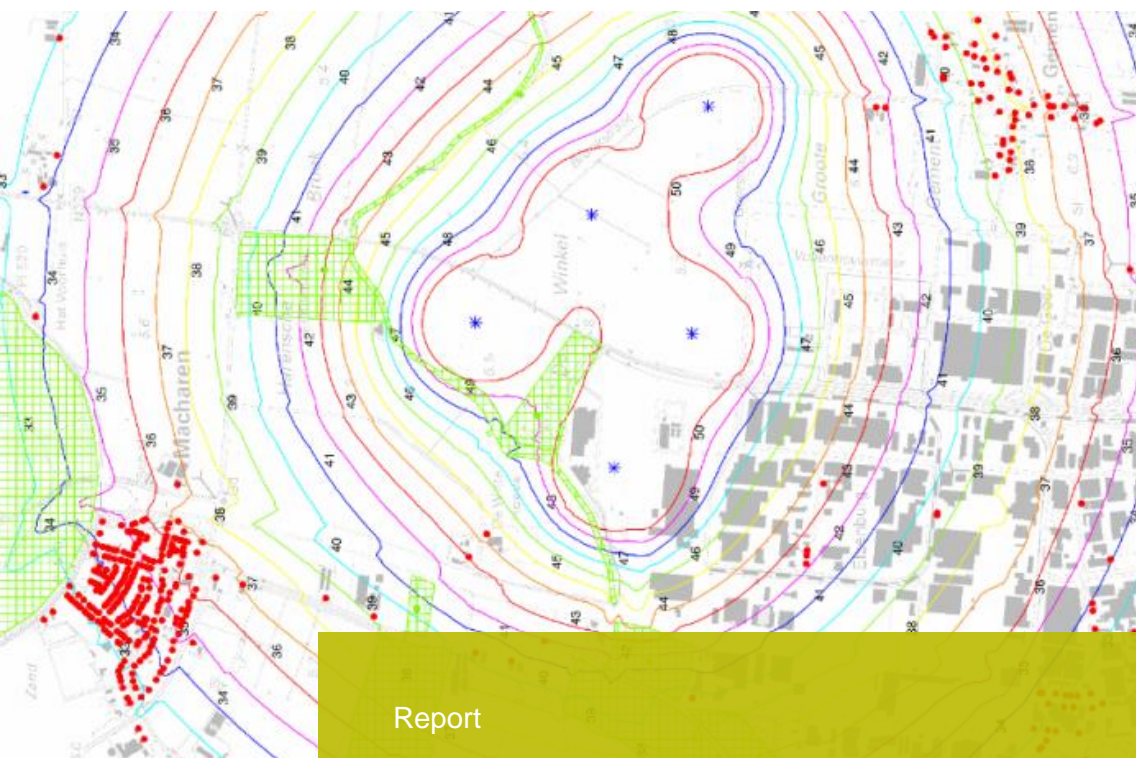


European Network of the Heads of Environment Protection Agencies (EPA Network)

Interest Group on Noise Abatement



Report

Overview of critical noise values in the European Region

Colophon

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|--------------------|--|
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Summary

In October 2018 the World Health Organization (WHO) has published its "Environmental noise guidelines for the European Region". In this report, WHO provides exposure-response functions for relevant noise-related health impacts and, based on these functions, recommendations for noise immission levels (i.e. limit values) that should not be exceeded in order to prevent these health impacts. What the WHO guidelines do not provide is guidance as to how these limit values should be implemented and enforced and what the consequences of exceedance should be. The goal of this report is to provide such guidance, by describing the State-of-the-Art of current noise limits in countries within the European region. The analysis focuses not only on the dB-values used as intervention levels, but also on how they are enforced and what consequences are attached to exceeding these levels. From these descriptions, recommendations are derived for countries that aim to implement the WHO guidelines.

National noise legislation can be quite complex and not all information is easily accessible. In order to create an overview of limit values in the European region, a questionnaire in the format of a fact sheet was sent out across the European region and 29 responses from 27 different countries were received. The fact sheets contain questions mainly about the limit values, the indicators used, the scope to which they apply and the consequences of exceedance. Wherever possible, questions differentiated between five noise sources: roads, railways, aircraft, industry and wind turbines.

Details of national noise legislation are undoubtedly more complex and refined than the summarized descriptions given by respondents. Additional simplification of the information may have resulted from aggregation and interpretation of the data by the researchers. However, by bringing the complexity of the regulations down to a limited selection of figures, insightful comparisons could be made between countries and with respect to the WHO guidelines. It should be noted that the noise limits do not directly reflect the actual noise levels. Conclusions about the current health situation in any country, or in Europe as a whole, should not be drawn from this report, but rather from the END strategic noise maps and action plans.

The results show that there is a certain degree of noise legislation in virtually all countries, with 90% of the countries reporting the use of limit values for environmental noise with a legal obligation to verify situations against these, not including countries that use these only as non-binding thresholds for the END action plans. Of all countries with limits, traffic noise limits (road, rail, aircraft) exist in 80% of the cases, industry noise limits in 75% of the cases, and slightly over 50% of the countries have limits for wind turbine noise. Limit values are most often assessed using L_{day} and L_{night} , sometimes in combination with $L_{evening}$, or using the L_{den} , often combined with a separate L_{night} limit.

A comparison of the limit values in different countries could be made by grouping the various indicators in two classes: daytime / average values including L_{day} , L_{den} and a few other indicators, and nighttime values including mainly L_{night} . Other indicators, such as limits for peak values, are not included in the analysis. All information which was received is available in the fact sheets supplied in the Appendix.

From the data analysis, it was found that the dB-values of the noise limits in different countries vary over a range of approximately 20 dB for roads, railways, with a slightly smaller range for aircraft and a wide range of more than 30 dB for industrial installations and wind turbines. 75% of the countries with noise limits for aircraft noise use values that are equal to or higher than the limits for road noise. This does not correspond to the fact that annoyance and sleep disturbance due to aircraft noise is higher than for road noise at the same level. Also, 25% of the countries apply a 'rail bonus', i.e. a higher noise limit for rail than for road noise. This is not justified by the new 2018 WHO

exposure-response functions, which indicate similar or slightly higher annoyance rates and health impacts for rail than for road noise, at least at levels above 55 dB L_{den} / 50 dB L_{night} .

Limit values used in European countries are generally higher, thus less stringent, than the intervention levels recommended by the WHO: for wind turbines about 60% of the countries with noise limits use values higher than the recommendation. For road and rail noise this is 80 to 90% and for aircraft noise, all countries with limits use values higher than the WHO recommendation. The situation is similar for the daytime / average values (L_{den} / L_{day}) and for the nighttime values. It should be noted that the WHO values are recommendations based on a health perspective. As the WHO states in their report, "additional considerations – such as feasibility, costs, preferences and so on – feature in and can influence the ultimate value chosen as a noise limit" ([1], paragraph 5.1).

The actual effect of any noise limit is determined not only by the dB-value, however, but also to a large extent by the consequences attached to exceeding the limit. Limit values may be applied as a 'target value', i.e. the noise level above which authorities will start to consider taking action. From a health perspective, such a target value should not be higher than the WHO-recommended values. Other countries have implemented a limit value as a maximum value that is not to be exceeded. This boundary is not quite so black-and-white, as a full prohibition of activities that lead to exceedance is not always the consequence, and rather uncommon for road, rail and air traffic. Also, specific exceptions to the limits may exist.

The actual consequences of exceeding limit values vary between countries and between noise sources. A full prohibition of activities or construction is common (70 to 80%) for industry and wind turbines, but uncommon (20%) for traffic noise sources (road, rail and aircraft). A legal obligation to consider active noise measures is a consequence in 70 to 100% of the countries, depending on the noise source. The consideration is often followed by the obligation to take passive measures (e.g. facade insulation) if active measures are not possible or not cost-effective. Financial sanctions, e.g. financial compensation for exposed people or fines for owners, operators and authorities, are also a regular instrument (30 to 70%, depending on the noise source). There is no clear relation between the height of the noise limits and the severity of the consequences.

National and local authorities in European countries may currently consider whether to update their current noise legislation based on the new WHO guidelines. From the results in this report, the following recommendations are given for the implementation of these guidelines:

- The legislation should be clear about the objective of any limit or target value, either as a minimum value above which actions should be considered, or as a maximum value that should not be exceeded. A combination of both an upper and a lower value, with room for situational policy in between, is also a possibility.
- The actual significance of a limit value is determined largely by the consequences of exceeding it. When considering new or different values for their noise limits, authorities should regard the legislative system as a whole, including the enforcement and legal consequences. Specifically for existing situations, a trigger to actually assess the noise levels against the limit should exist. This trigger could be the END noise maps and action plan.
- When deciding on limit values and their consequences, authorities should be aware that higher levels increase the health impact of noise on the population.
- In order to take into account the WHO-recommended values, noise limits based on L_{day} , $L_{evening}$ and L_{night} or other indicators different from the L_{den} / L_{night} could be used, but their values should be derived using appropriate conversions.
- For transparency and accountability, the rationale behind the actual dB-value should be clear and publicly documented. This should preferably be related to some exposure-response relation, along with cost-benefit and other consideration that may be the basis for that particular value. The WHO-guidelines could provide exposure-response functions for this.

- Following the WHO-recommendations, limit values for road and rail traffic should not be very different and limit values for aircraft should be considerably lower than for road and rail traffic. This consideration is purely from a health perspective, however, and other considerations may apply.

Contents

| | | |
|-------|--|----|
| 1 | Introduction | 8 |
| 1.1 | Background | 8 |
| 1.2 | Motivation and goal for this report | 8 |
| 1.3 | Study objectives and research questions | 8 |
| 1.4 | Disclaimer | 9 |
| 1.5 | Acknowledgment | 9 |
| 2 | Research methods | 10 |
| 2.1 | Scope | 10 |
| 2.2 | Methods | 11 |
| 2.2.1 | Exploration | 11 |
| 2.2.2 | Fact sheets | 11 |
| 2.3 | Indicators | 12 |
| 3 | Fact sheets | 14 |
| 3.1 | Description and interpretation | 14 |
| 3.1.1 | Section 1 - National limits vs. END | 14 |
| 3.1.2 | Section 2 - Bar graph | 15 |
| 3.1.3 | Section 3 - Limits and metrics | 16 |
| 3.1.4 | Section 4 - Consequences | 17 |
| 3.1.5 | Section 5 - Position of assessment | 18 |
| 3.1.6 | Section 6 - Basis of limit values | 19 |
| 3.1.7 | Section 7 - Main legal documents | 19 |
| 3.1.8 | Section 8 - Further comments | 19 |
| 3.2 | Evaluation | 20 |
| 4 | Results and analysis | 21 |
| 4.1 | Overview of limit values | 21 |
| 4.1.1 | Limit or target? | 21 |
| 4.1.2 | Occurrence of limit values | 22 |
| 4.1.3 | National noise legislation vs. the END scope | 23 |
| 4.1.4 | Other values | 23 |
| 4.2 | The actual dB-values used | 23 |
| 4.2.1 | Indicators | 23 |
| 4.2.2 | Values | 25 |
| 4.2.3 | Day – night differences | 28 |
| 4.2.4 | Limit value differences between sources | 29 |
| 4.2.5 | Penalty and correction factors | 31 |
| 4.2.6 | Position of assessment | 32 |
| 4.3 | Rationale | 32 |
| 4.4 | Scope | 33 |
| 4.4.1 | New vs. existing situations | 33 |
| 4.4.2 | Areas, land use types and zoning | 34 |
| 4.5 | Consequences | 35 |
| 5 | Conclusions and discussion | 37 |
| 5.1 | Research questions | 37 |
| 5.2 | Discussion | 38 |
| 5.3 | Conclusions and recommendations | 39 |



| | |
|--------------------------------|----|
| References | 41 |
| Appendix – Country fact sheets | 42 |

1 Introduction

1.1 Background

The EPA Network is an informal grouping bringing together the directors of environment protection agencies across Europe. The network exchanges views and experiences on issues of common interest to organisations involved in the practical day-to-day implementation of environmental policy. In the September 2010 EPA-Network meeting in Krakow the Interest Group on Traffic Noise Abatement (IGNA) was created and in 2017 its mandate was renewed for 2017-2022 at the EPA plenary meeting in Rome. The key activities of IGNA will focus on recommendations for actual and long term objectives, mainly to the following issues:

- *Harmonization of noise-monitoring*: harmonization and standardization of methods for monitoring and evaluation of noise exposure and remedial measures;
- *Noise abatement measures at source and quiet areas*: Information and exchange of successful measures to limit noise at sources and to protect quiet areas; exchange knowledge on action plans with stringent regulatory and incentive measures at sources such as for vehicles and machines;
- *Critical levels*: harmonized critical levels (limit values) that trigger specific remedial measures;
- *Economical instruments*: cost-benefit aspects and application of financial instruments in order to compensate external costs and to set incentives for measures at sources.

1.2 Motivation and goal for this report

The World Health Organization (WHO) has published its "Environmental noise guidelines for the European Region" in October 2018. The IGNA will take up this topic and discuss the practical consequences of the new publication for the noise regulations throughout Europe. In order to have an overview of the existing limit values in the European region, this report contains an analysis of the present situation, based on input from national experts in many European countries.

The WHO guidelines provide exposure-response functions for annoyance and relevant noise-related health impacts and, based on these curves, recommendations for noise immission levels (i.e. limit values) that should not be exceeded in order to prevent these health impacts. What the WHO guidelines do not provide is guidance as to how these limit values should be implemented and enforced and what the consequences of exceedance should be. The goal of this report is to provide such guidance, by describing the State-of-the-Art of current noise limits in countries within the European region, including a description of related regulations and consequences. From these descriptions, recommendations are derived for countries that aim to implement the WHO guidelines.

1.3 Study objectives and research questions

In short, this report aims to address the following two main questions:

- How does the current situation with regards to noise limit values in Europe relate to the WHO recommendations?
- How are limit values implemented; what is their scope and what are the consequences of exceedance.

In order to do so, the following research questions are investigated and answered:

- What types of limit values exist in the EU and at national levels? These may include separate values for different noise sources: road, rail, aircraft, industry, wind turbines, etc., and/or separate indoor and outdoor limits.

- What values and which quantities are used? Are these all L_{den} and L_{night} , as used in the Environmental Noise Directive, or also L_{day} , L_{24h} , L_{max} , etc.?
- What is the scope of limits in force and what are the legal consequences? How strict are they enforced: are they legal 'thou shalt not pass' limits, or more 'preferred target' values? What exceptions are allowed (i.e. cost effectiveness arguments, technical or visual criteria, ...)?
- How were they established: which criteria - health, cost-benefit, etc. - are used as a basis? Is there any (documented) link with the earlier WHO guidelines?

1.4 **Disclaimer**

The data and results in this report are based on the current noise legislation in the majority of European countries. Several countries have indicated that their noise legislation, including limit values, is currently being revised or will be revised in the near future, triggered in some cases by the new WHO recommendations. Therefore, the validity period of the results and conclusions in this report may be limited to no more than a few years.

1.5 **Acknowledgment**

This study was commissioned to M+P by the EPA Network Interest Group on Noise Abatement (IGNA). The authors are grateful to the IGNA members and chairs for their support and interest. Many thanks also go to the members of the EIONET NRC noise group who took the time and effort to provide the excellent information by completing the fact sheets, and to the European Environment Agency (EEA) for their assistance in distributing and collecting these.

2 Research methods

2.1 Scope

The primary objective of this study is to create an overview of limit values used for noise regulation in European countries, and to compare these noise limits to the WHO recommendations published in 2018. As such, the WHO publication co-determines the scope of this study. For one, this means the primary interest are limit values regarding noise immission at the facade of dwellings, outdoors. No information is gathered actively about indoor noise limits and requirements for acoustic properties of buildings. Limits to the emission of noise, which exist for vehicles, outdoor equipment and installations for instance, are also not regarded in this report. Secondly, just like the WHO recommendations, the study differentiates between different sources of sound: legislation was investigated regarding noise from roads, railways, aircraft, wind turbines and industry.

Although the WHO report does not include recommendations regarding industrial noise, industrial noise can indeed have a strong negative effect on human health. As many countries will have some legislation on industrial noise sources, and it is also included as a noise source in the END noise mapping and action planning obligations, it is regarded as an interesting supplementary source to take into account, as far as possible. Leisure noise, defined by the WHO as *all noise sources that people are exposed to due to leisure activities, such as attending nightclubs, pubs, fitness classes, live sporting events, concerts or live music venues and listening to loud music through personal listening devices*, was not included in this study. It was expected that there is not so much national noise legislation. Also, since the range of sources is so diverse, a comparison would be tedious and difficult.

A distinction was made in this study regarding legislation concerning the implementation of the European Noise Directive, and other, national noise-related legislation. Although in the context of the END, threshold values may be determined in the process of setting up action plans, these values do not protect citizens against noise the same way limit values do, as the actual follow-up of the action plans is not mandatory.

More specifically, the following data is included in the analysis of the information received:

- limit and target noise levels
 - for different sources:
 - road traffic;
 - rail traffic;
 - aircraft;
 - wind turbines;
 - industry.
- scope of the values, e.g.:
 - new infrastructure and installations, and/or reconstruction and improvement of existing infrastructure and installations;
 - new housing or building permits.
- consequences of exceeding the values, e.g.:
 - prohibition to build dwellings, or to change the infrastructure;
 - obligation to consider active noise measures (pavements, rail dampers, noise barriers, etc.);
 - passive noise measures;
 - financial sanctions or compensation;
 - possible exceptions described for specific cases.

Not included in the analysis of the received data are details regarding the following aspects:

- non-source specific values, used for spatial planning;

- specific limits for indoor noise levels;
- requirements for facade insulation or acoustical properties of buildings;
- separate noise limits for
 - military aircraft or other military vehicles;
 - leisure noise;
- quiet areas with specific noise limits;
- comprehensive details for different types of dwellings (e.g. schools, hospitals, specific outdoor terrains);
- local noise emission limits, such as the Dutch ‘noise emission ceilings’ for road and rail;
- emission regulations, such as EC or UNECE regulations for vehicles and tyres or outdoor equipment;
- “Best Available Technology” or “As Low As Reasonably Achievable” regulations.

2.2 Methods

2.2.1 Exploration

After publication of the new noise guidelines by the WHO in 2018, the question rose as to what the current status of noise limits in European countries is. As a first step, it was tried to collect information about national noise legislation by searching on the internet. Although relevant information for a couple of countries was found, it became clear that most countries have not published legislative texts in a language the writers of the underlying report could understand. Or at least, these texts were not found.

One main source of information was available to us at that point: the document *Evaluation of Directive 2002/49/EC relating to the assessment and management of environmental noise*, published by the European Commission in July 2016. The report summarizes implementation of the END across the 28 EU member states, including a section related to national legal noise limits. However, as the main focus of the report was implementation of the END, information related to national legislation was limited. Furthermore, as the report was published mid 2016, the presented information could by now be outdated.

Because the available information was not sufficient to get an up-to-date overview of noise limits in Europe, and a full understanding of national noise legislation requires in-depth knowledge, it was decided that the most appropriate source of information would be noise experts from those countries themselves. Therefore, a questionnaire was prepared and sent out to 35 countries represented in the EIONET NRC noise community, with the help of the EEA. In general, questionnaires were sent to EIONET members and members of the IGNA. The questionnaire was presented in the format of a fact sheet. For one, the fact sheet in itself is suitable for presentation of the information provided. And secondly, the fact sheet format provides a way of presenting questions in a structured way.

2.2.2 Fact sheets

In order to obtain the most relevant information, and as a way to present the received answers, questionnaires were formatted as fact sheets. Fact sheets were aimed to be designed such that no ambiguity would exist regarding the posed questions. A filled out fact sheet for the situation in the Netherlands was supplied to the readers as an example.

In total, 35 fact sheets were sent out to different contact persons. In the case of Belgium, fact sheets were sent separately to Flanders, Wallonia and Brussels, as these regions are separately represented in the EIONET NRC noise group. In the remaining of this document, the three regions

will be referred to as countries. For each country, fact sheets were filled in beforehand as far as possible, based on the prior data mining exercise on the internet, and the report of the EU Commission, as described in chapter 3.

After receiving the completed fact sheets, in some cases follow-up questions were asked. Answers given by the respondents are left the way they were, and presented in blue for clarity. This way, no information gets lost as a result of interpreting the answers. However, in order to end up with a well-defined set of limit values for each noise source, answers with regards to the values of the noise limits needed to be interpreted by the authors of this report, and the resulting limit values are presented in a bar graph as described in paragraph 3.1.2. The filled out fact sheets themselves are included in Appendix A.

Along with a fact sheet for their country, respondents received an explanatory e-mail. In this e-mail, no detailed instructions were provided with regards to the questions in the fact sheet, except the following guidance:

The IGNA needs your help in gathering (...) information. On behalf of IGNA, M+P from the Netherlands have compiled a questionnaire in the form of a fact sheet. Attached to this e-mail is the fact sheet to describe the current noise limit situation in your country. Some information may already be filled in from existing sources, such as the Commission's 2016 evaluation of the Environmental Noise Directive ([see here](#)). As an example of the kind of information we are looking for, the fact sheet for The Netherlands is also attached.

I would kindly like to ask you to do the following:

- *Please fill in the questions as completely as possible.*
- *Please check the information and values already filled in and provide corrections in case anything is incorrect or incomplete.*

(...)

To provide your information, you may fill in the fact sheet in the Word-file itself, provide a separate document or e-mail, use pen and paper, or any other means that suits you.

In chapter 3, the fact sheets and their content are described. A brief description is given of the questions asked, as well as an explanation of how answers were interpreted with regards to the analysis presented in chapter 4.

From the information provided in the filled out fact sheets, conclusions are drawn with regards to the limit values used and their scope and consequences of exceedance. By means of a statistical analysis, the current situation in Europe with regards to these topics has been mapped.

2.3 Indicators

Target or limit values for noise are usually expressed in L_{den} , L_{night} , L_{day} or L_{24h} . For specific sources or applications, other quantities may also be used. Table I, taken from the EEA 2010 Good practice guide [3], gives an overview of several indicators and their meaning.

table I

Various indicators used for short- and long-term noise levels (from [3])

| Indicator * | Description | Time-constant |
|-------------|---|---------------|
| L_{max} | Maximum sound pressure level occurring in an interval, usually the passage of a vehicle | 125 ms ** |
| SEL | Sound exposure level = Sound pressure level over an interval normalised to 1 second. | 1 s |
| L_{day} | Average sound pressure level over 1 day. This day can be chosen so that it is representative of a longer period — for example, L_{day} occurs in the END; if used in that context, a yearly average daytime level is intended. | 12 or 16 hrs |
| L_{night} | Average sound pressure level over 1 night. This night can be chosen so that it is representative of a longer period — L_{night} also occurs in the END; if used in that context, a yearly average night time level is intended. This is the night time indicator defined in EU-directive 2002/49 and used by WHO. | 8 hrs |
| L_{24h} | Average sound pressure level over a whole day. This whole day can be chosen so that it is representative of a longer period. | 24 hrs |
| L_{dn} | Average sound pressure level over a whole day. This whole day can be chosen so that it is representative of a longer period. In this compound indicator the night value gets a penalty of 10 dB. | 24 hrs |
| L_{den} | Average sound pressure level over all days, evenings and nights in a year. In this compound indicator the evening value gets a penalty of 5 dB and the night value of 10 dB. This is the 'general purpose' indicator defined in EU-directive 2002/49. | Year |

The L_{den} is related to the L_{day} , $L_{evening}$ and L_{night} by formula (1) below, where the multiplication factors 12, 4 and 8 might differ between countries according to the amount of hours in the day-, evening and night period:

$$(1) \quad L_{den} = 10 \log_{10} \left(\frac{12 \cdot 10^{L_{day}/10} + 4 \cdot 10^{(L_{evening}+5)/10} + 8 \cdot 10^{(L_{night}+10)/10}}{24} \right).$$

Researchers involved in the WHO guideline process have provided conversion tables to transpose each of the long-term average indicators into other indicators, for road, rail and aircraft noise [10]. The exact differences depend on the traffic volume and composition and its variations over the time of day and season, as well as on meteorological and geometric situation. The accuracy of the empiric conversions is provided and will in many cases be acceptable.

3 Fact sheets

3.1 Description and interpretation

3.1.1 Section 1 - National limits vs. END

The Environmental Noise Directive requires strategic noise maps and action plans every five years, but does not set any noise limits or target values. The END strategic noise maps have lowest thresholds of 55 dB L_{den} and 50 dB L_{night} . Several countries apply additional higher threshold values for their END noise action plans, although this is not required. These values then function as a limit or target value within the action plan, in the sense that countries will report all actions that are taken to keep or bring the noise immission levels below this value. The END action plan, as well as the noise threshold values used in it, does not have the same legal consequences in all countries. In some countries, the END noise maps and action plans are merely to monitor noise trends and inform the public, but there are no legally binding consequences or noise measures that are taken as a result of the END. Most of these countries then have separate noise legislation that include legally binding limit and/or target values with consequences. These limit values may then be equal to the thresholds defined for the END action plan, or not. In other countries, however, the national implementation of the END is all the noise legislation there is, and the END action plan does actually lead to legal obligations to take measures.

The first question is meant to make a clear distinction between threshold values used in the context of the END noise maps and actions plans, versus noise limit values in national legislation. Starting off by asking the respondents whether or not their country has any noise regulations apart from implementation of the END, is not only informative, but also serves to make clear the distinction between both, and the fact that the rest of the document relates to national legislation only. In figure 1, section 1 of the fact sheets is depicted.

1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

figure 1

Section 1: END thresholds versus national limits

3.1.2 Section 2 - Bar graph

The second section presents a bar graph summarizing the limit values. The bar graph is similar for all fact sheets. On the vertical axis, the five different sources are depicted:

- roads
- railways
- aircraft
- wind turbines
- industry

Whereas the information provided in the fact sheet may include several limit values for each source, for example due to differences between building functions (e.g. schools and hospitals) and types of sources (e.g. commercial and military airports), limit values depicted in the bar graph only represent figures that fall within the scope of this study, see paragraph 2.1. The limit values depicted in the bar graph form the basis for the analysis presented in chapter 4.

Noise limits for each of the five sources are represented by either one or more horizontal bars. The value of the noise limit is read from the horizontal axis in dB(A). More than one horizontal bar may be shown in two possible occasions:

- there are separate target values and limit values;
- limit values for new situations differ from existing situations. For a situation to be considered as *new*, either the sound source or the dwelling may be considered new, or both.

As an example, in figure 2 the bar graph depicting limit values in the Netherlands is shown. In the Netherlands, both target values and limit values exist for roads and railways, according to the definition provided in paragraph 4.1.1. Target values are presented with a diagonal pattern and recorded separately in the legend. In the case of the Netherlands, there exist only a target value for industrial noise, as higher noise levels are by law allowed, without a defined upper limit.

Still, there may be a certain range of limit values applying to a certain situation. Different values may apply to different types of residential areas, for instance. Also, there may be a range of values for different sub-types of noise sources. An example is the Czech Republic, where different limit values are in place for different types of roads, or France, where different limit values apply to high speed and conventional railway lines. In the text below the graph, such information is provided. The lowest value of the range will be used for the analysis presented in chapter 4.

In general, the limit values are presented in the bar graph according to the following principles:

- If limit values are set only as threshold values in the context of the END, we do not include them in the graph.
- If no limit values exist for a specific noise source, then the corresponding row is left empty.
- If there are no limit values at all, or if there are only non-source specific values, then the bar graph is left out.
- If different zones exist with different noise limits, different source types with different noise limits, and/or different building types with different noise limits, these are included as ranges.
- If it is unclear whether we are looking at new or existing situations: then this column is left empty in the graph.
- In some cases, two indicators have the same limit value. For example, in the case of Lithuania, there exist limits for both L_{day} and L_{den} , and they have the same value. In such a case, these two indicators are presented in the bar graph with the same colour, and are referred to in the legend by means of a slash: " L_{day} / L_{den} ".

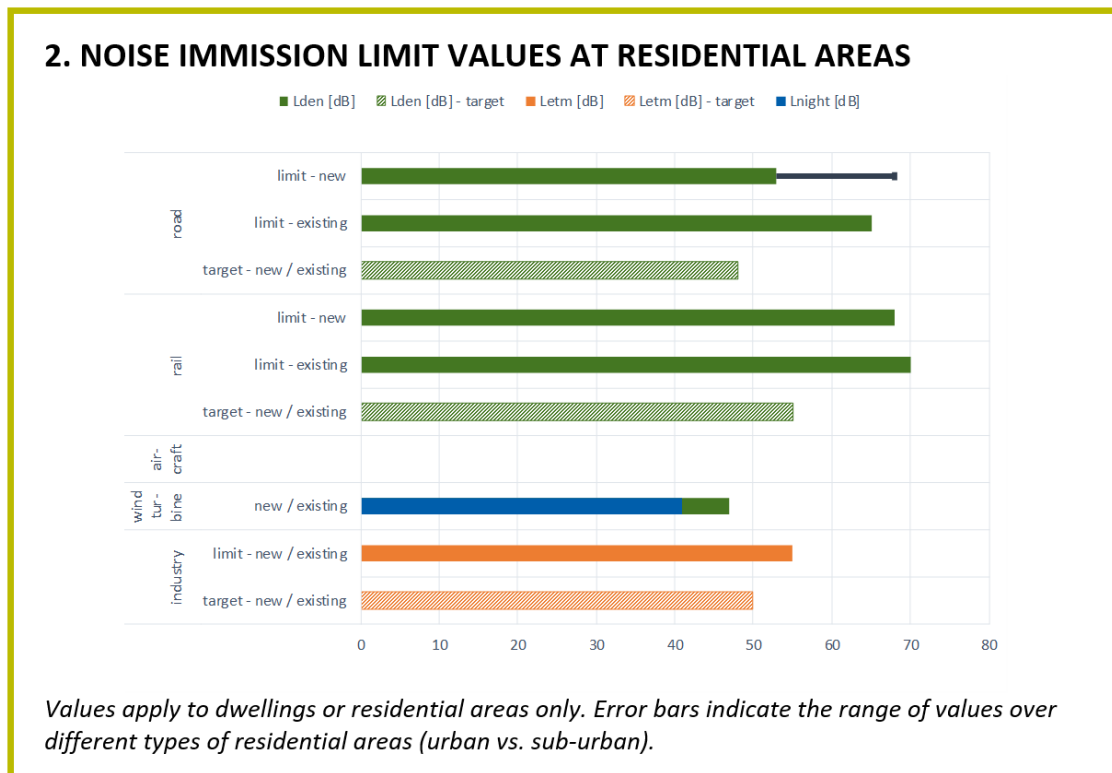


figure 2 Section 2 from the fact sheet of the Netherlands, with the bar graph representing the limit values

3.1.3 Section 3 - Limits and metrics

Under section 3, supplementary information is provided regarding the limit values. A definition is given of the indicators (metrics) used, and nuisance penalties and/or correction values are described.

Unless it was found otherwise or noted by the respondent, it is assumed that:

- all dB-values are A-weighted;
- values apply to noise immission levels at, or very close to, the building facades;
- values apply to dwellings, e.g. people's homes. Values may apply to other types of buildings also, but not necessarily.

The information provided by respondents under this section was mostly supplementary, though in several cases had an effect on the value of the noise limits presented in the bar graph, as well. For example, in the case of Austria, different indicators are used for noise from roads and railways: L_{day} and L_{night} and $L_{r,day}$ and $L_{r,night}$, respectively. Part of the fact sheet of Austria is depicted in figure 3. Under section 3, the respondents have indicated that a bonus of -5 dB is applied to the LA_{eq} for railways noise, before assessment of the $L_{r,day}$ and $L_{r,night}$. We have included this information in the bar graph by adding 5 dB to the limit values in terms of $L_{r,day}$ and $L_{r,night}$, and presented them as L_{day} and L_{night} . This way, we can take into account the limit values for railway noise when analysing the data.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

new motorways (noise of motorway): L_{den} 55dB, L_{night} 45dB

new motorways (total road traffic noise): L_{den} 60dB, L_{night} 50dB (up to L_{den} 65dB, L_{night} 55dB if increase of noise level ≤ 1 dB)

existing motorways and other roads: L_{den} 60dB, L_{night} 50dB

new railways: L_{den} 60dB, L_{night} 50dB (up to L_{den} 65dB, L_{night} 55dB depending on existing noise situation: existing noise situation + 10dB)

existing railways: L_{den} 65dB, L_{night} 55dB

For railway noise a bonus of -5 dB has to be applied to the $L_{A,eq}$.

In the bar graph under question 2, the 5 dB railway bonus has been taken into account by increasing rail limit values $L_{r,day}$ and $L_{r,night}$ by 5 dB, and depicting them as L_{day} and L_{night} values.

figure 3 Part of section 3 from the fact sheet of Austria

3.1.4 Section 4 - Consequences

In the section *Consequences*, respondents are asked to choose from a set of possible consequences resulting from exceedance of the limit values. Under the tick boxes, additional information may be provided. In figure 4, the section is depicted for the fact sheet of Denmark. By choosing a tick box format, the possibly widely varying forms of consequences and situations to which they apply are brought down to an easy-to-compare result, allowing for a meaningful analysis of the information provided.

In some cases, no consequences may be ticked off at all, even though limit values are included under section 2 and 3. Because we included the option “none”, most probably this means it was not known to the respondent which consequences are in place.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|---|--|-------------------------------------|---|-----------------------------|--------------------------|
| road | <input checked="" type="checkbox"/> City planning | <input checked="" type="checkbox"/> Barrier, screen | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input checked="" type="checkbox"/> City planning | <input checked="" type="checkbox"/> Barrier, screen | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input checked="" type="checkbox"/> Permit and planning | <input checked="" type="checkbox"/> Barrier, screen | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Time restrictions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> Permits and planning | <input checked="" type="checkbox"/> Time restrictions | <input type="checkbox"/> | <input checked="" type="checkbox"/> Worst case | <input type="checkbox"/> | <input type="checkbox"/> |

figure 4 Section 4, consequences, from the fact sheet of Denmark

3.1.5 Section 5 - Position of assessment

In this section, respondents are asked to indicate where at the dwelling, limit values are assessed. The receiver position, which may be a microphone or a receiver point in an acoustic calculation model, is important for the comparison since it may affect the results. Figure 5 shows an example answer from Liechtenstein.

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

In Liechtenstein, the position of assessment is in the middle of open windows of rooms sensitive to noise.

figure 5 Section 5 regarding the position of assessment, from the fact sheet of Liechtenstein

3.1.6 Section 6 - Basis of limit values

In section 6, respondents are asked how limit values were established. By including an exemplary answer in the fact sheet sent out to the respondents, the answer was clarified. In figure 6, an example is shown.

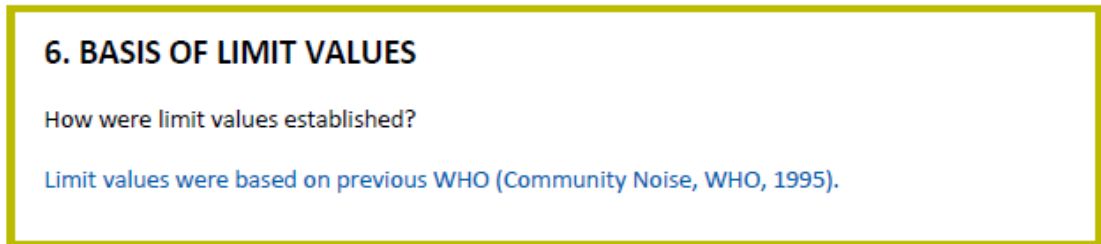


figure 6 Portugal's answer to the question regarding the basis of limit values, section 6 of the fact sheet.

3.1.7 Section 7 - Main legal documents

In this section, respondents are asked to provide the name of main legal documents regarding noise legislation from their country. In addition, we ask whether the documents are available in English and whether these can be found on the internet or provided digitally. The documents are meant as a reference and were not used for further analysis, except where they provided clarity on the limit values provided by the respondent. In figure 7 the response from the fact sheet of Sweden is given.

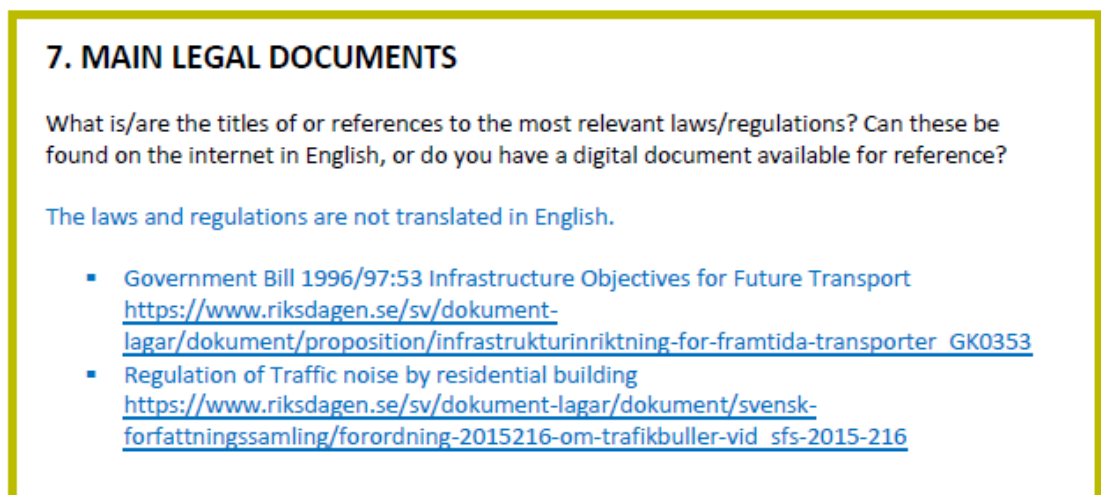


figure 7 Section 7 from the fact sheet of Sweden

3.1.8 Section 8 - Further comments

Any further comments by the respondent can be supplemented under this section. A filled out example is given in figure 8 for the case of Switzerland.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

The Noise Abatement Ordinance is currently being revised. An update is planned for the next 3-4 years.

This may lead to changes in limit values and consequences with respect to the information above.

figure 8

Section 8 from the fact sheet of Switzerland

3.2 Evaluation

In general, the information provided by respondents has been useful and complete, without being too detailed. The fact sheet format appeared to be a good choice, providing structure and a framework through which to supplement the most relevant information in an orderly fashion.

Largely, the questions in the fact sheets were understood the way they were set up. However, in a couple of cases, it appeared that there was some ambiguity. For example, one respondent indicated that it is confusing to compare limit values set in national legislation to threshold values set in the context of the END, as in section 1 of the fact sheet. In the case of one other country, limit values provided by the respondent under section 2 appeared to be END threshold values rather than limit values. In this particular case, the correct limit values were sent to us afterwards. But in the case of other fact sheets, we can not always be a hundred percent sure that the distinction between END threshold values and national limit values was clear, even though by the answers of the respondents, this appears to be the case.

In general, with regards to the questionnaire, there are several points of attention regarding the way questions were formulated:

- Respondents were asked to indicate whether limit values hold for new situations or existing situations, by including “new/existing?” in the bar graph. However, no distinction was made between new infrastructure or installation, or a new house. This might have led to confusion for the reader. In addition, by respondents’ answers, we do not know to which type of ‘new’ situation they refer. Furthermore, information might be lost for those cases where limit values for the two types of ‘new’ situations differ.
- Although in the exemplary fact sheet that was sent to the respondents along with the empty fact sheet, both target values and limit values were present in the bar graph under section 2, we did not provide any additional information on the difference between the two. Neither did we directly ask the readers whether or not their countries use separate target values and limit values. Therefore, we cannot be sure that respondents provided both, if present.
- It is not always clear whether a country does not have noise limits for a particular noise source, or whether the respondent simply does not know whether they do. It is possible that we have interpreted an empty row in the bar graph the way that there are no limit values for that particular source, while in reality it was not clear to the respondent whether they do, thus having him or her leave the row in the bar graph empty.

In general, one of the lessons learned is to always include an option “none” or “neither”. This way, it is possible to differentiate between a null-answer (“there exist no limit values for wind turbines”), or the question not being answered (“I do not know whether there are any limit values for wind turbines”).

4 Results and analysis

4.1 Overview of limit values

In the next paragraph, an overview is given of the limit values that are used to assess and/or enforce national policy and legislation in several European countries. This information has been extracted from the fact sheets supplied by the country representatives. Out of the 35 fact sheets sent, 29 were filled out and sent back to us. There is a number of countries in the European region that did not receive a fact sheet, mostly because contact information was lacking. And although some other countries did not respond, the results in this report represent the majority of European countries.

4.1.1 Limit or target?

Some interpretation by the authors is needed to decide whether the term 'limits' actually applies to a country. In order to be considered a 'limit value' in our definition, there needs to be a legal obligation to assess it, even if there are no consequences attached to the assessment.

Some countries (e.g. IE and UK) have reported that there is a legal obligation to consider noise as part of environmental impact assessment, and some best practice or guidance values may exist, but there are currently no statutory values defined as limits. This may also hold for specific sources in other countries.

The term 'limit' value could be interpreted as a maximum value or an upper limit, that should never be exceeded. Comparing the situation between countries, this definition of a 'limit' as an upper limit value is less applicable. For all countries that report having limit values, there will be various degrees of legal consequences upon exceedance of exceeding this value. But in most cases, exceptions will be possible. Some examples of exceptions that exist in national situations:

- If the dwelling was already there before the legislation came into force, the value may be exceeded (by x dB).
- If active noise measures are not technically possible, or would require excessive costs, the value may be exceeded (provided that dwellings are noise-insulated to some degree).
- The level may be exceeded (by x dB) if the most exposed facade has no openable parts/windows and there is access to a quiet side of the building.

There may be a level at which building new installations or new dwellings is no longer allowed. Existing situations with higher noise levels may still exist, however, and not be remediated. And there will always be situations that are in fact illegal, but are not enforced.

What many countries seem to consider as a 'limit value' could also be seen as a 'target value': a certain noise level above which noise measures need to be considered, or in other words, a noise level *below* which there will be *no* consequences. The definition of limit and target values corresponds to the definition used in the report with country fiches published by DG ENV [1]:

[...] mandatory noise limits at national level, whose exceedance generally leads to sanctions, or whose potential exceedance blocks the operation of installations (such as new roads, railways, or industry). Noise targets are values whose exceedance demands the consideration of action to reduce noise.

The END itself provides also a definition of a 'limit value': it *shall mean a value of L_{den} or L_{night} , and where appropriate L_{day} and $L_{evening}$, as determined by the Member State, the exceeding of which causes competent authorities to consider or enforce mitigation measures.*

The situation, therefore, is more like in figure 9: most countries will regard their limit value as the level above there are any consequences (*bottom*). The severity of the consequences varies widely (see paragraph 4.5). A few countries (Netherlands, Estonia, Belgium (Brussels)) have reported having also target values, in which case the situation as depicted in the top of figure 9 applies. The questionnaire did not explicitly ask for the existence of target values below the limits, there may be other countries that have this situation as well.

The values recommended in the WHO 2018 report could also be interpreted as ‘target’ rather than ‘limit’ values: WHO recommends that measures are taken above this level, which could be interpreted as if no measures are needed below this level. However, as WHO explains in their report and also commented during the guidelines launch event, there is still some risk of adverse health effects even below these levels and noise measures could still be beneficial even at such low levels.

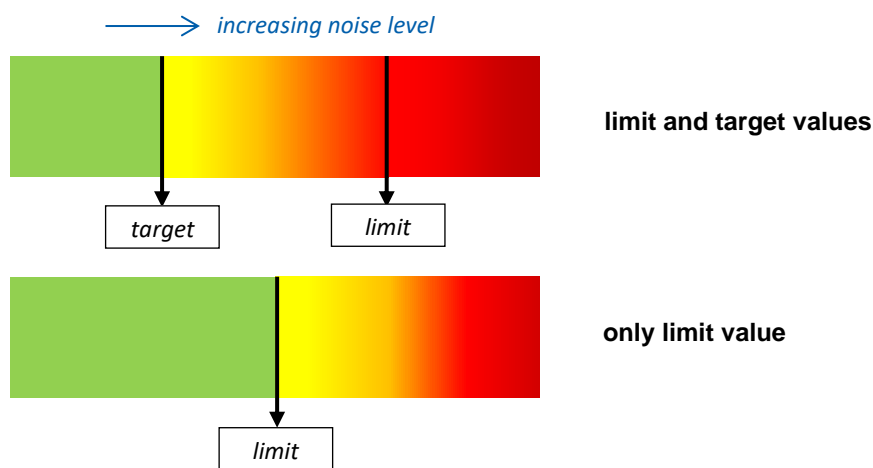


figure 9 Definition of limit vs. target values

4.1.2 Occurrence of limit values

In figure 10, it is shown what percentage of the responding countries have any regulatory noise limits.

- 26 out of 29 (90%) countries report having some noise limits, besides possible legislation with regards to the END. Three countries report having no legal noise limits at all. That does not mean that there is no noise legislation or guidance: these countries are in the EU and will still have the END-obligations to draw up noise maps and action plans, and there may also be other noise legislation that does not imply the use of limit values.
- Noise limits are usually source-specific and their values may be different for each separate noise source.
 - Approximately $\frac{3}{4}$ of the countries have limits for road, rail and air traffic, and industrial noise.
 - About half of the countries have limits that apply to wind turbines. These limits may be separate for wind turbines, or countries have explicitly stated that wind turbines are within the scope of the limits for industrial sources.
 - Some countries have reported that there are noise limits, but these are not source-specific and are used to assess the total noise level, e.g. for spatial planning purposes. Some other respondents have also indicated that the limits are actually defined by the receiver area type, rather than the source type, but the receiver area is usually related to a certain dominant source type. As the aim of this report is to compare the limit value situation to the WHO

guidelines, which are source specific rather than environment specific, only source-specific limits are considered in the analyses below.

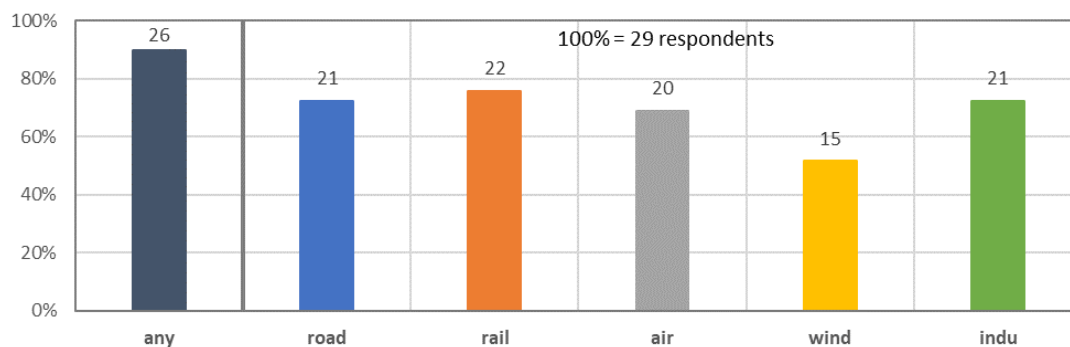


figure 10 Occurrence of limit values for noise, as a percentage of respondents; left bar applies to any noise limits at all, other bars apply to specific noise sources

4.1.3 National noise legislation vs. the END scope

As explained in 3.1.1, the threshold values defined for the END strategic noise maps and action plan are not regarded as legally binding limit values in the remainder of our analysis. In the questionnaire, countries were asked to distinguish between different options regarding national noise limits vs. the END-implementation. They responded as follows:

- 18 countries indicate that there is national noise legislation separately from the END, which uses its own limit values;
- 5 countries indicate that there is separate national noise legislation, but it uses limit values equal to the thresholds used for the END;
- 3 countries indicate that there is no national noise legislation other than the END noise maps and action plans;
- the three Belgian regions indicate that for road noise, there is only the END implementation while for some other sources, depending on the region, there is separate legislation with separate limits.

4.1.4 Other values

Other types of noise threshold values may also exist. Several countries have specific noise remediation (sanitation) programs in place, for instance, to reduce noise immission levels for existing buildings with the highest noise levels. Such a program may have its own threshold noise values, different from the general noise limits for new or existing installations. Details may be found in the fact sheets. Finally, as mentioned in 4.1.2, some countries define limits or targets at a general or cumulative level, rather than for each specific source.

4.2 The actual dB-values used

4.2.1 Indicators

Several different indicators are in use to quantify the noise levels and the limits, see section 2.3 for common indicators and their meaning. The survey results show that all limits are defined as equivalent (average) noise levels, although additional requirements for short-term events do exist. The values recommended by the WHO for road, rail, aircraft and wind turbine noise are specified in terms of both L_{den} and L_{night} .

Current national noise legislations in European countries are based on different combinations of L_{den} , L_{day} , $L_{evening}$ and L_{night} , with a few exceptions. Figure 11 shows the occurrence of these different combinations as reported by the European countries in the fact sheets.

- Common is the use of separate limits for L_{day} and L_{night} . In this case, the day period includes also the evening period, e.g. 06:00 – 22:00 or 07:00 – 23:00.
- In addition to L_{day} and L_{night} , separate $L_{evening}$ limits may exist for the evening period (e.g. 18:00 – 22:00 or 19:00 – 23:00) and the day period is shortened.
- The use of an L_{den} limit, or a combination of L_{den} , L_{night} and possibly $L_{evening}$, is less common.

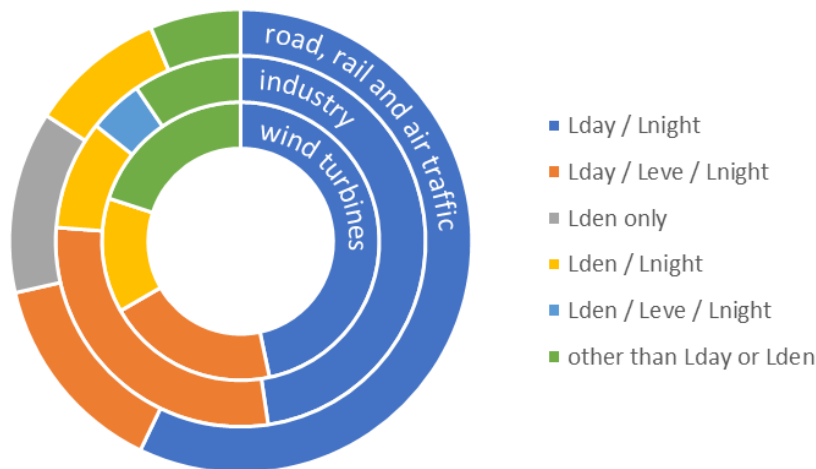


figure 11

Indicators used for different noise sources; combinations of L_{day} and L_{night} (dark blue) and L_{day} , $L_{evening}$ and L_{night} (orange) are most common

In figure 11, road, rail and air traffic noise have been grouped together since, with one or two exceptions, countries use the same indicators for these three sources. For wind turbines and especially for industrial sources, other indicators are used as noise limit indicators, such as:

- $L_{eq,24}$ (SE), which is the long-term average sound level over the whole 24-hour period, without the +5 dB and +10 dB penalty factors for evening and night periods;
- L_{etm} (industry in NL), which is the maximum of L_{day} , $L_{evening} + 5$ dB and $L_{night} + 10$ dB;
- L_{VA} (aircraft in IT), which is a specific indicator based on day and night levels averaged over three weeks, each week in a certain period in the year;
- BE (Flanders) applies different indicators to industrial installations and wind turbines. The limit value is the same for all installations, but different statistical quantities (e.g. L_{eq} , L50, L95 or $L_{eq,1s}$ for impulsive sounds) are used for assessment, depending on the situation and background noise levels.

Besides the long-term average noise levels, a few countries have additional maximum noise limits for short-term events. For aircraft noise in Germany, for instance, a maximum noise level of 68 or 72 dB¹ may not be exceeded more than 6 times during any night period. This 'NAT-criterion' applies in addition to a long-term L_{night} limit value. Bosnia and Herzegovina reports short-term maximum noise limits also for other noise sources besides aircraft.

The day, evening and night periods used for assessment of L_{day} , $L_{evening}$ and L_{night} are not equal for all countries. The END default periods are 07:00 – 19:00, 19:00 – 23:00 and 23:00 to 07:00, but several countries use 06:00 – 18:00, 18:00 – 22:00 and 22:00 – 06:00 instead. Two countries report

¹ The 68 dB value applies to airports that are new or have been substantially changed; the 72 dB value applies to existing airports.

the use of a 9-hour night period from 22:00 – 07:00, and one country (Austria) uses 13 hours for the day (06:00 – 19.00), 3 hours for the evening (19:00 – 22:00) and 8 hours for the night (22:00 – 06:00).

The time period between 06:00 and 07:00 is actually quite important: early morning traffic intensities may be quite high, yet many people are still sleeping. A few countries have specific provisions for this hour, e.g. by applying a penalty factor (DE) or by applying the $L_{evening}$ limits also to this morning hour (BE, Wallonia).

Some countries report the use of L_{night} , but instead of an average noise level over the entire night period, this is actually the maximum hourly-averaged level during this period (the loudest hour in the night).

4.2.2 Values

As stated, the limit values reported may have quite different meaning and consequences, and the values may be based on different long-term indicators. Nevertheless, it is interesting to look at the actual values used.

Figure 12 shows the distribution of limit values for residential areas found from the fact sheets, as follows:

- For each noise source, all limit values from various countries applying to the daytime are gathered. This includes L_{day} limits, whether they apply to evenings also or not, L_{den} limits and a small few other long-term indicators applying to the daytime. Limit values are chosen that apply to new situations (new infrastructure/installations or new dwellings).
- The graphs of figure 12 show the cumulative distribution: the vertical axis shows the countries that have a limit value equal to or lower than the value on the horizontal axis, as a percentage of the total number of countries with any limit value for that noise source and period. Countries with no limit value for that noise source have not been taken into account for that graph. The distribution has been calculated in 3 dB steps.
- The vertical shows the WHO-recommended maximum noise level for that source, as indicated in table II. No recommendations are given by WHO for industry noise.

It should be noted that L_{den} and L_{day} values are considered together and are mutually compared, and no distinction is made between L_{day} values that do or do not include the evening period. There is a systematic difference between these quantities, however, as is shown in [10]. In general, noise levels in the day period are lower than the average described by the L_{den} . This means that if the dB-values are equal, a limit defined as an L_{day} is less stringent than a limit defined as an L_{den} . If the L_{day} limit values would be converted to equivalent L_{den} limits, this would shift the cumulative curves in figure 12 to the right by 1 - 2 dB for road and aircraft noise. For railway noise the difference is bigger, especially for countries with heavy rail traffic during the night. If cargo trains become more silent in the future, the difference between L_{den} and L_{day} will diminish

Figure 13 shows similar graphs for nighttime noise limits (mostly L_{night}).

These graphs show that:

- there is quite a wide range of values used. For road and rail traffic, there is range of 18 and 20 dB between the highest and lowest values used as daytime noise limits. For aircraft, the range is smaller (10 dB). For industry and wind turbine noise, there is a higher range (over 30 dB), but the upper half of that range is covered by only a small portion of the countries: 80% of the limits are roughly between 40 and 55 dB;
- for nighttime noise, values are typically lower, but the ranges are similar to those found for daytime/average limits, for nearly all sources. For industry noise, the high-low range is 40 dB for

nighttime noise limits and also here there is a large fraction (80%) within a smaller low range (30 to 45 dB);

- noise limits are relatively high compared to the WHO recommended noise levels for road, rail, aircraft and wind turbine (daytime) noise.
 - For road and rail traffic, there are a few countries (about 10%) that have limits at or below the WHO values. For aircraft noise, there are none. For wind turbines, 40% (6 out of 15) countries have daytime limit values below or at the WHO-level (45 dB).
 - This indicates that there are currently many countries in which noise levels above the WHO-recommended values are allowed. There may be noise mitigating actions below the limits (see 4.1.1), but there definitely are many situations in which there is no obligation to bring down noise levels above the WHO-recommended levels.
 - Countries that have no noise limits for that particular noise source are not included in the graph. In these countries, there will also be many situations with noise levels above the recommendations.

table II Intervention levels for environmental noise, per noise source, recommended by WHO [1]

| noise source | average noise | nighttime noise |
|---------------|-----------------|-------------------|
| road traffic | 53 dB L_{den} | 45 dB L_{night} |
| rail traffic | 54 dB L_{den} | 44 dB L_{night} |
| aircraft | 45 dB L_{den} | 40 dB L_{night} |
| wind turbines | 45 dB L_{den} | - |

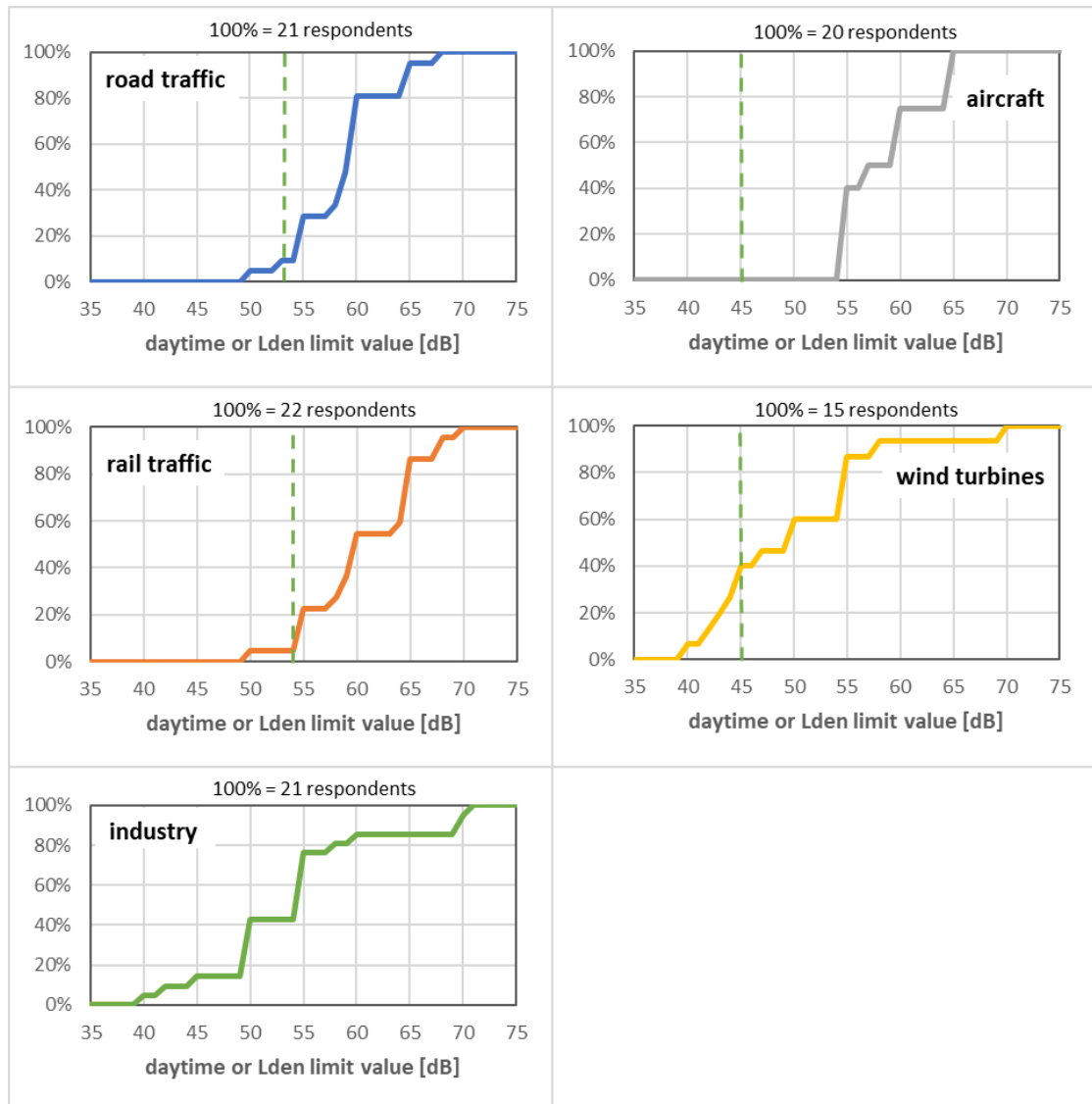


figure 12

Cumulative distribution of limit values per noise source: vertical axis indicates the percentage of countries with a limit value (L_{day} , L_{den} or other daytime indicator) lower than or equal to the value indicated on the horizontal axis. Countries with no limit value for that noise source have not been taken into account. Dashed vertical line shows the L_{den} value recommended by WHO.

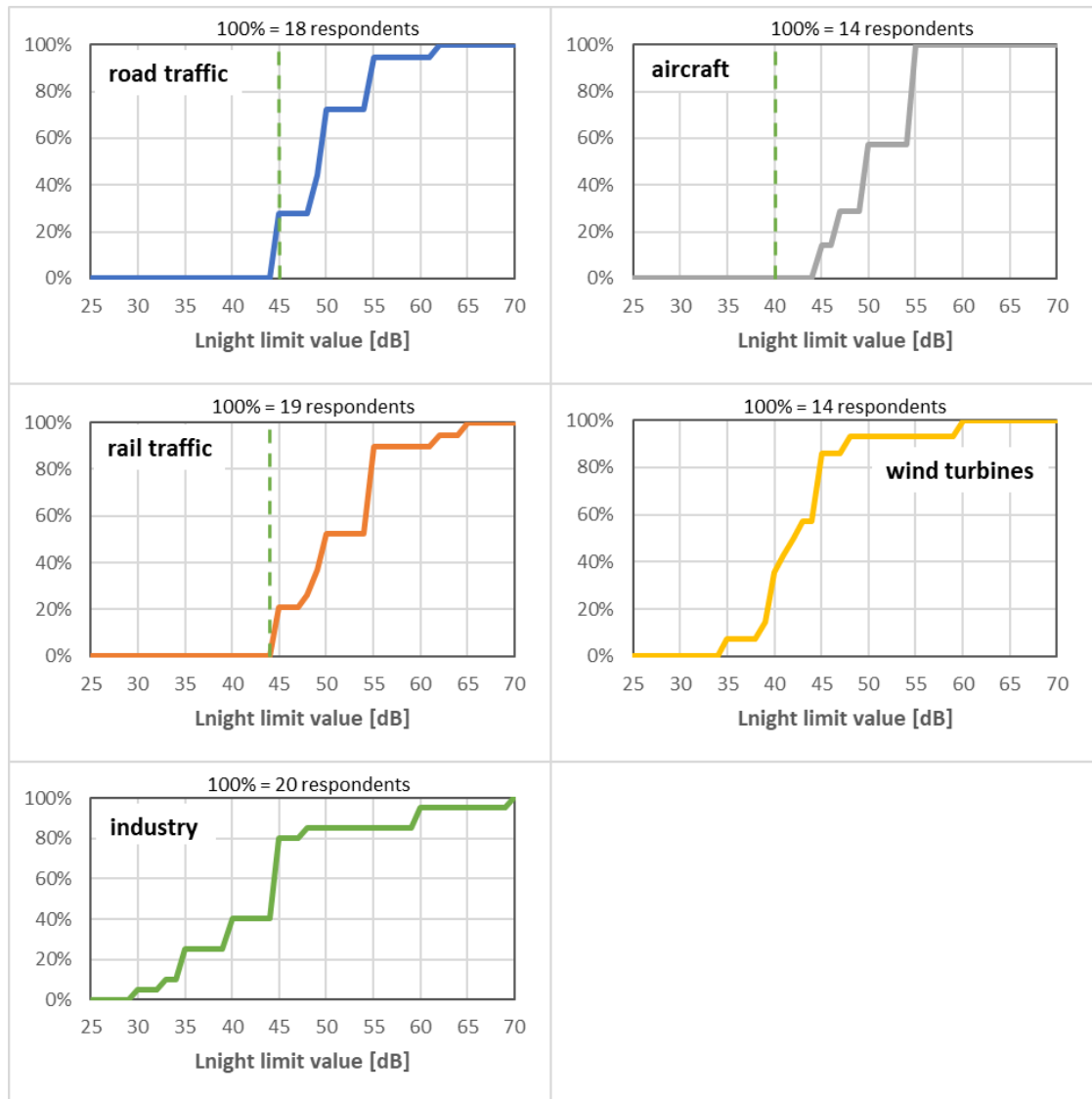


figure 13

Cumulative distribution of limit values per noise source: vertical axis indicates the percentage of countries with a L_{night} limit value lower than or equal to the value indicated on the horizontal axis. Countries with no limit value for that noise source have not been taken into account. Dashed vertical line shows the L_{den} value recommended by WHO.

4.2.3 Day – night differences

As can be seen in figure 11, most countries have separate night-time limits (L_{night}), apart from limits for the daytime and/or average noise levels (L_{day} , L_{den} or similar). Figure 14 shows the difference between the daytime/average limit value and the night-time limit value, as a percentage of countries that have separate limits for both periods.

For all sources except wind turbines, the night-time noise limit is usually 10 dB lower (>65% of the countries). The remainder of the countries apply a difference of 5 or 6 dB, although other values also occur for industry noise. For wind turbines approximately 50% of countries have a 10 dB difference, while the other countries have quite different values ranging from 0 to 15 dB.

The fact that night-time noise limits are generally lower, corresponds to the higher health impact of sleep disturbance compared to the health impact of annoyance. The WHO recommends 10 dB

lower night-time intervention levels for rail noise, 8 dB lower levels for road noise and 5 dB lower levels for aircraft noise (see table II). The WHO does not provide any recommended value for night-time wind turbine noise.

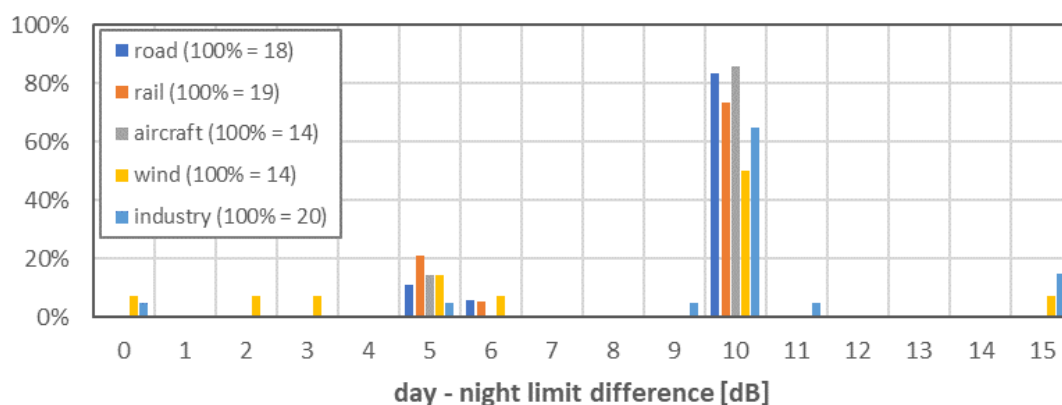


figure 14 Difference between daytime (L_{day}) or average (L_{den}) limit and the night-time (L_{night}) limit; legend shows the total number of countries that have both day-/average- and night-time limits

4.2.4 Limit value differences between sources

The effect of noise on health through sleep disturbance and annoyance differs from one noise source to another. People are generally more annoyed by noise from airplanes, for instance, than by noise from road traffic, even if the long-term average noise level at the dwelling is equal. This may be explained by the characteristics of the noise itself: a busy road is a more continuous 'background' noise source, whereas airplanes can be individually heard, resulting in a more dynamic, intermittent noise source. Psychological factors, such as fear of safety and environmental concerns, may also lead to a more negative attitude towards flying, with an increased level of annoyance and stress as a result.

Figure 15 shows the exposure-response functions for annoyance and sleep disturbance established in the systematic reviews [6][7] that form the basis for the WHO guidelines. The curves are different for road, rail and aircraft noise. For noise levels above 55 dB(A), the percentage of people that are highly annoyed and/or highly sleep disturbed is higher for rail noise than for road noise at the same noise level, and still higher for aircraft noise. Curves can also be compared in horizontal direction: the level at which 20% of the people is highly annoyed is 10 dB lower for aircraft noise than for rail noise, and 2.5 dB(A) lower for rail noise than for road noise. For nighttime noise, aircraft noise clearly causes much more sleep disturbance than rail noise, and rail noise also causes significantly more sleep disturbance than road noise.

These curves justify why the intervention levels recommended by WHO (see table II) are different for each noise source. It is interesting to see, therefore, how the noise limit values for different source relate to each other within each European country.

Rail vs. road noise

Figure 17 shows a histogram of the difference in dB between the rail and road traffic limit values. A positive value on the horizontal axis indicates that the rail limit is higher than the road limit. About 70% of the countries have a difference of zero, meaning that the road and rail limit values are equal. Approximately 20% of the countries allows 5 or 6 dB(A) higher levels for rail noise than for road noise (also known as the 'rail bonus'). This was justified by the exposure-response relations

from the earlier (1999) WHO guidelines. The updated 2018 exposure-response functions of figure 15 actually support the opposite: people are more annoyed by rail noise than by road noise, which would justify lower limit values for rail than for road. Differences between the road and rail curves are limited to a few dB or a few %, however, which would also justify equal limit values.

Aircraft vs. road noise

For aircraft noise, people are clearly more annoyed by a certain L_{den} or L_{night} level than for road noise. From figure 17, however, it shows that only about 25% of the countries report lower daytime limit values for aircraft noise than for road noise, and about 35% of countries allow higher levels for aircraft noise than for road noise. For nighttime aircraft noise, all countries have noise limits equal to or higher than for road noise, which is not supported by the exposure-response curves. Again, these histograms are based only on the 20 countries that actually have nighttime noise limits for aircraft noise.

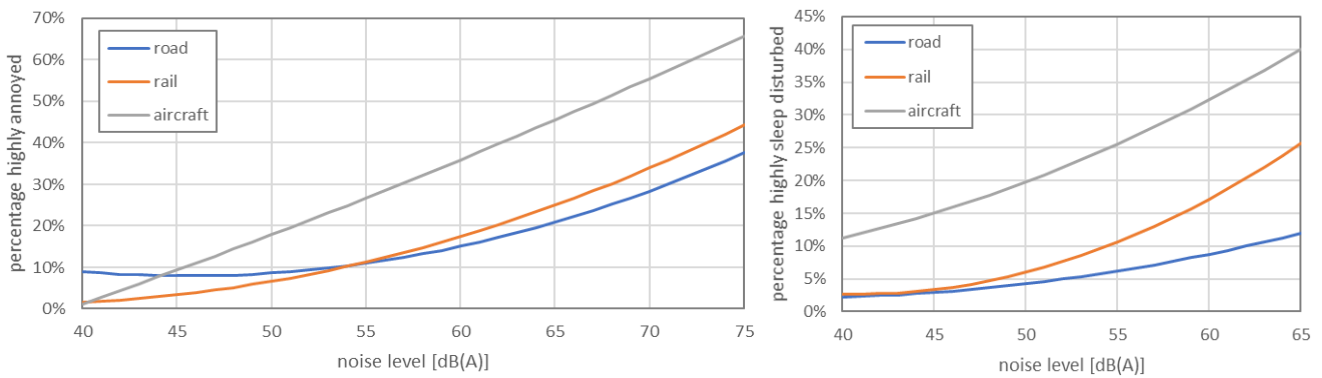


figure 15 WHO 2018 exposure-response functions for annoyance and sleep disturbance; left: %HA vs. noise level, for road, rail and aircraft, right: %HSD vs. noise level, for road, rail and aircraft

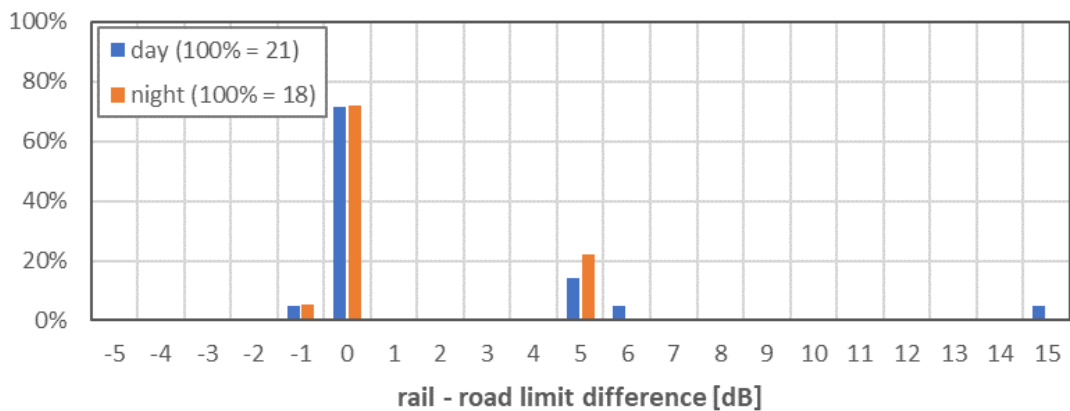


figure 16 Difference between noise limit values for rail and road traffic. A positive number indicates that rail noise limits are higher (less stringent) than road noise limits. Values apply to new situations and residential areas. Legend shows the number of countries that have limits for both road and rail.

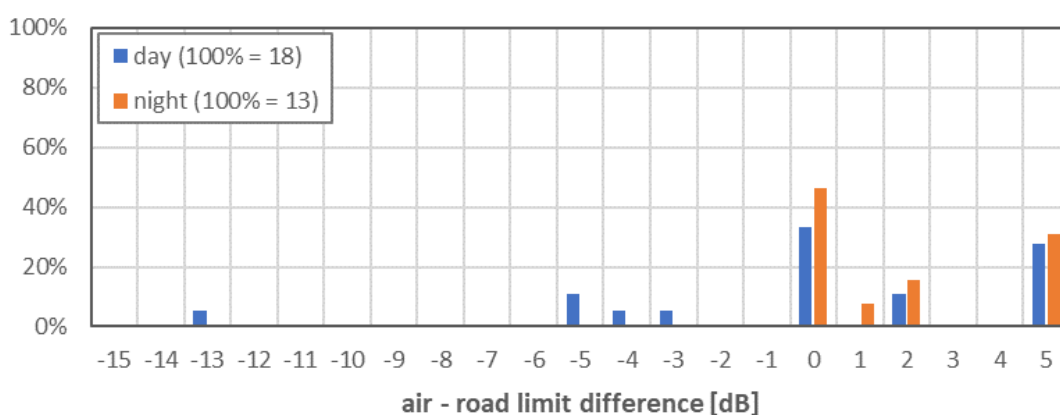


figure 17 *Difference between noise limit values for aircraft and road traffic. A positive number indicates that aircraft limits are higher (less stringent) than road traffic limits. Values apply to new situations and residential areas. Legend shows the number of countries that have limits for both road and aircraft.*

4.2.5 Penalty and correction factors

The exposure-response relations between long-term noise levels and annoyance and health impacts are based on average, long-term, generally broadband noise characteristics. In certain cases, the noise is particularly noticeable and annoying, leading to a higher response than indicated by the average exposure-response function. Industrial installations and wind turbines may produce tonal noise or impulsive sounds, for instance. Powered two-wheelers are another example, or squeal noise from trains in tight corners. Many countries have penalty factors in dBs that account for these kinds of noise. These penalty factors do not necessarily mean that the actual noise level is higher, but are rather a compensation for the fact that the average exposure-response function is not representative.

About 70% of countries report some form of penalty factor:

- Many countries have penalty factors for tonal noise and for impulsive noise. The correction factors range from +2 to +12 dB, but is usually +3 to +6 dB with +5 dB as the most common value. In most cases, these correction factors apply only to industrial installations or wind turbines, although this is not always explicitly stated. Impulsive noise may include noise from shooting ranges and explosions, but in one or two cases this is explicitly excluded.
- Several countries report that impulsive or tonal sounds are not permitted at all during evening/night periods.
- One country refers to the ISO 1996-1 and 1996-2 measurement standards for environmental noise, in which penalty factors for tonal and impulsive noise are defined.
- One country reports a penalty factor for curve squeal in rail noise assessment. For other countries, curve squeal may count more general as 'tonal noise', but this is not explicitly stated.
- One country reports a +5 dB penalty factor for special aircraft activities, such as parachuting, ultra-lights, visual training and scenic flights, during evening/night and weekend periods.
- One country reports a +10 dB penalty factor for musicality in industrial noise.
- One country reports a +3 dB penalty factor for low frequency noise in general and another penalty for low frequency noise from industrial installations specifically.
- Penalty factors are usually defined as an addition of a certain amount of decibels to the measured or calculated noise level. Two countries indicate that the penalty factor is implemented as a subtraction of a certain amount from the limit value, rather than an addition to

the measured or calculated level. This approach makes sense since the actual noise level may not be higher, and the penalty is actually a correction to the exposure-response relationship.

Then, there are also countries that report other correction factors that are applied to the calculated or measured noise levels prior to assessment of the limits:

- Two countries report that the 'rail bonus', i.e. the fact that people are considered to be less sensitive to rail noise than to road noise at an equal level, is not implemented as a difference in the limit values for road and rail, but as a -5 dB correction factor to the railway noise (using equal limit values for road and rail).
- One country applied a reduction factor to road noise, ranging -1 to -5 dB depending on speed, pavement type and area type, to account for the expected future decrease of noise by increased proliferation of silent vehicles and tyres.
- Two countries report a subtraction of 5 dB for roads with (very) low traffic intensities, and a similar 5 to 15 dB correction for low volume railway lines.

4.2.6 Position of assessment

The question about the position of assessment of the noise immission levels was answered with a large variety of replies. Respondents generally seem to be well informed about the exact position where noise levels are assessed. There was no specific question about the actual method used to assess the noise levels, so the responses may apply either to measurements, to model calculations, or to both. A few countries have specifically responded with 'measurements' or 'microphones'; other countries have not indicated this as such.

The following characteristics summarize the assessment positions that are used:

- The majority of countries uses multiple assessment positions per building. These may be specified as one receiver for each building floor, whereas other countries specify receiver positions in front of each window, for all noise-sensitive rooms. A few countries indicate the use of one single receiver per building, not for each separate floor. A few responses indicate that the position of assessment is at the border of a building parcel, or at some point within the parcel.
- About 40% of the respondents indicate that the noise level is assessed at the most exposed facade of the building. It is not specified how it is determined which facade is the most exposed. This may require actual measurements or calculations at multiple facades and then selecting the maximum level. Or the most exposed facade may be selected based on its position with respect to the noise source. Most of the other countries give no specification of the facade; one country indicates that noise levels are assessed at all facades exceeding a certain level.
- Several countries indicate that the position of assessment is different for different noise sources, or that their reply applies only to industrial sources and wind turbines.
- Many respondents indicate details about the exact positions required or allowed for the assessment. This includes a certain distance from the facade (from 0.5 m to 'at least 3.5 m') and a certain distance from the ground (mostly 1.5 to 4 m). For countries that use receivers for each building floor or window, a certain height with respect to the floor (1.2 to 2 m) or with respect to the window (e.g. 1.2 to 1.5 m, or 'the middle'). For windows, it is usually specified that they must be open.

4.3 Rationale

In the questionnaire, countries are asked about the rationale behind the limit values, i.e. on what basis are the values set at that particular level.

- 9 countries refer to the (previous) WHO guidelines and/or the Miedema exposure-response function used by the WHO. Several countries indicate that the value was chosen at a particular

annoyance level, between 9% and 15% highly annoyed people. The Brussels region indicates that limits were set at a higher level due to their urban-only situation.

- 2 countries refer to the END as a basis for their limit values, without further specification.
- 7 countries report that the limits are set on the basis of national studies into local exposure-response relationships, cost/benefit data and/or consultation with the public and/or other stakeholders.
- 5 respondents for countries with noise limits defined did not answer, or did not know, what was the basis for these values.

4.4 Scope

Limits may not apply to all situations, or their values may be different in different situations. Countries have reported that there are differences in the scope and/or the values for:

- new vs. existing situations,
- receiver area type, e.g. residential, industrial, commercial or mixed areas, or urban vs. suburban areas;
- other, source-specific discriminations, such as:
 - military vs. civil aircraft,
 - high-speed vs. regular rail lines.

4.4.1 New vs. existing situations

When planning new infrastructure, new installations or new housing, there are more possibilities to meet the noise limits and targets than in existing situations. For new situations, there are generally more options to take into account the noise levels in the spatial planning process, when deciding how far new houses are built from the noise source, or how far a new noise source is built from the houses. Also, there are more options to take active noise measures. When solving an existing noise problem, such as hot-spots identified in the END action plan, or when reconstructing existing infrastructure, there are less possibilities in terms of spatial planning and noise measures.

A limited fraction of countries (10 to 20%) report that limits only apply to new situations (see figure 18). The majority of countries with noise limits, however, have limits that apply to both new and existing situations. Of the countries with limits that cover both situations, some report higher limit values for existing situations than for new situations (see figure 19). This then mainly occurs for road and rail noise, to a lesser extent for aircraft and industry noise, and not at all for wind turbines. Noise limits for existing situations may be more relaxed or non-existent due to cost-benefit considerations, since it will generally be more expensive to solve an existing situation. But there is also evidence that people are more sensitive to noise in new situations, or situations with a big change in noise levels such as high rate change airports [6][9], which would also justify lower noise limits for new situations.

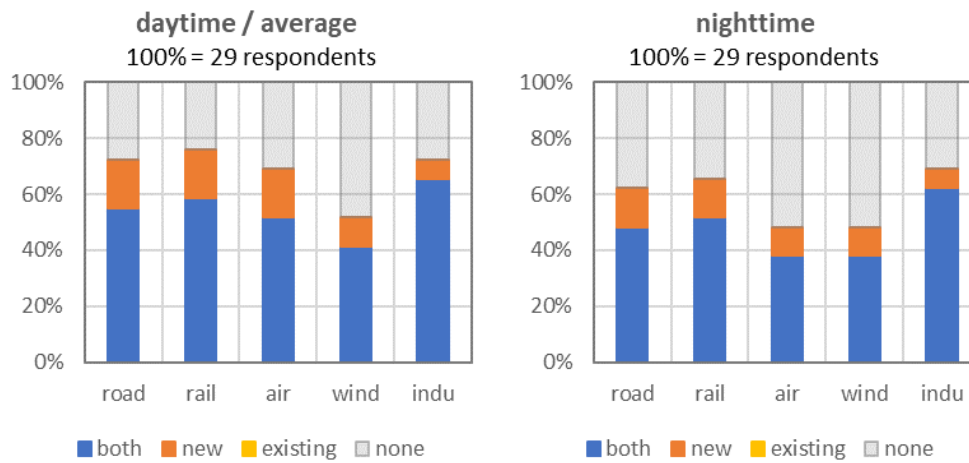


figure 18 Scope of limit values for daytime/average noise (left) and nighttime noise (right): limits exist only for new situations (orange), only for existing situations (yellow) or for both (blue), as a percentage of all responding countries; light grey bars indicate countries with no limits.

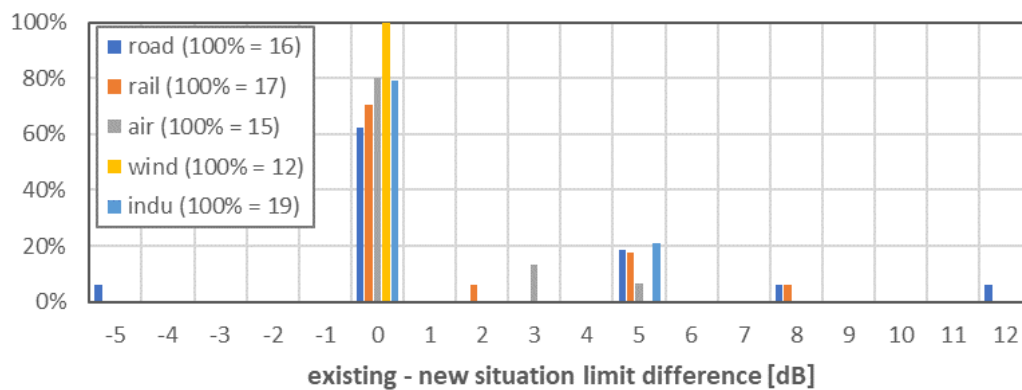


figure 19 Difference between limit values for existing and for new situations, as a percentage of countries that have limits for both scopes, per noise source; legend shows the total number of countries with limits for both new and existing situations.

4.4.2 Areas, land use types and zoning

Authorities, often municipalities, will try to separate houses and noise-sensitive buildings from activities with high impact on the local environment (noise, air quality, odour, etc.) by separating land use zones. In industrial, agricultural or commercial areas, higher noise levels will be allowed than in residential areas or more sensitive zones like hospital or school areas, or nature protection zones. Noise limits then apply only for specific noise-sensitive zones, or the noise limit values are higher for less sensitive zones than for residential areas, for instance. Some countries also define different noise limits for different residential areas, e.g. traffic noise limits for small villages vs. main residential areas in Germany, or in- and outside urban areas in the Netherlands.

Noise zones may be defined on a local level, i.e. some specific geographic area. Zones may also be defined on a global level, as a specific distance from the noise source. There may be a single zone around the noise source, which indicates how far from the noise source the noise immission levels actually need to be assessed. Some countries apply multiple zones around a particular noise source.

4.5 Consequences

As shown earlier, many countries have legally binding noise limits for the different sources. The consequences of exceeding the limit may differ, however. In the fact sheet questionnaire, six types of consequences have been distinguished, ranging from more to less severe:

- prohibition: the new installation, infrastructure or housing is not legally permitted, or the existing activity must be stopped;
- active noise measures: active noise measures, such as silent road/track measures, noise barriers or measures to reduce industrial sources must be taken, or at least considered;
- passive noise measures: facade insulation must be applied, or at least offered, house owners may be bought out;
- financial sanctions: fines for the installation owner or operator may apply, or exposed people must be financially compensated. The noise will not actually be reduced, although installation owners or operators may be stimulated to limit activities or take noise measures to prevent financial consequences. Financial compensation may also come in place of passive noise measures: house owners may be offered money to insulate their home, but do not necessarily need to spend it on insulation;
- non legally binding actions: the national or local authority, or the installation owner or operator, is obliged to consider actions, but not legally bound to take actions. Non legally binding actions may include the obligation to draw up a noise action plan and/or to inform the public;
- none: no consequences result from exceeding the limits.

Countries have reported which consequences apply to exceedance of the limit, for each noise source. Multiple options may apply. Figure 20 shows the occurrence of each of the legally binding consequences (the first four bullets above), per noise source, as a percentage of the countries that actually have noise limits for that noise source.

- Active noise measures are the most common consequence, occurring in 85-100% of the countries for all noise sources except aircraft noise. Countries have not explicitly stated what types of active noise measures are considered, as this information was not requested.
- Passive noise measures are also common for road, rail and air traffic noise. Several countries have explicitly stated that passive noise measures are to be taken if active noise measures are not possible or not cost-effective. Passive noise measures are less common for wind turbines and industrial noise sources.
- Prohibition of activities is common (> 75%) for wind turbines and industrial activities, but rather uncommon (< 20%) for traffic noise sources. Road traffic cannot simply be prohibited, as closing the road is generally not an option. Rail traffic and air traffic may be limited or reduced, for instance by allowing less flights from an airport, in general or specifically in the night. Respondents may consider this to be an active noise measure rather than a prohibition.
- Financial sanctions or compensation occurs for all noise sources, but are more common for air traffic and industry than for road and rail traffic.

In general, almost no situations have been found where countries have defined a noise limit without any binding consequences attached to it. The severity of consequences varies, however, and less severe consequences may not actually lead to a decrease of the noise exposure towards or below the limits.

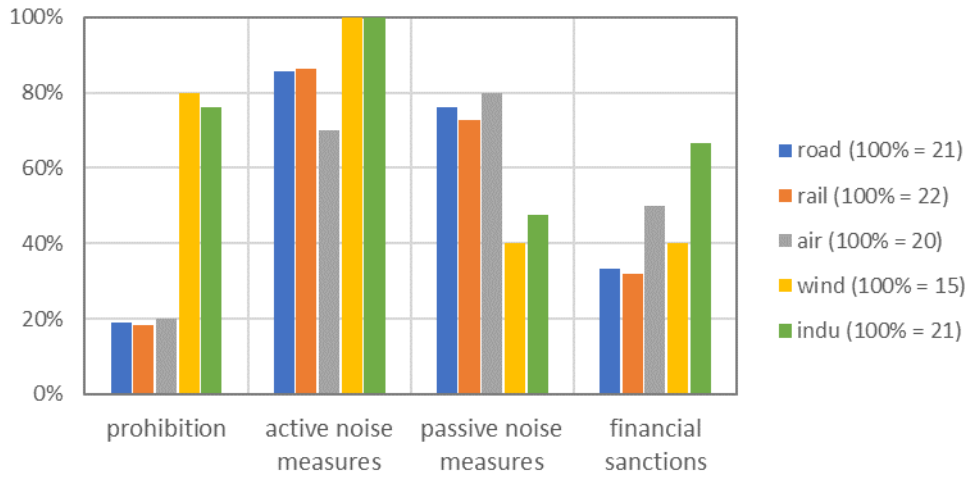


figure 20

Consequences of exceeding the noise limit per category, as a percentage of countries that have defined noise limits for that source; legend shows the total number of countries with limits

5 Conclusions and discussion

5.1 Research questions

What types of limit values exist?

There is a high level of noise legislation in Europe that includes assessment of the actual immission levels. 90% of the countries responding to our questionnaire report that they have limit values for environmental noise, with a legal obligation to compare the actual noise levels to these limits. The other countries still have some non-binding guidance values, or have noise legislation that does not use limit values. In addition, all EU countries are subject to the END obligations to draw up strategic noise maps and action plans. For the majority, national noise legislation enforcing the limits is separate from the END implementation and most, but not all, use different limit values than the threshold values used for the action plans.

Of all countries with noise limits, traffic noise limits (road, rail and/or aircraft) exist in 80% of the cases, and 80% have limits for industry noise. Slightly less than 60% of countries with limits have limits also for wind turbines, or have explicitly stated that these are included in the industry scope. A small few countries use non-source specific noise limits, defined for a type of receiver area rather than for a particular noise source, that apply to environmental noise more generally, using cumulative or dominant noise sources. Such limits may also exist in addition to source-specific limit values. Limit values for indoor noise are reported to exist by a minority of countries, but as this was not explicitly inquired the actual number of countries with indoor noise limits may be higher.

What values and quantities are used?

All noise limits are defined as equivalent (average) noise levels, although some countries have additional requirements for short-term maximum levels. For the nighttime, some national limits are based on 1-hour values, i.e. the loudest hour during the night. Almost all countries use the indicators L_{day} , $L_{evening}$, L_{night} and/or L_{den} . The few exceptions to that are for industrial noise sources, wind turbines and aircraft noise.

The L_{den} indicator covers all three periods: day, evening and night and could therefore be used as a single quantity to limit the noise. Several countries have, as WHO also suggests, separate L_{night} limits in addition to the L_{den} . The majority of countries, however, applies separate limits for the day and night periods in terms of L_{day} and L_{night} , rather than L_{den} or L_{den}/L_{night} limits. The 'day' period often also includes the evening. Variations in the definition of the time periods, e.g. the start of day at 06.00 or 07.00, exist. A few countries assess the noise in the morning hour from 06.00 to 07.00 specifically.

The values of the noise limits vary widely, with ranges of approximately 20 dB from low to high for road and rail, both in the day- and in the nighttime. For aircraft noise, the range is somewhat smaller, while for industry and wind turbine noise the range is close to 30 dB during the day, and 40 dB in the night in the case of industry.

The exposure-response functions presented by the WHO for road, rail and aircraft noise show that people are generally more annoyed and sleep disturbed by aircraft noise than by road or rail noise at the same dB-level. This is generally not reflected in the noise limits, however, as 75% of countries allow equal or higher levels of aircraft noise than for road noise.

For rail noise, 70% applies limit values that are equal to those for road noise, while 25% has to some degree a 'rail bonus', allowing higher rail noise than road noise levels. Such a rail bonus is not justified by the new 2018 WHO guidelines, which indicate that the occurrence of rail noise annoyance and sleep disturbance is actually equal or slightly higher for rail noise than for road noise at the same level, at least at levels above 55 dB L_{den} / 50 dB L_{night} .

What is the scope of these values and what are the legal consequences?

Even if limit values exist, they may not apply everywhere and always. In most (80%) of the countries with noise limits, these exist for both new situations (new dwellings, new infrastructure or new installations) and existing situations. A minority has noise limits only for new situations. The actual limit values for existing situations may be higher than for new situations: in 35% of the countries, road and rail noise limits are higher (usually +5 dB) for existing situations. For aircraft and industry noise this is 20% and for wind turbines such a difference was not reported. Reasoning for this difference was not provided, but may be found in cost-benefit considerations or in the fact that people are more sensitive to large changes, as is common for new infrastructure and installations. Also, it may not be legally possible to stop or restrict existing installations and activities that were allowed earlier, which leads (locally) to higher noise limits.

Although our survey focused on noise limits for residential areas, many respondents indicate that different noise limits apply to other receivers or area types. Noise limits may be higher for commercial or industrial areas, or lower for noise-sensitive buildings like schools and hospitals. Some countries discriminate between urban and rural areas, and a few have more detailed source-specific regulations, e.g. military vs. regular flights of high-speed vs. conventional railway lines.

The consequences of exceeding a limit value are quite different for different countries, and for different noise sources within the same country. A full prohibition of activities or planned constructions is common (75 to 80%) for industry and wind turbines, but uncommon (20%) for traffic noise sources (road, rail and aircraft). A legal obligation to consider the application of active noise measures (e.g. source measures, noise barriers) is common for all sources, often followed by the obligation to take passive noise measures (e.g. facade insulation) if active noise measures are not possible or not cost-effective. Financial sanctions are also a regular instrument (30 to 70%), as compensation for exposed people and/or as fines to the owners, operators and authorities. A clear relation between the height of the noise limits and the severity of the consequences was investigated, but was not found. There is no clear indication, therefore, that countries with lower noise limits use a more relaxed enforcement regime than countries with higher limits.

How were limits established? Which criteria are used as a basis?

About 1/3rd of the respondents indicate that the dB-values are based on the previous WHO-guidelines or the then-used Miedema exposure-response curves, often aimed at some level of annoyance (9 to 15%). Another 1/3rd of countries reports a specific national policy-making process to establish their limit values, incorporating national impact studies based on health impacts, cost/benefit data and/or public/stakeholder consultation.

About 20% of the respondents could not, or did not answer the question about the rationale behind the limit values. The basis for the limit values is not always known or well-documented.

5.2 Discussion

The findings in this report are based on data provided by national experts from 29 European countries and, therefore, covers the majority of European noise legislation. The amount of information provided in each of the fact sheets varies from more concise to quite extensive, but generally provides good and complete answers to the questions asked.

Nevertheless, the details of national noise legislation are undoubtedly more complex and refined than the summarized descriptions given. Moreover, some level of detail was lost in the process of analysing the data. In addition, some interpretation and generalization by the authors had to be made in order to enable a comparison of the data. Also, it cannot be fully excluded that questions have been understood differently than how they were intended, or that the answers have been

partially misinterpreted. A review of the draft report and the fact sheets has been done by the survey participants in order to resolve these issues as much as possible.

Many, but not all countries in the European region have received or responded to the fact sheet survey. From the Eastern European region, more data are missing than from other parts of Europe, which may lead to a slight bias in our results.

Finally, it should be noted that the noise limits do not directly reflect the real noise levels generally present. A country that has defined higher noise limit values than another country may still have a lower number of people exposed to harmful noise levels. Conclusions about the actual health situation in any country, or in Europe as a whole, should not be drawn from this report. These kinds of health assessments should rather be based on the strategic noise maps and action plans required by the Environmental Noise Directive, and are performed regularly by the EEA and other institutions.

5.3 Conclusions and recommendations

From the investigations in this report, it is clear that the current limit value situation varies widely across different countries in the European region. The limit values for any particular noise source vary widely between countries. For the majority of countries, the current limit values are considerably higher than the noise levels recommended in the recent WHO guidelines. The actual effect of any noise limit is determined not only by the dB-value, however, but also to a large extent by the consequences attached to exceeding the limit.

Limit values may be applied as a 'target value', i.e. the noise level above which authorities will start to consider taking noise measures. If this is how a limit value is implemented, then from a health perspective its value should not be higher than the WHO-recommended values. For noise levels above this value, there are serious health implications for which it is up to policy makers to decide how much effort and budget can and should be spent to avoid these. Cost-benefit considerations may apply, as was investigated in an earlier EPA-IGNA report [9]. Some countries have implemented a limit value as a maximum value that is not to be exceeded. This boundary is not quite so black-and-white, as a full prohibition of activities that lead to exceedance is not always the consequence, and rather uncommon for road, rail and air traffic. Also, specific exceptions to the limits may exist.

The WHO-recommended values are based on L_{den} and L_{night} . This does not match the current noise legislation in several countries, as current legislation is often based on L_{day} and L_{night} limit values, separated between the day (evening) and night periods. Limit values used in European countries are generally higher than the intervention levels recommended by the WHO. For wind turbines, approximately 60% of the countries with noise limits use values higher than or equal to the WHO-recommended level. For road and rail noise, 80 to 90% uses limits higher than or equal to the recommendations. For aircraft noise, all countries with limits use values higher than the WHO recommendation. The situation is similar for the daytime / average values (L_{den} / L_{day}) and for the nighttime L_{night} values.

WHO recommends considerably lower L_{den} and L_{night} limits for aircraft noise than for rail and road noise, which is justified by the exposure-response relations that have been established. This is not currently the case in the majority of European countries. Furthermore, the current scientific evidence does no longer justify the general use of higher noise limits for rail than for road traffic. The WHO recommendations are not scope-specific, i.e. they do not separate between new and existing situations, and they apply to any situation where people live, work, learn and sleep for longer periods of time. National noise limits, however, are shown to be more situational, depending

on details of the source, the receiving building or area. Limit values are sometimes higher for existing situations than for new situations, or they may not apply to existing situations at all.

National and local authorities in European countries may currently consider updating their current noise legislation based on the new WHO guidelines. From the results in this report, the following recommendations are given for the implementation of these guidelines:

- The legislation should be clear about the objective of any limit or target value, either as a minimum value above which actions should be considered, or as a maximum value that should not be exceeded. A combination of both an upper and a lower value, with room for situational policy in between, is also a possibility.
- The actual significance of a limit value is determined largely by the consequences of exceeding it. When considering new or different values for their noise limits, authorities should regard the legislative system as a whole, including the enforcement and legal consequences. Specifically for existing situations, a trigger to actually assess the noise levels against the limit should exist. This trigger could be the END noise maps and action plan.
- When deciding on limit values and their consequences, authorities should be aware that higher levels increase the health impact of noise.
- In order to take into account the WHO-recommended values, noise limits based on L_{day} , $L_{evening}$ and L_{night} or other indicators different from the L_{den} / L_{night} could be used, but their values should be derived using appropriate conversions.
- For transparency and accountability, the rationale behind the actual dB-value should be clear and publicly documented. This should preferably be related to some exposure-response relation, along with cost-benefit and other consideration that may be the basis for that particular value. The WHO-guidelines could provide exposure-response functions for this.
- Following the WHO-recommendations, limit values for road and rail traffic should not be very different and limit values for aircraft should be considerably lower than for road and rail traffic. This consideration is purely from a health perspective, however, and other considerations may apply.

References

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- [10] M. Brink et al., “*Conversion between noise exposure indicators L_{eq24h} , L_{Day} , $L_{Evening}$, L_{Night} , L_{dn} and L_{den} : principles and practical guidance*”, International Journal of Hygiene and Environmental Health, volume 221, nr. 1, p54-63, 2018

Appendix – Country fact sheets

Contents

| | |
|------------------------|-----|
| Albania | 43 |
| Austria | 47 |
| Belgium, Brussels | 51 |
| Belgium, Flanders | 56 |
| Belgium, Wallonia | 63 |
| Bosnia and Herzegovina | 68 |
| Bulgaria | 74 |
| Czech Republic | 78 |
| Denmark | 82 |
| England | 91 |
| Estonia | 94 |
| Finland | 97 |
| France | 101 |
| Germany | 104 |
| Ireland | 109 |
| Italy | 116 |
| Kosovo | 126 |
| Liechtenstein | 130 |
| Lithuania | 135 |
| Luxembourg | 141 |
| North Macedonia | 146 |
| Malta | 151 |
| Netherlands | 153 |
| Portugal | 157 |
| Slovakia | 161 |
| Slovenia | 166 |
| Spain | 170 |
| Sweden | 174 |
| Switzerland | 178 |

1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

3. LIMIT VALUES – METRICS

3.a) Please supplement limit values regarding noise immission at residential areas.

Guidance No.8, date 27.11.2007 On noise limit values in certain areas.

| Environment | Effect on health | LA _{eq} (dBA) | Time (hourly) | L _{Max} Fast (dB) |
|---|---|---------------------------|---------------------|-------------------------------|
| Residential area | | | | |
| Outdoor | Serious disturbance during the day and evening | 55 | 16 | - |
| | Moderate disturbance during the day and evening | 50 | 16 | - |
| Indoor | Moderate disturbance during the day and evening | 35 | 16 | - |
| Inside the bedroom | Night sleeping disorder | 30 | 8 | - |
| Outside the bedroom | sleeping disorder , open window (value measure outside) | 45 | 8 | - |
| Institutions | | | | |
| Inside the school | Understanding the conversation difficulty in understanding information, | 35 | During the learning | - |
| Inside the kindergarten 's bedroom | sleeping disorder | 30 | sleep time | - |
| the courtyard of the school | disturbance) - (external sources) | 55 | Rest time | - |
| Inside hospital | sleeping disorder, day, evening and night | 30 | 8 | 40 |
| | | 30 | 16 | |
| Hospital , inside the treatment room | Impact on rest and , relaxation | | | |
| Area with socio-economic activities | | | | |
| Industrial area , comercial , Trafik inside and outside area. | Hearing damage | 70 | 24 | 110 |
| Urban area | | | | |
| Inside and outside public area | Hearing damage | 85 | 1 | 110 |
| Ceremonies, festivals and entertainment | Hearing damage | 100 | 4 | 110 |
| Music through earphones | Hearing damage | 85 | 1 | 110 |
| Noises from fireworks and firearms | Hearing damage to adults and children | - | - | 140 |
| | | | | 120 |

The limit values supplemented above are applied to the sum of all types of noise sources. Related to the limit values under section "Residential Area ", until now Albania applied "Outdoor Serious disturbance" during the day and evening, that is 55 dB, and "Outside the bedroom" (value measured outside near the building), that is 45 dB.

3. LIMIT VALUES – METRICS

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

In Albania all indicators are A weighted. The L_{den} and L_{night} are calculated according to the European Noise Directive. The L_{Aeq} is defined for the following time sequences:

L_{Aeq} in the day (07:00 – 19:00)

L_{Aeq} in the evening (19:00 – 23:00)

L_{Aeq} in the night (23:00 – 07:00)

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

-

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|--------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

-

6. BASIS OF LIMIT VALUES

How were limit values established?

Noises limit values in certain areas are based on recommendations of WHO.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

Law No 9774 of 12.07.2007 "On assessment and administration of environmental noise",
Guidance of Council of Ministers No 8 of 27.11.2007 "On noise limit values in certain areas",
Decision of Council of Ministers No 587 of 7.07.2010 "Monitoring and control on noise level in urban", which approximate the Directive 2002/49/EC.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

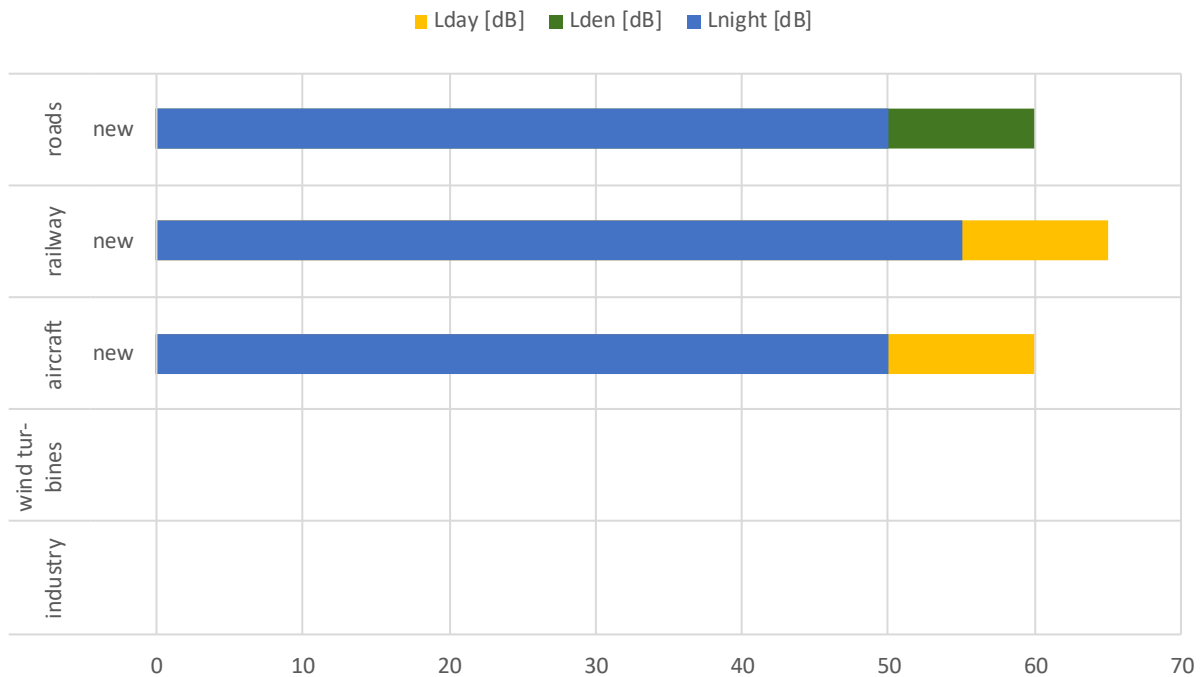
1. END THRESHOLDS vs. NATIONAL LIMITS

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- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

new motorways (noise of motorway): L_{den} 55dB, L_{night} 45dB

new motorways (total road traffic noise): L_{den} 60dB, L_{night} 50dB (up to L_{den} 65dB, L_{night} 55dB if increase of noise level \leq 1dB)

existing motorways and other roads: L_{den} 60dB, L_{night} 50dB

new railways: $L_{r,day}$ 60dB, $L_{r,night}$ 50dB (up to $L_{r,day}$ 65dB, $L_{r,night}$ 55dB depending on existing noise situation: existing noise situation + 10dB)

existing railways: $L_{r,day}$ 65dB, $L_{r,night}$ 55dB

For railway noise a bonus of -5 dB has to be applied to the LA_{eq} .

In the bar graph under question 2, the 5 dB railway bonus has been taken into account by increasing rail limit values $L_{r,day}$ and $L_{r,night}$ by 5 dB, and depicting them as L_{day} and L_{night} values.

new airports: $L_{day(6-22)}$ 60dB, $L_{night(22-6)}$ 50dB, LA_{max} 6x68dB per night

Limit values for existing roads and existing railways are used for the dimensioning of noise abatement measures in the noise abatement programs. The noise abatement programs for existing roads and railways are not legally binding.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

L_{day} is the A-weighted equivalent sound level over time sequence 06:00 – 19:00.

$L_{evening}$ is the A-weighted equivalent sound level over time sequence 19:00 – 22:00.

L_{night} is the A-weighted equivalent sound level over time sequence 22:00 – 06:00.

$L_{r,day}$ is the A-weighted equivalent sound level over time sequence 06:00 – 22:00 combined with the bonus for railway noise.

$L_{r,night}$ is the A-weighted equivalent sound level over time sequence 22:00 – 06:00 combined with the bonus for railway noise.

$L_{day(6-22)}$ is the A-weighted equivalent sound level over time sequence 06:00 – 22:00.

$L_{night(22-6)}$ is the A-weighted equivalent sound level over time sequence 22:00 – 06:00.

LA_{max} is the A-weighted maximum sound level.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

For railway noise a bonus of -5 dB has to be applied to the LA_{eq} , see question 3a.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|--------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

Motorways: At the facade, at the mean height of each floor.

Railways: In the middle of each window at a distance of 0,5m outside the building.

Aircraft noise: In front of the building at a height of 4m.

6. BASIS OF LIMIT VALUES

How were limit values established?

-

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

new motorways:

<https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20008929>

existing motorways:

https://www.bmvit.gv.at/verkehr/strasse/autostrasse/laermschutz/downloads/laermschutz_da.pdf

new railways:

<https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10012266>

existing railways:

<https://www.bmvit.gv.at/verkehr/eisenbahn/verkehrslaerm/rili2006.pdf>

new airports:

<https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20008039>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

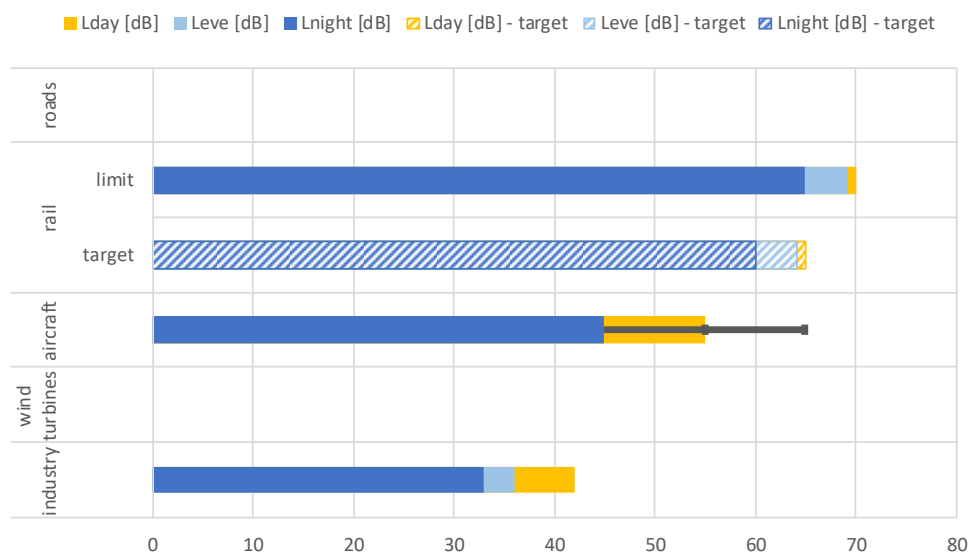
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
 There are noise limits for industries with an environmental permit (including wind turbines), for neighbourhood, for aircrafts and for amplified sound.
- Other, namely:
 For roads, the limits are exclusively those set in the END action plans.
 For rails (and other public transports), the limits are defined in environmental convention.

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different areas.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

| Noise source | L _{night} | L _{day} | L _{evening} | L _{den} | L _{Aeq07h-23h} | Comments |
|---------------------------|---|------------------|----------------------|------------------|---|---|
| Road traffic | 60 | 65 | 64 | 68 | | Limit values which correspond to intervention levels, i.e. noise levels from which the acoustic situation of residents is seen as intolerable and requires public authorities' intervention. |
| Rail traffic | 60; 65; 68 | 65; 70; 73 | 64,2; 69,2; 72,2 | 68; 73; 76 | | Specific measures at façades. Defined by the environmental convention signed between the Brussels Region and the SNCB (Belgian National Railway Society). For each period, 3 levels of intervention are defined (Target to be achieved after remediation; Limit threshold not to be exceeded; Emergency Action Threshold). |
| Aircraft around airports | 55 (Zone 2) 50 (Zone 1) 45 (Zone 0) | | | | 65 (Zone 2) 60 (Zone 1) 55 (Zone 0) | LAeq,T (23-7h) and (7-23h) : specific to environmental noise, generated by planes. Limit values set by order of 27 May 1999 of the Government of the Brussels. Three zones are defined in the region. SEL is also used to characterize the flights (Day 7-23h: 100-90-80; Night 23-7h: 90-80-70) |
| Industrial activity sites | (*)33-54 | (*)42-60 | (*)36-60 | | | (*) LAeq,T (22-7h), (7-19h) and (19-22h) take into account total level of noise, level of environmental noise and value of possible tonal emergence. The lowest limit values are applicable for residential areas. Saturday must be considered as "Evening" between 7h-19h and "Night" between 19-7h Sunday and public/legal holiday must be considered as "Night" between 19-7h |

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

The indicators are A-weighted equivalent sound levels. Corresponding time sequences differ per sound source:

- Rail and roads: L_{day} (07:00 – 19:00), $L_{evening}$ (19:00 – 23:00), L_{night} (23:00 – 07:00), L_{den}
- Aircraft: L_{day} (07:00 – 23:00) and L_{night} (23:00 – 07:00)
- Industry (and wind turbines): L_{Aeq} (07:00 – 19:00), L_{Aeq} (19:00 – 22:00) and L_{Aeq} (22:00 – 07:00)

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

-

3.d) Please supplement any relevant additional information.

Noise limits shown in section 2 are only valid in the Brussels region.

In Flanders and Wallonia, other noise regulations exist.

These limit values are explained in the document named (in french) Fiche documentée Bruit de l'état de l'environnement bruxellois n°37 "LES VALEURS ACOUSTIQUES ET VIBRATOIRES UTILISÉES EN RÉGION DE BRUXELLES-CAPITALE" (see

http://document.environnement.brussels/opac_css/elecfile/Bru_37.PDF or in NL

http://document.leefmilieu.brussels/opac_css/elecfile/Geluid_37.pdf?langtype=2067).

3. LIMIT VALUES – METRICS

3.d) Please supplement any relevant additional information. (continuation)

For aircrafts, three zones are defined.

Zone 2: Area located to the northeast between the limit of the regional territory and the arc of a circle centred at the point of coordinates 50° 54.2' N - 004°32.4' E and a radius of 10,000 metres;

Zone 1: Area located to the northeast, between the regional boundary, the boundary of zone 2 and the arc of a circle centred at the point of coordinates 50° 54.2' N - 004°32.4' E and a radius of 12,000 metres;

Zone 0: area of the regional territory not covered by zones 1 and 2.

For rail, three levels of intervention are defined.

For each period, 3 levels of intervention are defined: Target to be achieved after remediation; Limit threshold not to be exceeded; Emergency Action Threshold.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|---|--|------------------------------------|---|---|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> In the context of END action plan or EIA | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> Environmental convention between Brussels Region and SNCB/Infrabel | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> If airlines exceed the limit values expressed in SEL | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> As a last resort | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> As a last resort | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

- For roads and rails: the position of assessment is 4 meters above the ground at the most exposed facade of the dwelling, and at least 1.5 metres from any wall.
- For aircraft: at a height between 1.5 meters and 25 meters above the ground, and at least 1.5 metres from any wall
- For industry: at the limits of the parcel

6. BASIS OF LIMIT VALUES

How were limit values established?

WHO health-based assessments were used, but refined on basis of actual experience. Limit values had to be tailored to Brussels' unique urban-only nature. Otherwise the whole region would have been red zone, and priorities would have been harder to set.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

All the documents are in french or dutch.

The legal context is explained in the document named (in french) Fiche documentée Bruit de l'état de l'environnement bruxellois n°41 "CADRE LÉGAL BRUXELLOIS EN MATIÈRE DE BRUIT" (see in FR

http://document.environnement.brussels/opac_css/elecfile/Bru_41.PDF?langtype=2060 or in NL http://document.leefmilieu.brussels/opac_css/elecfile/Geluid_41.PDF?langtype=2067)

These limit values are explained in the document named (in french) Fiche documentée Bruit de l'état de l'environnement bruxellois n°37 "LES VALEURS ACOUSTIQUES ET VIBRATOIRES UTILISÉES EN RÉGION DE BRUXELLES-CAPITALE" (see in FR

http://document.environnement.brussels/opac_css/elecfile/Bru_37.PDF or in NL http://document.leefmilieu.brussels/opac_css/elecfile/Geluid_37.pdf?langtype=2067)

7. MAIN LEGAL DOCUMENTS

And also on the website of Brussels Environment:

<https://environnement.brussels/thematiques/bruit/laction-de-la-region/legislation-et-incitants>
<https://leefmilieu.brussels/themas/geluid/acties-van-het-gewest/wetgeving-en-stimulansen>

- ARRÊTÉ DU GOUVERNEMENT DE LA RÉGION DE BRUXELLES-CAPITALE (AGRBC) du 27 mai 1999 relatif à la lutte contre le bruit généré par le trafic aérien. Available on: http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=1999052751&table_name=loi_5
- REGION DE BRUXELLES-CAPITALE, 24 janvier 2001. « Convention environnementale entre la Région de Bruxelles-Capitale et la Société Nationale des Chemins de Fer Belges (SNCB) relative aux bruit et vibrations du chemin de fer ». Available on: http://document.environnement.brussels/opac_css/elecfile/conventionEnviro_RBC_et_SNCB_24jan2001_bilingue.PDF?langtype=2060_6
- REGION DE BRUXELLES-CAPITALE, 22 janvier 2009. « Annexe du Procès-Verbal de la réunion du comité d'accompagnement de la convention environnementale entre la Région de Bruxelles-Capitale et la SNCB relative aux bruit et vibrations du chemin de fer ». Available on: https://environnement.brussels/sites/default/files/user_files/convention-sncb-annexe_iden_fr.pdf_7
- ARRÊTÉ DU GOUVERNEMENT DE LA RÉGION DE BRUXELLES-CAPITALE (AGRBC) du 21 novembre 2002 relatif à la lutte contre le bruit et les vibrations générées par les installations classées. Available on: http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=2002112142&table_name=loi
- Liste coordonnée des installations classées en Région de Bruxelles-Capitale. Available on: http://app.bruxellesenvironnement.be/listes/?nr_list=IC_LIST
- ARRÊTÉ DU GOUVERNEMENT DE LA RÉGION DE BRUXELLES-CAPITALE (AGRBC) du 21 novembre 2002 fixant la méthode de contrôle et les conditions de mesure du bruit. Available on: http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=2002112139&table_name=loi

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

1. END THRESHOLDS vs. NATIONAL LIMITS

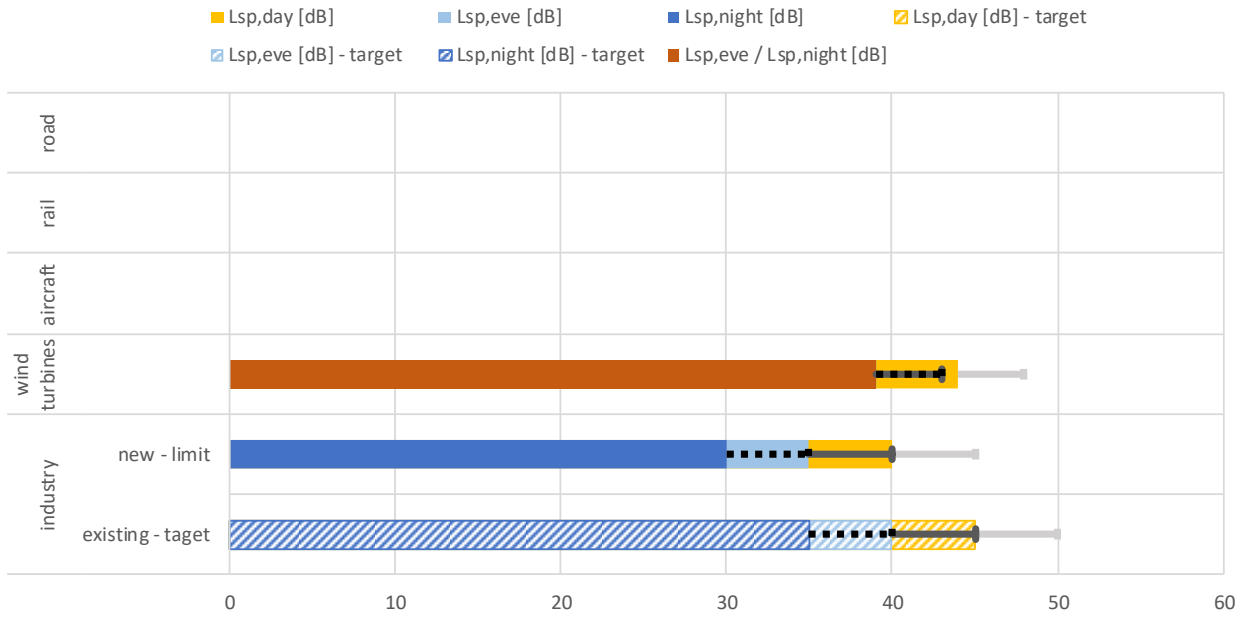
How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

There exists noise legislation for noise from wind turbines and establishments and activities classified as nuisance-producing (industry including leisure establishments such as concert halls, swimming pools, ...). For other types of noise sources (aircrafts, railways and roads), there exist no limit values apart from those set in the context of END action plans. Although in environmental impact assessment (EIA) procedures non-binding (informal) guiding values are taken into account.

In the remainder of this document, all limit values refer to legislation of the Flanders Region.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to residential areas only. Error bars indicate the range of values over different types of residential areas (related to the vicinity of e.g. industrial areas, areas for public utilities, ...). For inhabited dwellings in other areas types, other values apply. In case of new industry, values can be lower in certain areas if the existing background noise is low, and higher if it is high. In case of wind turbines, values can be higher if the existing background noise is high.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Roads: In the context of END action plans no threshold values in Lnight are considered. A threshold value of 70 dB Lden to address 'priority zones' is considered.

Railways: In the context of END action plans no threshold values in Lnight are considered. Only a threshold value of 73 dB Lden to address 'priority zones' is considered.

Although in environmental impact assessment (EIA) procedures non-binding (informal) guiding values in Lden and Lnight are taken into account for road and railway noise (See 8. 'Further Comments').

Aircraft: In the context of END action plans a threshold value of 65 dB Lden and 55 dB Lnight is considered to address a priority zone.

Industry (establishments and activities classified as nuisance producing): The maximum limit and target values are supplemented under question 3d. These limit and target values for establishments classified as nuisance-producing are set out in the VLAREM II legislation chapter 4.5 (<https://navigator.emis.vito.be/mijn-navigator?wold=263&woLang=nl>) and its appendices (<https://navigator.emis.vito.be/mijn-navigator?wold=17775&woLang=nl>). For establishments considered as new according to the legislation, there is a limit value. For establishments considered as existing according to the legislation (certain rules apply), there is a target value. To establish which specific limit or target value applies, one can use the decision trees in appendix 4.5.6 of VLAREM II. As stated under section 3d, the actual limit or target value depends on several factors.

For certain types of establishments classified as nuisance-producing:

- other limits values (wind turbines in VLAREM II section 5.20.6) or supplemental limit values (leisure establishments with musical activities in VLAREM II sections 5.32.2 and 5.32.3), loading and unloading operations at supermarkets in VLAREM II section 4.5.7) or specific metric systems (shooting ranges in VLAREM II section 5.32.7 and 5.32.8) apply than those mentioned above.

If a dwelling shares a communal wall with an establishment classified as nuisance-producing, a limit or target value inside the dwelling applies (see VLAREM II chapter 4.5).

For impulsive, intermittent, incidental and fluctuating noise (as defined in VLAREM II) the limit and target values are amended with the correction factors in appendix 4.5.6 of VLAREM II.

Wind turbine: The limit values are supplemented under question 3d. The limit values for wind turbine noise are set out in the VLAREM II legislation, section 5.20.6.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

Industry: The metric depends on the acoustic climate in which the measurement of the specific noise of the establishment is measured. The metric and the corresponding time sequences have to characterize the noise of the establishment.

All metrics are A-weighted. Mostly the equivalent sound level L_{Aeq} is used with a time sequence of 1h or shorter. In cases where the measurement is disturbed by other noise, the statistical sound level L_{A50} or another metric can be used. The choice of metric and time sequence must be motivated. The statistical sound level L_{A95} is needed to determine the specific limit value.

For impulsive, intermittent, fluctuating and incidental noise the equivalent sound level $L_{Aeq,1s}$ is used. This metric applies to every single peak.

Wind turbines: The metric depends on the acoustic climate in which the measurement of the specific noise of the establishment is measured. The metric and the corresponding time sequences have to characterize the noise of the establishment.

All metrics are A-weighted. Mostly the statistical sound level L_{A50} is used. The choice of metric and time sequence must be motivated. The statistical sound level L_{A95} is needed to determine the specific limit value.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

Industry and wind turbines: There is a penalty for tonal noise which depends on the manner it was established. The penalty is +2 dB in the case a small band analysis is used and + 5 dB when it is established using a third octave bands analysis.

3.d) Please supplement any relevant additional information.

For industry (including leisure establishments, ...) and wind turbine noise:

| Industry | Existing establishment – Maximum Target Value | | L _{sp} (dB(A)) |
|----------------------|---|-------------------|-------------------------|
| | | Day (7h-19h) | 40 - 60 |
| | | Evening (19h-22h) | 35 - 55 |
| | | Night (22h-7h) | 30 - 55 |
| | New establishment – Maximum Limit Value | | |
| | | Day (7h-19h) | 35 – 55 (40-60*) |
| | | Evening (19h-22h) | 30 – 50 (40-60*) |
| | | Night (22h-7h) | 25 – 50 (30-55*) |
| Wind turbines | Limit Value | | |
| | | Day (7h-19h) | 44-60** |
| | | Evening (19h-22h) | 39-55** |
| | | Night (22h-7h) | 39-55** |

**In areas with an existing background noise LA95 higher than the target value for existing establishments.*

***If the existing background noise LA95 is higher than the limit value, the Lsp has to be limited to the existing background noise. In that case, the distance between wind turbine and dwelling must be at least three times the rotor diameter.*

- *Limit and target values apply at every single dwelling in vicinity of the noise source (e.g. a factory, a wind turbine park).*
- *Maximum limit and target values are shown. The shown range of maximum values indicates the variation of the maximum value over different types of areas (e.g. industrial area, area in vicinity of an industrial area, residential area, agricultural area).*
- *For industry noise the actual limit and target values can be lower, depending on the value of the existing background noise without the establishment LA95, the type of area and the class of the establishment (class 1 to class 3).
For wind turbine noise the limit value can be higher if the existing background noise without the wind turbine(s) LA95 is higher than the limit value (see table footnote).*
- *The limit and target values apply to the Lsp (specific noise) of an establishment considered as an environmental-technical unit (e.g. a factory, a wind turbine park). The specific noise is defined as the numerical value of the acoustic quantity which represents the noise of an establishment or a part of it (e.g. LAeq,1h, LA50,1h) which may be adapted with an assessment figure (see further in penalties/correction factors); also counted as the specific noise of an establishment is noise resulting from transport, loading and unloading activities, traffic, the warming up or running of engines on the premises of the establishment, as well as incoming and outgoing traffic.*

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|---|--|---|--|---|--------------------------|
| road | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> In the context of END actionplan or EIA | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> In the context of END actionplan or EIA | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> In the context of END actionplan | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> Above limit, a permit can't be given when limits are not respected | <input checked="" type="checkbox"/> When limits are not met active measures have to be taken to respect the limit, otherwise prohibition will follow | <input type="checkbox"/> | <input checked="" type="checkbox"/> A penalty or fine is possible when limits are not met | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> <u>New establishments:</u> above limit, a permit can't be given when limits are not respected <u>Existing establishments:</u> Targets must be approached | <input checked="" type="checkbox"/> <u>New establishments:</u> When limits are not met active measures have to be taken to respect the limit, otherwise prohibition will follow <u>Existing establishment:</u> When the target is exceeded by 10 dB measures have to be taken to approach the target, when the target is exceeded by less than 10 dB measures can be imposed by the competent authorities to approach the target | <input type="checkbox"/> | <input checked="" type="checkbox"/> A penalty or fine is possible when limits or targets are not met | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

Example: In the Netherlands, the position of assessment is 1,5 - 2 meters above each floor at the most exposed facade of the dwelling.

Industry and wind turbines: Measurements in open air are carried out in the vicinity of dwellings at heights representative for the different living levels and, if possible, at least 3,5 m from walls, buildings and other sound-reflecting constructions. If a dwelling shares a communal wall with an establishment classified as nuisance-producing, measurements inside dwellings are carried out at a height between 1,2 m and 1,5 m above the floor and at least 1,5 m from windows and walls.

6. BASIS OF LIMIT VALUES

How were limit values established?

-

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

Legislation for noise from wind turbines, industry and other establishments classified as nuisance-producing are stated in the VLAREM regulations.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

- The non-binding (informal) guiding values (in Dutch 'gedifferentieerde referentiewaarden') in Lden and Lnight that are used in EIA for road and railway noise can be found on p 113 and 117 of the following report: 'MER-richtlijnenboek discipline geluid en trillingen' (<https://www.lne.be/sites/default/files/atoms/files/geluid%20en%20trillingen.pdf>)
- There is an ongoing study to amend the legislation for wind turbines, especially concerning metrics and the position of assessment.

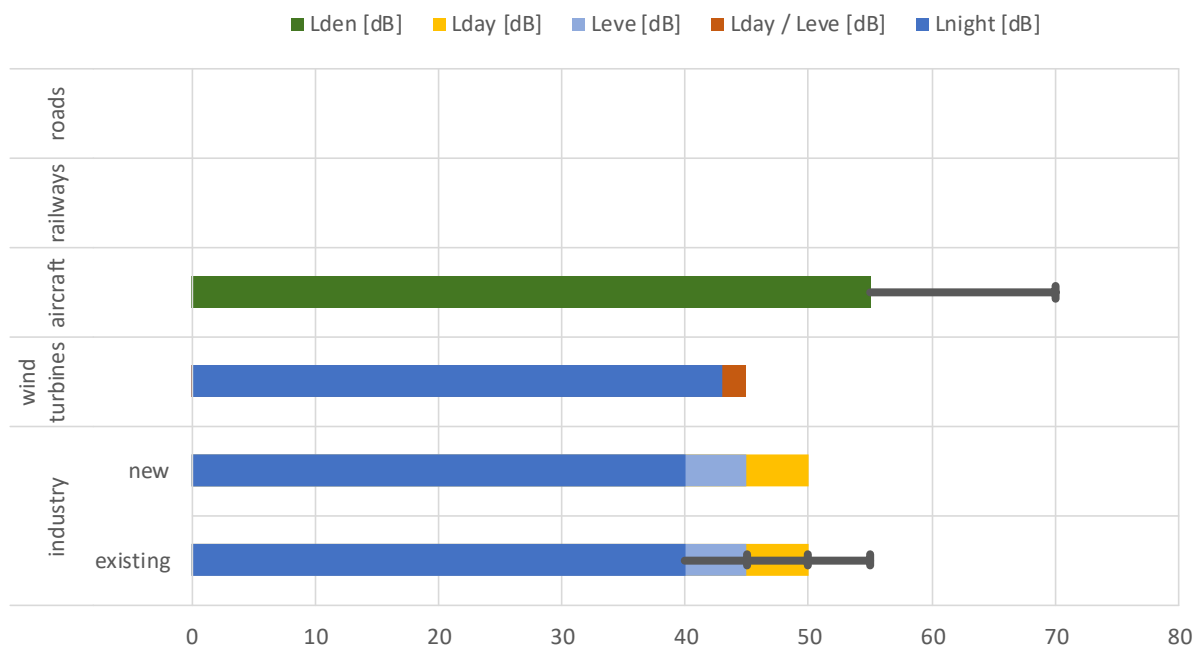
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values. *There are noise limits for industries with an environmental permit (including wind turbines) and airports. For roads, the limits are exclusively those set in the END action plans.*
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different types of areas (aircraft) or plant-specific characteristics (industry).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

For the industries (excluding wind turbines), limit values can be 5 dB higher if the plant was existing before 2002 (but it should be asked : derogation).

Table 1. – Limit values after 2002

| Area in which measurements are made | | Limit values (dBA) | | |
|-------------------------------------|---|--------------------|-----------------------------|-----------------|
| | | Day 7h-19h | Evening 6h-7h 19h-22h | Night 22h-6h |
| I | All areas, when the measurement point is located within 500m of the area of extraction, industrial area or within 200m of the economic area in which the plant is located | 55 | 50 | 45 |
| II | Residential areas, except I | 50 | 45 | 40 |
| III | Land, forest, green spaces, natural zones, except I | 50 | 45 | 40 |
| IV | Public service and leisure areas | 55 | 50 | 45 |

Table 2. – Limit values before 2002 (derogation)

| Area in which measurements are made | | Limit values (dBA) | | |
|-------------------------------------|---|--------------------|-----------------------------|-----------------|
| | | Day 7h-19h | Evening 6h-7h 19h-22h | Night 22h-6h |
| I | All areas, when the measurement point is located within 500m of the area of extraction, industrial area or within 200m of the economic area in which the plant is located | 60 | 55 | 50 |
| II | Residential areas, except I | 55 | 50 | 45 |
| III | Land, forest, green spaces, natural zones, except I | 55 | 50 | 45 |
| IV | Public service and leisure areas | 60 | 55 | 50 |

For the wind turbines, limit values are:

| Area in which measurements are made | | Limit values (dBA) | | | |
|-------------------------------------|--|--------------------|------------------------------------|--|---|
| | | Day 7 h-19 h | Evening 6 h-7 h 19 h-22 h | Night 22 h-6 h « hot nights » | Night 22 h-6 h « normal nights » |
| I | Residential areas | 45 | 45 | 40 | 43 |
| II | Land, forest, green spaces, natural zones | 45 | 45 | 43 | 43 |
| III | All areas, when the measurement point is located within 500m of the area of extraction, industrial area or within 200m of the economic area in which the wind turbines are located | 55 | 50 | 45 | 45 |
| IV | Public service and leisure areas | 55 | 50 | 45 | 45 |

For the airports areas exists with different limits:

- Noise Exposure Plan :
 - A' : $L_{den} \geq 70$ DB(A)
 - B' : 70 DB(A) > $L_{den} \geq 66$ DB(A)
 - C' : 66 DB(A) > $L_{den} \geq 61$ DB(A)
 - D' : 61 DB(A) > $L_{den} \geq 56$ DB(A)

- Long Term Development Plan :
 - A : $L_{den} \geq 70$ dB(A)
 - B : 70 DB(A) > $L_{den} \geq 65$ dB(A) day : < 93 dB(A) night : < 87 dB(A)
 - C : 65 DB(A) > $L_{den} \geq 60$ dB(A) day: < 88 dB(A) night: < 82 dB(A)
 - D : 60 DB(A) > $L_{den} \geq 55$ dB(A) day: < 83 dB(A) night: < 77 dB(A)
 - rest night : < 77 dB(A)day: 7 – 23 h and night : 23 – 7 h (LT)

For roads: guidance values are defined. The analysis of an area begins when noise levels are higher than these values.

- $L_{den} \geq 70$ dB(A)
- $L_n \geq 60$ dB(A)

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

For the industries (including wind turbines), the indicator is LA_{eq} (A-weighted).

In the residential areas, the limit for the wind turbines during the « hot nights », are decreased by 3 dB

For the airports, the indicators are L_{den} and LA_{max} . en dB(A).

L_{den} : day : 7 – 19h, evening : 19 – 23h and night : 23 – 7h.

LA_{max} : day : 7 – 23h and night : 23 – 7h.

For roads, the indicators are L_{den} and L_n in dB(A)

$L_{den} \geq 70$ dB(A)

$L_n \geq 60$ dB(A)

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

Industries : + 5 dB nuisance penalty for impulsive noise and + 2 – 6 dB nuisance penalty for tonal noise.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|-------------------------------------|--|---------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| road | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

Industries : The position of assessment is 1,2 – 1,5 meters above each floor at the most exposed facade of the dwelling.

Airports: the noise measurement is mandatory carried out outside buildings. The microphone must be placed on a mast at a height of at least four meters from the natural terrain and at a minimum distance of two meters from any acoustic reflective structure (walls, roof, shed, garden shed, ...).

6. BASIS OF LIMIT VALUES

How were limit values established?

-

7. MAIN LEGAL DOCUMENTS

Industries : <http://environnement.wallonie.be/legis/pe/pe004.htm>

Wind turbines : <http://environnement.wallonie.be/legis/pe/pesect074.html>

Airports : <http://environnement.wallonie.be/legis/BRUIT/bru001.htm>

Roads : <http://environnement.wallonie.be/legis/bruit/bru019.htm>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

Factsheet

BOSNIA AND HERZEGOVINA

1. END THRESHOLDS vs. NATIONAL LIMITS

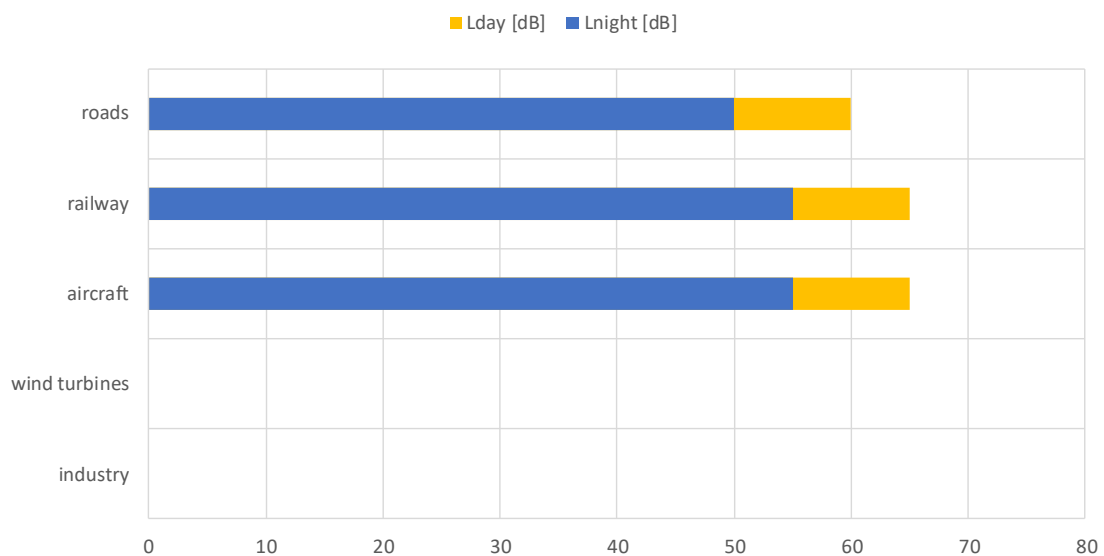
How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

The Ministry of Communications and Transport of Bosnia and Herzegovina has no jurisdiction over noise-related affairs, but this subject is under the competence of entity ministries. For other questions regarding the noise there are no regulations at the state level.

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Table 1 - Permissible noise from external sources in the premises by application

| No. | PURPOSE OF SPACES | Highest permissible noise level | | |
|-----|--|---------------------------------|-------|-------|
| | | 15 min Leg | | L1 |
| | | (dBA) | | (dBA) |
| | | day | night | |
| A | Hospitals, clinics, health centers | | | |
| A1 | patient rooms | 35 | 30 | 45 |
| A2 | consulting room | 40 | 40 | 55 |
| A3 | Surgery ward without medical appliances and equipment | 35 | 35 | 50 |
| B | Hotels, motels, hostels, hotels for singles and the like. | | | |
| | Hotel rooms 5 stars | | | |
| B1 | From noise sources in the building and stationary sources outside the building | 35 | 30 | 45 |
| | From non-stationary noise sources outside the building | 40 | 35 | 50 |
| | Hotel rooms 4 stars | 40 | 35 | 50 |
| B2 | From noise sources in the building and stationary sources outside the building | | | |
| | From non-stationary noise sources outside the building | 45 | 40 | 55 |
| | Dormitories | | | |
| B3 | From noise sources in the building and stationary sources outside the building | 40 | 35 | 55 |
| | From non-stationary noise sources outside the building | 45 | 35 | 55 |
| C | Schools, universities, libraries and the like. | | | |
| C1 | Amphitheatres and classrooms | 40 | 40 | 50 |
| C2 | Cabinets in colleges | 35 | 35 | 50 |
| C3 | Cabinets in schools | 40 | 40 | 50 |
| C4 | Reading rooms, Libraries | 40 | 40 | 45 |
| D | Halls | | | |
| D1 | Cinemas | 35 | 35 | 45 |
| D2 | Theatres | 30 | 30 | 35 |
| D3 | Concert halls | 30 | 30 | 35 |
| E | Facilities for pre-school children and the like. | | | |
| E1 | Rest rooms for children | | | |
| | From noise sources in the building and stationary sources outside the building | 40 | 35 | 50 |
| | From non-stationary noise sources outside the building | 45 | 35 | 50 |
| E2 | Rooms for work with children | 45 | 45 | 50 |
| F | residential buildings | | | |
| F1 | Bedrooms and living rooms | | | |
| | From noise sources in the building and stationary sources outside the building | 40 | 30 | 45 |
| F2 | From non-stationary noise sources outside the building | 45 | 35 | 50 |

3. LIMIT VALUES – METRICS

Table 2 - Permitted level of outside noise for the planning of new facilities or sources of noise

| Area (zone) | PURPOSE OF SPACES | Highest permissible noise level (dBA) | | |
|-------------|---|---------------------------------------|-------|------------|
| | | Equivalent levels Leq | | Peak level |
| | | day | night | L1 |
| I | Hospital and health resort | 45 | 40 | 60 |
| II | Tourist, recreational, recovery | 50 | 40 | 65 |
| III | Purely housing, educational and health institutions, public green and recreational areas | 55 | 45 | 70 |
| IV | Trade, business, residential and housing along transport corridors, storage areas without heavy transport | 60 | 50 | 75 |
| V | Business, administrative, commercial craft, service (municipal service) | 65 | 60 | 80 |
| VI | Industrial, warehouse, service and transport area without housing | 70 | 70 | 85 |

Table 3 - The noise in the working areas from external sources

| No | KIND OF ACTIVITY | Permissible noise level Leq u dBA |
|----|--|-----------------------------------|
| 1. | Predominantly intellectual work that requires concentration, or routine work | 55 |
| 2. | Intellectual work with focus on controlling labor of groups of people The work that requires concentration, or just speaking or telephone communication | 50 |
| 3. | Intellectual work focused on controlling labor groups of people performing predominantly intellectual work. Work that requires concentration, directly speaking and telephone communication. | 45 |
| 4. | intellectual work that requires great concentration, exclusion from the environment, accurate psychomotoric or communicating with a group of people | 40 |
| 5. | Mental work as a production of concepts, work related to great responsibility, communication for reaching agreement within a group of people | 35 |

Table 4 - The correction of levels of measured noise before comparison with the permitted levels in Tables 1, 2 and 3

| Factors of influence | Correction for Leq (dBA) | Correction for LAmax (dBA) |
|----------------------|--------------------------|----------------------------|
| Air traffic noise | - 5 | - 10 |
| Rail traffic noise | - 5 | - 10 |
| Impulse noise | + 5 | +10 |
| Prominent sounds | + 5 | + 5 |

3. LIMIT VALUES – METRICS

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

- dB (decibel) -1/10 Bel (tenth of Bel) - unit for measuring the sound level;
- dB (A) (decibel A-scale) and dB (C) (decibel C-scale) - an international noise or noise level measuring scale that takes into account the different sensitivity of the human ear at various frequencies at different noise levels;
- $P_0 = 20 \text{ Pa}$ - $20 \times 10^{-6} \text{ Pa}$ - sound pressure level at the threshold of audibility;
- $I_0 = 1 \text{ pW} / \text{m}^2 = 10^{-12} \text{ W} / \text{m}^2$ - level of sound;
- L_{eq} dB (A) is the mean energy noise level of the variable level equivalent to the noise of the continuous level measured for at least 15 minutes in periods from 06 to 22 hours (day) or from 22 to 06 hours (at night);
- L_n dB (A) is the sound pressure level above that indicated in n% of the time of the period in which it is measured;
- L_1 indicates the noise level exceeded by 1% of the time and the shortest measurement period is 15 minutes;
- L_{AmaxT} is the highest noise level in enclosed spaces during the measurement, standardized at an echo time of 0.5 seconds.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

If the noise level exceeds the allowed level by more than 5 dBA, the owner of the noise source is urged to take emergency measures before that deadline, and not longer than three years.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|-------------------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

When measuring noise on the facade of high buildings, the microphone is placed at 0.5 m outside the building, approximately in the middle of the open window with the noise of the endangered area. The measurement is carried out in accordance with BAS ISO 17025: 2005.

6. BASIS OF LIMIT VALUES

How were limit values established?

The basis for limit values is taken from END.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

There are no English language copies available of laws and Regulations related to noise. Listed below are some of the links to major legal documents of Bosnia and Herzegovina: regarding noise: <http://www.fbihvlada.gov.ba/bosanski/zakoni/2012/zakoni/35bos.html>
http://propisi.ks.gov.ba/sites/propisi.ks.gov.ba/files/MPZ_Zakon_zastita_buka_26-09.pdf.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

Factsheet

BULGARIA

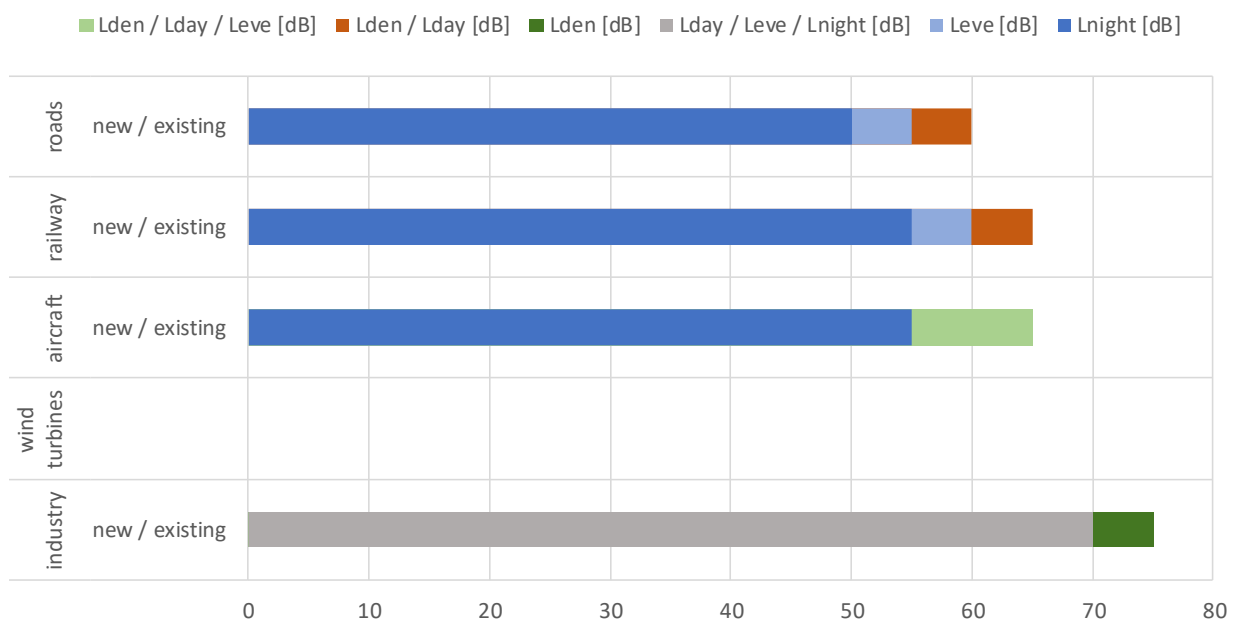
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- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Regulation of noise in Bulgaria is carried out with Ordinance № 6 of 26.06.2006 on noise indicators, limit values of the noise indicators, assessment methods for environmental noise indicators, as well as assessment methods related to the harmful effects on human's health (Promulgated, State Gazette No. 58/18.07.2006), issued by the Ministry of health and the Ministry of environment and water.

In Bulgaria the limit values are determined depending on the purpose of the zones and territories and not on the source of the noise source.

In the table below you can find the limit values of noise levels set for all different types of zones and territories, in the cities and beyond:

| № | Classification of the areas in the cities and beyond | Equivalent noise level in dB (A) outdoor | | | |
|----|--|--|----------|--------|--------|
| | | Lday | Levening | Lnight | Lden * |
| 1 | Residential areas | 55 | 50 | 45 | 55 |
| 2 | Central city areas | 60 | 55 | 50 | 60 |
| 3 | Areas exposed to intensive road traffic | 60 | 55 | 50 | 60 |
| 4 | Areas exposed to railway and tramway noise | 65 | 60 | 55 | 65 |
| 5 | Areas exposed to aircraft noise | 65 | 65 | 55 | 66 |
| 6 | Industrial and storage areas and zones | 70 | 70 | 70 | 76 |
| 7 | Areas for public and individual recreation | 45 | 40 | 35 | 45 |
| 8 | Areas for hospitals and sanatoriums | 45 | 35 | 35 | 44 |
| 9 | Areas for scientific and study research | 45 | 40 | 35 | 45 |
| 10 | Quiet areas outside agglomerations | 40 | 35 | 35 | 42 |

As a supplementary noise indicator is used Lmax for the areas exposed to the airports. It is the maximum level on the ground during the passage of an aircraft. The limit value for Lmax is 85 dB (A).

3. LIMIT VALUES – METRICS

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

Noise indicators, covered by the Ordinance, are the A-weighted equivalent sound levels, as follows: L_{day} – for the day period, $L_{evening}$ – evening period, L_{night} – night period and L_{den} – for day-evening-night period.

Day period includes the time from 7 to 19 h (12 hours), evening period includes the time from 19 to 23 h (4 hours) and night period is the time from 23 to 7 h (8 hours).

The noise indicators are defined over a long period in full accordance with the requirements of the Directive and with definition laid down in ISO 1996-2:1987.

The year is a relevant year as regards the emission of sound and an average year as regards the meteorological circumstances. Meteorological conditions are also determined as a long term average.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

-

3.d) Please supplement any relevant additional information.

The limit values for L_{den} are calculated by the following formula:

$$L_{den} = 10 * \lg \left[\frac{12 * 10^{L_{day}/10} + 4 * 10^{(L_{evening}+5)/10} + 8 * 10^{(L_{night}+10)/10}}{24} \right]$$

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|-------------------------------------|-----------------------------|-------------------------------------|
| road | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| industry | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

In Bulgaria, the position of assessment is selected according to the specific conditions - in front of buildings it is 2 m from the surrounding structures and at a height of 0,2 m above the upper edge of the window of the protected area.

6. BASIS OF LIMIT VALUES

How were limit values established?

The limit values are based on an old ordinance for protection of human health from harmful factors.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

The main Bulgarian legal acts concerning noise are:

1. **Protection From Environmental Noise Act**, Promulgated, State Gazette No. 74/13.09.2005, effective 1.01.2006, last amended and supplemented, SG No. 12/3.02.2017

Link: <https://www.moew.government.bg/en/protection-from-environmental-noise-act/>

2. **Ordinance № 6 of 26.06.2006 on noise indicators, limit values of the noise indicators, assessment methods for environmental noise indicators, as well as assessment methods related to the harmful effects on human's health** (Promulgated, State Gazette No. 58/ 18.07.2006), issued by the Ministry of health and the Ministry of environment and water

Available only in Bulgarian language at: <https://www.moew.government.bg/bg/naredba-6-ot-26-06-2006-g-za-pokazatelite-za-shum-v-okolnata-sreda-otchitasti-stepenta-na-diskomfort/>

There are other ordinances concerning noise that can be found only Bulgarian language at:

<https://www.moew.government.bg/en/noise/legislation/national-noise-legislation/ordinances/>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

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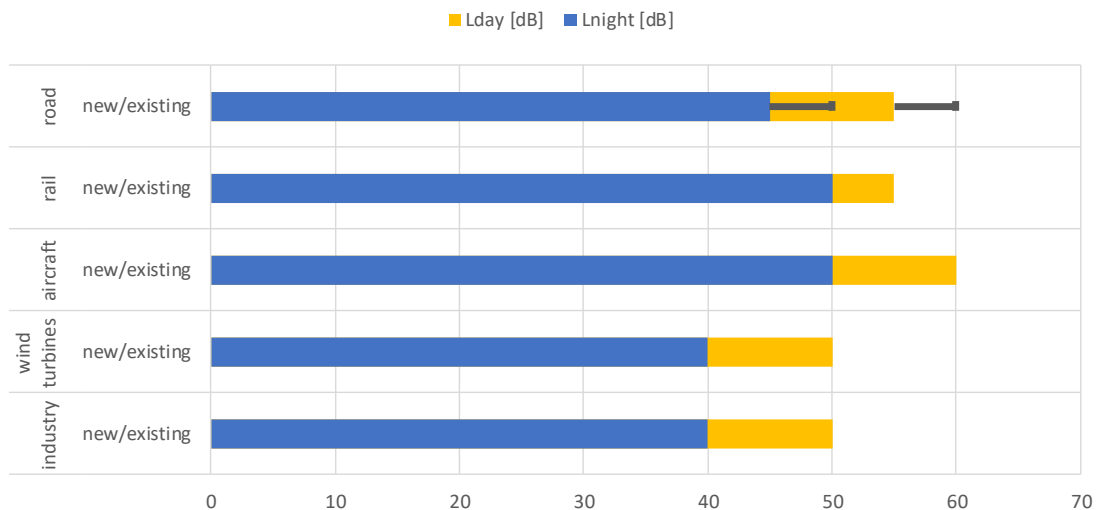
1. END THRESHOLDS vs. NATIONAL LIMITS

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- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars are used to indicate the range of values over different types of roads.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

-

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

$L_{Aeq,T}$ according ISO 1996-1

Transport (road, rail, air) T=16/8 hours day/night

Industry incl. WT T= 8/1 hours day/night

Day 6:00 – 22:00

Night 22:00 – 6:00

Note: Noise indicators L_{den} and L_n according END are used only for the strategic noise mapping and developing of action plans. For those indicators are so called “marginal limits” established. They are only administrative “trigger” limits for action plans. The noise mitigation measures adopted in the action plans must, however, comply the “operative” hygienic noise limits declared above.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

Penalty (adjustment) –5 dB is added to the limit value for noise with tonal component (industrial sources)

Penalty (adjustment) –12 dB is added to the limit value for high impulsive noise

3.d) Please supplement any relevant additional information.

For all “old” roads $L_{Aeq,T} = 70/60$ dB and “old” railways $L_{Aeq,T} = 70/65$ dB are conditionally and temporarily allowed (so called “old load”).

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|-------------------------------------|--|---------------------------------------|-------------------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

Microphone position: 0,5 – 2,0 m in front of the centre of a shut window to the protected room (e.g. living room or bedroom). The same holds for the assessment point in the case of computation.

6. BASIS OF LIMIT VALUES

How were limit values established?

The limits of LAeq,T were originally established in 1977 and are valid without substantive changes because they are still very well in accordance with WHO recommendations.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

1. The Law No. 258/2000 Coll., public health safety (§30 – 34)
2. Governmental Regulation No. 272/2011 Coll., protection of the public health against adverse effects of noise and vibrations
3. Guidelines of the Ministry of Health for measurement and assessment of noise in non occupational environment (Bulletin of MoH, part 11/2017)

Only in Czech.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

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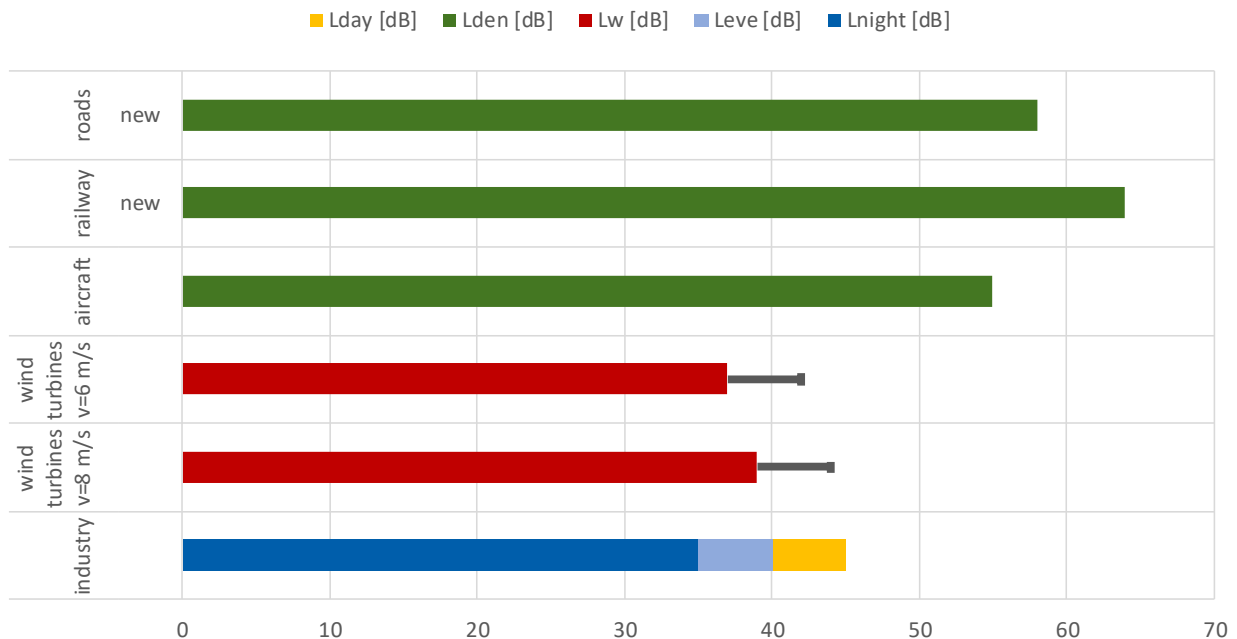
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- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars can be used to indicate the range of values over different types of residential areas (e.g. urban vs. sub-urban).

3. LIMIT VALUES – METRICS

ROADS

| |
|--|
| 3a. LIMIT VALUES – At residential areas |
| 58 dB |
| 3b. LIMIT VALUES – Metrics |
| L _{den} |
| 3c. LIMIT VALUES – Penalties and/or correction factors |
| None |
| 5. POSITION OF ASSESSMENT |
| At the most noise-exposed point in outdoor residential areas 1.5 meters above the terrain and in front of windows 1.5 m above each floor at the most exposed facade of the dwelling. |
| 6. BASIS OF LIMIT VALUES |
| Approx. 9 % of people being highly annoyed based on the Miedema dose-effect relationships |
| 7. MAIN LEGAL DOCUMENTS |
| Recommendations only except for city planning |

The recommended noise limits are mainly used in spatial planning when planning for new dwelling areas near existing roads.

Moreover, they are used for assessment of noise impact in existing dwellings as well. It is recommended to consider the noise impact and secure the lowest possible noise level when planning new roads and road expansions.

The noise limits for road traffic noise are:

- Recreational areas in the open country (areas for holiday cottages, camping sites, green areas, etc.): 53 dB
- Recreational areas near or in cities (parks, allotment gardens, city camping, etc.): 58 dB
- Dwelling areas (dwellings, areas for staying out of doors): 58 dB
- Public purposes (hospitals, institutions, schools, universities, etc.): 58 dB
- Commercial purposes (hotels, offices, etc.): 63 dB

The recommended noise limits for road traffic noise are described in Guidelines from the Danish Environmental Protection Agency, no. 4/2007 "Noise from Roads" (in Danish).

<http://mst.dk/service/publikationer/publikationsarkiv/2007/jul/stoej-fra-veje/>

3. LIMIT VALUES – METRICS

RAIL

| |
|---|
| 3a. LIMIT VALUES – At residential areas |
| 64 dB |
| 3b. LIMIT VALUES – Metrics |
| L_{den} |
| 3c. LIMIT VALUES – Penalties and/or correction factors |
| Requirements for the maximum noise level and vibration level of the individual dwellings. The recommended limit for the maximum level is 85 dB, and the limit for vibrations is 75 dB KB-weighted acceleration level. |
| 5. POSITION OF ASSESSMENT |
| At the most noise-exposed point in outdoor residential areas 1.5 meters above the terrain and in front of windows 1.5 m above each floor at the most exposed facade of the dwelling. |
| 6. BASIS OF LIMIT VALUES |
| Approx. 10 % of people being highly annoyed |
| 7. MAIN LEGAL DOCUMENTS |
| Recommendations only except for city planning |

Like the recommended noise limits for roads, they are mainly used in spatial planning for new dwelling areas near existing railroads.

The noise limits for railway noise are:

- Recreational areas in the open country (areas for holiday cottages, camping sites, green areas, etc.): 59 dB
- Recreational areas near or in cities (parks, allotment gardens, city camping, etc.): 64 dB
- Dwelling areas (dwellings, areas for staying out of doors): 64 dB
- Public purposes (hospitals, institutions, schools, universities, etc.): 64 dB
- Commercial purposes (hotels, offices, etc.): 69 dB

The recommended noise limits for railway noise are published in an addendum from July 2007 to Guidelines from the Danish Environmental Protection Agency, no. 1/1997 "Noise and Vibration from Railways" (in Danish)

https://mst.dk/media/92637/Tillaegtiltogstoejveiledning_end.pdf

Additional guidelines, no. 1/1997 "Noise and Vibration from Railways" (in Danish).

<http://www2.mst.dk/Udgiv/publikationer/1997/87-7810-830-6/pdf/87-7810-830-6.pdf>

3. LIMIT VALUES – METRICS

AIRCRAFT

| |
|--|
| 3a. LIMIT VALUES – At residential areas |
| 55 dB for airports and airbases |
| 3b. LIMIT VALUES – Metrics |
| L _{DEN} |
| 3c. LIMIT VALUES – Penalties and/or correction factors |
| 5 dB penalty applies to special aircraft activities (such as parachute flying, visual training flights, scenic pleasure flights, ultra-light flying, etc.) in weekends and in the evening and night on weekdays. |
| 5. POSITION OF ASSESSMENT |
| At the most noise-exposed point in outdoor residential areas 1.5 meters above the terrain. |
| 6. BASIS OF LIMIT VALUES |
| Approx. 10 % of people being highly annoyed |
| 7. MAIN LEGAL DOCUMENTS |
| Airports are regulated by specific environmental permits for each airport |

In spatial planning, the authorities designate a noise zone around noise sources, where the noise level exceeds the recommended noise limit. The noise limits are used both for environmental permits and for spatial planning.

| Air limit values | Airfield | Airport, airbase |
|---|----------|------------------|
| Dwelling areas and noise sensitive buildings for public use (schools, hospitals, nursery homes, etc.) | 45 dB | 55 dB |
| Scattered dwellings in the open country | 50 dB | 60 dB |
| Commercial purposes (hotels, offices, etc.) | 60 dB | 60 dB |
| Recreational purposes with overnight residence (holiday cottages, allotment gardens, camping sites, etc.) | 45 dB | 50 dB |
| Other recreational purposes, not for staying overnight | 50 dB | 55 dB |

The recommended noise limits for airports and airfields can be found in Guidelines from the Danish Environmental Protection Agency, no. 5/1994 "Noise from Airfields" (in Danish). <https://www2.mst.dk/Udgiv/publikationer/1994/87-7810-117-4/pdf/87-7810-117-4.pdf>

3. LIMIT VALUES – METRICS

WIND TURBINES

| |
|---|
| 3a. LIMIT VALUES – At residential areas |
| 39 dB (wind speeds of 8 m/s) and 37 dB (wind speeds of 6 m/s) |
| 3b. LIMIT VALUES – Metrics |
| For the measurement: The sound power level LWA in 1/1 octave band |
| 3c. LIMIT VALUES – Penalties and/or correction factors |
| Penalty of 5 dB for clearly audible tones |
| 5. POSITION OF ASSESSMENT |
| At the most noise-exposed point in outdoor residential areas 1.5 meters above the terrain. |
| 6. BASIS OF LIMIT VALUES |
| Approx. 10 % of people being highly annoyed |
| 7. MAIN LEGAL DOCUMENTS |
| Statutory order number 1736 from 21/12/2015: https://www.retsinformation.dk/forms/R0710.aspx?id=176330 |

Noise limits for wind turbines:

Wind turbines must respect the binding noise limits in accordance with the Statutory Order. The limits are:

- For dwellings in residential areas: 39 dB (wind speeds of 8 m/s) and 37 dB (wind speeds of 6 m/s) at the most noise-exposed point in outdoor residential areas 1.5 meters above the terrain.
- For dwellings in open country: 44 dB (wind speeds of 8 m/s) and 42 dB (wind speeds of 6 m/s) at the most noise-exposed point in outdoor residential areas 1.5 meters above the terrain, no more than 15 meters from the neighboring dwelling in open countryside.
- For both categories of areas, the limit for low frequency noise is 20 dB. The limit for low frequency noise applies to the calculated indoor noise level at both 6 and 8 m/s wind speed.

Determination of noise exposure:

The noise from wind in trees and bushes makes it impossible to take sufficiently precise measurements of wind turbine noise at neighboring properties under the necessary wind conditions. In addition to the wind noise, traffic noise and sound from birds and from noise sources inside or near the dwelling may disturb measurement of the low noise levels in question. Regulations governing noise experienced by neighboring properties therefore calculate noise annoyance based on the wind turbines' noise emission. Noise emission is measured relatively close to the wind turbine using a microphone mounted on a large plate on the ground. Here there is much less influence from the background noise. At the same time, the wind speed is measured or preferably derived from the produced power, as this corresponds better to the wind speed acting on the blades. The wind turbine noise emission is determined on this basis.

Noise emissions are measured under both very windy conditions (8 m/s at 10 m height) and less windy conditions (6 m/s) to reflect the two sets of noise limits.

In general, overall data shows that the noise from the wind turbines rises with wind speed up to approx. 7 m/s. The noise at higher wind speeds is approx. constant – find more information in this report:

<https://www2.mst.dk/Udgiv/publikationer/2016/04/978-87-93435-66-7.pdf>

3. LIMIT VALUES – METRICS

The calculation of the amount of noise emitted to neighboring properties is very simple, because the noise is emitted from a significant height. The calculation presupposes downwind sound propagation. The calculated noise level is almost always higher than actual noise experienced by neighboring properties.

A penalty of 5 dB is added for clearly audible tones.

The method is fully described in the statutory order:

Statutory Order number 879 from 26/06/2010 on wind turbines is available in English:

<https://eng.mst.dk/media/mst/69035/Statutory%20Order%20on%20noise%20from%20wind%20turbines.pdf>

The current statutory order number 1736 from 21/12/2015 is available in Danish only:

<https://www.retsinformation.dk/forms/R0710.aspx?id=176330>

Find more information on the Danish EPA website <https://eng.mst.dk/air-noise-waste/noise/wind-turbines/noise-from-wind-turbines/>

INDUSTRY

| |
|--|
| 3a. LIMIT VALUES – At residential areas |
| 45 dB/40 dB/ 35 dB (50 dB) |
| 3b. LIMIT VALUES – Metrics |
| $L_{(A)eq,8h}$ 07-18/ $L_{(A)eq,1h}$ 18-22/ $L_{(A)eq,0,5h}$ and $(L_{p(A)max})$ 22-07 for Monday - Friday |
| 3c. LIMIT VALUES – Penalties and/or correction factors |
| Penalty of 5 dB for clearly audible tones or clearly audible impulses at the receiver |
| 20 dB limit for low frequency noise inside dwellings |
| 5. POSITION OF ASSESSMENT |
| At the most noise-exposed point in outdoor residential areas 1.5 meters above the terrain and in front of windows 1.5 m above each floor at the most exposed facade of the dwelling. |
| 6. BASIS OF LIMIT VALUES |
| 10-15 % of people being highly annoyed |
| 7. MAIN LEGAL DOCUMENTS |
| Recommendations only except for some types industries, which are regulated by specific environmental permits for each individual industrial plant |

In spatial planning, the authorities designate a noise zone around industries and other noise sources, where the noise level exceeds the recommended noise limit.

The recommended noise limits are mainly used in processing environmental permits or bans related to noise. However, the limits are also used for spatial planning. The recommended limits differ in the day, evening and night periods.

3. LIMIT VALUES – METRICS

INDUSTRY (CONTINUATION)

| Type of area, usage | Monday - Friday 07-18 Saturday 07-14 | Monday - Friday 18-22 Saturday 14-22 Sundays and Holidays 07-22 | All days 22-07 (dB L _{p(A)max}) |
|--|---|---|--|
| 1. Industry | 70 dB | 70 dB | 70 dB |
| 2. Industry and business area with restrictions | 60 dB | 60 dB | 60 dB |
| 3. Mixed residential dwellings and business, city center, etc. | 55 dB | 45 dB | 40 dB (55 dB) |
| 4. Multi-storey residential dwellings | 50 dB | 45 dB | 40 dB (55dB) |
| 5. Open low rise residential dwellings | 45 dB | 40 dB | 35 dB (50 dB) |
| 6. Holiday cottages, public recreational areas | 40 dB | 35 dB | 35 dB |

The recommended noise limits for industries, enterprises etc. are published in Guidelines from the Danish Environmental Protection Agency, no. 5/1984 "Environmental Noise from Industry" (in Danish).
<https://www.retsinformation.dk/Forms/R0710.aspx?id=85774>

Low frequency noise does also apply the regulation of industrial noise

| Room usage | | Low frequency noise level A-weighted level: 10-160 Hz | Infrasound level G-weighted level |
|---|---------------------|--|--------------------------------------|
| Living rooms in dwellings, kindergartens, etc. | Evening/night 18-07 | 20 dB | 85 dB |
| | Day 07-18 | 25 dB | 85 dB |
| Offices, rooms for teaching and similar noise sensitive use | | 30 dB | 85 dB |
| Other rooms in industrial facilities | | 35 dB | 90 dB |

The Danish Environmental Protection Agency has published recommendations about low frequency noise and infrasound in Information from the Danish Environmental Protection Agency, no. 9/1997 "Low Frequency Noise, Infrasound, and Vibrations in the Environment" (in Danish).
<http://www2.mst.dk/Udgiv/publikationer/1997/87-7810-830-6/pdf/87-7810-830-6.pdf>

Additional instructions for low frequency measurements (in Danish).
https://mst.dk/media/92649/maalemetode_lfstoej.pdf

3. LIMIT VALUES – METRICS

3.d) Please supplement any relevant additional information.

General comment regarding new/existing noise sources

For supervisory purposes the result of the noise exposure assessment does account for the uncertainty of the calculations or measurements. That is, the limit value must be significantly exceeded before taking action issuing an injunction or prohibition.

Example: The limit value is 35 dB and the uncertainty is 4 dB. In this case, the noise exposure must exceed 39 dB to significantly exceed the limit value.

For environmental permits for industry and for planning purposes for new dwellings the result of the noise exposure assessment does not account for the uncertainty of the calculations, and the noise limits cannot be exceeded.

For road and railtraffic the recommended noise limits are mainly used in spatial planning when planning for new dwelling areas near existing roads or rails. That is, the noise limits do not regulate the traffic but the urban development.

City planning is regulated by the Danish Planning Act § 15a: A city plan may only designate areas exposed to noise for noise-sensitive use, if the plan contains provisions on the establishment of measures for noise reduction, and can ensure future use against noise annoyance.

The Danish Planning Act <https://www.retsinformation.dk/Forms/R0710.aspx?id=200614>

General comment for L_{den} and L_{DEN} (airports)

Day period: 07-19

Evening priod: 19-22 penalty +5 dB

Night period: 22-07 penalty +10 dB

For airports, L_{DEN} applies for the three noisiest months (not necessarily coherent months).

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|---|--|---------------------------------------|---|-----------------------------|--------------------------|
| road | <input checked="" type="checkbox"/> City planning | <input checked="" type="checkbox"/> Barrier, screen | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input checked="" type="checkbox"/> City planning | <input checked="" type="checkbox"/> Barrier, screen | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input checked="" type="checkbox"/> Permit and planning | <input checked="" type="checkbox"/> Barrier, screen | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Time restrictions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> Permits and planning | <input checked="" type="checkbox"/> Time restrictions | <input type="checkbox"/> | <input checked="" type="checkbox"/> Worst case | <input type="checkbox"/> | <input type="checkbox"/> |

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

English website and manual

Find more information on the English website of the Danish Environmental Protection Agency <https://eng.mst.dk/air-noise-waste/noise/>

The attached English manual on environmental noise regulations in Denmark is made by DELTA: <https://referencelaboratoriet.dk/wp-content/uploads/2012/01/rl-1001-Orientering-nr.-45-Environmental-noise-regulations-in-Denmark.pdf>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

An extensive body of noise legislation exists governing statutory nuisance in England; industrial noise, transport noise etc. There are no legislated national limits, however, there are many guidance documents including national standards, and additional local procedures are in place.

In the remainder of this document, all limit values refer to national legislation.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Not applicable. There are no legislated national limits, however, there are many guidance documents including national standards, and additional local procedures are in place.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

-

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

-

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

Not applicable

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|--------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

Not applicable

6. BASIS OF LIMIT VALUES

How were limit values established?

Not applicable

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

The Noise Policy Statement for England - <https://www.gov.uk/government/publications/noise-policy-statement-for-england> (not legislation)

Environmental Noise (England) Regulations 2006 (as amended) - <http://www.legislation.gov.uk/ukxi/2006/2238/contents/made>

Statutory Nuisance legislation (including noise from premises, vehicles, equipment or machinery in the street - [Environmental Protection Act 1990](#))

Building Regulations 2010 refers to many British Standards for internal noise levels - <https://www.gov.uk/government/publications/resistance-to-sound-approved-document-e>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

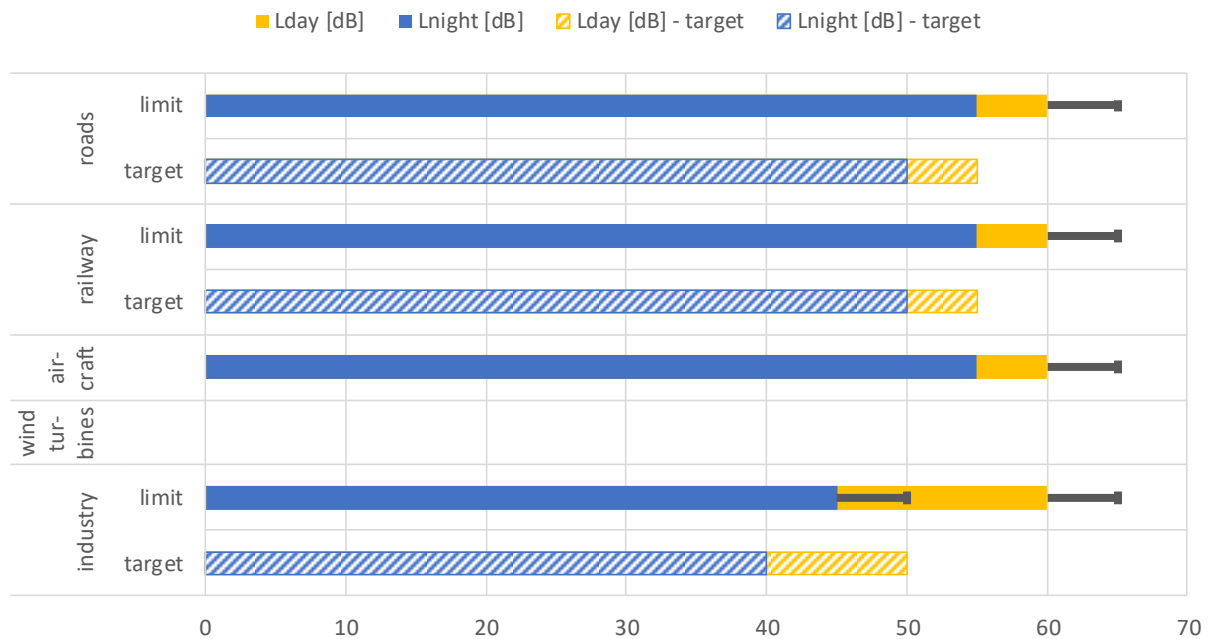
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different types of residential areas (e.g. urban vs. sub-urban).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

-

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

The L_{day} and L_{night} are used. L_{day} 07:00-23:00; L_{night} 23:00-07:00.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

The limit value for noise emitted by technical equipment and commercial and commercial activities is implemented target value for industrial noise.

- The relevant noise category shall be applied as the limit value for building noise between 21:00 and 07:00

standard of industrial noise.

- Industrial noise from the relevant noise category shall be applied as the impulse noise limit value normal rate. Impulse noise, such as blasting, ramming, etc., can be done on weekdays from 07:00 to 19:00.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|--|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Up to €32 000 | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Up to €32 000 | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Up to €32 000 | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Up to €32 000 | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Up to €32 000 | <input type="checkbox"/> | <input type="checkbox"/> |

If noise level exceeds the limit value, noise source must draw up the noise reduction action plan.

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

Near the facade.

6. BASIS OF LIMIT VALUES

How were limit values established?

Limit values in Estonia are with quite long history and during the implementation period we try to make the system more simple and actually enforceable considering WHO and other international guidelines.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

Atmospheric Air Protection Act <https://www.riigiteataja.ee/en/eli/511012019007/consolide>

Regulation of the minister of the environment no 71 from 16.12.2016 "The normative levels of environmental noise and the methods of noise measurement" (in Estonian)
<https://www.riigiteataja.ee/akt/121122016027>.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

Factsheet

FINLAND

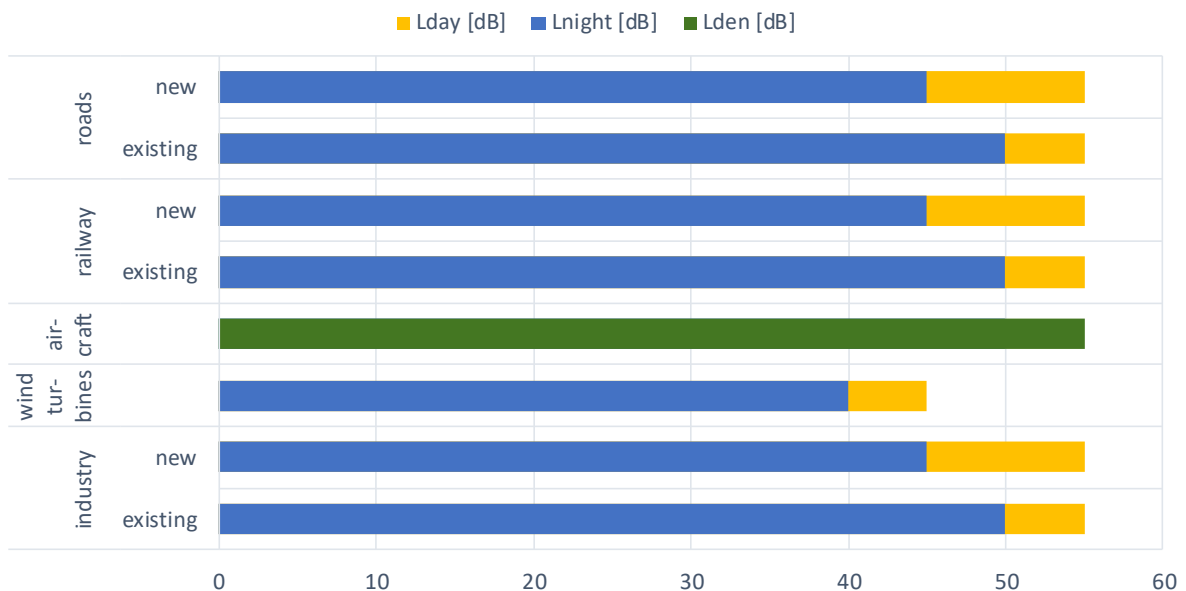
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- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

All values showed in tables (2) are used in land use planning and building. Same values are also used in environmental permission procedure (mostly).

L_{Aeq}, night 22-7 dB, new areas*. New area in land use planning is area size at least one block, which spreads resettlement area to vacant area.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

Roads, railway and industry

Metric is A-weighted equivalent noise levels L_{day} 7-22 and L_{night} 22-7.

Aircraft

Metric is A-weighted L_{den} where day is 7-19, evening 19-22 (+5 dB) and night 22-7 (+10 dB)

Shooting range

Metric is A-weighted maximum impulse level L_{AImax} (mean of at least 5 gunshots)

In some cases, it is possible to use A-weighted and impulse-corrected (+10 dB) daytime 7-22 equivalent noise level for a land use planning. Used guideline is 55 dB L_{Aeq} 7-22.

Heavy weapons and explosives

Metric is A-weighted and impulse-corrected (+15 dB) and weekend corrected (+5 dB) yearly averaged sound level L_{Rden} , where day is 7-19, evening 19-22 (+5 dB) and night 22-7 (+10 dB).

For heavy weapons and explosives, there is also functional limit value. The C-weighted sound exposure level L_{CE} resulting from the shooting activities and explosions at heavy weapons shooting and training range should not exceed the outdoor noise functional limit value 105 dB L_{CE} in the areas exposed to noise (100 dB L_{CE} in national parks).

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

If noise from industry or other source (excluding shooting, heavy weapons and explosives) is tonal or impulsive +5 dB penalty should be added in measured noise level.

3.d) Please supplement any relevant additional information.

Noise Levels (993/1992). These are the limit/guide values presented under section 2 of this factsheet.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|-----------------|-------------------------------------|--|---------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| road* | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| rail* | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| wind turbines** | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry*** | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

* if renovating roads or railways, present noise level should not be exceeded. For new roads and railways, noise limits should be reached if it is economically feasible/possible. If noise levels are high, property could be expropriated or reimbursement could be paid.

**If guideline is exceeded windturbine/-farm should get environmental permission or operator should made noise control actions to achieve level values.

*** if noise levels exceeding levels given in environmental permission

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

The position of assessment is 1,5 - 2 meters above the ground level or 1,5 - 2 meters above the balcony/terrace floor level in each floor at the most exposed facade of the dwelling

6. BASIS OF LIMIT VALUES

How were limit values established?

Limit values are based on dose-effect relationships (WHO). They roughly correspond to 10-15 % of people being highly annoyed.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

all links below are in Finnish

<https://www.finlex.fi/fi/laki/alkup/2014/20140527>

<https://www.finlex.fi/fi/laki/alkup/1992/19920993>

<https://www.finlex.fi/fi/laki/alkup/2015/20151107>

<https://www.finlex.fi/fi/laki/alkup/2017/20170903>

<https://www.finlex.fi/fi/laki/alkup/2017/20170796>

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=9&ved=2ahUKEwix7H8ydvgAhWKwqYKHTAYA7MQFjAlegQIABAC&url=https%3A%2F%2Fwww.ecde.info%2Fsites%2Fdefault%2Ffiles%2Fdocs%2Farticle_saarinen_0.pdf&usg=AOvVaw34go5G0RjKtCiRBTjus2vH

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

Factsheet

FRANCE

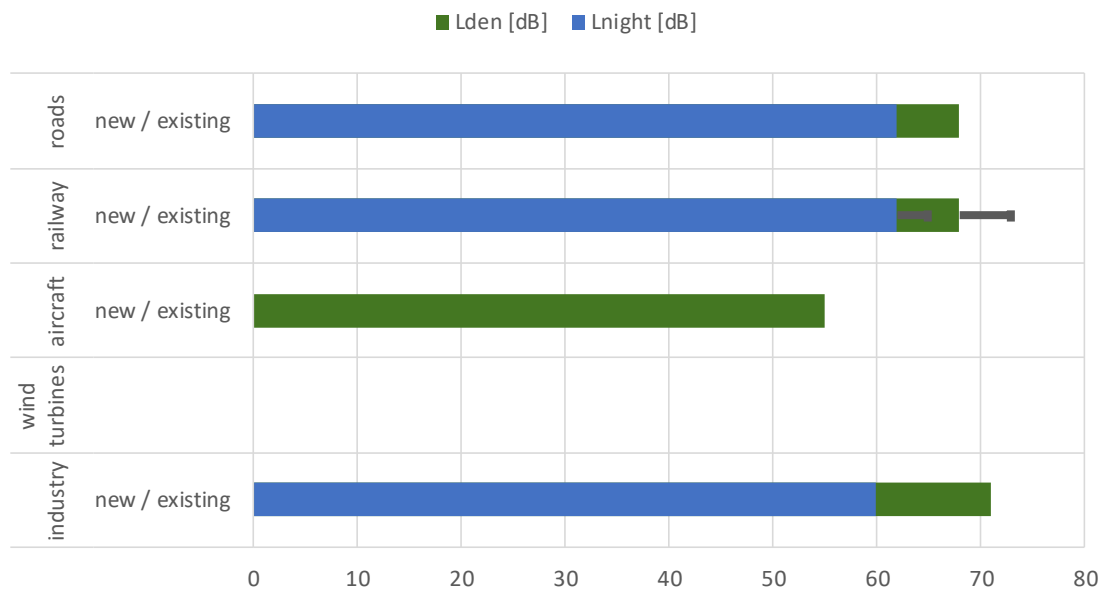
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- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate different types of railway lines (see answer under question 3.a)

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

| | Aircrafts | Road and high speed railway lines | Conventional railway | Industrial activity |
|------------------|-----------|-----------------------------------|----------------------|---------------------|
| L _{den} | 55 | 68 | 73 | 71 |
| L _n | | 62 | 65 | 60 |

The limit values hold in existing as well as in new situations. However, measures to reduce the noise are not compulsory in the regulation. When a dwelling is built near a road, a railway or an airport, it has to take the situation into account so that the noise level inside the dwelling is correct.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

-

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

No.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|-------------------------------------|--------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

2 meters before the façade of the dwelling, 4 m above the floor.

6. BASIS OF LIMIT VALUES

How were limit values established?

-

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

For roads: Arrêté du 4 avril 2006 relatif à l'établissement des cartes de bruit et des plans de prévention du bruit dans l'environnement

For railways: Arrêté du 8 novembre 1999 relatif au bruit des infrastructures ferroviaires

For windmills: Arrêté du 26 août 2011 relatif aux installations de production d'électricité utilisant l'énergie mécanique du vent au sein d'une installation soumise à autorisation au titre de la rubrique 2980 de la législation des installations classées pour la protection de l'environnement

For industry: Arrêté du 20 août 1985 relatif aux bruits aériens émis dans l'environnement par les installations classées pour la protection de l'environnement

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

Factsheet

GERMANY

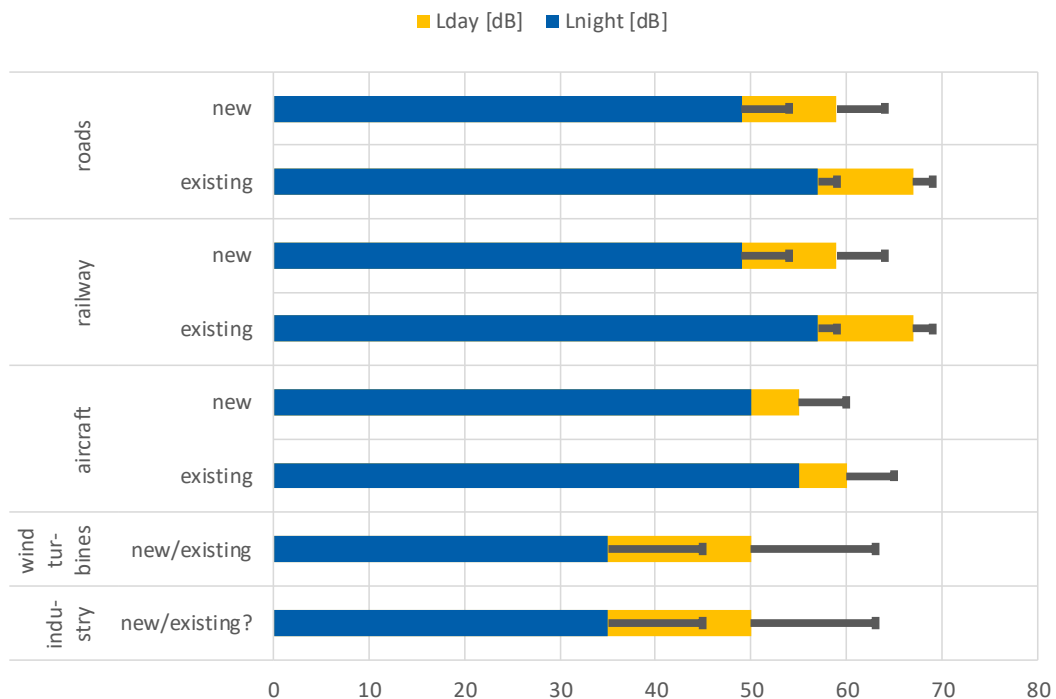
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different types of residential areas / sources.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

roads (newly built or significantly changed): $L_{day} = 59$ dB [up to 64 dB], $L_{night} = 49$ dB [up to 54 dB]

roads (existing): $L_{day} = 67$ dB [up to 69 dB], $L_{night} = 57$ dB [up to 59 dB]

railways (newly built or significantly changed): $L_{day} = 59$ dB [up to 64 dB], $L_{night} = 49$ dB [up to 54 dB]

railways (existing): $L_{day} = 67$ dB [up to 69 dB], $L_{night} = 57$ dB [up to 59 dB]

commercial airports (newly built or significantly changed): $L_{day} = 55$ dB [up to 60 dB], $L_{night} = 50$ dB and NAT criterion 6 x 68 dB

commercial airports (existing): $L_{day} = 60$ dB [up to 65 dB], $L_{night} = 55$ dB and NAT criterion 6 x 72 dB

military airports (newly built or significantly changed): $L_{day} = 58$ dB [up to 63 dB], $L_{night} = 50$ dB and NAT criterion 6 x 68 dB

military airports (existing): $L_{day} = 63$ dB [up to 68 dB], $L_{night} = 55$ dB and NAT criterion 6 x 72 dB

wind turbines (new and existing): $L_{day} = 50$ [up to 63 dB], $L_{night} = 35$ [up to 45 dB]

industry (new and existing): $L_{day} = 50$ [up to 63 dB], $L_{night} = 35$ [up to 45 dB]

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

L_{day} for traffic noise [roads, railways, airports] is the A-weighted equivalent sound level over time sequence 06:00 – 22:00.

L_{night} for traffic noise [roads, railways, airports] is the A-weighted equivalent sound level over time sequence 22:00 – 06:00.

L_{day} for noise from wind turbines and industry is the A-weighted rating level with adjustments (+6 dB for morning hours [06:00-07:00] and evening hours [20:00-22:00]).

L_{night} for noise from wind turbines and industry is the A-weighted equivalent sound level for the loudest hour over time sequence 22:00 – 06:00.

3. LIMIT VALUES – METRICS

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

+ 3 up to 6 dB nuisance penalty for tonal noise from wind turbines or industry

+ 3 up to 6 dB nuisance penalty for impulsive noise from wind turbines or industry

3.d) Please supplement any relevant additional information.

The limit values for industrial noise and wind turbines shown under section 2. refer to the cumulative noise of all the business activities together. Noise from wind turbines is treated the same way as noise from other technical installations, i.e. the same way as industrial noise.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--|--|--|---|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> to comply with the limit values | <input checked="" type="checkbox"/> in the case of exceeding the limit values | <input checked="" type="checkbox"/> in some cases, financial compensations are possible | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> to comply with the limit values | <input checked="" type="checkbox"/> in the case of exceeding the limit values | <input checked="" type="checkbox"/> in some cases, financial compensations are possible | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> in noise protection zones | <input checked="" type="checkbox"/> in noise protection zones | <input checked="" type="checkbox"/> numerous residents are reimbursed by the airport operator for soundproofing measures | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> to comply with the limit values and with the state of the art in noise abatement techniques | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> to comply with the limit values and with the state of the art in noise abatement techniques | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

The position of assessment is 0,5 meters before the open window of rooms requiring protection (e.g. living room, bedroom, children's room, eat-in kitchen, office).

6. BASIS OF LIMIT VALUES

How were limit values established?

The limit values were set based on noise impact, financial resources and technical feasibility.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

- Federal Immission Control Act (Bundes-Immissionsschutzgesetz, BImSchG)
- Traffic Noise Protection Ordinance (16. Verordnung zur Durchführung des BImSchG (Verkehrslärmschutzverordnung), 16. BImSchV)
- Act on Protection against Aircraft Noise (Gesetz zum Schutz gegen Fluglärm, FluLärmG)
- Technical Instruction on Noise Abatement (Technische Anleitung zum Schutz gegen Lärm - TA Lärm)

These documents are only available in German.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

For national legislation on environmental noise, the main relevant pieces of legislation in Ireland are the Environmental Protection Agency Act (Noise) Regulations 1994, and Sections 106, 107 and 108 of the Environmental Protection Agency Act 1992 (as amended). However, there are currently no statutory noise limits specified in Ireland.

3. LIMIT VALUES – METRICS

3.a) Please supplement any information on limit values with regards to noise immission at residential areas.

For roads, and aircraft emissions, the relevant bodies such as Transport Infrastructure Ireland (roads, light rail-Dublin), and Dublin airport authority (Dublin airport) have developed **guidance** which sets out the noise levels that should not be exceeded at nearby residential developments.

For **national roads**, Transport Infrastructure Ireland have developed a Design Goal of 60 dB (L_{den}) which is applicable to new proposed national road schemes only. In Environmental Impact Assessment Report terms, this means that it is applied to existing sensitive receptors in respect of both the year of opening and the design year (i.e. 15 years after projected year of opening).

For **light rail** in Dublin (the Luas network), airborne noise levels for new schemes are assessed on a case-by-case basis. The assessment is based primarily on pre-existing levels at sensitive receptors and predicted operational noise levels that will be experienced in respect of both the year of opening and the design year (i.e. 15 years after projected year of opening).

Heavy Rail; Iarnród Éireann assesses noise levels for new infrastructure on a case-by-case basis, and also investigate noise complaints received relating to operations, freight activities and track/station maintenance.

See also section 8 Further comments below.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

Roads; For national roads, the L_{den} metric is used as a Design Goal for new proposed national road schemes.

Light Rail

For light rail in Dublin, different metrics have been used for the different sections of the network. For the original operations (2004, 2009) $L_{Aeq, 18Hr}$ and L_{Amax} were used. For the 1st Red Line extension (commenced 2009) $L_{Aeq,16Hr}$ and $L_{Aeq,8Hr}$ were used. For the 2nd Red Line extension (commenced 2011) $L_{Aeq,18Hr}$, $L_{Aeq,6Hr}$ and L_{den} were used. For the Green Line extension (commenced 2017) $L_{Aeq,16Hr}$, $L_{Aeq,8Hr}$ & L_{den} were used.

Airports; For airports there are no limit values in Ireland. Around Dublin Airport there are noise zones in which new residential development is controlled through the local planning process. In the outer noise zone (57 dB $L_{Aeq16\text{ hour}}$) the provision of new residential and/or noise sensitive development is strictly controlled, and the developer is required to include appropriate insulation in any new development. Within the inner noise zone (63 dB $L_{Aeq16\text{ hour}}$) provision of new residential and/or other noise sensitive development is actively resisted.

For the EPA Guidance Note for Noise Action Planning, the proposed onset levels for assessment of noise mitigation measures for aircraft noise are:

- 63 dB, $L_{Aeq,16hr}^*$ and 57 dB, L_{night} .

Industry; Use $L_{AR,T}$; $L_{Aeq,T}$ &

Wind; Use dB(A) for day and night. See section 8 Further comments below.

3. LIMIT VALUES – METRICS

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

For road noise; No. For Light Rail noise; No. For rail noise - No. For aircraft noise - No.

Industrial noise emissions;

A penalty of 5dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured $L_{Aeq,T}$ values to determine the appropriate rating level ($L_{Ar,T}$). During the night-time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.

3.d) Please supplement any relevant additional information.

Typical Limit Values for Noise from Industrial Emissions Directive (IED) Licensed Industrial Sites

- Daytime (07:00 to 19:00hrs) – 55dB $L_{Ar,T}$
- Evening (19:00 to 23:00hrs) – 50dB $L_{Ar,T}$
- Night-time (23:00 to 07:00hrs) – 45dB $L_{Aeq,T}$
(Where T is typically 15 – 30 mins).

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|-------------------------------------|--|-------------------------------------|-------------------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Iarnród Éireann noise assessments for new **Heavy rail** infrastructure on a case by case basis.

For **light rail**: Active mitigation measures e.g. lubricant systems on board trams/rails. Preventative maintenance through rail grinding.

For **national roads**: Active mitigation measures e.g. noise barriers and low noise pavement implemented during scheme construction.

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

In Ireland, the position of assessment is 1.5 - 2 meters above each floor at the most exposed facade of the dwelling.

For proposed national roads: Assessment is at any façade that exceeds the Design Goal. Assessment is at 4m for two storey dwelling. For a single storey dwelling, assessment is at first floor level.

For light rail: Assessment is at most exposed façade. Assessment is at 4m for two-storey dwelling. For a single storey dwelling, assessment is at first floor level.

6. BASIS OF LIMIT VALUES

How were limit values established?

In Ireland, there are currently no statutory noise limits specified.

For proposed national roads, the Design Goal was developed following research and validation studies for Irish specific road conditions.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

- **Road:** Roads Act 1993, as amended.
- **Rail:** Transport (Railway Infrastructure) Act 2001. Planning and Development (Strategic Infrastructure) Act 2006.
- **Aircrafts:** European Communities (Air Navigation and Transport Rules and Procedures for Noise Related Operating Restrictions at Airports) Regulations 2003 (for now).
- Aircraft Noise (Dublin Airport) Regulation Bill 2018 which will implement the requirements of Regulation 598/2014 on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at Union airports.
- **Wind turbines:** Wind Farm Planning Development Guidelines 2006 (currently being revised).
<https://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/DevelopmentandHousing/Planning/FileDownload%2C1633%2Cen.pdf>
- Industry: section 107 of the EPA Act 1992 (as amended).
<http://www.irishstatutebook.ie/eli/1992/act/7/section/107/enacted/en/html>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

Ref; Guidance Note For Noise Action Planning (July 2009).

<https://www.epa.ie/pubs/advice/noisemapping/EPA%20Guidance%20Note%20for%20Noise%20Action%20Planning.pdf>

Roads; The NRA (now TII) *Guidelines for the Treatment of Noise & Vibration in National Road Schemes (2004 Rev 1)* set out that for the design of new national roads, mitigation measures should be considered above a level of 60 dB L_{den} free-field.

The EPA Guidance Note for the Noise Action Planning has set proposed onset levels for assessment of noise mitigation measures are:

- 70 dB, L_{den} ; and 57 dB, L_{night} .

The proposed onset levels, for assessment of noise level preservation where they are good, are:

- 55 dB, L_{den} ; and 45 dB, L_{night} .

These levels reflect an annual average 24 hour period.

Railways; Under the Environmental noise regulations the definition of railways is to include traditional heavy rail systems, plus more recent light rail systems, such as Luas.

Iarnród Eireann operate on existing network under historic railway orders. New infrastructure and associated noise impacts are assessed on a case by case basis. For light rail in Dublin, schemes and associated noise impacts are assessed on a case by case basis.

The EPA Guidance Note for the Noise Action Planning has set proposed onset levels, for assessment of noise mitigation measures, are:

- 68 dB, L_{den} ; and 59 dB, L_{night} .

The proposed onset levels, for assessment of noise level preservation where they are good, are:

- 55 dB, L_{den} ; and 45 dB, L_{night} .

These levels reflect an annual average 24 hour period

Ref; Noise Insulation (Railways and Other Guided Transport Systems) Regulations (1993).

Airports; According to EPA Action planning Guidelines, the proposed onset levels for assessment of noise mitigation measures are:

- 63 dB, $L_{Aeq,16hr}^*$ and 57 dB, L_{night} .
- Dublin airports offers insulation to properties within the current 63dB contour and those predicted to be within the 63dB contour in the year of opening of the new North Runway.

8. FURTHER COMMENTS

EU Regulation 598/2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports. This binding EU regulation sets out rules for a standard approach to dealing with situations at airports where noise problems have been identified. Legislation is currently being drafted by the Department of Transport, Tourism and Sport (DTTAS) to implement these regulations.

WHO guidelines; The implementation of the 2018 WHO Noise Guidelines by Ireland through transposing a new Annex III (which is currently being negotiated at EU level) will radically change Noise policy in Ireland. However, the Commission has indicated that there is currently no time limit to this process and it may take a few years to complete. The development of a National Noise policy in Ireland will be significantly influenced by the outcome of this transposition process.

Wind Energy Planning Guidelines; The current guidelines suggest a “*lower fixed limit of 45 dB(A) or a maximum increase of 5 dB(A) above background noise at nearby noise sensitive locations*”. The latter requirement may be relaxed in areas with low background levels. A fixed limit of 43 dB(A) at night-time is deemed appropriate as there is no requirement to protect external amenity.

The Department Environment (DCCA), & Dept. of Planning (DHPLG) are currently in the process of revising the 2006 Wind Farm Planning Development Guidelines (WFDGs).

1. END THRESHOLDS vs. NATIONAL LIMITS

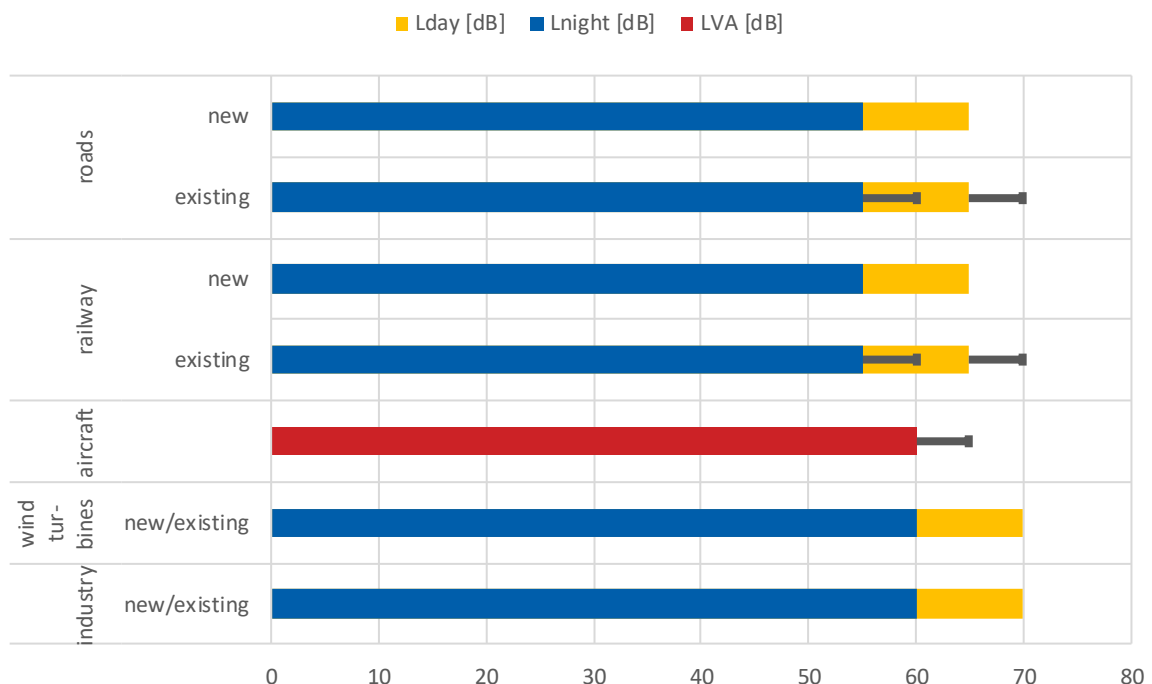
How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.*
- Other, namely:

* Harmonization of European and national legislations is currently in progress.

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different types of sources and/or different types residential areas.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

ACOUSTIC ZONING

The implementation Decree of the Framework Law, D.P.C.M. November 14th 1997 “*Determination of the limit values for noise sources*”, defines the different noise limit values (emission limit value, input limit value (absolute and differential), attention limit value and quality limit value), referred to the acoustic zoning of the territory that each municipality must define. The Legislative Decree 42/2017 introduced the *specific input limit value* as the maximum value due to the contribution of the specific noise source measured at the facade of the receiver.

Framework law on noise n.447/95 establishes the classification of the territory in six zones, based on the characteristics regarding the presence and typology of transports infrastructures, the population density, the residential areas, the presence of industrial sites. The first zone is characterized by the presence of typologies where the “quiet condition” is necessary to carry out the activities (Hospital, Schools, urban parks, etc). The six homogeneous areas are characterized by different noise limit values, in Leq (A), on two temporal periods, referred to day period Lday (06-22) and night period Lnight (22-06). (See the table below, referred to absolute input limit values, the maximum values of noise that can be emitted by one or more noise sources in living environment or outdoor, which is measured close to the receiver)).

| Absolute input limit values – Leq dB(A) – D.M. 14/11/97 | Day 06-22 Leq dB(A) | Night 22-06 Leq dB(A) |
|---|---------------------------|-----------------------------|
| Land use acoustic zoning | | |
| Area Class I – Particularly protected areas: the areas belong to this zone are territories where the quiet represents a priority characteristics: hospitals, schools, areas dedicated to relax and recreation, public park, residential rural areas, more interesting urban planning areas, etc. | 50 | 40 |
| Area Class II – Areas mainly dedicated to a residential use: the areas belong to this zone are mainly characterized by local road traffic, low population density, low presence of commercial activities and absence of industrial and handcrafted activities. | 55 | 45 |
| Area Class III – Mixed areas: the areas belong to this zone are characterized by local and crossing road traffic, by medium density of population, presence of commercial activities, offices, low density of handcraft activities and absence of industries; rural areas characterized by the presence of machinery. | 60 | 50 |
| Area Class IV – Intensive human activities areas: the areas belong to this zone are characterized by busy road traffic, high density of population, high presence of commercial activities and offices, presence of handcraft activities; areas close to main road traffic and railway infrastructures; ports; areas with a presence of factories. | 65 | 55 |
| Area Class V – Mainly industrial areas: the areas belong to this zone are characterized by the presence of factories and a low presence of residential buildings. | 70 | 60 |
| Area Class VI – Exclusively industrial areas: the areas belong to this zone are interested exclusively by industrial activities and there are not residential buildings. | 70 | 70 |

In the buffer zones of road and rail networks, described by national decrees, specific limit values are in force.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

The acoustic zoning of municipality territory establishes classes where the presence of industries is considered: Class IV Areas with intense human activities, Class V Mainly Industrial Areas and Class VI, Exclusively Industrial Areas, with related emission limit value and input limit value (absolute and differential).

The Emission limit Value is the maximum value of noise that can be emitted from a noise source and measured nearby the source itself.

The differential input limit values (art.2, let. b of the law n. 447 of 26 October 1995) are defined with reference to the difference between the equivalent level of the environmental noise and the residual level (without the presence of the noise source). They are defined as follows: 5 dB for the day period and 3 dB for the night period, inside house living places.

Such values do not apply into areas included in the VI class of the municipal zoning.

They have not to be applied to the following cases, because noise effects are deemed negligible:

- a) If the noise measured with open windows is less than 50 dB(A) during the diurnal period and 40 dB(A) during the nocturnal period;
- b) If the level of the environmental noise measured with close windows is less than 35 dB(A) during the day period and 25 dB(A) during the night period.

For industries, noise is generated by a wide range of different sources for size, location, machineries, operation mode in time (continuous or not), for the presence of impulsive and tonal components and predominance of low frequencies). The reference decrees are: D.M. Ambiente 16-3-1998; D.P.C.M. 14-11-1997; D.M. Ambiente 11-12-1996. The following technical standard is used: UNI 10855-1999 measurement and evaluation of the acoustic contribution of the single sources.

The wind turbine farms are currently considered as industrial sites and a national decree on wind turbine noise is expected. As references, the "Guidelines for the evaluation and the monitoring of the acoustic impact of wind farms" and the technical standard UNI / TS 11143-7: 2013 - "Method for estimation impact and noise climate by type of source – Part 7: Noise from wind turbines " have been published.

Below, the table of the Classes of land use of the municipality territory and noise emission limit values.

| Emission limit values – Leq dB(A) – D.M. 14/11/97 | Day 06-22 Leq dB(A) | Night 22-06 Leq dB(A) |
|---|------------------------------|--------------------------------|
| Land use acoustic zoning | | |
| Area Class I – Particularly protected areas | 45 | 35 |
| Area Class II – Areas mainly dedicated to a residential use | 50 | 40 |
| Area Class III – Mixed areas | 55 | 45 |
| Area Class IV – Intensive human activities areas | 60 | 50 |
| Area Class V – Mainly industrial areas | 65 | 55 |
| Area Class VI – Exclusively industrial areas | 65 | 65 |

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

The Decrees on transport infrastructures establish the “buffer zones”- zone A and zone B-: areas, with a defined width, where specific limit values are in force, related exclusively to the noise emitted by the considered infrastructure.

ROAD

For roads (Presidential Decree No. 142 of 30 March 2004, “Provisions for the control and prevention of noise pollution caused by vehicular traffic”), see the tables below, with limit values and buffer zones, for existing and new roads. Sensitive receivers belong to the Class I of the acoustic zoning of municipality territory and they are hospitals, schools, nursing homes and rest homes.

Noise input limit values for new roads

| ROADS CLASSIFICATION | | Acoustic pertinence area – Buffer zones Extension (m) | Sensitive receivers* | | All the others receivers | |
|---|-----|---|----------------------------|-----------------------------|---------------------------|-----------------------------|
| | | | L _{Aeqday} dB(A) | L _{Aeqnight} dB(A) | L _{Aeqday} dB(A) | L _{Aeqnight} dB(A) |
| A – Highways | | 250 | 50 | 40 | 65 | 55 |
| B – Main extra urban roadways | | 250 | 50 | 40 | 65 | 55 |
| C – Secondary extra urban roadways | C 1 | 250 | 50 | 40 | 65 | 55 |
| | C 2 | 150 | 50 | 40 | 65 | 55 |
| D – Main urban roadways | | 100 | 50 | 40 | 65 | 55 |
| E – Secondary urban roadways | | 30 | Defined by acoustic zoning | | | |
| F – Local roadways | | 30 | | | | |

* For schools only day period

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Noise input limit values for existing roads

| ROADS CLASSIFICATION | | Acoustic pertinence area – Buffer Zones Extension (m) | Sensitive receivers* | | All the others receivers | |
|-----------------------------------|----|---|----------------------------|-----------------------------|---------------------------|-----------------------------|
| | | | L _{Aeqday} dB(A) | L _{Aeqnight} dB(A) | L _{Aeqday} dB(A) | L _{Aeqnight} dB(A) |
| A – Highways | | 100 (Zone A) | 50 | 40 | 70 | 60 |
| | | 150 (Zone B) | | | 65 | 55 |
| B – Main extraurban roadways | | 100 (Zone A) | 50 | 40 | 70 | 60 |
| | | 150 (Zone B) | | | 65 | 55 |
| C – Secondary extraurban roadways | Ca | 100 (Zone A) | 50 | 40 | 70 | 60 |
| | | 150 (Zone B) | | | 85 | 55 |
| | Cb | 100 (Zone A) | 50 | 40 | 70 | 60 |
| | | 50 (Zone B) | | | 65 | 55 |
| D – Main urban roadways | Da | 100 | 50 | 40 | 70 | 80 |
| | Db | 100 | 50 | 40 | 65 | 55 |
| E – Secondary urban roadways | | 30 | Defined by acoustic zoning | | | |
| F – local roadways | | 30 | | | | |

* For schools only day period

3. LIMIT VALUES – METRICS

RAIL

About railway limit values, there are two buffer zones (A-B, areas, with a defined width, where specific limit values are in force, related exclusively to the noise emitted by the considered infrastructure.) and distinctions according to different speed (lower or higher than 200 km/h).

For the railways (Presidential Decree No. 459 of 18/11/1998, “Regulation allowing the definition of regulation rules of the art. 11 of the law 26 October 1995, n. 447, concerning noise pollution produced by railways traffic):

- For existing railways and new railways with speed project lower than 200 km/h:

Zone A: extended from rail alignment for 100 m

Zone B: extended from the end of Zone A for 150 m

- For new railways with speed project higher than 200 km/h (High Speed)

Acoustic pertinence area: extended from rail alignment for 250 m; this “acoustic pertinence area” is extendible up to 500 m if there are sensitive receivers (schools, hospitals, nursing and rest homes).

Input limit values for **existing** railways and new railways with speed project lower than 200 km/h are the following:

- sensitive receivers

L_{Aeqday} = 50 dB(A), L_{Aeqnight} = 40 dB(A)

- all other receivers -Fascia A

L_{Aeqday} = 70 dB(A), L_{Aeqnight} = 60 dB(A)

- all other receivers - Fascia B

L_{Aeqday} = 65 dB(A), L_{Aeqnight} = 55 dB(A)

Input limit values for **new** railways with speed project higher than 200 km/h:

- sensitive receivers:

L_{Aeqday} = 50 dB(A), L_{Aeqnight} = 40 dB(A)

- all other receivers:

L_{Aeqday} = 65 dB(A), L_{Aeqnight} = 55 dB(A)

Sensitive receivers belong to the Class I of the acoustic zoning of municipality territory and they are hospitals, schools, nursing homes and rest homes.

3. LIMIT VALUES – METRICS

AIRCRAFT

For aircraft noise there are three buffer zones:

zone A: the index LVA must not be greater than 65 dB(A);

zone B: the index LVA must not be greater than 75 dB(A);

zone C: the index LVA can be greater than 75 dB(A).

Beyond zones A, B and C the index LVA must not be greater than 60 dB(A).

The following land use zones are required:

Zone A: there are no restrictions;

Zone B: agricultural activities and livestock breeding, industrial and similar activities, commercial activities, activities of office, tertiary and similar, subject to the adoption of adequate sound insulation measures;

Zone C: exclusively the activities functionally connected with the use and services of the airport infrastructures.

3. LIMIT VALUES – METRICS

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

L_{day} is the A-weighted equivalent sound level over time sequence 06:00 – 22:00.

L_{night} is the A-weighted equivalent sound level over time sequence 22:00 – 06:00.

For aircraft noise: **LVA** is evaluation level of the airport noise. **LVA,d** over time sequence 06:00 – 23:00; **LVA,n** over time sequence 23:00 – 06:00;

$$L_{VA} = 10 \log \left[\frac{1}{N} \sum_{j=1}^N 10^{L_{VAj}/10} \right] dB(A)$$

LVA represents the evaluation level of the airport noise;

N is the number of the days of the period of phenomenon observation and

LVAj is the daily value of the evaluation level of the airport noise.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

The Decree 16th of March, 1998, *Techniques for detecting and measuring noise pollution*, in Annex A, *Definitions*, defines the correction factor (Ki) as the correction in dB(A) introduced to take into account the presence of noise characterized by impulsive components, tonal or low frequency.

In presence of impulsive components, the value of correction is KI = 3 dB (A)

In presence of tonal components, the value of correction is KT = 3 dB (A)

In presence of low frequencies, the value of correction is KB = 3 dB (A).

The correction values must be added to the measured noise level. These correction factors are not applicable to transport infrastructures.

In Annex B *Technical standards for measurement*, it is established that, if the frequency analysis highlights the presence of tonal components in the frequency range between 20 Hz and 200 Hz, in addition to the correction factor KT, also the correction factor KB, related to low frequency, must be applied, exclusively in the night-time period.

3.d) Please supplement any relevant additional information.

Legislative Decree N. 42/2017 introduces a new typology of limit, the *specific input limit value* as the maximum value due to the contribution of the specific noise source measured at the facade of the receiver.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---|--------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Explaining economic, technical and environmental reasons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> “ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> “ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> “ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> “ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

For road and railway, in outdoor spaces: the microphone must be placed at a distance of 1 m from the facades of buildings exposed to the highest sound levels and to a height of 4 m. In case of buildings located away from the road, the microphone must be placed within the space usable by people and, in any case, not less than 1m from the facade of the building.

Inside buildings: the microphone must be placed at 1.5 m from the floor and at least 1 m from reflective surfaces. Detection in a residential environment must be performed both with open windows and closed, in order to identify the most burdensome situation.

6. BASIS OF LIMIT VALUES

How were limit values established?

Legislative Decree No 42/2017 prescribes a Commission with representatives of competent Ministries, for the definition of the limit values, according to END requirements, which will be decided taking into account the results of the revision of the Annex III of END, and considering the impact of noise on health. This Commission has not yet been established.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

Legislative Decree No 42/2017 of 17 February Provision of harmonization of national legislation on noise pollution

- Legislative Decree No. 194/2005 of 19 August 2005 transposes the specific requirements of the END.
- Law No. 447 of 26 October 1995, Framework Law on Noise Pollution
- Decree of the President of the Cabinet, 14 November 1997, "Determination of limits for noise sources"
- Decree 16th of March, 1998, "Techniques for detecting and measuring noise pollution", which defines measurements methods, equipment and acoustic parameters about outdoors environmental noise, particularly regarding road and railway transports
- DM 29 November 2000 "Criteria for the predispositions of noise reduction plans by Public Transport Authority"
- For road: Presidential Decree No. 142 of 30 March 2004, "Provisions for the control and prevention of noise pollution caused by vehicular traffic"
- For railway: Presidential Decree 18 November 1998 n. 459
- For aircrafts: Minister Decree of October 31, 1997.

Documents are available, in Italian, at: <https://agentifisici.isprambiente.it/normativa-rumore.html>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

Legislative Decree No 42/2017 of 17 February, *Provision of harmonization of national legislation on noise pollution*, provides many implementing decrees, in order to harmonize national and European legislation. The activities are currently in progress and this may cause changes in limit values and procedures.

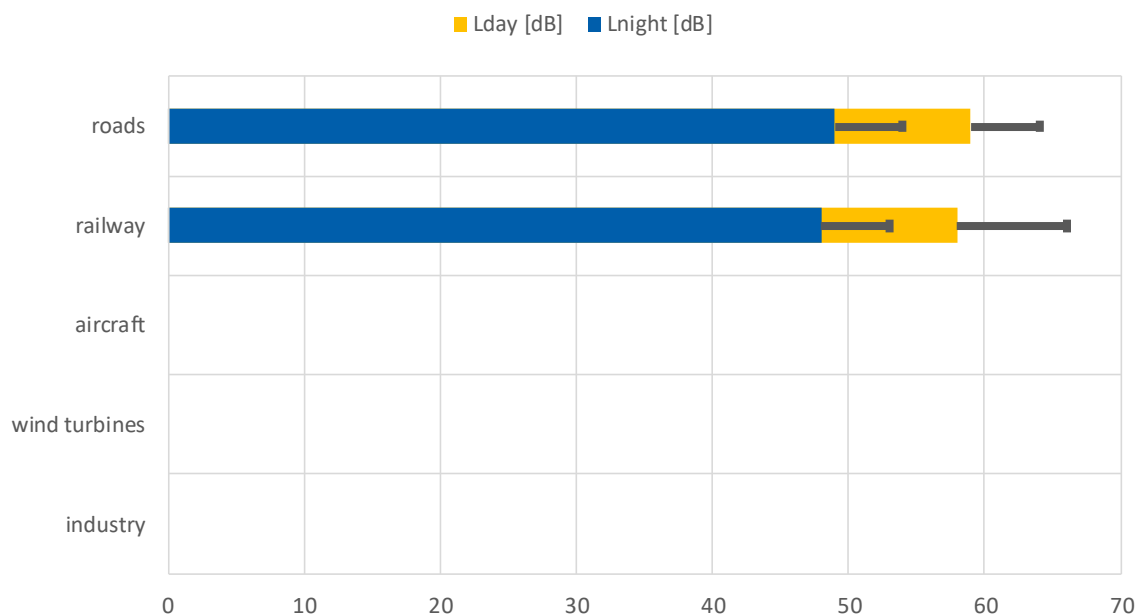
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different types of residential areas (purely residential vs mixed areas).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

By the infrastructure law for noise protection are these limit values, see below:

| Places | Limit values from traffic road | |
|---|--------------------------------|-------------|
| | L_{day} | L_{night} |
| Industrial area | 69 | 59 |
| villages and mixed areas | 64 | 54 |
| Residential areas and small settlements | 59 | 49 |
| hospitals, schools, institutions for rehabilitation and homes for the elderly | 57 | 47 |

| Places | Limit values from rail traffic | |
|---|--------------------------------|-------------|
| | L_{day} | L_{night} |
| Industrial area | 68 | 58 |
| villages and mixed areas | 65 | 53 |
| Residential areas and small settlements | 57 | 48 |
| hospitals, schools, institutions for rehabilitation and homes for the elderly | 54 | 45 |

Although limit values are defined, they are not applied in Kosovo, but will be implemented in the future.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

L_{day} - is the A-weighted equivalent sound level over time sequence 07:00 – 19:00.

L_{den} - is the A-weighted equivalent sound level over time sequence 19:00 – 22:00.

L_{night} - is the A-weighted equivalent sound level over time sequence 22:00 – 07:00.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

The noise that is harmful to human health by the law on noise protection is any noise that exceeds the permitted limit values (which will be determined by a special normative act), viewed from time to time and from the place where the noise is bursting where people work and live. At the moment, they are not yet applied in Kosovo.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|-------------------------------------|--|---------------------------------------|-------------------------------------|-----------------------------|-------------------------------------|
| road | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

The boxes are completed according to the legal infrastructure for noise protection in Kosovo.

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

In the Kosovo, the position of assessment is under 2 meters above each floor at the most exposed facade of the dwelling.

6. BASIS OF LIMIT VALUES

How were limit values established?

In Kosovo, limit values are based on the Directive 2002/49/EC, because not yet existing any indicators as an evaluation measure at the national level.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

- Law on noise protection No. 02/L-102
- Administrative Instruction NO.08/2009, on allowed values of noise emissions from pollution sources

<https://mmph.rks-gov.net/en-us/Home>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

Legal infrastructure for noise protection must be completed from our institutions;

All documents for noise protection should be drawn up;

- Strategic noise maps,
- Action plans,
- The definition of quiet areas, barriers for noise protection near settlements, improve road infrastructure, isolation of all building etc.

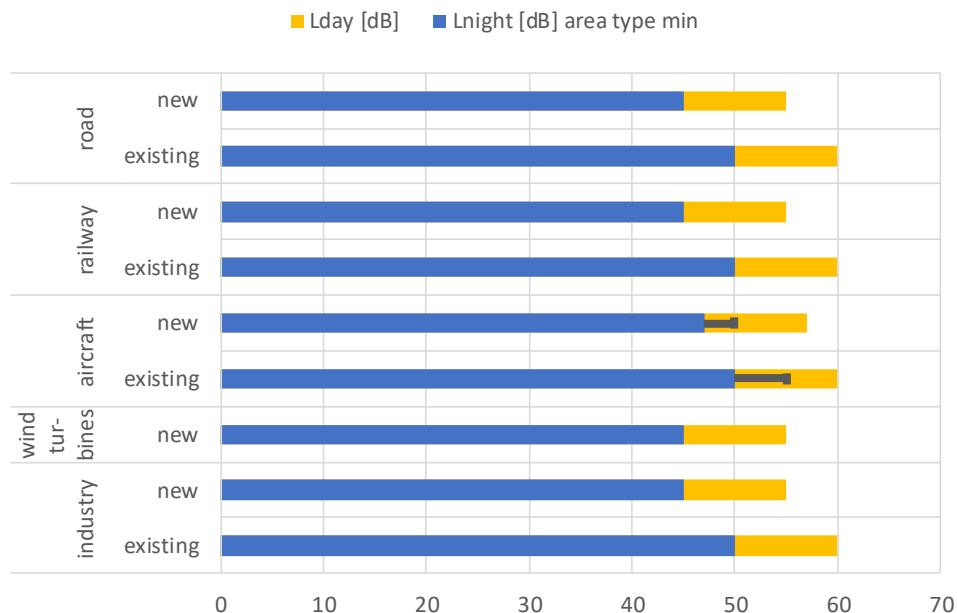
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different periods of the night (see question 3.a and 3.b).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Aircraft:

For aircraft noise the limit values are different for the different night hours:

22-23 hours: 50 dB(A) for new installation and 55 dB(A) for existing installation

23-24 hours: 47 dB(A) for new installation and 50 dB(A) for existing installation

Flight ban

05-06 hours: 47 dB(A) for new installation and 50 dB(A) for existing installation

Airports with only light aircrafts or heliports have different limit values, which are not shown here.

Wind turbines

All wind turbines are new installations.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

Roads and railway:

L_{day} is the A-weighted equivalent sound level over time sequence 06:00 – 22:00.

L_{night} is the A-weighted equivalent sound level over time sequence 22:00 – 06:00.

Aircraft:

L_{day} is the A-weighted equivalent sound level over time sequence 06:00 – 22:00.

L_{night1} is the A-weighted equivalent sound level over time sequence 22:00 – 23:00.

L_{night2} is the A-weighted equivalent sound level over time sequence 23:00 – 24:00.

L_{night3} is the A-weighted equivalent sound level over time sequence 05:00 – 06:00.

Wind turbines and industry:

L_{day} is the A-weighted equivalent sound level over time sequence 07:00 – 19:00.

L_{night} is the A-weighted equivalent sound level over time sequence 19:00 – 07:00.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

Roads:

When a road doesn't have much traffic (less than 100 vehicles per hour), then there is a level correction K1 between 0 and -5.

Railway:

There is a rail bonus K1 of -5. When there is not a lot of traffic (less than 80 train journeys per day or night), then the rail bonus K1 is rising and between -5 and -15.

The level correction K2 for shunting noise is based on the frequency and audibility of all pulsating, tonal and screeching types of noise, and is equal to:

| Audibility of all types of noise | Frequency of all types of noise | | |
|----------------------------------|---------------------------------|------------|----------|
| | Seldom | Occasional | Frequent |
| Weak | 0 | 2 | 4 |
| Clear | 2 | 4 | 6 |
| Strong | 4 | 6 | 8 |

Industry and wind turbines:

Wind turbine noise is assessed as a sort of industry noise.

There is a penalty for industry noise of K1 = 5 and therefore also for wind turbine noise.

For some special noise sources within the perimeter of industrial installation, K1 is adapted as follows:

For heating, ventilation and air-conditioning systems K1 is 10 at night time. There is no malus for traffic (K1=0).

2, 4 or 6 nuisance penalty for tonal noise (K2) and for impulsive noise (K3), depending of the audibility of the noise at the point of exposure.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--|---|--|--------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> Above limit values for existing installations, except of public or licensed installations | <input checked="" type="checkbox"/> public or licensed installations | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Exceeding the limit values has also has spatial planning consequences.

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

In Liechtenstein, the position of assessment is in the middle of open windows of rooms sensitive to noise.

6. BASIS OF LIMIT VALUES

How were limit values established?

In Liechtenstein, limit values are based on dose-effect relationships obtained from surveys in Switzerland. They roughly correspond to 15-25% of people being highly annoyed.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

The relevant laws are only available in German; please go to <https://www.gesetze.li> and search for « lärm-schutzverordnung » or « umweltschutzgesetz »

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

1. END THRESHOLDS vs. NATIONAL LIMITS

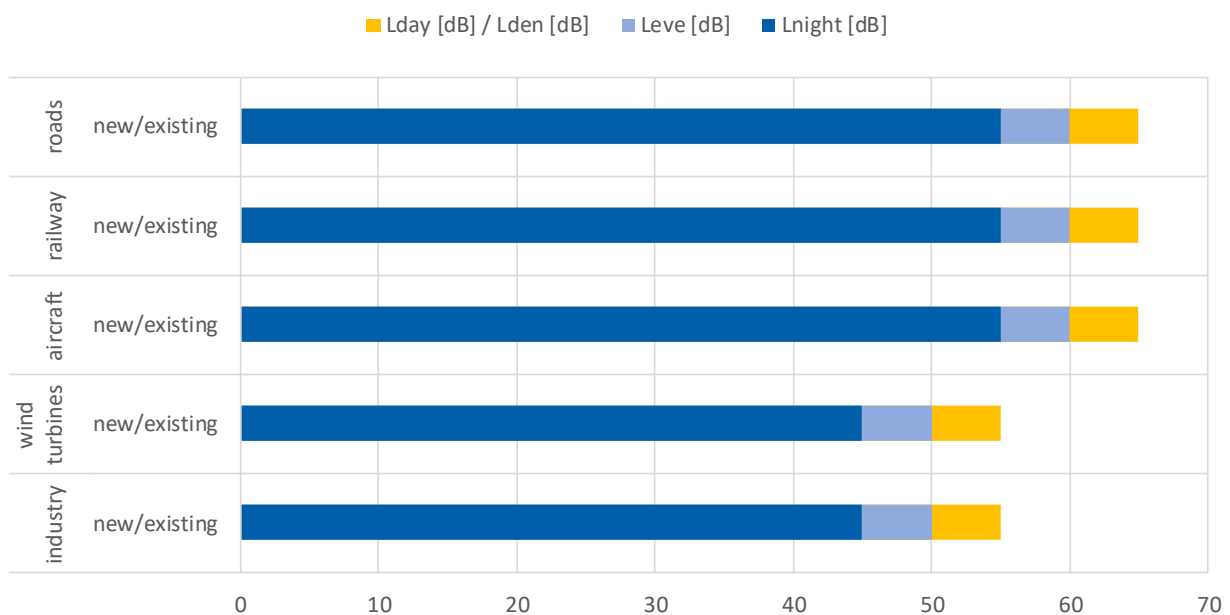
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- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

National noise limit values for action planning differ from those, set in the Environmental Noise Directive 2002/49/EC (END) as thresholds for the preparation of noise maps. Besides implementation of the END, there is additional national noise legislation.

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Besides noise limit values for the action planning according to the END, for other purposes additional noise limit values are applicable:

1. Rooms of residential dwellings, bedrooms in public buildings, ward rooms in hospitals (indoors): 45 dBA LAeqT and 55 dBA LAFmax at day; 40 dBA LAeqT and 50 dBA LAFmax at evening; and 35 dBA LAeqT and 45 dBA LAFmax at night.
2. Training and/or education rooms in public buildings (indoors): 45 dBA LAeqT and 55 dBA LAFmax during classes.
3. Outdoor living area of residential and public buildings (excluding catering and cultural buildings) exposed to traffic noise (outdoors): 65 dBA LAeqT and 70 dBA LAFmax at day; 60 dBA LAeqT and 65 dBA LAFmax at evening; and 55 dBA LAeqT and 60 dBA LAFmax at night. In delimited resorts areas noise limit values are reduced by 5 dBA.
4. Outdoor living area of residential and public buildings (excluding catering and cultural buildings) exposed to noise from noise sources except traffic noise (outdoors): 55 dBA LAeqT and 60 dBA LAFmax at day; 50 dBA LAeqT and 55 dBA LAFmax at evening; and 45 dBA LAeqT and 50 dBA LAFmax at night. In delimited resorts areas noise limit values are reduced by 5 dBA.
5. Halls of catering and cultural buildings during entertainment events and cinema halls during the display of movies: 80 dBA LAeqT and 85 dBA LAFmax.
6. Open concert and dance halls during entertaining events: 85 dBA LAeqT and 90 dBA LAFmax at day; 80 dBA LAeqT and 85 dBA LAFmax at evening; and 55 dBA LAeqT and 60 dBA LAFmax at night.

Noise limit values are the same for all means of transportation (road, rail and air traffic). Wind turbines are treated as industrial activity (there is no special noise legislation regarding wind turbines).

The noise limit values are the same for new or existing installations.

The noise limit values are the same for new and for existing houses too. In the case of existing houses, the compliance with the noise limit values would be examined during the planning of new noise emitting sources (or changing existing ones), e.g. planning of commercial activities or transport infrastructures. The compliance with the noise limit values would be examined during the investigation of noise complaints too.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

L_{day} – as defined in END (the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the day periods of a year), where day period is 07:00–19:00.

$L_{evening}$ – as defined in END (the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the evening periods of a year), where evening period is 19:00–22:00.

L_{night} – as defined in END (the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the night periods of a year), where night period is 22:00–07:00.

L_{den} – is calculated according to the formula of END.

3. LIMIT VALUES – METRICS

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

Penalties regarding tones and impulsiveness have to be applied. Values of penalties are determined according to the ISO 1996-1 and ISO 1996-2.

3.d) Please supplement any relevant additional information.

In addition to the noise limit values for the action planning according to the END, there are noise limit values for regular planning (e.g. land use / territorial planning, environmental impact assessment etc.) and noise control, see question 8.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | Financial sanctions | non legally binding actions | none |
|---------------|---|--|---------------------------------------|-------------------------------------|-----------------------------|--------------------------|
| road | <input checked="" type="checkbox"/> (prohibition of new construction and prohibition of reconstruction of existing roads where permits are required) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input checked="" type="checkbox"/> (prohibition of new construction and prohibition of reconstruction of existing railroads where permits are required) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input checked="" type="checkbox"/> (prohibition of new construction and prohibition of reconstruction of existing airports (airfields) where permits are required) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> (prohibition of new construction or prohibition of reconstruction of existing installations where permits are required) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> (prohibition of new construction or prohibition of reconstruction of existing installations where permits are required) construction) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

In case of implementation of END, the noise assessment points shall be located at the most exposed façade at the 4 metres noise assessment height. Incident sound field requirements (free-field case) are applicable.

For other (national) purposes, the noise assessment points may be located within the parcel where residential or public buildings are build, but no more than 40 metres away from the buildings. Incident sound field requirements are applicable too. Assessment height – according to the requirements of recent edition of ISO 1996-2 (no special national requirements).

6. BASIS OF LIMIT VALUES

How were limit values established?

Noise limit values have been determined largely based on experience obtained through implementation and on the basis of complaints made by the public. The Noise limit values are adopted with respect to the consultation with other state institutions, stakeholders and public. Before adoption the noise limit values have to be agreed by the inter-institutional Noise Prevention Council.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

- The Law on Noise Management, <https://www.e-tar.lt/portal/lt/legalAct/TAR.7E6F5E3523EA/BdvioivcMG>
- Description of the Procedures For the Drawing up and Approving of Noise Prevention Action Plans and for the Implementation of Noise Prevention and Reduction Measures Adopted Therein, <https://www.e-tar.lt/portal/lt/legalAct/178ca9e042d211e8acd6a982d1f6431f>
- Description of the Procedures For the State Noise Control, <https://www.e-tar.lt/portal/lt/legalAct/178ca9e042d211e8acd6a982d1f6431f>
- Lithuanian Hygiene Regulation HN 33:2011 “Noise Limit Values in Residential and Public Buildings and in Their Environment”, <https://www.e-tar.lt/portal/lt/legalAct/TAR.8B79388EACD2/fcHfnWnJgf>
- Technical Construction Regulation STR 2.01.07:2003 “Protection of Internal and External Environment of Buildings from Noise”, <https://www.e-tar.lt/portal/lt/legalAct/TAR.BEFE83252B3B/rwTHtZdJZs>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

1. In addition to the noise limit values outdoors, there are noise limit values indoors. Noise limit values indoors are defined using short term noise indicators L_{AeqT} and L_{AFmax} , where L_{AeqT} is equivalent continuous sound pressure level as defined in ISO 1996-2:2016 3.1.6 (no specific requirements for the time base) and L_{AFmax} is a maximum time-weighted and frequency-weighted sound pressure level as defined in ISO 1996-2:2016 3.1.2, where time-weighting is F (fast) weighting and frequency-weighting is A weighting.

2. There are ongoing revisions of legal acts relating to noise limit values and relating to the legal basis of noise control.

3. The above mentioned Technical Construction Regulations set requirements for the sound insulation of external walls of residential and public buildings depending on the noise level outdoors.

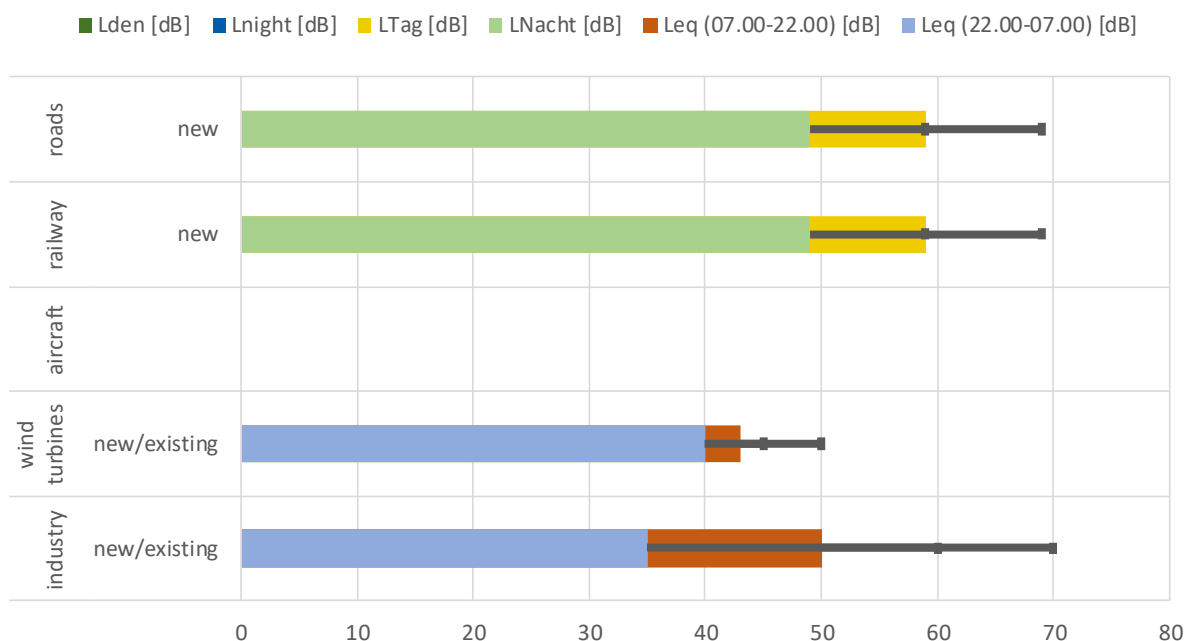
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- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different types of residential areas (e.g. urban vs. sub-urban).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

For major new roads and major new railway constructions the recommended maximum noise immission values change depending on type of surroundings:

| Day 6:00 – 22:00 (L _{Aeq, Tag}) (dB(A)) | Night 22:00 – 6:00 (L _{Aeq, Nacht}) (dB(A)) |
|---|---|
| 1. Hospitals, Schools, Sanatoriums, Retirement homes | |
| 57 | 47 |
| 2. Pure and general residential areas, small residential estate areas | |
| 59 | 49 |
| 3. village areas, mixed areas | |
| 64 | 54 |
| 4. Commercial areas | |
| 69 | 59 |

For existing roads, railway lines and airports the noise action planning indicates two different threshold levels. Noise levels above the first threshold of L_{DEN}>70 dB(A)/L_{Night} >60 dB(A) should be considered as a priority for managing and reducing noise in the action planning, whereas the second threshold of L_{DEN}>65 dB(A)/L_{Night} >55 dB(A) should be considered as a more long term goal for managing and reducing noise in the action planning. These threshold levels are also used to identify noise hot spots.

For industrial noise the noise immission limit values change depending on type of surroundings and is categorized into different zones:

| Zone | Noise immission limit value L _{eq} (dB(A)) | | Description of surroundings |
|------|---|-------|---|
| | Day | Night | |
| I | 45 | 35 | Hospitals, recreational areas |
| II | 50 | 35 | Rural areas, low traffic |
| III | 55 | 40 | Urban area, mostly residential, low traffic |
| IV | 60 | 45 | Urban area with some light industry or businesses, medium traffic |
| V | 65 | 50 | City center (offices, shops, businesses, nightlife areas), heavy traffic |
| VI | 70 | 60 | Mostly heavy industry |

Note : Zones I and VI were not taken into account for point 2 of fact sheet as they are not considered to be residential areas.

For wind turbines the noise immission limit values change depending on type of surroundings and is categorized into different zones:

| Zone | Noise immission limit value $L_{eq}(1h)$ (dB(A)) | | Description of surroundings |
|------|--|-------|---|
| | Day | Night | |
| I | 38 | 35 | Hospitals, recreational areas |
| II | 43 | 40 | Rural areas, low traffic |
| III | 43 | 40 | Urban area, mostly residential, low traffic |
| IV | 45 | 42 | Urban area with some light industry or businesses, medium traffic |
| V | 45 | 42 | City center (offices, shops, businesses, nightlife areas), heavy traffic |
| VI | 50 | 45 | Mostly heavy industry |

Note : Zones I and VI were not taken into account for point 2 of fact sheet as they are not considered to be residential areas.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

For action plans for environmental noise:

L_{den} is a representative average noise indicator for a 24-hour day, evaluated over a full year and for which the evening (19:00-23:00) is penalized by 5 dB(A) and the night period (23:00-07:00) is penalized by 10 dB(A).

L_{night} is an indicator of the representative noise level for an 8-hour night (23:00-07:00), evaluated over a full year and associated with sleep disturbance.

For transport infrastructure projects:

L_{Tag} is an equivalent noise level in dB(A) for the day period (06:00-22:00).

L_{Nacht} is an equivalent noise level in dB(A) for the night period (22:00-06:00).

For industry noise :

L_{eq} (7:00-22:00) is an equivalent level of the noisiest hour in dB(A) for the day period (07:00-22:00).

L_{eq} (22:00-07:00) is an equivalent level of the noisiest hour in dB(A) for the night period (22:00-07:00).

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

In Luxembourg, the following penalties and correction factors apply for industrial noise:

In case where repeated impulsive events overlap the basic sound level and exceed this level by 10 dB(A), the determined L_{eq} is to be increased by 5 dB(A).

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|-------------------------------------|--|--|--|---|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> For new | <input checked="" type="checkbox"/> If active measures not possible | <input type="checkbox"/> | <input checked="" type="checkbox"/> For existing | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> For new | <input checked="" type="checkbox"/> If active measures not possible | <input type="checkbox"/> | <input checked="" type="checkbox"/> For existing | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> For new | <input checked="" type="checkbox"/> Within defined zones | <input checked="" type="checkbox"/> Take off/landing fees | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> If limit values exceeded repeatedly | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> If limit values exceeded repeatedly | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

For industrial noise:

When measuring the microphone should be placed at a height of 1.2 - 1.5 m from the ground, and if possible, at least 3.5 m of any wall, building or other possible reflection screen.

6. BASIS OF LIMIT VALUES

How were limit values established?

Road / Rail / Aircraft (existing): non-legally binding limit values have been established in the framework of action planning, for a short-term and a long-term phase.

Industry: limit values were established according to the existing acoustic situation.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

- Loi du 21 juin 1976 relative à la lutte contre le bruit
- Loi du 10 juin 1999 relative aux établissements classés
- Industrial noise and wind turbines: Règlement grand-ducal du 13 février 1979 concernant le bruit dans les alentours immédiats des établissements et des chantiers
- Road/Rail/Aircraft (existing): Règlement grand-ducal du 2 août 2006 portant application de la directive 2002/49/CE du Parlement européen et du Conseil du 25 juin 2002 relative à l'évaluation et à la gestion du bruit dans l'environnement
- Road/Rail (new): Loi du 15 mai 2018 relative à l'évaluation des incidences sur l'environnement
- Aircraft: Règlement grand-ducal du 18 février 2013 relatif à l'octroi des aides financières en vue de l'amélioration de l'isolation acoustique de bâtiments d'habitation contre le bruit aérien en provenance

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

According to the Article 4 of the Rulebook on limit values of the level of noise in the Environment

The limit values for the level of basic indicators of noise inside the premises where people reside, and especially those premises where the vulnerable population groups are residing, as well as for the prevention of adverse effects on the health, are:

| Types of premises | noise level expressed in dBA | | |
|--|------------------------------|----|----|
| | Ld | Le | Ln |
| Hospital room, intensive care units, operating theatres | 30 | 30 | 30 |
| Rooms in residential buildings, children relaxation rooms bedrooms in old people's home , hotel rooms | 35 | 35 | 30 |
| Surgery in health facilities, conference halls, cinemas, theatres and concert halls | 40 | 40 | 35 |
| Classrooms, reading rooms, amphitheatres, lecture rooms, facilities for scientific research work | 40 | 40 | 40 |
| Operating rooms in administrative buildings, offices | 50 | 50 | 50 |
| Theatre and cinema lobby, hair and beauty salons, restaurants, pastry | 55 | 55 | 55 |

According to the Article 2 of the Rulebook on limit values of the level of noise in the Environment

The limit value for the additional indicator, LAmax, which shall not be exceeded in order to prevent adverse health effects in exposed populations, is:

| Types of premises | level of noise expressed in dBA | |
|---|---------------------------------|-------------|
| | LAmax day | LAmax night |
| Residential area (outside) | / | 60 |
| Rooms in residential buildings, children relaxation rooms bedrooms in old people's home and hotel rooms (inside) | / | 45 |
| Hospitals and other stationary objects for treatment | / | 45 |
| Industrial, commercial, trade and traffic areas | 110 | 110 |
| Public gatherings, festivals, concerts, discos | 110 | 110 |

3. LIMIT VALUES – METRICS

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

According to the Article 2 of the Law on Protection against Noise in the Environment

(1) Noise indicators are the following: day-evening-night noise indicator (L_{den}), day noise indicator L_d , evening noise indicator L_e and night noise indicator (L_{night}).

(2) The day-evening-night noise indicator L_{den} in decibels (dB (A)), shall represent an average equivalent noise level for the period of the day, evening and night or of the whole day of twenty four hours calculated under the formula referred to in Article 10, paragraph 3 of the Law on noise in the environment.

(3) The day noise indicator or daily noise level – L_d shall represent A-long-term average equivalent sound level defined in ISO 1996-2:1987, determined by the overall daily periods of one year.

(4) The evening noise indicator or evening noise level – L_e shall represent A-long-term average equivalent sound level defined in ISO 1996-2:1987, determined by the overall evening periods of one year.

(5) The night noise indicator or night noise level – L_{night} shall represent A-long-term average equivalent sound level defined in ISO 1996-2:1987, determined by the overall night periods of one year.

According to the Article 20 of the Law on Protection against Noise in the Environment

Protection against noise shall be performed daily, while for the purposes of The Law on Protection against Noise in the Environment, it shall be considered that the day lasts 12 hours, from 7.00 to 19.00, the evening lasts 4 hours, from 19.00 to 23.00, and the night lasts 8 hours, from 23.00 to 7.00.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

In the Republic of Macedonia, several additional penalties and correction factors apply:

- for road noise:
 - 2 up to 6 dB, depending on road pavement and at speed exceeding 50 km/h
- for railway noise:
 - 2 up to 3 dB, depending on different types of railway wagons
 - 2 up to 5 dB, depending on different types of railway roads

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

In the Republic of Macedonia, the position of assessment is $4,0 \pm 0.2\text{m}$ (3.8 to 4.2) meters above each floor at the most exposed facade of the dwelling.

For other purposes of assessment, such as acoustical planning and noise zoning other heights may be chosen, but they shall never be lower than 1.5 m above the floor.

6. BASIS OF LIMIT VALUES

How were limit values established?

In the Republic of Macedonia, limit values are based on the dose-effect relationships and WHO recommendation.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

- Law on Protection Against Environmental Noise
- Rulebook on limit values of the level of noise in the Environment
- Rulebook on the application of noise indicators, additional noise indicators, the method of noise measuring and assessment methods by using noise indicators in environment
- Rulebook on locations of measuring stations and measuring points
- Regulation on agglomerates, main roads, main railways and the main airports for which the strategic noise charts should be prepared
- Rulebook on the detailed contents of strategic noise charts and noise action plans, the manner and collection of data for the preparation thereof, as well as the manner of their collection, storage and recording
- Rulebook on the manner of cooperation between the bodies competent for the preparation of strategic noise charts and noise action plans with the bodies competent for adoption of strategic noise charts and preparation of noise action plans of the neighboring country
- Rulebook on the detailed conditions regarding the necessary equipment that the authorized scientific and professional organizations and institutions as well as other legal entities and natural persons should hold in order to perform professional noise monitoring activities
- Rulebook on the manner, conditions and procedure of monitoring network establishment and operation, the methodology and manner of monitoring, as well as the conditions, manner and procedure of submitting monitoring information and data on the state of noise
- Decision on determining in what cases and under what conditions it shall be considered that the peace of the citizens is impaired by harmful noise

All relevant documents are available online on the Ministry's web page only in Macedonian language

http://www.moep.gov.mk/?page_id=16552

Unofficial translation is available upon request.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS

N/A

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

N/A

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

N/A

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

N/A

3.d) Please supplement any relevant additional information.

N/A

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|--------------------------|-----------------------------|-------------------------------------|
| road | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| rail | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| industry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

N/A

6. BASIS OF LIMIT VALUES

How were limit values established?

N/A

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

N/A

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

Malta will be issuing legislation regulating neighborhood noise in the near future.

Factsheet

NETHERLANDS

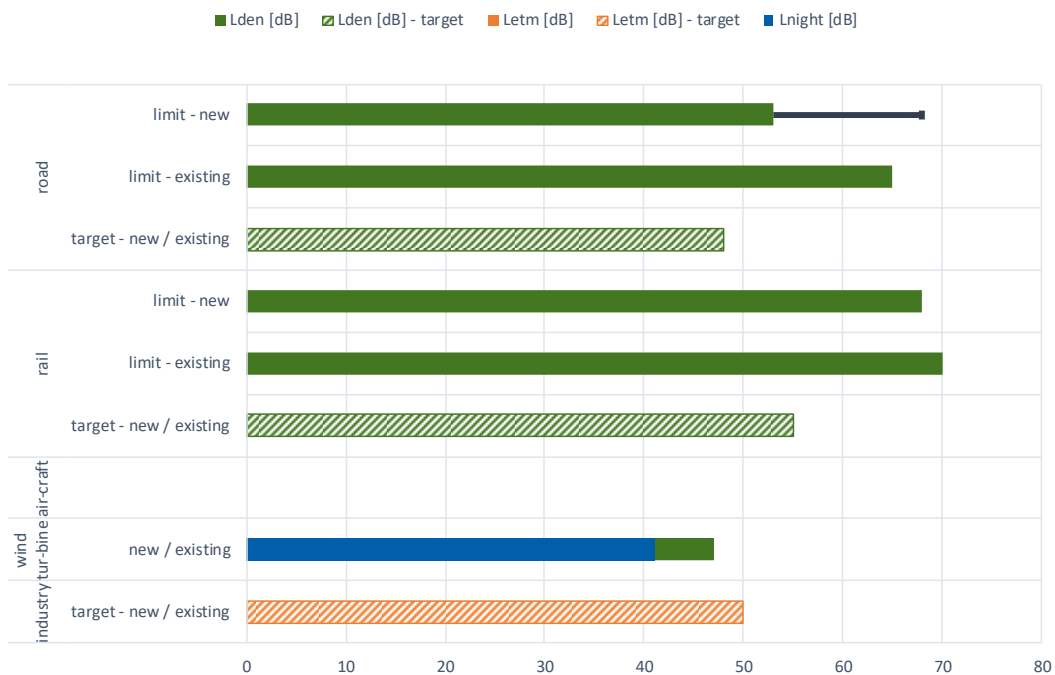
1. END THRESHOLDS vs. NATIONAL LIMITS

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- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different types of residential areas (urban vs. sub-urban).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Limit values are correct and complete. In the case of noise from roads, a distinction is made between sub-urban areas (limit value of 53 dB(A)) and urban areas (limit value of 63 – 68 dB(A)).

Noise levels higher than target and limit values are allowed if the exposed facade is 'deaf', meaning that there are no parts that can be opened, such as windows and doors. In that case, limit values for indoor noise levels are in place (33 dB L_{den} for road and rail, 35 dB(A) L_{etm} for industrial noise).

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

In the Netherlands, besides the L_{den} and L_{night} , the metric L_{etm} is used. All indicators are A-weighted. The L_{den} and L_{night} are calculated according to the European Noise Directive. The indicator L_{etm} is used for industrial noise only, and is equal to the maximum value of the following three equivalent sound levels:

- L_{Aeq} in the day (07:00 – 19:00)
- L_{Aeq} in the evening + 5 dB (19:00 – 23:00)
- L_{Aeq} in the night + 10 dB (23:00 – 07:00)

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

In the Netherlands, several additional penalties and correction factors apply:

- For road noise:
 - -1 or -2 dB, depending on road pavement, for future trends towards silent tyres
 - -2 up to -5 dB, depending on average velocity, for future trends towards silent vehicles
- For industrial noise:
 - + 5 dB nuisance penalty for tonal noise and for impulsive noise
 - + 10 dB nuisance penalty for musicality in noise

3.d) Please supplement any relevant additional information.

For aircrafts, there exist no limit values. Around Schiphol Airport, there exist regions in which construction of new dwellings is either restricted or forbidden. In zones where noise levels (L_{den}) exceed roughly 56 dB, construction is restricted and passive noise measures are applied according to the sound level at the facade.

4. CONSEQUENCES

What are the consequences of exceeding a limit value?

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|---|--|--|--|-----------------------------|--------------------------|
| road | <input type="checkbox"/> above limit | <input checked="" type="checkbox"/> above target | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> above target | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> within restriction zone | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> if noise measures not cost-effective or impossible | <input checked="" type="checkbox"/> include restrictions on operation | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> above target | <input checked="" type="checkbox"/> above target | <input checked="" type="checkbox"/> if limit values are exceeded repeatedly | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

In the Netherlands, the position of assessment is 1,5 - 2 meters above each floor at the most exposed facade of the dwelling.

6. BASIS OF LIMIT VALUES

Limit values are based on the Miedema dose-effect relationships. They roughly correspond to 10% of people being highly annoyed.

7. MAIN LEGAL DOCUMENTS

- Road: Wet geluidhinder / Wet milieubeheer
- Rail: Wet geluidhinder / Wet milieubeheer
- Aircrafts: Wet luchtvaart and Luchthavenindelingsbesluit
- Wind turbines: Wet milieubeheer
- Industry: Wet geluidhinder / Wet milieubeheer (Activiteitenbesluit)

8. FURTHER COMMENTS

All Dutch noise legislation is currently being revised into the 'Omgevingswet', planned for 2021. This may lead to changes in limit / target values and consequences with respect to the information above.

Factsheet

PORTUGAL

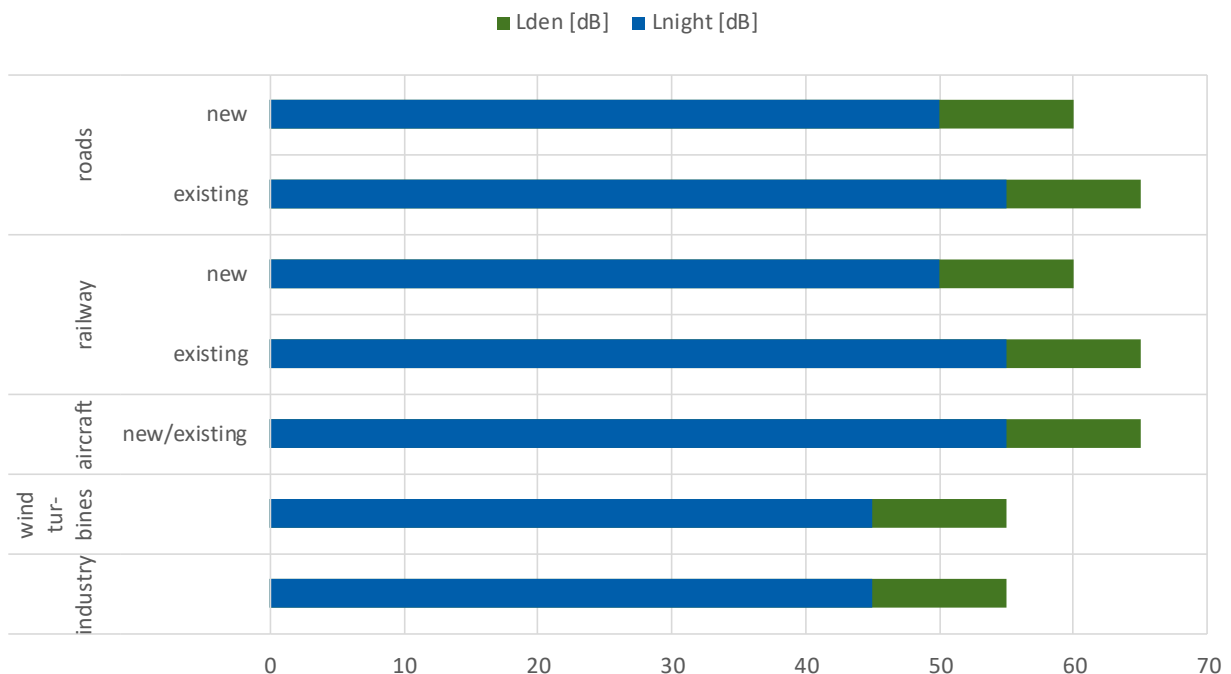
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



In Portugal noise limit values are not set by noise source but depend on noise sensitivity of the zone where limits are to be applied as a result of all existing noise sources. Please refer to question 3a.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

In Portugal noise limit values are not set by noise source but depend on noise sensitivity of the zone where limits are to be applied as a result of all existing noise sources.

Noise immission limit values at mixed residential areas (areas where residential dwellings are together with commerce, light industries and other soil uses) are $L_{den} \leq 65$ and $L_{night} \leq 55$ as a result of all noise sources. At exclusively residential areas, noise limits are also as a result of all noise sources.

From the Noise Limit Values Report the following table has been copied. See https://cdr.eionet.europa.eu/pt/eu/noise/df3/envvab4tg/PT_a_DF3_Aggl.docx/manage_document.

| | Noise limit values in force, dB(A) | | | | Comments |
|---|------------------------------------|-----------|-----------|----------|--|
| | L_{den} | L_n | L_{day} | Levening | |
| Mixed zones** | ≤ 65 | ≤ 55 | --- | --- | From all noise sources, including roads, railways, airports and industries |
| Noise sensitive zones* | ≤ 55 | ≤ 45 | --- | --- | |
| Noise sensitive zones in the vicinity of existing major roads, major railways or major airports | ≤ 65 | ≤ 55 | --- | --- | |
| Noise sensitive zones in the vicinity of planned major airports | ≤ 65 | ≤ 55 | --- | --- | |
| Noise sensitive zones in the vicinity of planned major roads or major railways | ≤ 60 | ≤ 50 | --- | --- | |
| Interim values (in force until zone classification is completed by the municipalities) | ≤ 63 | ≤ 53 | --- | --- | |

*zones appropriated for housing, schools, hospitals, leisure activities and other community facilities mainly used for rest

**zones where, along with the above mentioned land uses, there are other uses such as commercial and services facilities

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

L_{den} and L_{night} are the metrics used to define limit values. L_{night} is the A-weighted equivalent sound level over time sequence 23:00 – 07:00. L_{den} considers L_{day} from 07:00 to 20:00 and Levening from 20:00 to 23:00.

In addition to absolute limit values for outside noise, new or changes in non transportation noise sources (i.e, industries, wind turbines, commerce, etc.) are also committed to a maximum increase in relation to existing noise level, where the metric is $L_{Aeq,T}$ (+5dB(A) permitted in day period; +4dB(A) in evening period; +3dB(A) in night period). This legal requirement considers some penalties (see answer 3c).

3. LIMIT VALUES – METRICS

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

Yes; +3dB nuisance penalty for tonal noise and +3dB for impulsive noise.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|-------------------------------------|--|---------------------------------------|-------------------------------------|-----------------------------|--------------------------|
| road | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Active noise measures are due. Passive noise measures permitted whenever active noise measures are not enough to comply with outside noise limits.

Prohibition of a new noise source is also valid at its license application, when no effective measures are available.

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

The position assessment is at 1,2-1,5m above each floor and 3,5m away from the façade or from any other reflective surface.

6. BASIS OF LIMIT VALUES

How were limit values established?

Limit values were based on previous WHO (Community Noise, WHO, 1995).

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

- [Decree-Law No. 9/2007 of January 17](#), as amended by [Decree-Law 278/2007 of 1st August 2007](#).
[Decree-Law No. 146/2006 of 31 July](#) (transposition of END).
No English versions available.

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

END Noise Action Plans must be elaborated to comply with noise limit values from Portuguese Noise legislation.

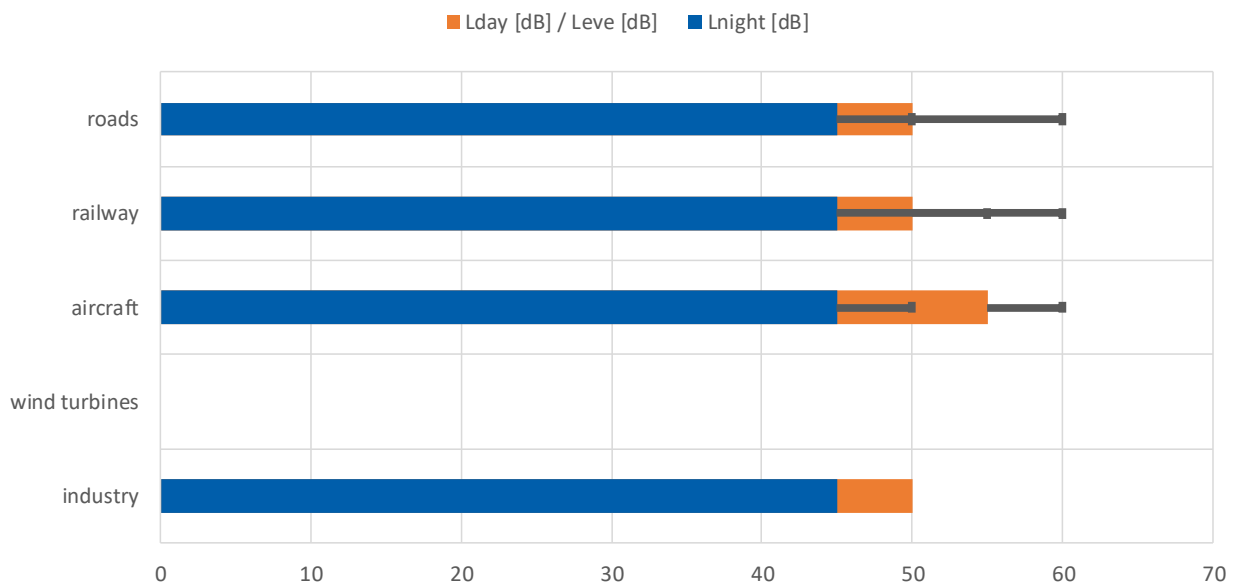
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different types of residential areas (see table 2.1 under question 3.a).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Legislation is built on two pillars-laws:

1/ Act of the National Council of the SR 355/2007 Z.z. about the protection, promotion and development of public health and Decree of Ministry of Health of the SR 549/2007 Z.z. with a hygienic limit values of outdoor and indoor noise, infrasound and vibration (Tab.3.1 and 3.2).

Note 1: exceeding the limit values is the reason for the public health authorities with the cooperation of territorial self-government and municipalities to take specific measures in the prevention as well as in the performance of the healthy surveillance, including fines, penalties or another sanctions etc., with the aim to reduce the noise in environment mainly directly on the source etc.

Note 2: there are short-term (one day or less, or 7 days for airplane noise) measured levels during the week (without weekend) and with the assessing of uncertainty for safety protection side!

Tab 3.1: Limit values of outdoor noise in environment - “operative” hygienic noise limits.

| Noise Sources in the Outdoor | Outdoor limit values $L_{Aeq,p}$ (dB) - L_{out} | | | | | |
|------------------------------------|---|---------------|-------------|---|---------------|-------------|
| | Outdoor environment - cat.II / III *) | | | Outdoor environment with special protection against noise - cat.I. *) | | |
| | L_{day} | $L_{evening}$ | L_{night} | L_{day} | $L_{evening}$ | L_{night} |
| Roads, trams and water transport | 50 / 60* | 50 / 60* | 45 / 50* | 45 | 45 | 40 |
| Railways | 50 / 60* | 50 / 60* | 45 / 55* | 45 | 45 | 40 |
| Airplane transport - $L_{Aeq,p}$ | 55 / 60* | 55 / 60* | 45 / 50* | 50 | 50 | 40 |
| Airplane transport - $L_{ASmax,p}$ | - | - | 65 / 75* | - | - | 60 |
| Industry , other sources | 50 | 50 | 45 | 45 | 45 | 40 |

*)

Category I - Territory with special protection against noise (spa, hospital and treatment areas).

Category II - Territory in front of bloc of flats, dwellings, family houses, school buildings, in the residential and recreational area and in urban areas.

Category III - Territory as in category II nearly highways and motorways, roads of 1. and 2. classes, local public transport, railways and airports, city centers.

Tab 3.2: Permissible-limit values of noise level in the indoor environment.

| Noise Sources in the Outdoor (Traffic noise) | Indoor limit values (from noise penetrating from the outdoor environment) | | | | | |
|---|--|---------------|-------------|--|---------------|-------------|
| | $L_{Aeq,p}$ (dB) - L_{in} | | | | | |
| | Indoor environment in living rooms, residential buildings, retirement homes, nurseries - kat.II / III *) | | | Indoor environment in hospital rooms, patient accommodation in the spa - kat.I | | |
| | L_{day} | $L_{evening}$ | L_{night} | L_{day} | $L_{evening}$ | L_{night} |
| Roads and water transport Railways, Airplane transport | 40 / 45* | 40 / 45* | 30 / 35* | 35 | 30 | 25 |

2/ Implementation of END 2002/49/EC → Act of the National Council of the SR 2/2005 Z.z. on Environmental Assessment and Control of Noise and Regulation of the Government of the SR 43/2005 Z.z. with a target or action values of external exposure of noise to human beings, especially in residential areas, in public parks or other quiet areas in the agglomeration and in the open country, nearby schools, hospitals and other buildings and another areas sensitive to noise.

The main purpose of this Act is to establish Noise indicators L_{den} and L_{night} according to END so called “action values” used only for the strategic noise mapping and developing of action plans (Tab 3.3).

Tab 3.3: Action values of outdoor noise indicators L_{den} and L_{night} according to the END

| Sources of the outdoor noise | Outdoor environment | | Outdoor environment with special protection against noise **) | |
|------------------------------|---------------------|-------------|---|-------------|
| | L_{den} | L_{night} | L_{den} | L_{night} |
| Roads | 65 | 55 | 60 | 50 |
| Railways | 60 | 50 | 55 | 45 |
| Airports | 65 | 55 | 55 | 40 |
| Industry | 55 | 40 | 50 | 35 |

**) Quiet areas in agglomeration, e.g. spa and treatment areas etc.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

$L_{Aeq,T}$ according to the ISO 1996-1 (Tab.3.1 and 3.2)

- $L_{Aeq,T}$ in the day (06:00 – 18:00)
- $L_{Aeq,T}$ in the evening (18:00 – 22:00)
- $L_{Aeq,T}$ in the night (22:00 – 06:00)

Note 1: Noise indicators L_{den} and L_n according to END are used only for the strategic noise mapping and developing of action plans (Tab.3.3).

Note 2: The noise mitigation measures adopted in the action plans must, however, comply the “operative” hygienic noise limits declared above (Tab.3.1)

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

In the Slovakia, several additional penalties and correction factors apply:

- For road noise:
 - - 5dB and - 10dB correction factors for old roads and railways so called “old load” conditionally and temporarily allowed.
- For outdoor industrial noise, leisure noise etc.:
 - + 5 dB nuisance penalty for tonal component noise, impulsive noise or specific annoyance including rhythmic musicality in noise.
 - + 12 dB nuisance penalty for high impulsive noise (ISO 1996-1, Appendix B).

3.d) Please supplement any relevant additional information.

Measurement uncertainty shall be added to the measured value in favor of health protection side. In the Slovakia compliance with the limit shall be demonstrated as follows:

$$\text{RATING LEVEL} \leq \text{LIMIT}$$

Rating Level = $L_{Aeq,T} + U + \sum K_i$, where U is the expanded measurement uncertainty and K_i represents penalties and corrections in accordance with decree above, e.g. for specific noise (particularly disturbing noise, high pulse, tone noise, etc.), multiple sources of noise from different operators, background noise, etc., if it is necessary.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|-------------------------------------|--|---------------------------------------|-------------------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

Microphone position: 1,0m – 2,0m in front of the window to the protected room (e.g. living room or bedroom) as a rule at the most exposed facade of the dwelling.

Note: For airplanes the position of assessment is 4m meters as a rule above the roof

6. BASIS OF LIMIT VALUES

How were limit values established?

The basic limits of LAeq,T were originally established in 1977 (in Czechoslovakia before) and are in accordance with WHO recommendations.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

Legislation in environmental noise is built on two pillars-laws:

1/ Act of the National Council of the SR 355/2007 Z.z. about the protection, promotion and development of public health.

Decree of Ministry of Health of the SR 549/2007 Z.z. with a hygienic limit values of noise, infrasound and vibration and the requirements for objectivization of noise, infrasound and vibration in the environment etc.

2/ Act of the National Council of the SR 2/2005 Z.z. on Environmental Assessment and Control of Noise (implementation of END 2002/49/EC).

Regulation of the Government of the SR 43/2005 Z.z. laying down details of strategic noise maps and action plans including of action values.

<https://www.slov-lex.sk/web/en>

<https://www.slov-lex.sk/vyhľadavanie-legislativneho-procesu>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

-

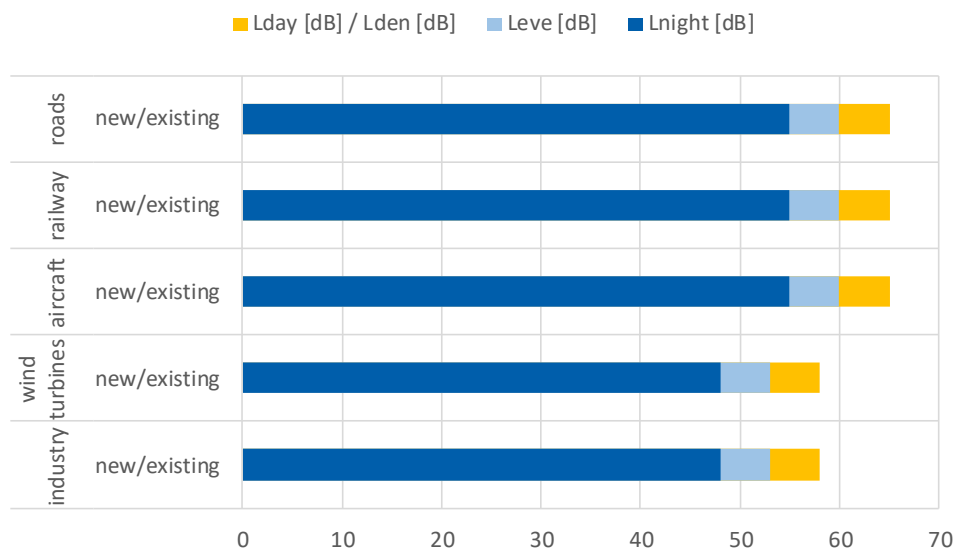
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

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- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only.

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Limit values are equal for new or existing noise sources.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

In Slovenia, beside L_{den} , L_{day} and L_{night} , the metric $L_{evening}$ is used. All indicators are A-weighted. The L_{den} is calculated according to the Environmental noise Directive. L_{day} , L_{night} and $L_{evening}$ are calculated according ISO 1996-2.

- L_{day} is the A-weighted 1 year equivalent sound level over time sequence 06:00 – 18:00.
- $L_{evening}$ is the A-weighted 1 year equivalent sound level over time sequence 18:00 – 22:00.
- L_{night} is the A-weighted 1 year equivalent sound level over time sequence 22:00 – 06:00.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

- + 5 dB to + 12 dB nuisance penalties for highly impulsive noise
- + 5 dB nuisance penalties for regular impulsive noise
- + 4 dB nuisance penalties for tonal noise

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|---|--|--|--|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> if noise measures not cost-effective or impossible | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> above limit | <input checked="" type="checkbox"/> if limit values are exceeded repeatedly | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

The position of assessment is 1,5 - 2 meters above each floor at the most exposed facade of the dwelling.

6. BASIS OF LIMIT VALUES

How were limit values established?

-

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations?

- Decree on the assessment and management of environmental noise (Official journal RS nu. 121/04), <http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED2682>
- Decree on limit values for environment noise indicators (Official journal RS nu. 43/18), <http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED7531>
- Rules on initial measurements and operational monitoring of noise sources and on conditions for their implementation (Official journal RS nu. 105/08), <https://www.uradni-list.si/glasilo-uradni-list-rs/vsebina/2008-01-4490?sop=2008-01-4490>

8. FURTHER COMMENTS

-

Factsheet

SPAIN

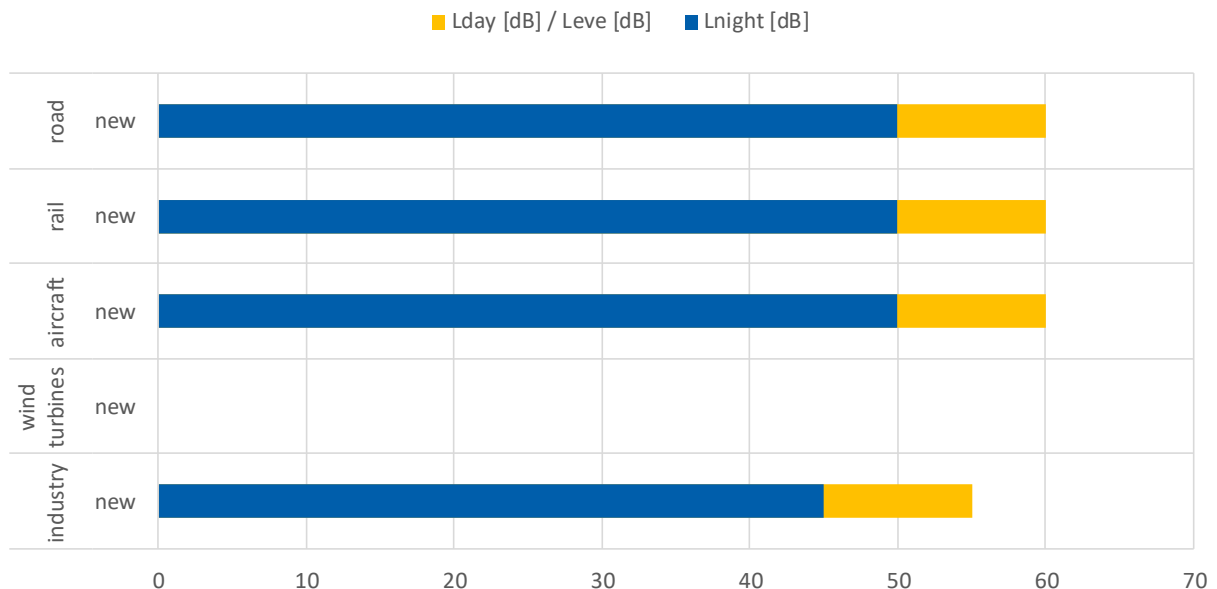
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- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



3. LIMIT VALUES – METRICS

3.a) Please supplement any relevant information regarding the above shown limit values.

- 6 types of acoustic areas are defined according to the predominant land uses.
- Acoustic quality objectives applicable to existing and new (- 5 dB) urbanized areas are defined.
- Immission limit values are defined for new road infrastructure, airport railways and industry (activities).

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

L_{day} , $L_{evening}$, L_{night} , (as defined in the END)

L_{Amax} , -> Railway and airport infrastructures (defined in RD1367 / 2007)

$L_{Aeq,T}$ -> Industry (defined in RD1367 / 2007)

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

In Spain, several penalty factors apply:

- For industry:
 - +3, o + 6 dB nuisance penalty for low frequencies and for impulsive noise
 - +3, o + 6 dB nuisance penalty for tonal noise
- Are there any other nuisance penalties or correction factors applied in Spain?
No.

3.d) Please supplement any relevant additional information.

Anexo I y IV del RD1367/2007.

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--------------------------|--|---------------------------------------|--------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

The evaluation position is 1.5 - 4 meters above the ground and separated at least 1.2 m from the most exposed facade of the building.

6. BASIS OF LIMIT VALUES

How were limit values established?

The WHO noise guidance values were taken as reference.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

- Ley 37/2003, del Ruido
<https://boe.es/buscar/pdf/2003/BOE-A-2003-20976-consolidado.pdf>
- Real Decreto 1513/2005
<https://www.boe.es/buscar/act.php?id=BOE-A-2005-20792>
- Real Decreto 1367/2007
<https://www.boe.es/buscar/act.php?id=BOE-A-2007-18397>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

The Autonomous Communities can set quality objectives and limit values that are stricter than those established by state legislation.

Factsheet

SWEDEN

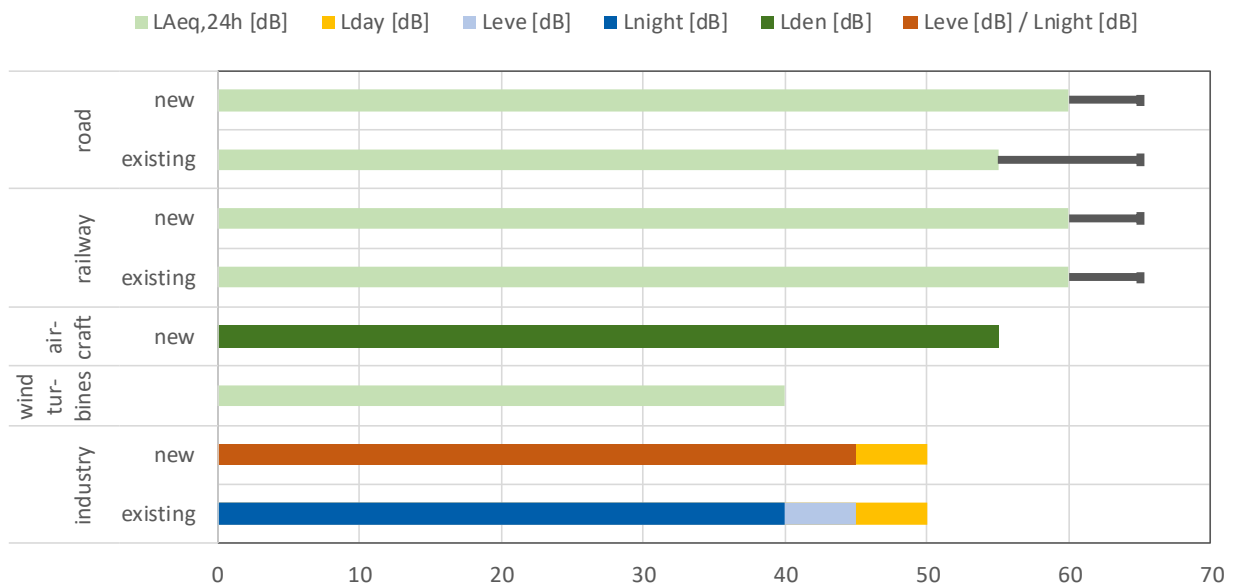
1. END THRESHOLDS vs. NATIONAL LIMITS

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- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values depending on characteristics of the dwelling (see question 3.a).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

In Sweden, guideline values are used rather than limit values.

For new (after 2015) residential buildings the guideline values are 60 dB or 65 dB if the apartment is under 35 sqm in size. If at least half of the bedrooms/livingrooms in the apartment is facing a façade with less than 55 dB (so called quiet side) then there is no upper guideline value on the exposed side. Indoor noise guideline values always apply.

For residential built between 1997-2015 the guideline value is 55 dB for road and 60 dB for railway. Many buildings have been built during these years where the guideline values are exceeded but with a “quiet side”.

For residential built before 1997 the guideline value is 65 dB. At that level measures are taken to reduce noise indoors.

For wind turbines the guideline value is 40 dB.

All guideline values mentioned above is in 24-hour A-weighted equivalent level (not L_{den}).

For aircraft the guideline value is 55 dBA FBN (which equals L_{den})

For industries the guideline values are 50 dB L_{day} , 45 dB $L_{evening}$ (the evening value is also used for daytime on weekends) and 40 dB L_{night} . New dwellings have a guideline value of 45 dB L_{night} . Noise limits in environmental permits can be higher.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

$L_{Aeq,24h}$ is the A-weighted equivalent sound level over 24 hours is used for rail and road.

L_{day} , $L_{evening}$ and L_{night} are used for industrial noise and are the A-weighted equivalent levels for the time periods 06 – 18, 18 – 22 and 22 – 06.

In many regulations we also use L_{Amax} as a compliment to the equivalent level.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

- 5 dB on guideline value for tonal noise and for impulsive noise on the regulations of industry and wind power noise.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|-------------------------------------|--|---------------------------------------|--------------------------|-----------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

The actions taken for exceeding a limit value are decided per case of the local or regional environmental authority.

For industries or wind turbines of a certain size the environmental permit usually contains noise limits. The consequences for exceeding a noise limit in a permit is generally more severe than if a guideline value is exceeded.

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

At the façade or at a patio. A specific height is not stated, usually 1,5 – 2 m above ground or each floor.

6. BASIS OF LIMIT VALUES

How were limit values established?

The guideline values have been through a formalized referral process before established.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

The laws and regulations are not translated in English.

- Government Bill 1996/97:53 Infrastructure Objectives for Future Transport
https://www.riksdagen.se/sv/dokument-lagar/dokument/proposition/infrastrukturinriktning-for-framtida-transporter_GK0353
- Regulation of Traffic noise by residential building
https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/forordning-2015216-om-trafikbuller-vid_sfs-2015-216

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

We have at present not taken a position on the WHO guidelines for Europe and their role in future national policy decisions.

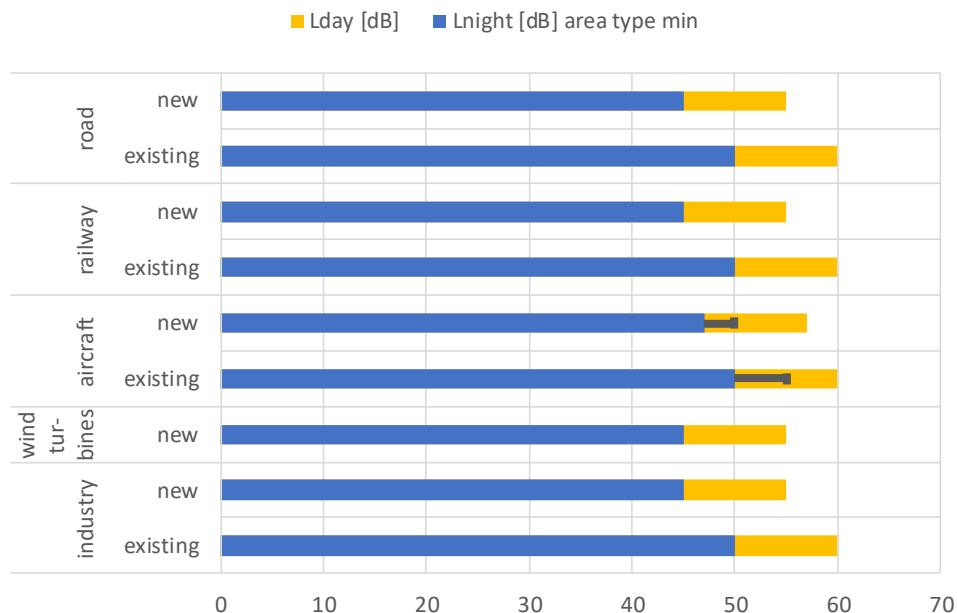
1. END THRESHOLDS vs. NATIONAL LIMITS

How does national legislation regarding environmental noise relate to threshold values set in the context of END action plans?

- There exists no national noise legislation apart from implementation of the END.
- Besides implementation of the END, there is other national noise legislation which is based on the END and uses the same limit values.
- The national noise legislation is separate from the END implementation and uses different limit values.
- Other, namely:

In the remainder of this document, all limit values refer to national legislation.

2. NOISE IMMISSION LIMIT VALUES AT RESIDENTIAL AREAS



Values apply to dwellings or residential areas only. Error bars indicate the range of values over different periods of the night (see question 3.a and 3.b).

3. LIMIT VALUES – METRICS

3.a) Please correct and supplement the above shown limit values where necessary.

Aircraft:

For aircraft noise the limit values are different for the different night hours:

22-23 hours: 50 dB(A) for new installation and 55 dB(A) for existing installation

23-24 hours: 47 dB(A) for new installation and 50 dB(A) for existing installation

Flight ban

05-06 hours: 47 dB(A) for new installation and 50 dB(A) for existing installation

Airports with only light aircrafts or heliports have different limit values, which are not shown here.

Wind turbines

All wind turbines are new installations.

3.b) Which metrics (L_{den} / L_{day} / L_{night} / other..) are used to define limit values? Please specify the metrics and corresponding time sequences.

Roads and railway:

L_{day} is the A-weighted equivalent sound level over time sequence 06:00 – 22:00.

L_{night} is the A-weighted equivalent sound level over time sequence 22:00 – 06:00.

Aircraft:

L_{day} is the A-weighted equivalent sound level over time sequence 06:00 – 22:00.

L_{night1} is the A-weighted equivalent sound level over time sequence 22:00 – 23:00.

L_{night2} is the A-weighted equivalent sound level over time sequence 23:00 – 24:00.

L_{night3} is the A-weighted equivalent sound level over time sequence 05:00 – 06:00.

Wind turbines and industry:

L_{day} is the A-weighted equivalent sound level over time sequence 07:00 – 19:00.

L_{night} is the A-weighted equivalent sound level over time sequence 19:00 – 07:00.

3.c) Are there any nuisance penalties and/or correction factors applied before sound levels are examined with respect to limit values?

Roads:

When a road doesn't have much traffic (less than 100 vehicles per hour), then there is a level correction K1 between 0 and -5.

Railway:

There is a rail bonus K1 of -5. When there is not a lot of traffic (less than 80 train journeys per day or night), then the rail bonus K1 is rising and between -5 and -15.

The level correction K2 for shunting noise is based on the frequency and audibility of all pulsating, tonal and screeching types of noise, and is equal to:

| Audibility of all types of noise | Frequency of all types of noise | | |
|----------------------------------|---------------------------------|------------|----------|
| | Seldom | Occasional | Frequent |
| Weak | 0 | 2 | 4 |
| Clear | 2 | 4 | 6 |
| Strong | 4 | 6 | 8 |

Industry and wind turbines:

Wind turbine noise is assessed as a sort of industry noise.

There is a penalty for industry noise of $K1 = 5$ and therefore also for wind turbine noise.

For some special noise sources within the perimeter of industrial installation, K1 is adapted as follows:

For heating, ventilation and air-conditioning systems K1 is 10 at night time. There is no malus for traffic ($K1=0$).

2, 4 or 6 nuisance penalty for tonal noise (K2) and for impulsive noise (K3), depending of the audibility of the noise at the point of exposure.

3.d) Please supplement any relevant additional information.

-

4. CONSEQUENCES

What are the consequences of exceeding a limit value? Please tick the boxes below, and enter additional information below the corresponding box.

| | prohibition | active noise measures (at source / transmission) | passive noise measures (at facade) | financial sanctions | non legally binding actions | none |
|---------------|--|---|--|--------------------------|-----------------------------------|--------------------------|
| road | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| rail | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| aircraft | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| wind turbines | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| industry | <input checked="" type="checkbox"/> Above limit values for existing installations, except of public or licensed installations | <input checked="" type="checkbox"/> public or licensed installations | <input checked="" type="checkbox"/> if active measures not cost-effective or impossible | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Exceeding the limit values has also spatial planning consequences.

5. POSITION OF ASSESSMENT

Where at the facade of a dwelling or apartment building are limit values examined?

In Switzerland, the position of assessment is in the middle of open windows of rooms sensitive to noise.

6. BASIS OF LIMIT VALUES

How were limit values established?

In Switzerland, limit values are based on dose-effect relationships obtained from surveys in Switzerland. They roughly correspond to 15-25% of people being highly annoyed.

7. MAIN LEGAL DOCUMENTS

What is/are the titles of or references to the most relevant laws/regulations? Can these be found on the internet in English, or do you have a digital document available for reference?

Noise Abatement Ordinance NAO: <https://www.admin.ch/opc/en/classified-compilation/19860372/index.html>

8. FURTHER COMMENTS

Please supplement any additional information regarding limit values in your country.

The Noise Abatement Ordinance is currently being revised. An update is planned for the next 3-4 years.

This may lead to changes in limit values and consequences with respect to the information above.