

Selecting Road-Noise Abatement Measures: Economic Analysis of Different Policy Objectives

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Abstract: To satisfy new legislation, the Norwegian Public Roads Administration implemented a national façade insulation program encompassing 2,500 dwellings exposed to high levels of road traffic noise. Thereby, the road owner brought the equivalent noise levels from road traffic in compliance with a new indoor limit of 42dB. Cost-effectiveness analyses show that façade insulation was the least expensive noise-control alternative per dwelling. However, cost-benefit analyses show that the benefits were less than 20 per cent of costs. One reason for the poor benefit-cost ratio is that only the residents of the targeted dwellings benefit from at-receiver measures. Measures at the source and/or targeting the propagation paths also provide noise benefits for residents living along the same streets as the most noise exposed and inadequately insulated dwellings.

A mixed noise abatement policy employing low-noise asphalts in addition to façade insulation is therefore considered. For 750 dwellings where two or more of the dwellings were located along the same road stretch, low noise asphalts replaced façade insulation as noise abatement method. Façade insulation was kept as noise abatement method for the remaining 1,750 dwellings. The mixed noise abatement policy costs more, but now provides total benefits that match the total costs.

Even higher benefit-cost ratios are obtained when reframing the economic analyses within the context of a national policy to reduce noise annoyance, and when focussing solely on more densely populated areas where low-noise asphalts is a viable alternative to façade insulation. Since environmental authorities are in the process of further lowering the indoor noise limit, the road authorities should consider preparing an organisational and financial framework for implementing low-noise surfaces based on cost-benefit calculations. Such a policy would have the added benefit of improving urban soundscapes for a significant number of residents, workers, cyclists, pedestrians and children.

Keywords: Environmental limits, façade insulation, low-noise asphalt, noise measures, noise policy, dual objectives, soundscape.

1. INTRODUCTION

Traffic noise became the subject of Norwegian pollution regulation in 1997, regulation specifying that indoor equivalent noise levels should not exceed 42 decibels (dB). Where indoor noise levels exceeded the new environmental limit, infrastructure owners, among them, the Norwegian Public Road Authorities, were obliged to comply with the new regulations before the year 2005. One measure reducing indoor noise exposure, indoor noise annoyance and sleep disturbance is façade insulation [1-3]. To meet the new noise limits, the Norwegian Public Road Authorities introduced a façade insulation programme affecting 2,500 dwellings nationally and, to capitalize on the research opportunity presented, the Norwegian Façade Insulation Study [4] was realised.

The first round of results from the Norwegian Façade Insulation Study shows that respondents receiving façade insulation benefited significantly and substantially from the measure [5]. However, since noise abatement using façade insulation is costly, economic analyses were undertaken as part of the Insulation Study. Here, we examine this clean-up

effort along the roads, focussing on how an alternative mix of noise-abatement measures would have been in terms of costs and benefits compared to façade insulation alone.

When the objective of fulfilling a new pollution regulation is being considered, a cost-effectiveness analysis (CEA), which is about finding the least costly way of meeting the regulatory limit, is often carried out. Measures more costly than the least costly are disregarded, even though the additional benefits may outweigh the added cost. Cost-benefit analysis (CBA), on the other hand, compares the various benefits of a measure to the costs [6]. In CBA, the measure with the highest ratio between benefits and costs will often be considered the most advantageous, regardless of whether it is relatively costly or not. When considering CEA vs CBA, it is relevant to point out that Norway has been moving towards a national target of noise annoyance reduction by 25 per cent before the year 2010. This reduction was to be accomplished mainly by addressing noise emissions at source. The target has since been reduced to 10 per cent reduction in noise annoyance, and the time limit for attaining the target pushed forward to 2020. Since road traffic noise is responsible for 80 per cent of noise-annoyance in Norway [7], and the main cause is road surface/tyre interaction, the authorities may need to find low-noise road surfaces that will survive winter conditions in the country [8].

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Economic Analysis Of Transportation Noise Abatement

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Management of Air Operations at NAS Whidbey Island Between Ault Field and Outlying Field Coupeville, Oak Harbor, 1993 The Full Costs and Benefits of Transportation David L. Greene, Donald W. Jones, Mark A. Delucchi, 2012-12-06 Modern transportation systems have pervasive and far reaching effects on society and the environment Mobility and other benefits of modern transportation arrive with many serious undesired consequences deaths and injuries in transport accidents pollution of air water and groundwater noise congestion greenhouse gas emissions etc Governments and markets both play critical roles in providing infrastructure and operating and policing transportation systems As world transport systems expand and become increasingly motorized the transportation community is searching for transportation

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F-35B West Coast Basing ,2010 *Environmental Methods for Transport Noise Reduction* Mats Nilsson,Jörgen Bengtsson,Ronny Klæboe,2014-11-20 Presents Evidence Based Guidance on Noise Abatement Methods Solutions for reducing the noise impact of road and rail traffic can be found in the use of natural elements in combination with artificial elements in urban and rural environments Ground and road surface treatments trees forests and tall vegetation and the greening of buildings and other surfaces can contribute to powerful and cost effective noise reduction *Environmental Methods for Transport Noise Reduction* presents the main findings of the Holistic and Sustainable Abatement of Noise by optimized combinations of Natural and Artificial means HOSANNA research project This project involved experts from seven countries and assessed noise reduction in terms of sound level reductions perceptual effects and cost benefit analysis It considered a number of green abatement strategies and aimed to develop a toolbox for reducing road and rail traffic noise in outdoor environments Combines Theory with Practice Broad in both theory and application and based on leading edge research the book brings together the findings and their practical use It details assessment methods for perceived noise and outlines noise prediction methods that can be integrated with noise mapping software It also explores the economic benefits and positive effects on urban air quality and CO2 levels The material is this book Includes up to date results on noise mitigation using vegetation and ground treatments Contains relevant results on innovative noise barrier designs Presents data on acoustic performance of vegetation and soil substratum Provides perceptual and cost benefit analyses of noise mitigation methods *Environmental Methods for Transport Noise Reduction* is a helpful guide for noise consultants city planners architects landscape architects and researchers **Scientific and Technical Aerospace Reports** ,1973

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