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Experiences of implementation of Soundscapes in Policies

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ABSTRACT

Noise is difficult to manage from the political side. The reason is that there is no technological fix available on the source side and that the discrepancy between the existing situation and the desired one is so great. When discussing policy results, it is necessary to distinguish between the local level, the national public agency level (non-departmental public body), the national political level and the EU/international level. The results from our research program has strongly influenced the public agency level in Sweden, but less the national political level. Access to a "quiet side" has become an important element in the planning when the noise level at the directly exposed side of dwellings does not fulfill the national guideline value, which is $L_{Aeq,24h}$ free field < 55 dB. A clear definition of the concept has also been set ($L_{eq,24h} < 45$ dB free field with the relation $+3$ dB 2 m from facade wall and $+6$ dB at the facade wall). From the agency level, revised formulations of the national environmental goals have also been proposed as a result of our research results. On the EU level, in the Directive 2002/49/EC, (END), the concepts quiet areas and "quiet facades" have been introduced and should be part of the national reports to the Commission. Also, results from our research have been important in position papers from the working groups linked to END.

1 INTRODUCTION

The mission of the Swedish Foundation for Strategic Environmental Research, MISTRA, is to support such research, the result of which could be implemented in a time perspective of 10 – 20 years. One important instrument to get this happen is therefore to influence legislation on different levels. In the goals for the research program "soundscape support to health" [1], this was expressed as follows: To achieve that policies, directives, requirements, etc. within the environmental field are effective in improving health and well-being, taking the results of the soundscape research program into account.

This would then be done through a number of activities on different levels, the most important being:

(1) Participation in and proposals to working groups and seminars organized by Swedish National, regional and local administrations aiming at developing guidelines, ordinances, etc. such that these promote health and well-being based noise abatement using the results of the program.

(2) Working on proposals for a revised Swedish standard on acoustic classification of dwellings.

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(3) Participation in and proposals to EU steering committee of the EU Directive 2002/49/EC, [2], and in working groups linked to the implementation work for the Directive.

(4) Establish contacts with other agencies of relevance for the work.

The fourth point esp. concerns the experiences from the emission side. Our research program primarily concerns measures on the immission side. However, during the work it has become clear that there is an unbalance between the emissions, which are determined by internationally agreed requirements on road vehicles and tyres and the properties of the road surfaces, and possibilities to achieve reasonable immission levels through planning and building designs in areas with dense traffic. Road vehicles in ordinary traffic are too noisy to be compatible with a sustainable development. This has led to some studies of the emission side.

In the following, the experiences from efforts to influence different decision levels will be discussed. The clearest result is that the concept of and importance of access to a quiet side of a dwelling is now well understood on the Swedish national and local level. An agreement of its definition has been reached and quiet sides have become important elements in the planning. The wider concept soundscape is not yet much discussed in policies.

2 GENERAL EXPERIENCES

There are a number of difficulties with noise policies which contribute to making progress slow. A basic difficulty is that there exists no single technological fix that could solve the problem, neither on the emission side nor on the immission side. The noise source in itself, the individual vehicle, is very complex. The environmental noise problem is then caused by a lot of individual vehicles in a complex traffic system. To reduce the emissions, several actors must be involved; the vehicle manufacturer, the tyre manufacturer and the road owner who is responsible for the road surfaces and the traffic management. Also, we do not yet have the technology to reduce the emissions so much that measures in town planning and building design to reduce the immissions would be unnecessary. Instead, to solve the traffic noise problems demands participation from a number of parties on the emission side and very insightful and competent acoustic planning of the city, including traffic planning, town planning, building design and building construction. In addition, the force of the motorism is impressive and the industrial actors have effective lobbying organizations who do their job well. There is no noticeable lobbying on the immission side – from or for the citizens who suffer from the immissions (and who themselves in their role as travelers contribute to the emissions).

The citizens' cause is mainly pleaded by the politicians. For the politicians, noise is not primarily unwanted sound but above all a very unwanted issue. On the political side, on all levels, there are conflicts between those who are responsible for the environment and those who are responsible for other aspects of the development of the city.

A further complication is the time perspective to bring about a real change. No drastic change is possible in the short time perspective except on the immission side where mitigation measures can improve a local situation immediately. However, to renew a whole city takes several decades. Due to these circumstances and the general lack of understanding of the complex technical problem and the health effects, the environmental noise issue is seldom given high priority on the political agenda except on the local community level.

There does not exist any legal limit values on the immission side that must not be exceeded except in a few cases for indoor noise with closed windows. In general, we only have guideline values. These are often more ambitious for new buildings than for existing ones. The legislation is often rather weak and the guideline values are often exceeded. The guidelines are mainly the headache of local politicians and therefore the application is much

dependent upon their ambitions. What is said above is to a high degree based on experiences from Sweden, but it seems to be similar in many other countries.

Also the emission side is complicated. There are agreed limit values for vehicles and tyres set by the international body United Nations Economic Commission for Europe, UNECE. These limits are such, that they cause industry very minor efforts to fulfill. The emission question is the responsibility for persons on the national and international level, but they do not care much about the noise problem. Stricter emission limits require certain lead times for the industry to adopt, are taken in small steps (if taken at all) and do not lead to noticeable reductions of LAeq-levels until almost all old products (vehicles, tyres) have disappeared from the traffic. In total, this means a delay time of the order 5 to 10 typical election periods for politicians. By that time, the traffic may have increased so much that it compensates for the noise reduction of the individual vehicles.

The existing noise situation is far from being compatible with a sustainable development. The immission goals, when expressed, are surprisingly similar in different regions of the world. The gap between the goals and the actual noise level in many existing situations, however, differ and can be up to 30 dB; in Europe typically 10 – 20 dB. See e. g. [3], [4]. But maybe the political interest will have to increase now that the first noise mapping of major cities in EU according to the END [2] soon shall be completed.

3 IMPLEMENTATION IN SWEDISH POLICIES

3.1 History

Environmental noise has been an issue in Swedish policy since long time. However, progress has been slow and the real political decisions have been weak. A long-term goal of LAeq24h < 55 dB (free field value) outside dwellings goes back to the 60'ies. It is worth mentioning that originally it was set as a technical/economic compromise. It was not until 1997 that the Swedish parliament took a formal decision on guideline values. For road traffic noise, these guideline values are for dwellings:

	LAeq,24h dB	LAmix dB
Outdoor	55	70
Indoor	30	
Indoor, night		45

For railways, the guideline value is 60 dB outdoors in the dwelling area in general, but 55 dB shall apply for outdoor "sitting areas".

Observe that they are guidelines and not limits. They should, however, be fulfilled for all new dwellings and they should also be applied when major changes are undertaken in the traffic system. In existing situations the traffic noise levels in Swedish cities are not much different from those in many other European cities of comparable size. But also in new projects, the guideline values often get exceeded.

Reduction of the environmental noise is also part of one of the Swedish National Environmental Goals, "Good built environment", decided by the Parliament in 1998. These goals are ambitious and cover the wide environmental field; water, air, biodiversity, etc. The goal expressed by the Parliament is that all should be fulfilled in 2020. For noise, which is part of a goal called "Good built environment", the ambition is very high: "No citizen should be exposed to noise disturbances"!

Medium term goals for the year 2010 have also been formulated. For noise it is a very minor step considering the ambitions for 2020: By the year 2010, the number of persons who

are exposed to traffic noise above the guideline values shall be decreased by 5 % compared to the situation in 1998. The interpretation of this formulation is that it refers to the indoor value only; $L_{Aeq,24h} < 30$ dB and $L_{Amax} < 45$ dB. The reason for this might be to allow for improved facade insulation as a sufficient mitigation method in many practical situations. It is obvious that the noise goal for 2020 will not be reached. In fact, the ambitious goal for 2020 is impossible to reach.

3.2 Recent Swedish planning guidelines

Among the public agencies, it is the Swedish Board of Housing, Building and Planning, which has the primary task to follow up the development towards reaching the national goal “Good built environment”, report to the government and suggest which measures that should be taken. The results from our research program has had a substantial influence upon this board’s reports to the government and its proposals concerning the practical handling of the environment noise question in the planning. The importance of access to a quiet side when the directly exposed façade has levels above 55 dB has been emphasized. The definition of what is meant by a quiet side is in agreement with our results. The board’s proposals concerning improved formulations of medium and long-term goals have been made in close cooperation with our research group. All these steps have improved and strengthened the handling of the environment noise question in the planning process.

Recently, the Board has circulated a draft proposal on how to handle noise in all new planning which summarizes and confirms the last years’ discussions. [5].

The general rule is that the guideline values should be fulfilled. Under all circumstances, the indoor levels have to comply with the guidelines. Expected traffic increases must be taken into account. The outdoor levels may be exceeded under specified conditions concerning the planning situation: need for dwellings, compacting of the city (which is expected to decrease the transportation needs), closeness to public transportation, etc.

If the outdoor level lies in the interval 55-60 dB, dwellings may in general be allowed if each dwelling also has a quiet side or at least a “sound attenuated side”. Only exceptionally, new dwellings may be allowed if the outdoor level exceeds 60 dB but not 65 dB, with the same demand for a quiet or a sound attenuated side. Such exceptions demand extra good sound insulation of the dwellings. Reference is here made to the Swedish standard for acoustic classification of dwellings. See below. An action plan concerning compensating measures must be shown. The consequences must be well described with an emphasis on health effects.

A quiet side means that the free field level, $L_{eq,24h}$, is below 45 dB with the relations +3 dB 2m from any façade wall and +6 dB at the façade wall. A “sound attenuated side” requires a free field level below 50 dB. A quiet side, as well as a sound attenuated side, should further be attractive also visually. It is pointed out that it is difficult to predict the sound level on the quiet side correctly. Follow up programs are important.

It is emphasized, that these specified conditions make it impossible to build one-sided dwellings facing a busy street.

In the report, also the concept “soundscape” is introduced. The importance of the acoustic conditions in a wider neighborhood is discussed in qualitative terms.

It is esp. important that the concept “quiet side” has been precisely defined. Before that definition was agreed upon and clarified, we observed several attempts to get approval to plans arguing that the dwellings had a quiet side; also when that side did far from comply with reasonable demands on quietness or attractiveness.

The reports from the Swedish Board of Housing, Building and Planning has had a substantial influence on planning and renewal projects in Swedish communities.

Several national agencies have also cooperated for defining guideline values appropriate for quiet outdoor areas, ranging from wilderness areas to city parks. Our research on soundscapes in city parks [6], [7] has had a substantial influence on the suggested guidelines [8].

3.3 The Swedish classification standard

In Sweden we have a standard for acoustic classification of dwellings. [9] The standard has four classes, A–D. Class C is identical with the minimum requirements for new dwellings. Class A represents a very high acoustic quality.

In its latest version, published in 2004, the requirements on outdoor levels are clearly formulated. To fulfill class C, the free-field level outside all windows shall in general be $L_{Aeq,24h} < 55$ dB. Exceptions are accepted but then the dwellings must have a quiet side, defined in principle as in section 3.3 above.

4 IMPLEMENTATION IN EU POLICIES

The most important expression for EU's environmental noise policy is the Directive 2002/49/EC on the assessment and management of environmental noise, END. Its background is the shortcomings of noise abatement through emission legislation only. EU's general policy to solve environmental problems has been through emission legislation, but that does not work for environmental noise, esp. not traffic noise. Cf section 2 above.

We have participated both in the Steering Committee for the Directive as representatives for Sweden, and its predecessor, an ad hoc Committee for the preparation of the directive and in a number of the working groups linked to the Directive. What is written in the Directive about quiet areas and quiet facades is strongly influenced by proposals from Sweden. However, in the late political process just preceding its adoption and release, the "quiet facades" were moved from the main text to an annex (Annex VI) and the formulations were weakened. The requirement upon maximum noise in a quiet area within an agglomeration is not specified in the END but left to the MS.

It should also be remarked that the definition in the END of a quiet façade (in Annex VI) requires a noise level being more than 20 dB lower than that at the exposed side. By the time that definition was set, data on real levels on shielded sides in urban areas were sparse. Our experience from the research program is that this 20 dB criterion is very difficult to meet. Many prediction programs certainly give calculated values that fulfill the criterion. However, today with a better data base from measurements it has become clear that real level differences between exposed and quiet sides of buildings in cities are often substantially less due to the diffuse noise field in the air above the buildings caused by the emissions from the traffic in a vast urban area. [10]

Results from the research program have also been included in the working groups' position papers on annoyance and sleep disturbance.

The Directive "shall also aim at providing a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles...". Unfortunately, the EU DG Environment has left this task to the DG Enterprise, whose main task is to promote free flow of goods between member states. DG Enterprise's interest in the environment appears to be very minor.

5 EXPERIENCES ON THE EMISSION SIDE

As mentioned in the Introduction, we have also studied the possibilities to decrease the emissions. The background is the unbalance between the emissions from the ordinary traffic and the possibilities to achieve reasonable immissions through planning and building designs

even with optimal use of measures on the immission side. Considering actual traffic noise levels in cities, it appears that a general emission reduction of 5 dB would make a great difference in the possibilities for a sustainable development in the renewal of the city. It would be of still greater importance in many highly exposed existing situations where renewal lies in a more remote future. In many of these cases, the demand for emission reductions is much higher. A reduction of 10 dB would, however, be sufficient in many cases.

In a pilot study [11], we have investigated the technical potential to reduce the noise emissions from road traffic and its policy implications. The findings of the report is that 5 dB(A) emission reduction can be achieved by utilizing technology available today. In order to reach 10 dB, research and development is needed on tyres and road surfaces.

Already a reduction of 5 dB of the traffic noise emissions requires actions by each of the main actors; the vehicle manufacturer, the tyre manufacturer and the road owner. This is true both at low and high speeds. The noise limits for vehicles and tyres are set by the United Nations Economic Commission for Europe, UNECE, in their regulations 51 and 117. The technical group on noise within UNECE is GRB under Working Party 29, responsible for the harmonization of the requirements on road vehicles. We have the tools in the form of relevant technical test methods for vehicles, tyres and road surfaces and good knowledge about lower noise technology. It is, however, evident that the political process towards sufficiently sharp noise limits within UNECE is very slow. Instead of being technology driving, the noise limits are slowly technology following. The coordination between the three parties (vehicle manufacturers, tyre manufacturers and road owners) needs to be much improved.

Our efforts to influence the emission side has been taken up by the Swedish Board of Housing, Building and Planning in their reports to the government. The Board points at the necessity to decrease the emissions by more effective legislation. Our experiences on the emission side is that this is not easy. However, if the process towards lower noise technology is not speeded up within UNECE and among the road owners, the traffic noise situation will rather continue to get worse than better at all during the next 10 to 20 years.

6 CONCLUSIONS

It is a tedious process to influence bodies responsible for policies. The difficulties increase when moving from local to national to international levels. The main reason for the difficulties is certainly that fulfillment of goals concerning a good acoustic environment often get in conflict with other goals concerning the society's development. The difficulties are further related to the complexity of the environmental noise issue.

On the immission side, the results from our research programme has had a strong influence on the Swedish public agencies' guidelines concerning planning and building. The Swedish Board of Housing, Building and Planning has also in their reports to the government stressed the importance of stricter noise emission limits for road vehicles and tyres.

It is a real long-term project to achieve an acceptable acoustic environment for all citizens, but this needs to be seen as an important criterion upon a sustainable development. There are many different actors involved and to get them to act in consortion is a demanding task. The political goals should be better formulated so that consorted action gets promoted. Hopefully, the political interest will increase now that the first noise mapping of major cities in EU according to the END soon shall be completed.

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