NOISE MODELLING IN ESTONIA

Marko Ründva, Kadri-Piibe Luik

Insinööritoimisto Akukon Oy Estonian branch
Kiisa str 8, 11313 Tallinn, Estonia

ABSTRACT

As of 2004-2005, big-scale noise assessment in Estonia has been started and noise maps, in particular inside and around Tallinn, have been done. There are no official prediction methods set in Estonia and thus every consultant can follow their own best experience. As many consultants, road designers are from Scandinavian origin Nordic Prediction Methods are quite much used. Also Interim-methods mentioned in European Noise Directive are use by various consultants.
This paper describes some of the problems that comes from misunderstandings of how noise regulations should be implemented initial data for calculations interpreted and gives overview of some bigger projects.

1. INTRODUCTION

The aim of this paper is to describe environmental noise related legislation of Estonia, give overview about most commonly used prediction methods; point out main problems related to noise assessment and possible solutions for these. In addition a short summary on realized noise assessment projects will be given.

2. LEGISLATION

2.1. Legislation

The main (and only) legislative document about environmental noise limits has been published by Ministry of the Social Affairs in 2002. The document is called: Act no. 42 of Ministry of the Social Affairs from 4th March 2002 *"Müra normtasemed elu- ja puhkealal, elamutes ning ühiskasutusega hoonetes ja mürataseme mõõtmise meetodid"*, which describes normative noise levels outdoors and indoors, and sets methods for environmental noise level measurements. In this document target, limit and critical values of environmental noise are determined. The levels are calculated or measured equivalent sound levels L_{Aeq} which are corrected, if applicable, with level adjustments relating to the character of the noise. Adjustments of +5 dB are specified for noises which are tonal or impulsive in character.
The Act defines three types of levels:

- Target level is a sound level which generally does not cause annoyance and represents good acoustical conditions.
- Limit value is a sound level the exceeding of which may cause annoyance and which generally represents sufficient (acceptable) acoustical conditions.
- Critical level is a sound level which causes strong annoyance and represents unsatisfactory noise situation.

Critical levels have been set for traffic and industrial noise. These values are used for assessing existing situations nearby external noise sources. The construction of new noise sensitive buildings to areas where critical values prevail is generally forbidden.
The normative values are compared with rating levels during day and night periods and rating levels should not exceed normative values. The reference time intervals are:

- daytime 07–23 (including evening 19–23)
- night-time 23–07.

Always for area under assessment suitable land-use category based on the classification in general planning of local municipality shall be determined, as the normative values depend from land-use. There are altogether four categories:

I: recreational area in national parks

II: residential area, kindergartens, schools, hospitals, recreational areas and parks in towns

III: mixed area (residential and office buildings, shops, service and production companies)

IV: industrial area

In addition the values vary for existing situation and for a new site.

The different normative values for environmental noise are given in table 1.

	I category		II category		III category		IV category	
	day	night	day	night	Day	night	day	night
Target levels – new planned area								
Traffic noise	50	40	55	45	60	50	65	55
Industrial noise	45	35	50	40	55	45	65	55
Target levels – existing area								
Traffic noise	55	45	60	50	60 65[1]	50 55[1]	70	60
Industrial noise	50	40	55	40	60	45	65	55
Limit values								
Traffic noise —"— noisy facade[1]	55	50	60 65	55 60	65 70	55 60	75	65
Industrial noise	55	40	60	45	65 60[2]	50 45[2]	70	60
Critical levels								
Traffic noise	65	60	70	65	75	65	80	70
Industrial noise	60	50	65	55	70	55	75	65

1 - allowed on the noisy side of a noise-sensitive building (facing road or railway)

2 – normative value in case of noise abatement measures

Table 1. *Normative levels for environmental noise, L_{Aeq} (dB).*

As can be seen the normative value requirements for industrial noise are stricter than the requirements for traffic noise.
The maximum noise levels L_{Amax} are assessed in relation to single noise events of traffic. The maximum noise levels should not exceed 85 dB during daytime and 75 dB during night-time.

There are no requirements stated for wind farms (rapidly growing business segment in Estonia) and military noise (shooting fields of Ministry of Defence), so consultants are comparing these against normative values of industrial noise.

2.2. Authorities

There are several official bodies who have right to ask for a noise assessment: local municipality (or its Environmental Department), Health Protection Inspectorate, Road Administration, Ministry of the Environment and its local departments. So it is hard to predict which body will make the requirement and in which stage of the project.
Usually noise assessment reports are demanded by officials in following cases:

- new general, detailed plans in towns;
- new detail plans close to busy streets or roads, railways;
- design or reconstruction design of new roads;
- EIA.

The noise assessment results can be presented as noise maps or noise levels can be calculated based on some known formula and presented as a table. Also the noise levels could be measured, if possible, and measurement report presented. Still the calculation approach including noise maps is more preferred by the authorities.

3. PREDICTION AND MEASUREMENT METHODS, NOISE MAPPING

There is no prediction methods set in legislation how road traffic and railway traffic noise should be calculated. There is one formula given in Estonian standard EVS 843:2003 *Linnatänavad* (Town streets) meant for road design is towns, which gives you L_{Aeq} at 7.5 m distance from edge of a road and 1.5 m high.
In the Act no. 42 of Ministry of the Social Affairs specifies two Nordtest measurement methods for road traffic and railway traffic noise measurements (Nordtest Method - NT ACOU 056 Road Traffic*:* Measurement of noise immission – Survey method, 2001 and Nordtest Method – NT ACOU 098 Railway Traffic: Noise, 1997). In clause “field of application” it is mentioned that these measurements should give same results than calculated according to Nordic Prediction Methods. This is a link between the Act and Nordic Prediction Methods.
Some consultants/authorities use the interim computation methods for road and railway traffic noise (NMPB-Routes-96 and RMR), set in Directive 2002/49/EC of the European Parliament and of the Council (the European Noise Directive) after Estonia implemented the European Noise Directive, although the interim methods have been meant for strategic noise mapping and the aim was to have equivalent strategic noise maps in all Member States of EU. Other consultants use Nordic computation methods (Road Traffic Noise - Nordic Prediction Method. TemaNord 1996:525 and Railway Traffic Noise – Nordic Prediction Method. TemaNord 1996:524).
There are view consultants who use Russian SNIP, German DIN calculation formulas or even active formulas found in Internet.
Modern time noise mapping is a new tool in Estonia and has been used last 3-4 years for noise assessment. Mainly road and railway traffic noise levels are calculated; there are quite few noise maps made for industrial noise sources (harbours, rail yard, shooting fields). This can be explained by lack of experience, know-how and equipment for determing noise emissions of industrial noise sources.
The main software used for noise mapping are CadnaA and Soundplan, IMMI is less used.

4. PROBLEMS AND SOLUTIONS

4.1. Problems

After the Act has been in use for 6 years, several items have been discovered which are causing misunderstanding, misinterpretation and questions, while noise assessment reports are prepared or evaluated by the officials.

4.1.1. Prediction methods

As described before, various Estonian consultants and officials use different prediction methods: Nordic, Interim, German, DIN, Russian SNIP, etc; it is hard to estimate which is more accurate or better, but such variety can not be accepted in a small country.

4.1.2. Road traffic data

For roads Estonian Road Administration organizes regular yearly counts and so 24 h traffic flow counts, flow deviation over 24 h and % of heavy traffic are known and can be used for noise calculations. Such detailed information is missing for towns. For big towns (Tallinn, Tartu) only peak hour traffic flow values do exist. Suggestion by Good Practice Guide for strategic noise mapping and other literature suggest peak h traffic flow x10 for 24 h period. The question is how to divide so calculated 24 h traffic flow backwards for day, evening and night periods for different road types to have reliable data. Different consultants use different deviation. Depending from assumption it might lead for some streets to high counts and for some streets to low counts, giving respectively too high or low equivalent noise level values (especially important for determing night-time noise levels). Mostly 10% is used for heavy traffic percentage from total traffic flow if no accurate information is available, which will most likely lead to overestimating L_{Aeq} levels.
Most commonly speed limits are used, but some have tried to measure/estimate average speed. In city centre using a speed limit of 50 km/h will lead to overestimating as the average speed over day/evening period is lower.

4.1.3. Railway traffic data

The main problem related to railway traffic noise calculation is that there is now proven/valid emission data about passenger and freight trains moving on Estonian railways. Some measurements have been performed by Physics Laboratory of Health Protection Inspectorate, but data as given as single number values TEL, SEL, pass-by L_{Aeq}, L_{Amax}, L_{AE} which cannot be used as such in Nordic or Interim prediction methods as they require more detailed information for creating/inserting a new train type. It still gives possibility to find similar train from train library of software based on these values. Also correction values for track quality have not been determined; this is important factor as big part of the tracks are not the best quality.
There is no clear instruction which traffic flow should be used for freight trains, as the number of freight trains has dropped remarkably (3-4 times) over the last 2 years. Especially it is critical for future noise situation predictions. There has been cases where authorities have not accepted noise assessments, although real statistics from previous year obtained from Estonian Railway has been used for noise calculations (considered as too low values).

4.1.4. Summary

The main conclusion is that consultants shall make very many decisions and assumptions during noise assessment based on their experience, which definitely influence the calculated end-result. It is of course normal that consultant shall make decisions, but there are too many open items to decide currently in Estonia.

If the decisions would be different, the result would be different as well. All above-given leads to current situation where everyone does what he thinks is the best or suitable for the client, as there are no rules what prediction methods shall be used and how the initial data shall be handled; at the moment the authorities face a question who's calculations are more correct and could be trusted.

There has been cases where real estate developers / planners have asked for 2nd, 3rd calculation from different consultants to get most "suitable" (=lower) sound levels for the projects; mainly it happens if there is a risk that local authority might make a requirement for noise abatement or reduce number of buildings.

4.2. Solutions and plans

For improving the existing situation in Estonia following steps shall be executed in the new future, otherwise the noise assessment, as such, will loose its reliability (there are quite many comments already now from public about credibility of noise maps).

- prediction methods for various noise sources to be fixed or limited to some selection (until harmonized methods published);
- study for traffic flow deviation on different street types;
- noise emissions of three most common train types shall be measured according to agreed method(s) and information made public, so same data could be used by consultants.

Due to above given there is a plan to make a guideline (similar to Good Practice Guide for strategic noise mapping) how data for initial noise calculations shall be handled. It would mean that everyone will do the same "mistake" – but results will be comparable. In the Ministry of Environment is under preparation a legislative document about planning procedures related to environmental noise and how noise shall be assessed. Ministry of Defence has shown initiative for establishing normative values for military noise.

5. PROJECTS

Despite of given problems quite many big-scale noise assessment projects has been performed over the past few years in Estonia. Below the biggest realized or going projects have been listed.

- Strategic noise map of Tallinn
- Strategic noise map action planning of Tallinn
- Strategic noise map of major roads (~11 km)
- Strategic noise map action planning of major roads
- Noise assessment as part of EIA in reconstruction design of roads – in all main roads of Estonia, biggest project Tallinn Ring road (~65 km)
- Military shooting fields (4 big scale projects)
- Tallinn Old Harbour

6. CONCLUSION

Noise mapping in Estonia has short history, but during this time quite much has been performed and experience gained. There are some problems caused by the legislation, which should be fixed to make different noise assessment comparable and end-results more reliable. Still wider education of public is needed related to noise matters.