dB money value between modes for changes in noise levels. The relationship between reported annoyance and willingness to pay requires further research to resolve this apparent inconsistency. This study might also give indications into the existence and the value of a threshold.

27. Whilst there is not yet conclusive evidence on the differences between modes, it is important to recognise that differences may indeed exist. We recommend that specific research is taken up. In the meanwhile, for the purposes of this paper we propose that an adjustment be made to the road based value to provide mode specific values. This will require some judgement and further discussions will be needed on the interim adjustment process to be used.

28. For use in Accession States it is proposed that this point estimate monetary value be corrected by PPP indices. That is in line with EU practice on mortality values for CBAs.

## Recommendations

29. The working group of **Health and Socio-Economic Aspects** recommends the following:

For road transport, the (interim) use of the **median value change in noise perceived by households of 25 € per dB (Lden), per household per year**. The validity range of this interim value is between 50/55 Lden and 70/75 Lden and it should be adjusted as new research on the value of noise becomes available.

The estimate of the change **should apply at all initial noise levels**, and **regardless of the size of any change** brought about;

In the absence at present of conclusive evidence on how the value might vary on different modes, it is advised to leave open the possibility of **an adaptation of this roads-based value for use on other noise sources like rail and air** using adjustment factors. Specific research should be carried out to resolve this issue.

This value should be **corrected using PPP indices for use in accession candidate countries if necessary; and** For other **impacts**, it is recommended that, in the interim, **qualitative** and **qualitative assessments** are used to complement the value of the perceived changes and that research is initiated on this issue.