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NOISE CONTROL FOR QUALITY OF LIFE

## The results of the CEDR Project Group Road Noise 2009-2013

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### ABSTRACT

The Conference of European Directors of Roads (CEDR) is endeavoring to improve cooperation between its members in order to enhance progress in various road transport sector themes. The purpose of this cooperation is to facilitate the exchange of experience and information on road-related issues like infrastructure, traffic and transport, safety, environment and to perform research in all of these areas.

Road noise is one of the topics within the environmental domain. In 2009 the CEDR Project Group Road Noise (CEDR RN2) was formed to investigate the status of a range of noise related issues that would contribute to the goals defined in the CEDR Strategic Plan 2009-2013 [1], such as establishing standards in line with the objectives of national road authorities, taking appropriate action on EU directives and develop and share knowledge on road noise.

The research areas identified by CEDR RN2 were closely related to the Environmental Noise Directive 2002/49/EC (END) [2] and consist of:

- END noise maps;
- END noise action plans;
- EU directives on vehicle noise;
- EU noise calculation model (CNOSSOS-EU).

CEDR RN2 completed its tasks in April 2013. The results on the areas identified above will be presented. Also, conclusions and recommendations will be highlighted

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## **1. INTRODUCTION**

National Road Authorities (NRAs) face many challenges to provide the necessary sustainable and efficient road networks required to satisfy the mobility needs of its many users. Among these challenges is the need to reduce a range of environmental impacts associated with operating and maintaining such networks, including the requirement to monitor and minimize the impacts of road traffic noise.

In the CEDR Strategic Plan 2009-13 (SP2), road traffic noise formed part of the Thematic Domain (TD) Construction which focused on the role of the National Road Authorities (NRAs) in monitoring developments in areas, such as standards and EU Directives, as well as in environmental and road safety issues. CEDR Project Group Road Noise 2 (CEDR RN2) was established in 2009 with the objective of meeting the goals relating to road traffic noise. Seventeen CEDR member states participated in CEDR RN2, chaired by the Netherlands.

At the commencement of the CEDR RN2 work programme, it was identified that the noise mapping and action planning requirements of the EU Environmental Noise Directive (END) would form a significant component of the group's activities. Five subgroups were established to review and monitor activities associated with END noise mapping, END action planning, value for money in road traffic noise abatement, EU noise calculation model (CNOSSOS-EU) and road noise research needs. It was generally perceived that addressing these issues would fulfil the requirements outlined in SP2.

## **2. CEDR OBJECTIVES & PROCESS**

### **2.1 Objectives**

In the Strategic Plan 2, the following more general goals were defined:

- contribute to the efforts deployed by standardization bodies to establish and update modern standards in line with the objectives of the NRAs and how to facilitate the individual use of new standards;
- monitor European lawmaking and take appropriate action on EU Directives;
- develop and share knowledge on a sustainable infrastructure.

At the opening meeting in The Hague in May 2009, CEDR RN2 identified the more specific goals related to noise outlined in Table 1 and they were defined in accordance with the goals specified in the 2009-13 CEDR Strategic Plan.

Table 1 : CEDR RN2 objectives in accordance with the goals of the CEDR Strategic Plan

CEDR Road Noise 2 objective		TD Construction goal
1	Review CEDR members approach to strategic noise mapping of major roads in 2007 with a view to identifying best practice for the second round in 2012	Develop and share knowledge on a sustainable infrastructure
2	Assess CEDR members responses to the European Commission and the European Environment Agency Working Group on the Assessment of Exposure to Noise (WG-AEN) questionnaire on validation of national noise mapping methods and software in relation to assessment methods for noise indicators in relation to Directive 2002/49/EC	Take appropriate action on EU Directives
3	Review and assess CEDR members approach to action planning in 2008 with a view to providing best practice advice for the second round in 2013	Develop and share knowledge on a sustainable infrastructure
4	Undertake a survey of CEDR members ambitions regarding the (ongoing) procedure in the European Parliament (early 2009) on the new regulation on advanced safety features and tyres COM(2008) 316 (especially the tighter noise emission requirements (2001/43/EC)	Monitor European lawmaking
5	Assess CEDR members views and support for tyre noise limits for heavy duty vehicles in COM(2008) 316	Monitor European lawmaking
6	Assess and review CEDR members views regarding the Tyre Label Directive	Monitor European lawmaking
7	Assess and review engine/vehicle noise limits	Establish and update modern standards in line with the objectives of the NRAs
8	Review CEDR members position regarding input data requirements of the European Noise Model	Establish and update modern standards in line with the objectives of the NRAs
9	Review acoustic characteristics of silent pavements (durability, labelling and conformity checking)	Establish and update modern standards in line with the objectives of the NRAs
10	Noise barrier standards and improvements (design, absorption, multifunction)	Develop and share knowledge on a sustainable infrastructure
11	Monitor the European Position on Europe wide noise limit values	Monitor European lawmaking

## 2.2 PROCESS

In order to undertake the specific objectives identified by CEDR RN2 in total six subgroups were formed each with a designated subject. The six subgroups were END Noise mapping, END Action planning, Road traffic Noise Abatement, Road traffic Noise Research needs, European Noise Model (CNOSSOS-EU) and Factsheets.

Towards the end of the group's activities, it was recognised that since the development of CNOSSOS-EU will continue after 2013, the outcome of this work be summarised in a separate factsheet rather than an individual report. A total of five results orientated reports were produced by CEDR RN2. In general, these reports assessed and evaluated CEDR member state experiences with

the following main topics END noise mapping, END action planning, value for money in road traffic noise abatement and CEDR Road Noise research needs. A fifth report (Executive Summary) was also produced compiling the outcomes of the individual factsheets on END major road data, END policy options, END noise mapping colour regimes and the CNOSSOS-EU computational model.

The executive summary report outlines a short synopsis of the main findings of each report along with highlighting some of the key recommendations formulated by the various subgroups.

### 3. RESULTS

This section highlights the results from a number of key reports generated by CEDR RN2.

#### 3.1 END Noise Mapping

##### 3.1.1 Summary

This report [3] presents the results of a survey conducted across all CEDR members to ascertain the extent of planning and preparation works undertaken for END noise mapping. The results demonstrated that NRAs adopted either a strategic approach to noise mapping, using simplified input data or an advanced approach with detailed data to prepare noise maps for their respective road networks. Significant differences were also found in the number of reflections, grid size and calculation methodologies used to determine noise levels at receiver façades. These differences may be attributed to the wide range of costs reported by NRAs to undertake their respective noise mapping programmes, ranging from less than EUR 100 to more than EUR 2000 per kilometre. For the next phase of strategic noise mapping (2017) it is likely that all member states will be required to implement a common European calculation method, CNOSSOS-EU. Although not yet finalised, initial reports indicate that this method will require additional datasets that are not readily available to NRAs.

##### 3.1.2 Recommendations

In advance of using CNOSSOS-EU, a number of different technical, methodological and legal issues will have to be resolved before its use is common practice. It is anticipated that on completion of the 2017 round of END mapping, a significant number of issues will be resolved that will pave the way for establishing an approach to a common mapping procedure with the objective of achieving comparable, reliable, understandable and useful strategic noise maps.

Recommendation 1
In order to minimise costs associated with undertaking strategic noise mapping in 2017, all NRAs should closely monitor or actively participate (through relevant channels in their country) in the development of the proposed new calculation methodology (CNOSSOS-EU) to ensure that a simplified approach rather than a more advanced approach is adopted. This should avoid NRAs having to incur additional costs associated with augmenting current data collection methodologies.

It is proposed that in the 2017 round of the END, the European Commission intends to introduce the collection of data on populations exposed to noise bands lower than those established in the original END. The proposed noise bands are Lden 50-54 dB and Lnight 40-44 dB. While this requirement may not be mandatory, it will more than likely be strongly recommended. Current CEDR RN2 member is of the view that a lowering of noise bands will have significant implications for CEDR NRAs from both a technical and cost perspective.

Recommendation 2
CEDR NRAs should oppose (through relevant channels in their country) the introduction of noise bands lower than 55 dB Lden and 45 dB Lnight.

CEDR RN2 has identified that coordinating efforts with other administrations responsible for the

preparation of noise maps for other sources, such as railways or other roads, would represent a progressive step to strategic noise mapping. This cooperation should ease the costs associated with noise mapping for all authorities and will ensure that a common database is used across all assessments.

**Recommendation 3**

CEDR NRAs should work together with noise mapping bodies across all disciplines (road, rail, industry, air and agglomerations) to ensure cost sharing and access to all relevant datasets.

**3.2 END Action planning**

**3.2.1 Summary**

In preparing noise action plans, one of the greatest challenges identified by CEDR members was the lack of available resources to implement the necessary noise abatement measures needed to reduce noise levels where they were deemed unacceptable [4]. Therefore, most noise action plans tended not to include any specific goals and actions for reducing noise. Currently, the implementation of noise action plans are not well defined within NRAs, however, it is envisaged that with a more coherent approach to planning new or upgrading existing roads, the content of noise action plans could be the driving force for change in the approach to mitigating noise in locations where it is deemed to be unacceptably high. In addition, it is also anticipated that noise action plans could provide justification for NRAs when seeking additional funding for road maintenance and improvements.

**3.2.2 Recommendations**

A general challenge experienced by most member states was the lack of resources available for implementing the noise abatement measures identified in the plans. Many countries are currently impacted by the economic crisis which has also impacted budget allocations for noise mitigation. It is difficult to prepare detailed actions plans for noise abatement measures in the absence of designated funding. Similar to the noise maps, the action plans operates over a five year period, while budgetary funding for noise control measures, if allocated, typically covers a much shorter time frame. However, it is important to note that a noise action plan can be a driving force for change and that the contents of the plan may help NRAs seek additional funding for network maintenance in terms of noise abatement.

**Recommendation 4**

NRAs could use the content of the noise action plans as a justification for seeking additional funding for road maintenance and noise mitigation measures.

One of the objectives of the END is to define a common approach intended to avoid, prevent or reduce on a prioritized basis the harmful effects, including annoyance, due to exposure to environmental noise. The preparation of noise action plans is a complex process that involves a number of different stakeholders e.g., rail, airport authorities, including the general public etc. In the responses received on the challenges encountered in implementing noise action plans, it was noted that cooperation between the relevant stakeholders was not sufficient and there was insufficient focus on the process of creating the plan.

**Recommendation 5**

In order to improve the consultation process, NRAs should put a plan in place to improve the cooperation between relevant stakeholders that have responsibilities under the noise legislation for preparing noise action plans.

As specified in Annex 5 of END, an action plan must include financial information, if available,

on budgets, cost-effectiveness assessments and cost-benefit assessments. Approximately 60 % of CEDR members reported to having a specific budget for noise abatement while the remaining 40 % reported having no budget at all (Figure 1). CEDR RN2 members believe that cost-benefit analysis (CBA) should form an integral part of the noise action planning process. CBA can be used to prioritize the various noise abatement measures and it can also illustrate the socio-economic benefits of using such measures. The results of this study identified that over 80 % of NRAs did not undertake any cost-benefit assessment of their noise action plans during the first phase of action planning (Figure 1). In countries where cost-benefit analysis was undertaken it seems to be used exclusively at a local level, e.g. for prioritization or optimization of selected projects. No CEDR member reported to undertaking CBA on action plans at a larger scale.

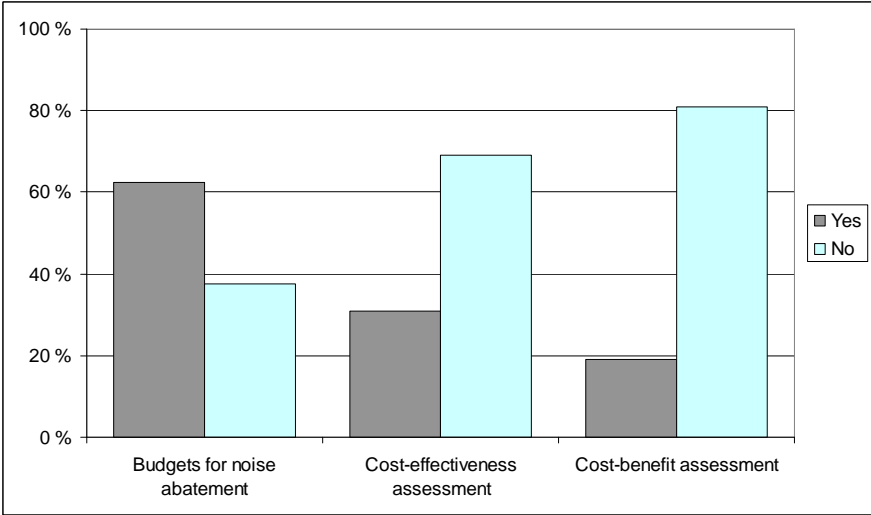


Figure 1: Financial information associated with NRAs noise action plans as required by Annex 5 of END

**Recommendation 6**

NRAs should request the European Commission to provide a harmonised cost benefit assessment tool for undertaking cost-benefit analyses of noise action plans.

The majority of respondents stated that the status of the noise action plan is unclear. For instance, it is not very evident what type of document a noise action plan should be e.g., policy, planning, or financial document etc., and how it should interact with other plans. It appears that an action plan describes the noise situation but it has no binding obligations. Most countries indicated that the noise action plan is similar in nature to a policy statement where objectives have been described on a general level. Currently, it appears that the END (or national legislation) is lacking a clear enforcement regime e.g. where noise action plans are linked to the overall aspects of planning procedures e.g. within environmental planning and planning in rural and urban areas.

**Recommendation 7**

NRAs should give consideration to integrating the content of noise action plans into their respective planning process or road maintenance regime.

**3.3 Value for money in Road traffic noise abatement**

**3.3.1 Summary**

The results arising from the report [5] on value for money in road traffic noise abatement provide robust evidence for the provision of source related noise reduction measures on vehicles and tyres prior to the introduction of infrastructural noise reducing measures such as noise barriers, acoustic glazing on buildings, low noise pavements etc., in close proximity to receivers. Exploiting the most

cost-effective abatement measures will potentially lead to significant cost savings to NRAs. This report clearly demonstrates that source related noise measures (quiet vehicles and tyres) are by far the most cost-effective measures for reducing road noise from major roads, the cost varying from EUR 16 to EUR 4200 per person per year (see Annex 1). With regard to infrastructural noise reducing measures, low noise pavements proved to be the most economical while noise barriers were identified to be the most expensive approach to reduce noise annoyance.

**3.3.2 Recommendations**

In keeping with the central theme of the END, national and community policies should aim to achieve high levels of human health and environmental protection. Reducing noise from vehicles is more than seven times less expensive than any other measure outlined above. The CEDR RN2 recommendation to NRAs is to have a strategy for exploiting the most cost-effective actions to mitigate noise, and this could involve one of the following.

- Advising national governments to have a position on the proposal for the Regulation on sound level from motor vehicles, COM(2011) 856, which includes strict noise limits and a long-term strategy for noise reduction.
- Advising national governments to have a position when revisions are proposed for Regulation (EC) No. 661/2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units. Such position may include a long-term strategy to reduce tyre noise limits with particular emphasis on reducing noise from heavy goods vehicle (HGV) tyres.
- Advising national governments to promote the use of low noise tyres.

<b>Recommendation 8</b>
NRAs should liaise closely with the European Commission (through the appropriate channels in their country) to ensure that stricter EU regulations are put in place to reduce noise levels from vehicle and tyres. CEDR itself should also give consideration to submitting a position paper to the Commission.

At a national level, NRAs when treating areas exposed to unwanted noise should consider the following.

- Use thin layer asphalt as the preferred measure to reduce general noise annoyance.
- Porous double layer asphalt is significantly more costly than single layer, even though you get twice as much reduction in noise than you would get with a single layer surface. Porous double layer asphalt is probably more suitable as a local measure than a measure to reduce the general noise annoyance, because single layer gives better value for money.
- Continue research and testing in order to develop new and higher quality noise reducing pavements which give greater value for money.

<b>Recommendation 9</b>
With regard to mitigating noise at receivers, NRAs should exploit low noise pavements as a first option as they have been shown to be the most cost-effective noise abatement measure.

It is important to note that in local situations where member states have to reduce noise levels greater than 4 dB, the use of noise barriers and façade insulation may be considered as more efficient solutions.

**3.4 Factsheet colour proposal**

**3.4.1 Summary**

On reviewing the END strategic noise maps produced by CEDR national road authorities in 2007, it became clear that the colours used by each member state to depict the various noise bands differed significantly across Europe. At a European level, there appears to be no coordination regarding the choice of colours to be used for the various noise bands under consideration.

The CEDR Road Noise group prepared a proposal [6] on the use of colours for future strategic noise mapping programmes. In preparing the proposal, consideration was given to the use of specific colours for various noise bands, for example, green colour for noise bands below 50 dB and a red colour for the noise band 65-69 dB.

### 3.4.2 Recommendations

In order to standardize END strategic noise maps across the EU, it is recommended that each CEDR member state should follow a common approach as shown in Annex 2 in mapping noise on the major roads by using the proposed colour proposal.

The proposal also recommends that the area to be mapped should be limited to the validation distance of the model.

#### Recommendation 10

NRAs should promote, where possible, the use of the proposed colours in any future noise mapping programmes.

## 3.5 Factsheet CNOSSOS EU

### 3.5.1 Summary

In line with the END, the EC embarked upon the preparation of a Common Noise Assessment Method (CNOSSOS-EU) for strategic noise mapping across the EU [7]. The objective of having a common assessment method is to improve the reliability and comparability of noise mapping results. During a meeting of the Noise Regulatory Committee (NRC) in June 2010, EU member states were invited to nominate experts to be involved in the development and implementation process of CNOSSOS-EU. The first meeting of this Technical Forum of Experts took place in November 2010. This expert group then established a number of working groups to assess various aspects of a common calculation method addressing the requirements of the Directive.

In June 2012, the Commission announced a call for tenders to develop the next phase of the CNOSSOS-EU framework. The overall objectives of the call is to have a common noise assessment methodology operational for the third round of noise mapping in 2017 and to develop a set of guidelines for the competent use of the CNOSSOS-EU framework. This contract was formally awarded in December 2012.

At a recent meeting of the Regulatory Committee on Noise, a new platform Communication and Information Resource Centre for Administrations, Businesses and Citizens (CIRCABC) was announced for implementing phase B of CNOSSOS-EU. On this platform, one national expert per EU member state can bring forward the national discussion addressing CNOSSOS-EU issues. This platform will act as an expert group to follow progress in the development of the CNOSSOS-EU project as well as the development of the guidelines. The legislative progress for implementing the CNOSSOS-EU will be discussed further by the NRC over the next few years.

Members of the CDR RN 2 group participated in the development of CNOSSOS EU and gave recommendations on the further developments.

### 3.5.2 Recommendations

On the topic of CNOSSOS-EU the following recommendations were given in the first drafting phase of CNOSSOS-EU:

- input data for traffic flows should ideally be available from regular national traffic counting that is already undertaken by the NRAs;
- the effect of low noise road surface should be derived from national datasets to account for national differences;
- geometry of traffic lanes and noise screens should be available from existing databases that were generated during the first two rounds of strategic noise mapping;
- for the propagation model, the type of ground (G value), especially in close proximity to roads



should be given by default values.

For the further implementation phase of CNOSSOS-EU it is recommended that, in order to ensure the simplicity of CNOSSOS-EU and the availability of road related data (traffic flow, low noise surface corrections, geometry of lanes and noise screens), a close collaboration of CEDR Project Group Road Noise members with the national responsible person for CNOSSOS-EU should be encouraged [8].

#### **Recommendation 11**

NRAs should collaborate closely with their national responsible person for CNOSSOS-EU to facilitate the preparation and implementation of CNOSSOS-EU methodology.

## **4. CONCLUSION**

Over a period of four years, CEDR RN2 produced some very interesting results with regard to road traffic noise from the perspective of National Road Administration in Europe. The main recommendations of the five reports generated by the group were summarized in the executive summary [9] that was forwarded to the Executive and Governing Board of CEDR.

The three most significant recommendations that evolved from the group were as follows:

- In order to minimise costs associated with undertaking strategic noise mapping in 2017, all NRAs should closely monitor or actively participate (through relevant channels in their country) in the development of the proposed new calculation methodology (CNOSSOS-EU) to ensure that a simplified approach rather than a more advanced approach is adopted. This should avoid NRAs having to incur additional costs associated with augmenting the current approaches used for data collection on their respective networks.
- NRAs should initially define the status of noise actions plans within their organisation and incorporate the content of such plans into their road planning and road maintenance processes in order to achieve quick wins when it comes to mitigating road traffic noise. Also, NRAs could use the content of the noise action plans as a justification for seeking additional funding for road maintenance and noise mitigation measures.
- NRAs should liaise closely with the European Commission (through the appropriate channels in their country) to ensure that stricter EU regulations are put in place to reduce noise levels from vehicle and tyres. CEDR itself should also give consideration to submitting a position paper to the Commission. With regard to mitigating noise at receivers, NRAs should exploit low noise pavements as a first option as they have been shown to be the most cost-effective noise abatement measure.

Research will continue in CEDR Road Noise 3 which has already started in June 2013. The implementation of the results and recommendations of the CEDR RN2 group is one of the main objectives of the CEDR RN3 group.

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## ANNEX 1 : COST OF NOISE ABATEMENT MEASURES

Table Annex 1 : Possible noise abatement measures, their potential for reduction in road traffic noise annoyance and the cost of reducing the number of annoyed people

Noise abatement measure	Reduction annoyed people (million)	Cost reduction annoyed people (EUR per person per year)
Vehicle noise reduction: 5 dB	31.5	16
Vehicle noise reduction: 3 dB <sup>1</sup>	19.7	18
Thin layer asphalt	2.2	136
Single layer porous asphalt	1.1	290
Façade insulation <sup>2</sup>	0.5	570
Double layer porous asphalt	0.3	940
Noise barriers	0.07	4200

<sup>1</sup> According to the 'Proposal for a Regulation of the European Parliament and of the Council on the sound level of motor vehicles, COM(2011) 856 final, December 2011'.

<sup>2</sup> Façade insulation measure used is replacing two windows, assuming 60 % effect on annoyance reduction.

**ANNEX 2 : COLOUR PROPOSAL**

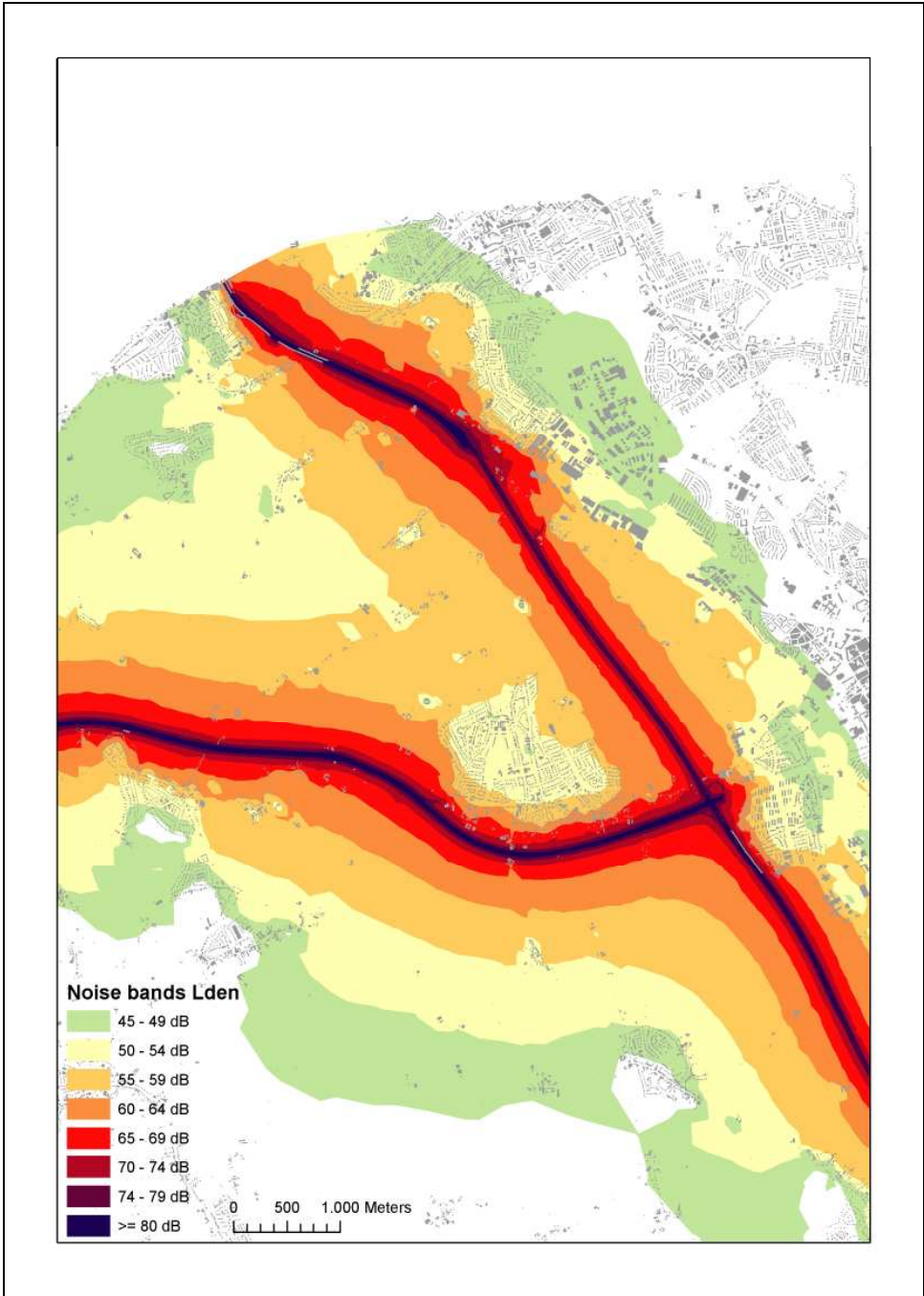


Figure Annex 2 : Example of map with proposed colour proposal