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Using planning guidelines as a tool to achieve good soundscapes for residents

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ABSTRACT

This paper will deal with the sound environment in existing or planned new residences as seen from the point of view of the dweller. We will concentrate on the experience of the parts of the soundscape that comes from outdoor sources. The emphasis will be on regulations that can be managed in a predictable way.

Current Norwegian regulations are taken as an example as a possible basis for a soundscape approach to planning good residences. These regulations for new projects have requirements for permissible equivalent and maximal indoor noise from outdoor sources. The regulations are about noise, but a wise use of planning guidelines and regulations should give good ways to achieve a satisfactory soundscape.

There are also regulations giving limits for outdoor areas in the immediate vicinity of the apartment. Local authorities will decide whether private or common areas should be required, or if nearby parks or other suitable public outdoor spaces can be accepted.

1. INTRODUCTION

Much work has been made on the sonic environment in settings like national parks, recreational areas, urban parks etc. However, the fact remains that people spend by far the most of their time in or in the immediate vicinity of their homes. And so it seems reasonable that a great gain in perceived soundscape could be achieved by focusing on the situation in and around people's homes. In Norway there's both a planning guideline called T-1442[1] and a Norwegian standard[2] for acoustic conditions in buildings to ascertain the inclusion of noise considerations in all new planning. The main hypothesis for this paper is as follows:

Reduction of community noise in and around the home leads to a better perceived soundscape.

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2. SCOPE OF THE PLANNING GUIDELINE T-1442

The planning guide T-1442 is to be used for planning purposes. It gives guidelines for planning and zoning in the vicinity of the following type of noise sources:

Roads
Railways including trams and subways
Airports
Industrial plants
Harbors and terminals
Shooting ranges for light weapons
Motor sport and exercise fields
Windmills

Guidelines for noise from construction activity are included as well.

The requirements are given as yellow and red zones around a noise source. The yellow zone can be used for new construction if satisfactory conditions can be achieved. The red zone should not be used for new houses, noise sensitive buildings should only be put up if the area is defined as a center area.

3. SCOPE OF THE NS 8715

The NS 8175, "Acoustic conditions in buildings. Sound classification of various types of building" gives requirements for 4 different classes, A ,B, C and D. Class A and B represent buildings with good acoustic conditions, class C is effectively the Norwegian Building Code. Class D is an alternative for rehabilitation projects when upgrading to current requirements is not possible. For residences, the NS 8715 gives requirements for the following parameters:

Insulation against airborne sound from neighbors
Impact sound from neighbors
Reverberation time in shared areas in the building
Indoor sound levels from technical installations in the building
Indoor sound levels from outdoor sources
Sound levels on outdoor spaces and outside windows

4. REQUIREMENTS FOR OUTDOOR LEVELS

There are regulations giving limits for outdoor areas in the immediate vicinity of the apartment. Local authorities will decide whether private or shared areas should be required, or if nearby parks or other suitable public outdoor spaces can be accepted.

A private outdoor space is defined as an area for exclusive use by a single household.
A shared outdoor space is defined as a shared outdoor area for a building or a project.
A public outdoor space is freely available to the public.

The requirements vary for different noise sources. The two most important sources in Norway are road and rail traffic noise. The requirements for these sources are as follows:

Noise source	Noise level on outdoor areas and outside noise sensitive rooms	Noise level outside bedroom at night, 11 pm – 7 am
Road	55 L_{den}	70 L_{5AF}
Railway	58 L_{den}	75 L_{5AF}

The requirements for outdoor levels are given in different metrics than the requirements for indoor levels.

5. REQUIREMENTS FOR INDOOR LEVELS

It seems a reasonable assumption that quieter is better. Current Norwegian regulations for new projects have the following requirements for indoor noise from outdoor sources:

L_{Aeq}, 24h $\leq$ 30 dB for living rooms, kitchens and bedrooms
This requirement is usually critical when road traffic is the main noise source.

L_{Amax}, night $\leq$ 45 dB in bedrooms if there are normally more than 10 events per night.
The maximal level requirement is usually critical for houses very close to railway lines.

6. A PRACTICAL EXAMPLE

The following example is a new residential project on a site exposed to railway and road traffic noise. As this is given as a general example, there are no details given beyond those required to show the procedure. The calculations were made with Soundplan. Calculations are made according to the Nordic methods for road traffic noise[3] and railbound noise[4]. Indoor levels were originally calculated according to the Norwegian method for indoor noise from outdoor sources.[5].

For this project, four situations were considered:

1. Outdoor level on the ground, shared outdoor area
2. Outdoor level on balconies, private outdoor area
3. Outdoor level on façade, used to predict indoor levels
4. Indoor levels in the rooms where people spend their time

6.1 Outdoor level on the ground, total L_{den}

These outdoor levels are calculated as L_{den}, free field values, at a height of 2 meters above ground level. This describes the noise situation on the shared outdoor areas of the project.

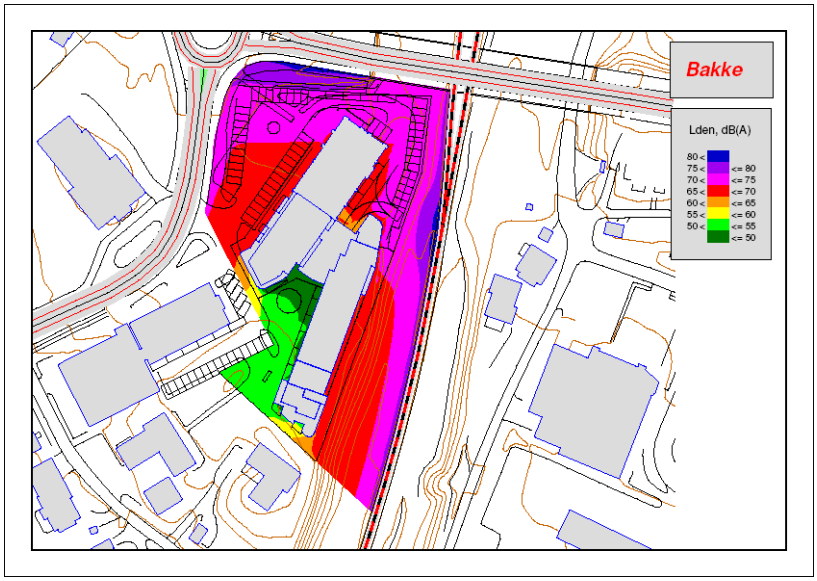

Figure 1: Noise levels on the ground, given as L_{den}

6.2 Outdoor level on balcony

These levels are shown as a noise map. The noise levels on the private balcony of each apartment are quite high, and so local authorities will need to decide whether shared outdoor areas is an acceptable solution.

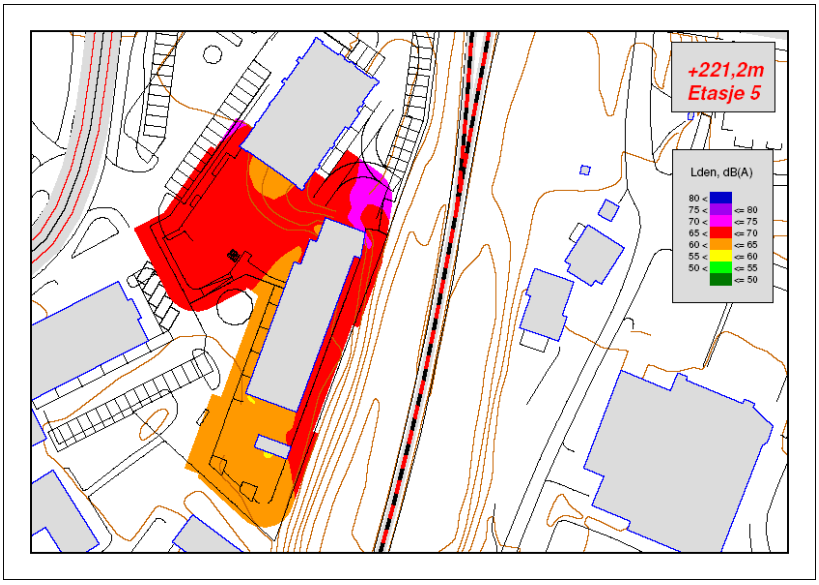

Figure 2: Noise levels on level 5, given as L_{den}

6.3 Outdoor levels on the façade

The levels below are given as L_{Aeq}, 24 h. They are used primarily to calculate indoor equivalent levels for bedrooms, living rooms and kitchens.

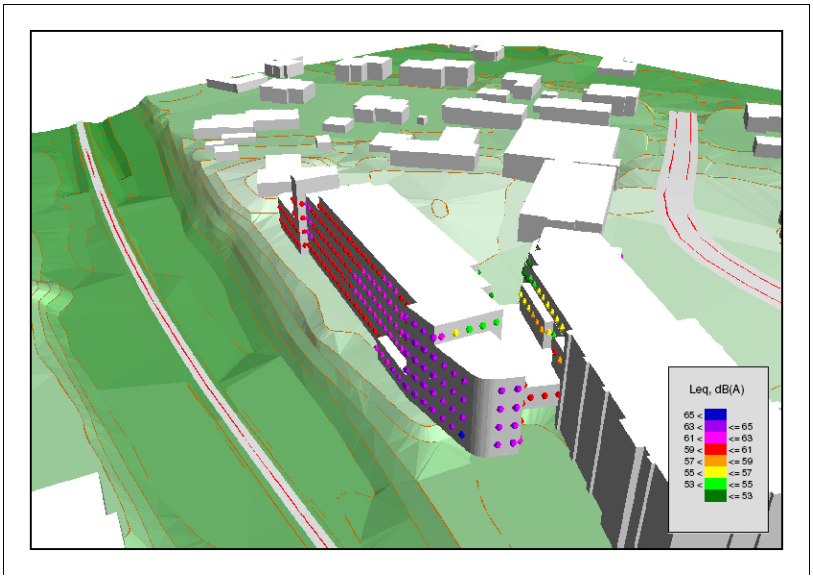

Figure 3: Noise levels on façade, given as L_{Aeq},24h

Maximal levels must also be calculated to be used for evaluation of maximal indoor levels in bedrooms.

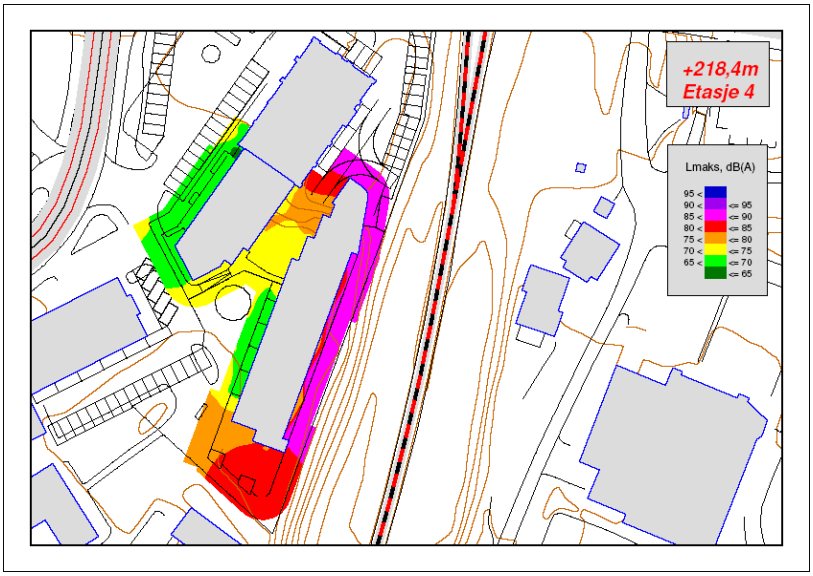

Figure 4, noise levels on façade, given as L_{Amax}

6.4 Indoor levels

The indoor level was originally calculated using the ordinary Norwegian calculation method for indoor noise[5]. As the sound insulation on the façade facing the railway was extremely critical for the project, it was decided to build two full-scale mockup walls. The test wall with the best results was tested again with two different types of window.

These calculations and tests showed that the requirements for indoor levels could be met.

7. CONCLUSIONS

An example has been shown of a typical example of how requirements are handled in Norway. It's submitted that the approach of considering noise levels on public, shared and private outdoor areas as well as indoor noise levels is a good way of achieving a good soundscape in and around residences.

ACKNOWLEDGMENTS

My sincere thanks go to all the other participants in group 5 during the Soundscape Symposium in Berlin in January this year for fresh ideas and inspiration from our discussions. It's also gratefully acknowledged that the calculations of the outdoor noise for this project were made by my colleague Lars Nordin.

REFERENCES

[1] T-1442, Retningslinje for behandling av støy i arealplanlegging. (in Norwegian only), guidelines for handling of noise in planning

[2] NS 8175:2008, Acoustic conditions in buildings. Sound classification of various types of buildings.

[3] Railway traffic noise - Nordic Prediction Method, TemaNord 1996:254. Nordic Council of Ministers, Copenhagen 1996

[4] Road traffic noise - Nordic Prediction Method, TemaNord 1996:254. Nordic Council of Ministers, Copenhagen 1996

[5] Handbook 47, Isolering mot utendørs støy (in Norwegian, only short summary in English), calculation method for insulation against external noise together with data for sound insulation