

# Advanced Approach to the Assessment of Road Traffic Noise in the Czech Republic

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In the field of noise, Environmental Section of Transport Research Centre (CDV) is specialised primarily in acoustical situation along roads, because road traffic has a dominant position among noise sources. For the purpose of the effective assessment and management of noise from the point of view of long-term noise burden, the research team is also concentrated on the assessment of noise burden of people affected by road traffic noise. For this purpose, the method for determination of the number of affected people at the national level was proposed. At present the method is being verified in the feasibility study in model localities, the outputs will be percentages of inhabitants in the Czech Republic affected by road traffic noise in particular 5-dB bands. The basic input data for noise calculations are data on traffic on the selected road network, the inputs and outputs are being processed in the environment of the software SoundPLAN that enables their adequate graphical presentation. The calibration of the calculation model is necessary for achieving correct results, thus calibration measurements are being realized on the chosen sites. The obtained results about noise burden from road traffic will enable to manage efficiently noise issues by the competent authorities.

## 1 Introduction

Traffic noise remains a major environmental problem, as transport demand continues to grow, and thus traffic noise reduction measures have the highest priority. The activities of the research team from Transport Research Centre (CDV), which relate to the effective assessment and management of road traffic noise, are presented. These activities should also contribute to improving the current noise situation.

## 2 Assessment of noise burden from road transport

### 2.1 Principles

The procedure for determination of the number of people exposed to road traffic noise is based on acquiring information on:

- acoustical situation in the vicinity of roads,
- numbers of inhabitants that live in the vicinity of roads and are exposed to road traffic noise.

Noise maps represent technical basis for acquiring information on acoustical situation described by defined noise indicators. From the point of view of the current legislation, the A-weighted equivalent sound pressure level  $L_{Aeq}$  [dB(A)] is the only obligatory indicator for the description of the acoustical situation.

The noise map can be used for the assessment of:

- the current, previous or predicted noise situation,

- exceeding the limit values,
- the estimated number of protected objects, which are exposed to specific values of the noise descriptor,
- the estimated number of people exposed to specific levels of the noise descriptor.

This fact relates also to the form of the noise maps. There are the following forms of the noise maps:

- areal noise maps – cover the whole area of the city or some its part,
- line noise maps – cover the area between the road and the first row of buildings along the road.

The choice of the map depends on the purpose, for which the maps was carried out.

In the presented project, the noise map of road transport in the town Bucovice was carried out by using the software LimA 5 version 4.27, the noise maps of road transport in the towns Kurim and Moravsky Krumlov were carried out by using the software SoundPLAN version 6.2.

SoundPLAN is the specialized comprehensive software, in the applied version for modelling noise from road traffic. It enables to evaluate and visualize conflict information in relation to the noise map (module Grid Noise Map Evaluation) and also the assessment of noise burden of inhabitants in buildings in relation to noise levels on facades (module Facade Noise Map).

## 2.2 Description

The proposed method has been developed for assessing noise burden of people from transport in the Czech Republic.

Based on the worked out typology of representatives, model localities in two following categories were selected for verification of the proposed method for determination of the number of people affected by road traffic noise. The considered categories are:

- municipalities over 10,000 inhabitants,
- municipalities up to 10,000 inhabitants.

The procedure and results are presented on the examples of the several following municipalities.

Calculations of noise levels on facades of the first row of dwellings are being done on the both sides of roads.

All calculations of the acoustical values in the vicinity of the selected road network refer to the height of 4.0 m above the ground and to the distance of 2.0 m from the most noise exposed facades of each dwelling.

Dwellings in the distance of 120 m on the both sides of roads were considered.

Data on the number of people who live in dwellings exposed to traffic noise can be acquired from:

- population statistics - the average occupancy rate per residential address,
- field survey in the model area,
- registration databases,
- electoral roll databases.

Numbers of people exposed to traffic noise in particular 5-dB bands are received by cumulative summarizing people living in all exposed dwellings.

## 3 Feasibility studies

### 3.1 Kurim

The proposal of the guideline for determination of the number of people affected by noise from road traffic is being verified simultaneously in municipalities up to 10,000 inhabitants. On the basis of prepared typology of modelled localities in the South Moravian Country, one of the localities chosen according to the specified parameters was the town Kurim.

Noise from road traffic is calculated for daytime (6-22 hrs). The input data for noise calculations are data on traffic on the selected road network. This network of the most important roads from the point of view of traffic is split into particular segments, calculations of noise levels on facades of dwellings are being done on

the both sides of roads. All calculations of the acoustical values in the vicinity of the selected road network refer to the height of 4.0 m above the terrain. The calibration of the calculation model is the necessary requirement for achieving correct calculation results, calibration measurements for this purpose were realized on the nine chosen sites (see Figure 1).

The measuring procedures correspond to the valid Czech method for the measurement of road traffic noise.

Traffic volume, percentages of particular categories of vehicles, climatic and topographical data were determined simultaneously on measuring sites during acoustical measurements. The acoustical data from the particular measuring sites in the town Kurim are summarized in Table 1.

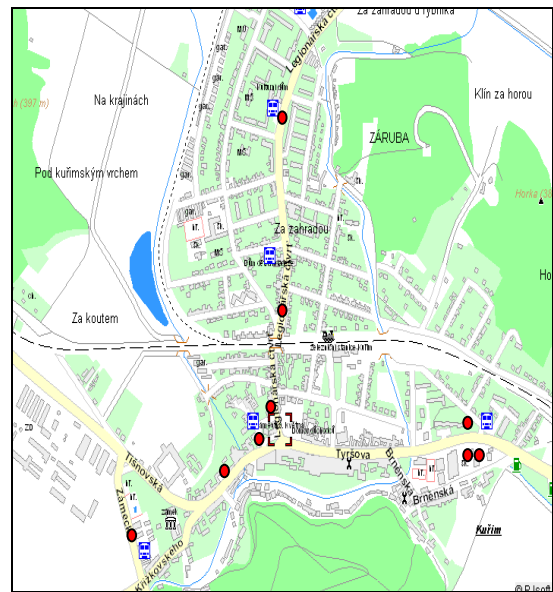


Figure 1: Measuring sites in the town Kurim

Table 1: Acoustical data from the measurement in Kurim

Measuring sites	Acoustical data [dB(A)]			Notes
	LAeq	MAX L	MIN L	
Tyrsova Street, No. 1217	62.5	81.5	47.7	side facade
Tyrsova Street, No. 1256	63.1	78.8	46.0	
Tyrsova Street, No. 1256	61.9	91.4	41.7	back facade
1. kvetna Square	75.5	101.3	51.2	
Legionarska Street, No. 182	71.1	96.1	48.7	
Otevrena Street,	68.6	84.2	44.5	

Measuring sites	Acoustical data [dB(A)]			Notes
	LAeq	MAX L	MIN L	
Zamecka Street, No. 959	63.8	83.7	47.2	
Tisnovska Street, No. 39	77.2	100.9	45.7	
Osvobozeni Square, No. 847	62.2	75.8	41.2	

**Results:**

Immision values of LAeq in particular calculation points represent basic data for noise map of road traffic. The calculation noise map of road traffic in the town Kurim is shown in Figure 2.

The immision values of LAeq of road traffic were calculated in 258 calculation points in the area of Kurim in the considered 120-m two-sided vicinity of the roads.

The brief overview of results is given in Table 2.

Table 2: Numbers of inhabitants affected by noise from road traffic in the area of Kurim

Decibel band of LAeq [dB]	50-55	55-60	60-65	65-70	≥70
Number of inhabitants	135	503	1152	425	448

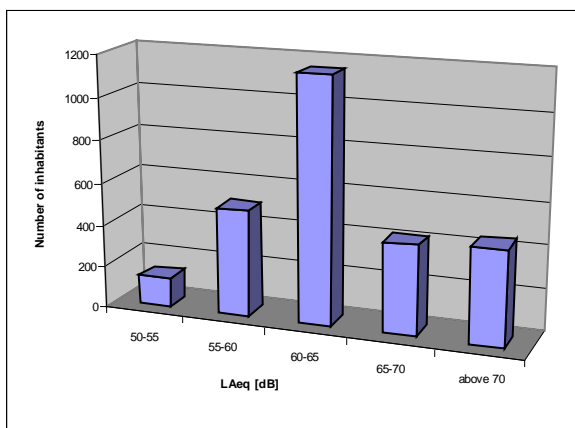


Figure 3: Share of population exposed to different road traffic noise levels in the area of Kurim

In the vicinity of the assessed roads 2,663 inhabitants of the town Kurim live (about 30 % of the total number). From the point of view of the health limits, it was concluded that:

- In the area of Kurim the largest number of inhabitants is exposed to immision values of LAeq 60-65 dB in the day-time period,

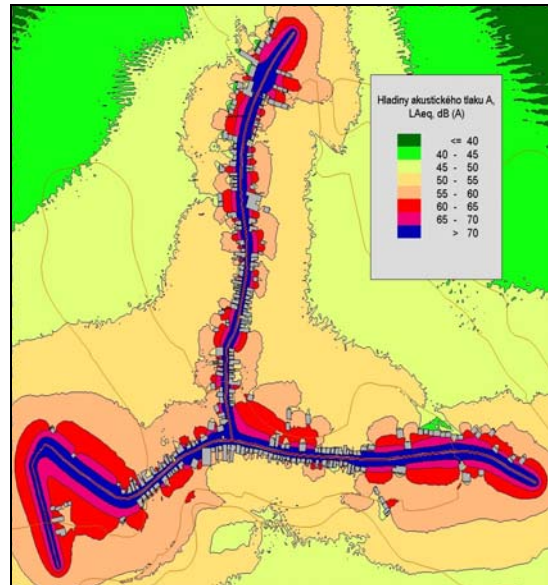


Figure 2: Noise map of Kurim

- In the area of Kurim 161 calculation points exist where the immision values of LAeq in the day-time period are higher than 70 dB, which is 64.4 % of the all calculated points, 448 inhabitants live there,
- There are 228 (91.2 %) calculation points where the immision values of LAeq in the day-time period are higher than 60 dB, 2,025 inhabitants of Kurim live there,
- It is assumed that the remaining inhabitants belong to the category under 50 dB.

**3.2 Bucovice**

In the frame of the proposed guideline for the assessment of the noise burden from road traffic, the model of the town Bucovice was also created.

The immision values of LAeq in 370 calculation points in the considered 120-m two-sided vicinity of the roads were the basic output data from the calculations of LAeq for the calculation noise map of road traffic.

The basic survey of calculated values of LAeq in 5-dB bands is presented in Table 3. In the vicinity of the assessed roads 1,483 inhabitants of the town Bucovice live (about 24 % of the total number). From the point of view of the health limits, it was concluded that:

- In the area of Bucovice 100 calculation points exist, where the immision values of LAeq in the

day-time period are higher than 70 dB, which is 44.86 % of the all calculated points, 349 inhabitants live there,

- There are 191 (83.78 %) calculation points where the immission values of LAeq in the day-time period are higher than 60 dB, 1,308 inhabitants of Bucovice live there,
- It is assumed that the remaining inhabitants belong to the category under 45 dB.

Table 3: Numbers of inhabitants affected by noise from road traffic in the area of Bucovice

Decibel band of LAeq [dB]	45	50	55	60	65	≥70
	-	-	-	-	-	-
	50	55	60	65	70	
Number of inhabitants	44	26	105	449	510	349

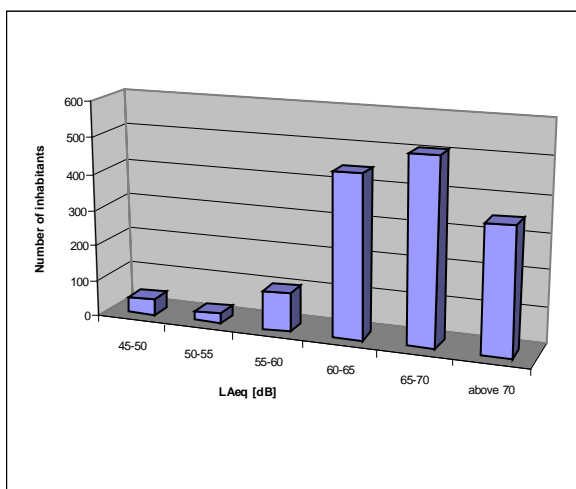


Figure 4: Share of population exposed to different road traffic noise levels in the area of Bucovice

### 3.3 Moravsky Krumlov

At present the 3-D model of the assessed area of Moravsky Krumlov is being created in the environment of the software SoundPLAN. In the following period in 2005 the model will be finalized and the calculation of noise levels on facades of buildings will be realized for the purpose of the assessment of the number of inhabitants affected by noise in particular 5-dB bands.

## 4 Summary

Based on the results from the previous years, the draft of the Guideline for the assessment of the noise burden from transport in the Czech Republic were formulated. The Guideline for the assessment of the noise burden from transport in the Czech Republic was being verified in the selected model localities (Kurim, Bucovice, Moravsky Krumlov). The results about noise burden from road traffic will enable to manage efficiently noise issues by the competent authorities.

## Acknowledgement

This research is supported by the Czech Ministry of Transport as research project CE 801 210 109.

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