



A REVIEW OF THE EU PROJECT “ADAPTATION AND REVISION OF INTERIM COMPUTATION METHODS FOR STRATEGIC NOISE MAPPING”

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ABSTRACT

This paper briefly presents both the aim and the results of the different tasks of the project “Adaptation and Revision of INTERIM Computation Methods for strategic noise mapping”, hereafter called AR-INTERIM-CM.

This study has been done in 2002, by an international consortium headed by Wölfel and with the participation of LABEIN. The project findings and recommendations have been used by both DG Environment and WG-AEN to prepare the EC Guidelines for Strategic Noise Mapping and to draft the Good Practice Toolkit.

Both these documents will help acousticians – especially in Member States that do not have their own national computation methods - to solve the compromise between quality and complexity in Strategic Noise Mapping. To ensure the technical quality of strategic noise mapping both repetitiveness in calculating scenarios and sensitiveness to evaluate the effect of noise abatement measures must be guaranteed.

RESUMEN

Esta ponencia presenta el proyecto de Revisión y Adaptación de los Métodos de Cálculo Provisionales, AR-INTERIM-CM, sus objetivos y una breve exposición del trabajo realizado.

Este estudio ha sido realizado durante el año 2002 y en el ha participado un consorcio liderado por Wölfel y con la participación de LABEIN. Los resultados y recomendaciones del proyecto están siendo utilizados, por la DG Environment y por WG-AEN para preparar las Guías Europeas de realización de Mapas de Ruido Estratégicos y el Manual de Buenas Prácticas.

Estas publicaciones ayudarán a realizar mapas de ruido estratégicos buscando el mejor compromiso entre calidad y complejidad. Los puntos clave de la calidad técnica de los mapas de ruido estratégicos son la repetitividad en el cálculo de diferentes escenarios y la flexibilidad para valorar posibles medidas de reducción del ruido.

1. INTRODUCTION

The most important reference of this paper is the European Noise Directive (DIRECTIVE 2002/49/EC of the European Parliament and of the Council of 25 June 2002, referred to hereafter as END), as it establishes the Interim Calculation Methods to be used to assess the environmental noise levels in the agglomerations and around infrastructures.

The END also defines the concept of Strategic Noise Mapping, a global management point of view into the acoustical assessment. This idea sets new priorities:

- The Strategic Environmental Noise Assessment: Strategic Noise Mapping relates to large scale and determines noise levels in a two-dimensional plane. Strategic Noise Mapping determines the annual average level as an indicator of the environmental noise. The assessment is completed with data about people exposed or annoyed by noise.

The strategic assessment cannot cope with the particular citizen complaints about noise, as it cannot represent a particular situation at a time. Therefore it should be complemented with other assessment technologies as noise level measurements at fixed points to describe the level during the measurement time.

- The Environmental Noise Management: Strategic Noise Mapping is the basic tool to develop action plans. The process should be based on the study and comparison of scenarios (strategic assessment of different situations), in order to evaluate the effectiveness of the proposed action to reduce the environmental noise.

Therefore the Strategic Noise Mapping should be repetitive, as the most important result is the comparison between different scenarios. In planning it is of minor importance whether the noise levels calculated are highly accurate. It is however utterly important that both the inaccuracy and the model behavior remain constant in all scenarios. It should be also sensitive to evaluate the effect of future measures that could be considered. Those ideas, **repetitiveness in different scenarios** and **sensitiveness to evaluate the effect of noise abate measures**, defines the quality and accuracy needed for Strategic Noise Mapping.

The END recommends to use calculation methods for Strategic Noise Mapping. To calculate the noise levels, we must model the reality and assume some simplifications, knowing the acceptable inaccuracies. But the quality of Noise Mapping is a complex issue related not only to calculation methods, but also to their implementation in software, input data and finally the most important factor: user experience. It will have to combine all these factors to find the best compromise between quality and complexity.

To ensure technical quality of Strategic Noise Mapping, both repetitiveness and sensitiveness to noise abatement measures must be guaranteed. These are key points determining the complexity of both the site model and the calculation. Other causes adding to the complexity of a Strategic Noise Map are the calculation method itself. Even though the input data (procurement, quality assurance, input, description and documentation, ...) remains the major factor influencing complexity, calculation methods have to be:

- Adapted to accept the type of input data normally accessible,
- Properly implemented in software,
- Easy to learn and understand which requires that they are well documented,
- Under permanent quality control with periodic reviews .

In the process of implement the END, both EC DG Environment and WG AEN have taken the initiative to produce and promoting Good Practice to guide and help in Strategic Noise Mapping. Here an opportunity to improve our Environmental Noise Assessment and Management processes arises.

2. ADAPTATION AND REVISION OF INTERIM COMPUTATION METHODS FOR STRATEGIC NOISE MAPPING

In the field of noise mapping, the END recommends the use of INTERIM computation methods for Strategic Noise Mapping and indicates minimum requirements for noise maps. These methods are listed below:

For INDUSTRIAL NOISE: ISO 9613-2: 'Acoustics — Abatement of sound propagation outdoors, Part 2: General method of calculation'.

Suitable noise-emission data (input data) for this method can be obtained from measurements carried out in accordance with one of the following methods:

- ISO 8297: 1994 'Acoustics — Determination of sound power levels of multisource industrial plants for evaluation of sound pressure levels in the environment — Engineering method',
- EN ISO 3744: 1995 'Acoustics — Determination of sound power levels of noise using sound pressure — Engineering method in an essentially free field over a reflecting plane',
- EN ISO 3746: 1995 'Acoustics — Determination of sound power levels of noise sources using an enveloping measurement surface over a reflecting plane'.

For AIRCRAFT NOISE: ECAC/CEAC Doc. 29 'Report on Standard Method of Computing Noise Contours around Civil Airports', 1997. Of the different approaches to the modelling of flight paths, the segmentation technique referred to in section 7.5 of ECAC/CEAC Doc. 29 will be used.

For ROAD TRAFFIC NOISE: The French national computation method 'NMPB-Routes-96 (SETRA-CERTU-LCPC-CSTB)', referred to in 'Arrêté du 5 mai 1995 relatif au bruit des infrastructures routières, Journal Officiel du 10 mai 1995, Article 6' and in the French standard 'XPS 31-133'. For input data concerning emission, these documents refer to the 'Guide du bruit des transports terrestres, fascicule prévision des niveaux sonores, CETUR 1980'.

For RAILWAY NOISE: The Netherlands national computation method published in 'Reken- en Meetvoorschrift Railverkeerslawaaier '96, Ministerie Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, 20 November 1996'. ¹

These methods may be used, once adapted and revised, for strategic noise mapping as required by the END. A Member State that does not have any national methods of its own is required to use these interim methods. Alternatively, END allows the use of national methods provided EU M.S. demonstrate that the results produced using such methods are equivalent with the results produced using the interim methods. This is meant to ensure comparability of results across EU Member States which is one of the ultimate goals of the END. Interim methods and national methods will be superseded by the planned harmonized calculation method.

The three methods that deal with the surface noise sources of road traffic, railway traffic and industry have one common denominator in that they are either based on ISO 9613-2 or employ equations derived from ISO 9613-2. The method to calculate noise contours around airports is different.

It should be noted that, with the exception of industrial noise, the release date of the methods is specified in the END. This implies a legal obligation to use a particular edition of the methods or an adapted version of them provided by the EC and announced in END:

Those methods must be adapted to the definitions of L_{den} and L_{night} . No later than 1 July 2003 the Commission will publish guidelines in accordance with Article 13(2) on the revised methods and provide emission data for aircraft noise, road traffic noise and railway noise on the basis of existing data.

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The above clause splits into two parts: The first sentence on adaptation to noise indicators L_{den} and L_{night} is applicable to both the interim methods and the national methods. This adaptation is an element of primary importance in the search for comparability of noise maps. In the second sentence, the EC sets itself a time limit to produce guidelines on the revised interim methods.

¹ quote from Directive 2002/49/EC

Early 2002, EC DG Environment awarded the contract on “Adaptation and Revision of INTERIM Computation Methods for strategic noise mapping” (related hereafter AR-INTERIM-CM) to a consortium including Labein and headed by Wölfel. The aim of the study was to propose adaptations and revisions of the interim methods to make them suitable for strategic noise mapping in all EU Member States. The project is finished by now and its findings and recommendations have been used by both EC DG Environment and WG AEN to prepare the guidelines announced in the END to be published before 1 July 2003. The final reports of the projects can be found in the "[Recommended Interim Noise Computation Methods](#)" section of the following website <http://forum.europa.eu.int/Public/irc/env/noisedir/library>

2.1 Aim

The aim was to propose adaptations and revisions of the interim methods to make them suitable for strategic noise mapping in all EU Member States.

The terms of reference defined the project as a desk study. As a consequence this project is qualified as an application project. The aim was strictly limited to studying existing data, reports, methods and information. It is of utmost importance to note that the project AR-INTERIM-CM by definition was not meant to produce new computation methods. This is the goal of a project called HARMONOISE.

The project team contracted by EC DG Environment in early 2002 consist of experts from five EU Member States (listed in alphabetic order): AIB-Vinçotte EcoSafer (B), AKRON n.v.-s.a. (B), Labein S.L. (E), Prof. Dr. Judith LANG (A), Lärmkontor GmbH (D), Proscen Environmental Ltd. (UK) and Wölfel Meßsysteme · Software GmbH & Co (D)+(B) as main contractor.

2.2 Short Presentation of Tasks

The following gives a short explanation of the different tasks of AR-INTERIM-CM :

Description of the calculation method:

- For the French NMPB/XP S 31-133 and the Dutch RMR methods this task consisted of two parts: first the translation into ‘non-contextual’ English. A neutral English text had to be produced that is free from any national or country-specific text. In addition, the language had to be adapted to the terminology of END. Furthermore, separate documents had to be produced in which the similarities and differences with the END are explained².
- In the case of ISO 9613-2 and ECAC.CEAC Doc. 29 no translation was needed as both these texts are available in English. ISO 9613-2 is an international standard and as such any modification is precluded. ECAC.CEAC Doc. 29 had to be adapted as the END requires the use of ‘segmentation’ instead of the ‘point of closest approach’ method described in this document. Even though the 1997 edition allows the use of a segmentation method, it does not describe how this could work in the frame of the existing set of equations and constraints.

Revision of emission data:

- In the case of ISO 9613-2, the emission measurement methods listed in the END have been described. In addition, a selection of suitable industrial noise emission databases has been presented.
- In the case of NMPB/XP S 31-131 the existing French method “Guide du Bruit” had to be adapted and at least road surface correction had to be added. The latest advances in the revision of the French emission data by French

² both ‘non-contextual’ English and ‘similarities and differences’ with END are expressions used by the Terms of Reference of the contract.

authorities have been presented as a viable alternative to using the “old” data. The “Guide du Bruit” data of 1980 has been compared with other national emission data.

- For RMR, it was found that the database characteristic of the built-in emissions method is suitable to either attribute trains not yet included to any of the existing train classes or to use the measurement method provided to produce new classes.
- Finally, ECAC.CEAC Doc.29 does not provide any emission data at all. Here a suitable set of emission groups has been selected from existing data already in use in one or more EU Member States. The suitability of the data was verified.

Guidance on the application:

- Here practical hints and good practice on the use of the different methods have been provided.
- This section does not qualify as adaptation or revision and is not likely to be part of the EC guidelines but may well be used in WG AEN's Good Practice Toolkit.

Guidelines on a basic software package:

- For all calculation methods, the basic requirements for a suitable software package for all interim calculation methods have been described without prejudice to the liberty of each software manufacturer to develop his own implementation.
- This section does not qualify as adaptation or revision and is not likely to be part of the EC guidelines but may well be used in WG AEN's Good Practice Toolkit.

3. CONCLUSIONS

The implementation of the END is based on Strategic Noise Mapping to manage and reduce environmental noise levels. To ensure the technical quality of Strategic Noise Mapping, both repetitiveness in calculating scenarios and sensitiveness to noise abate measures must be guaranteed. Those are the key points determining the complexity of the calculation.

In 2002, the project Adaptation and Revision of Interim Computation Methods for Strategic Noise Mapping provided the required technical understanding for the preparation of the EC guidelines announced in the END to be published before 1 July 2003.

The study was by definition a desk study aimed at producing adaptations of the four interim computations methods. A major constraint was to stay as close as possible to the specific edition of each of the interim computation methods mentioned in the END. It was thus neither possible nor the aim to produce new methods. In addition to providing practical adaptations of interim methods and revisions of the noise emission data, the project had to produce good practice in the use of the interim methods.

The adaptations have been presented with success to EC DG Environment and WG AEN in a two-volume report at the end of 2002. Part A [2] of the report presents the findings in a short form, whereas Part B [3] provides all background information.

The results of the project have been used by EC DG Environment and WG AEN to produce the EC guidelines announced in the END.

ACKNOWLEDGEMENTS

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REFERENCES

- [1] DIRECTIVE 2002/49/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of June 25 2002 relating to the assessment and management of environmental noise, Official Journal of the European Communities, L189/12-25, 18.7.2002
- [2] Adaptation and revision of interim computation methods for strategic noise mapping – Final Report Part A, B4-3040/2001/329750/MAR/C1, 2003
- [3] Adaptation and revision of interim computation methods for strategic noise mapping – Final Report Part B, B4-3040/2001/329750/MAR/C1, 2003