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APPLICATION OF SOCIAL COSTS OF NOISE IN TRANSPORT POLICY DECISIONS

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ABSTRACT
In this paper, examples of application of social costs of transport noise in Denmark are presented and assessed. Estimates of social costs of transport noise comprise a part of the planning tools of the Danish Road Directorate for assessment of the social costs of new road infrastructure. Estimates of social costs of transport noise have also been used in an analysis comparing the social cost efficiency of policy instruments for reducing CO_2-emissions in the Danish transport sector, and in an assessment of the social costs of extensions of the Danish railway net. Estimates of avoidance costs of transport noise were used for assessing instruments to reduce transport noise, and indicated that low-noise road surfaces and phase-out of noisy tires have promising cost effectiveness ratios. The examples show that in spite of uncertainties, estimates of social costs can still be useful by indicating the magnitude of the noise component in the total social cost assessments.

1 - INTRODUCTION

Social costs of transport noise are relevant for various transport policy considerations, such as considerations regarding transport taxation, transport infrastructure investments, assessments of the social costs of transport and comparing costs and benefits of transport noise abatement. This paper concerns the application of estimates of social costs of noise in policy considerations, based on examples from Denmark.
Four examples of application of social costs of transport noise are presented:

- Unit social costs of transport from the Danish Road Directorate
- Analysis of cost efficiency of policy instruments for CO_2 reduction in the transport sector
- Social costs estimates of extensions of the Danish railway net.
- Assessment of policy instruments to reduce transport noise

2 - UNIT SOCIAL COSTS OF TRANSPORT

The Danish Road Directorate publishes on a yearly basis a list of unit costs to be used for assessments of road infrastructure projects by the road administrations in Denmark. Apart from noise costs, the cost figures comprise value of time costs, vehicle costs for passenger cars and trucks, accident costs, air pollution costs and barrier costs.
The noise costs are based on an update of a 1978-study, using the hedonic method for estimating transport noise costs. Based on this study, the reduction in house prices is estimated to be 1 % per dB(A) in the noise interval 65-70 dB(A).
This estimate, however, only reflect welfare loss, whereas costs of transport noise are also inflicted on society in terms of reduced productivity, hospital and health care costs, etc. Such costs have been roughly estimated to comprise 50% of the welfare loss. The estimate is further modified in order to reflect that annoyance increases relatively more at higher noise level. The noise cost estimates have been updated, using updated house prices.

There is a need for an updated basic study on noise costs in Denmark. However, it is assessed that the estimate does not differ widely from international estimates.

3 - POLICY INSTRUMENTS FOR CO_2 REDUCTION

This example concerns a complex study of the cost efficiency of policy instruments for CO_2 reductions in the transport sector, carried out by the Danish Ministry of Transport in 1998. The study was carried out as part of the Danish policy considerations for reaching the target of CO_2 reductions in the transport sector by 2005. A large number of instruments were assessed in terms of technical costs, external costs and welfare loss, and a shadow price per ton CO_2 reduced was calculated.
The external costs included were noise costs, air pollution costs, accident costs and infrastructure costs. The estimate of noise costs were based on the above mentioned unit costs from the Danish Road Directorate, supplemented by a review of international cost estimates, resulting in an interval with a high and a low estimate.
The marginal costs per kilometre were calculated by using a reference noise level, and the costs were calculated for four vehicle categories and for city and rural areas respectively.
The policy analyses illustrated that, in spite of uncertainties, the inclusion of noise costs and other external costs gave valuable information in the assessment of cost efficiency. The study provided a better understanding of the cost efficiency of the various transport policy instruments, especially with regard to changes in transport taxation.

4 - EXTENSION OF THE DANISH RAILWAY NET

In 1998, the Danish Government considered an enlargement of the railway net between Copenhagen and the neighbouring city, Ringsted, because this part of the railway net had become a bottleneck. Considerable effort was put into producing background analysis, and various alternative solutions were considered. Social cost analyses were carried out for a number of alternatives, using data on investments, variable costs, time savings, noise costs and other environmental costs.
The estimate of noise costs comprised two elements, noise mapping and estimate of unit costs. For each alternative solution, the number of house affected by noise before and after enlargement of the infrastructure were calculated and multiplied by a nuisance factor and a unit cost.
The unit costs were based on an update of the noise costs from the Danish Road Directorate, using a high and a low estimate. In this way the total noise costs of the various alternatives were estimated. In the overall social cost assessment it turned up, that construction costs and time savings were the major elements.
Noise abatement was to some extent included in the various alternatives. In order to reflect this, the costs of noise barriers were included in the investment costs, and similarly the calculation of the noise effect of the various solutions took the noise barriers into account.

5 - POLICY INSTRUMENTS TO REDUCE TRANSPORT NOISE

In the Danish Transport Policy paper, Transport 2005, a target is set for reducing the number of seriously noise affected houses − houses affected by noise levels at 65 dB(A) and above − to 50.000 by 2010. To this end, the Danish Environmental Agency and the Danish Ministry of Traffic in 1997-1998 initiated a study on reduction of traffic noise. The study identified and assessed the effect of a number policy instruments to reduce traffic noise.
The instruments selected for analysis were: Phase-out of the most noisy tires; replacement of road surfaces with low-noise road surfaces; lower speed in urban areas; noise barriers; sound insulation of buildings; and redirection of traffic to less noise sensitive areas.
Avoidance costs were estimated and compared to the benefits of the various policy instruments in terms of reductions in the number of houses affected by traffic noise at 65 dB(A) and above.
The results of the study indicated, that replacement of road surfaces with low-noise road surfaces and phase-out of noisy tires have promising cost effectiveness ratios. A main reason is, that these instruments reduce noise at the source, and therefore have a large impact, whereas noise barriers and insulation are relatively expensive, and only reduce noise at the level of the receiver. Unfortunately replacement with low-noise pavement and phase-out of noisy tires are not readily available policy instruments. Therefore, noise barriers and insulation are still relevant solutions to reduce serious noise problems in the short term.

6 - SUMMARY AND CONCLUSIONS

A number of examples of application of social costs of transport noise are available in Denmark. The basic estimates of noise costs should definitely be updated in the future. However, in spite of uncertainties,

estimates of social costs can still be useful by indicating the magnitude of the noise component in the total social cost assessments. Thus, the perspective seems good for further inclusion of noise costs in social cost assessments in the transport sector.

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