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THE GOOD PRACTICE GUIDE FOR STRATEGIC NOISE MAPPING

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Abstract

The European Directive 2002/49/EC relating to the assessment and management of environmental noise requires all European Member States to engage in the activities of noise data collection, management and reporting with the purpose of reducing the exposure to noise. Deadlines are set for the completion of strategic noise maps and of action plans for agglomerations and transport infrastructures. Common noise indicators are to be followed and harmonized calculation methods will be mandatory when they are available. For the first round of noise mapping, to be completed by 2007, existing nationally approved or recommended methods can be used. They have to answer to the minimum requirements set up in the Directive.

Most European countries have some experience on noise mapping or have already started mapping activities to fulfil the Directive requirements. To make such requirements clearer, the Working Group on Assessment of Exposure to Noise (WG-AEN), which is part of the EU noise Expert Network, prepared a Good Practice Guide for Strategic Noise Mapping and the Production of Associated Data on Noise Exposure. Version 1 of that document was made widely available on December 2003. A revised, much enhanced version was developed during 2004 and 2005. Version 2 is a totally new edition of the Good Practice Guide where new items, such as implications for acoustic accuracy, were introduced. The contents of the Guide reflect the expertise and experience of a large number of professionals from all over Europe, members of WG-AEN.

The objectives of version 2 of the Good Practice Guide for Strategic Noise Mapping, as well as general hints on how it should be used and applied are presented and discussed here. The general contents and the toolkits provided are described. Limits of applicability and implications for acoustic accuracy are also addressed.

INTRODUCTION

The European Directive 2002/49/EC relating to the assessment and management of environmental noise [1] requires all European Member States to engage in the activities of noise data collection, management and reporting for the purposes of managing, and reducing where necessary, exposure to noise. This Environmental Noise Directive sets deadlines for the completion of strategic noise maps and for the development of action plans for agglomerations and for transport infrastructures.

For the purposes of strategic noise mapping, common noise indicators are to be used and harmonised calculation methods will be mandatory when these are available (after the first round of mapping). For the first round of mapping, which must be completed by the 30th of June 2007, recommended interim calculation (or measurement) methods or existing national methods are to be used [2].

To assist the European Commission (EC) and Member States in the implementation of specific requirements of the Environmental Noise Directive (END), the EC set up Working Group - Assessment of Exposure to Noise (WG-AEN) as part of the EU Noise Expert Network [3]. The Group produced a "Good Practice Guide for Strategic Noise Mapping and the Production of Associated Data on Noise Exposure" intended to help European Member States to comply with the requirements of the END.

Version 1 of the Good Practice Guide was produced in December 2003 and was the subject of a pan European consultation process. The document has now been revised, modified and enhanced to take account of the feedback from this consultation process and recent developments including the results of an 'Accuracy Study' [4] sponsored by the United Kingdom (UK) Government, resulting in version 2 (GPGv2) that will replace the initial version following consideration by the EC's Environmental Noise Steering Group.

OBJECTIVES

The Good Practice Guide for Strategic Noise Mapping version 2 (GPGv2) is intended to assist European Member States in understanding and fulfilling the requirements of the END and, in particular, those requirements which relate to the first round of noise mapping and noise exposure assessment that must be completed in 2007. It sets out to achieve this through providing technical recommendations on noise mapping practicalities.

Many of the recommendations in the Guide are linked to toolkits, which provide options for dealing with specific technical issues.

A particular challenge for WG-AEN in preparing the GPGv2 was to decide how much guidance should be provided. The Group has attempted to find an appropriate balance between the need for a consistent approach across Europe and the flexibility required by individual Member States to develop noise mapping programmes that meet their own national needs.

OVERVIEW OF THE CONTENTS OF THE GOOD PRACTICE GUIDE

The main body of Good Practice Guide version 2 contains discussions on, and recommendations for dealing with, issues raised by the END, a set of toolkits to complement the recommendations and an introduction on implications for the acoustic accuracy of using some of the toolkits.

Seven appendices are also provided, the most notable being Appendix 4 and Appendix 5, which are based on the results of the 'Accuracy Study' [4] and deal with understanding sources of uncertainty in noise modelling and the importance of data quality for strategic noise mapping.

Issues raised by the END

The Good Practice Guide deals with general issues and noise source, noise propagation and receiver related issues that have been raised by the END providing discussions and some recommendations for dealing with them (Chapter 2).

These issues relate to the subjects listed below. Some of the issues are linked to toolkits (in Chapter 4) that provide further assistance and help.

General issues

Strategic noise maps (and mapping)
Assessment methods
The role of noise measurement
Area to be mapped (Toolkit 1)
Sources outside the agglomeration area being mapped
Relevant year as regards the emission of sound
Average year as regards the meteorological circumstances
Reviewing strategic noise maps
Special insulation against noise

Source related issues

Road traffic models
Traffic flows and traffic speeds (Toolkits 2, 3 and 4)
Major roads with less than 6 million vehicle passages per year on some sections*
Low flow roads in agglomerations
Speeds on low flow roads in agglomerations
Geographical errors in road alignment
Road surface type (Toolkit 5)
Speed fluctuations at road junctions (Toolkit 6)
Road gradient (Toolkit 7)
Determination of the number of road lanes
Assignment of flows and speeds to different lanes of multi-lane roads
Calculation of railway noise
Rail roughness

Trams and the sound power levels of trams and light rail vehicles (Toolkit 8)
Train (or tram) speed (Toolkit 9)
Major railways with less than 60,000 train passages per year on some sections**
Noise from stopping trains at stations
Geographical errors in rail track alignment
Assignment of train movements to different tracks in multi-track rail corridors
Helicopter noise
Noise from aircraft activities other than aircraft movements and noise from other sources at airports
Sound power levels of industrial sources (Toolkit 10)

*In the first round of END mapping in 2007, only major roads with more than 6 million vehicle passages per year have to be mapped
** In the first round of END mapping in 2007, only major railways with more than 60,000 train passages per year have to be mapped

Propagation related issues

Ground surface elevation (Toolkits 11 and 12)
Ground surface type (Toolkit 13)
Noise barriers
Building heights (Toolkit 15)
Simplification of building outlines
Merging of heights on individual buildings and buildings of a similar height
Tunnel openings in the model
Sound absorption of building façades and barriers (Toolkit 16)
Consideration of meteorological impacts and favourable sound propagation conditions (Toolkits 17 and 18)

Receiver related issues

Calculation height
Most exposed façade
Quiet façade
Assessment point (grid spacing, contour mapping and reflections)
Assignment of noise levels to dwellings
Assignment of population to dwellings in residential buildings (Toolkits 19 and 20)
Dwelling
Determination of the number of dwelling units per residential building and population per dwelling unit (Toolkits 20 and 21)
Quiet areas in an agglomeration
Quiet areas in open country

The implications for accuracy of using the toolkits

The Good Practice Guide provides (Chapter 3) an introduction to, and a discussion on, the implications for acoustic accuracy of using some of the toolkits included.

This chapter also starts to address issues of the END's requirements for acoustic accuracy and how such accuracy might be achieved.

Toolkits of solutions to specific challenges

The GPGv2 provides 21 toolkits (Chapter 4) which are listed below.

Most of these toolkits supplement recommendations regarding the various issues (Chapter 2). Six have been produced following the 'Accuracy Study' (these are marked thus *).

General issues

Toolkit 1. Area to be mapped

Source related issues

Toolkit 2. Road traffic flow
Toolkit 3. Average road traffic speed
Toolkit 4. Composition of road traffic
Toolkit 5*. Road surface type
Toolkit 6*. Speed fluctuations at road junctions
Toolkit 7*. Road gradient
Toolkit 8. Sound power level of trams and light rail vehicles
Toolkit 9. Train (or tram) speed
Toolkit 10. Sound power levels of industrial sources

Propagation related issues

Toolkit 11*. Ground elevation close to the source
Toolkit 12. Cuttings and embankments
Toolkit 13*. Ground surface type
Toolkit 14*. Barrier heights near roads
Toolkit 15. Building heights
Toolkit 16. Sound absorption coefficients α_r for buildings and barriers
Toolkit 17. Occurrence of favourable sound propagation conditions
Toolkit 18. Humidity and temperature

Receiver related issues

Toolkit 19. Assignment of population data to residential buildings
Toolkit 20. Determination of the number of dwelling units per residential building and the population per dwelling unit

Toolkit 21. Assignment of noise levels to residents in dwellings in multi-occupied buildings

Some of the above toolkits provide examples for dealing with issues arising from the END and, in particular, those issues concerning shortfalls in data availability and quality. The Guide emphasises, however, that every effort should be made to obtain accurate updated real data on noise sources.

A colour code, as shown in Figure 1, has been associated to each tool. Where the accuracy has not been quantified, a qualitative code, identical to that used for complexity and cost, has been included.

Colour code to rate Tools					
complexity	colour code	accuracy	colour code	cost	colour code
simple		low	> 5 dB	inexpensive	
-		-	4 dB	-	
-		-	3 dB	-	
-		-	2 dB	-	
-		-	1 dB	-	
sophisticated		high	< 0.5 dB	expensive	

Figure 1 - Colour codes for tools where the accuracy implications have been quantified.

DISCUSSION AND CONCLUSIONS

WG-AEN has completed a major task that was set by the European Commission's Directorate General – Environment (DG-Env.) in that the Group has produced the final draft of its Good Practice Guide on Strategic Noise Mapping and the Production of Associated Data on Noise Exposure, version 2 (GPGv2).

The GPGv2 is not to be considered as a manual for strategic noise mapping. It is only intended to provide advice on specific issues that were raised initially by Member States and more recently through consultation on Version 1.

The document deals solely with strategic noise mapping and the production and management of data, with no recommendations on the action planning required by the END. According to the END, action plans must be based upon the results of strategic noise maps and must apply to the most important areas as established by strategic noise mapping. After the production of strategic noise maps, more detailed noise modelling/mapping and noise exposure assessment may have to be undertaken in order to develop detailed local action plans. Figure 2 depicts samples of a strategic

and of a detailed noise map showing that a larger volume of information is conveyed by the latter, which may be necessary for developing local action plans.

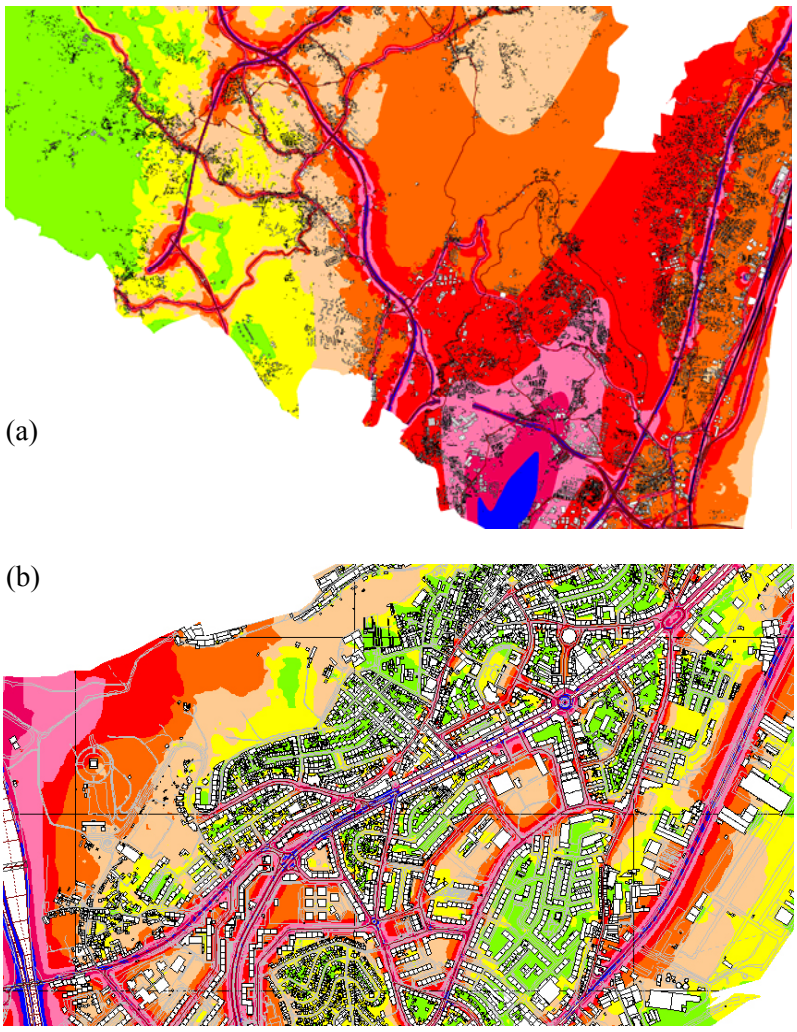

Figure 2 – Samples of noise maps: strategic (a); detailed (b).

The GPGv2 was not designed to assist noise mapping software engineers develop software and systems that are consistent with the requirements of the END. Neither is it intended to address in detail the role of Geographical Information Systems (GIS) in noise mapping and the production of associated data.

WG-AEN has set up a HELPDESK to deal with requests for information on the detailed contents of the document [5]. Such requests will be answered by WG-AEN whilst the Group has a mandate to do so from the EAA. A forum has been set up on the European Commission's CIRCA website [6] where requests for information on the GPGv2 and WG-AEN replies will be posted.

Work of WG-AEN with the purpose of providing further assistance and help on the requirements of the Environmental Noise Directive is continuing. A descriptive catalogue of currently available noise mapping software is being prepared and a Position Paper on options for presenting noise maps to the public will soon be produced. The Group is also supporting and contributing to the CALM II Network [7] and the IMAGINE Project [8].

REFERENCES

[1] Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise, published 18.7.2002, L189/12-25.
[2] Commission Recommendation of 6 August 2003 concerning the guidelines on the revised interim computation methods for industrial noise, aircraft noise, road traffic noise and railway noise, and related emission data, published 22.8.2003, L212/49-64.
[3] http://europa.eu.int/comm/environment/noise.
[4] *WG-AEN's Good Practice Guide and the Implications for Acoustic Accuracy*, The Department for Environment, Food and Rural Affairs (DEFRA), Research Project NAWR 93, May 2005.
[5] goodpracticeguide2@dsl.pipex.com.
[6] http://forum.europa.eu.int/Public/irc/env/noise_map/home.
[7] http://www.calm-network.com.
[8] http://www.imagine-project.org.