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ASSESSMENT OF CONFLICT PLANS ON THE BASIS OF NOISE MAPPING IN GERMANY

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ABSTRACT

Since 1990, § 47a of the German Federal Immission Control Act requires that noise abatement plans have to be drawn up if harmful effects due to noise exposure are presumed to exist in certain areas. Noise maps showing the noise exposure in the neighborhood of all kinds of noise sources are commonly used to give the basic information needed in the process of noise abatement planning. Noise maps with colored bands - each color representing a certain range of (physical) exposure level - give an indication of the noise pollution in the respective area due to the separate noise sources. However, decision makers at the administrative or political level need further information. It has to be assessed whether and where conflicts due to noise exposure may occur. The German Länder as the responsible administrative authorities in Germany in a joint action have issued a model administrative regulation containing provisions concerning the assessment of conflict plans. Noise exposure is compared with limit values given in German legislation for the different noise sources. If these limits are exceeded, harmful effects are presumed to exist, a conflict is recognized and a conflict plan is drawn up. In cases where several noise sources contribute to the noise exposure an overall conflict may be assessed by adding up the differences between existing noise exposure and noise limits for the different noise sources. Conflict plans may serve as the basis for further assessment, for instance concerning the number of people affected.

1 - NOISE MAPS IN GERMANY

In the early 1960ies, the assessment of noise exposure and its presentation by noise maps in Germany started on a totally voluntary level. At these times noise maps were mainly based on measurements carried out during characteristic times at characteristic point. The noise maps were mainly limited to road traffic noise. They showed colored bands, each color characterizing a noise level class with a bandwidth of 5dB(A). These maps aimed mainly at describing the noise exposure, not at reducing noise levels extensively. Noise reduction measures were always applied for certain points where the exposure was measured. The Federal Environmental Agency, in 1981, listed about 40 cities and towns where noise maps had been set up.

In the 70ies and 80ies prediction models and methods have been developed and the calculation of exposure due to the different noise sources has been introduced. Calculation methods are laid down in legislation (Air Traffic Noise Act, Ordinances concerning road and rail traffic noise, administrative regulations concerning noise from industry), in VDI-Guidelines or in DIN-Standards. Appropriate soft ware for the assessment of noise exposure by the different noise sources is available and sold and used professionally. A great number of experts and noise consultants offer the assessment of noise exposure and the drawing up of noise maps. In general the noise exposure is calculated, no measurements are taken. Reasons are:

- There are legal consequences based on these exposure data; therefore data must be absolutely fixed; it does not matter whether they are correct or not, but they have to be laid down in an unchangeable way.
- Noise maps do not reflect the current situation, in order to protect citizens they are set up taking into account the development of the next years; this cannot be verified by measurements of the current state.

- The maps show a long term L_{eq} ; it is impossible to measure this L_{eq} .

2 - THE FEDERAL IMMISSION CONTROL ACT AND ITS § 47a

The Federal Immission Control Act of 1974 aims at

”protecting human beings, animals, plants, the soil, the water, the atmosphere as well as cultural and other assets from harmful effects on the environment and, insofar as installations subject to licensing are concerned, from dangers, considerable disadvantages and considerable nuisances and at preventing such harmful effects on the environment.”

In 1990, article § 49a ”Noise Abatement Plans” has been added to the Act. This article requires that

- ”in areas where harmful effects due to noise are caused or are expected to be caused the responsible authorities have to assess the exposure caused by the relevant noise sources and have to evaluate the effects on the environment.
- the responsible authority shall set up noise abatement plans for residential areas or other areas worthy of protection against noise, if these harmful effects not only occur temporarily and if the harmful effects can only be eliminated or reduced by a co-ordinated action concerning the different noise sources.
- noise abatement plans shall give the data concerning
 - the current and the expected noise exposure
 - the sources of noise exposure
 - the measure foreseen to reduce the exposure or at least to prevent a further increase of the exposure”.

The Act itself does not lay down specified limits which, if exceeded, require noise abatement plans to be drawn up. This is an issue that the responsible authorities implementing the provisions of the Act (these being the Federal States or the Länder or other responsible administrative authorities in Germany) do themselves on the regional level. In 1992, the responsible authorities of the States have published a ”Joint Guideline concerning Noise Abatement Plans”. It contains a list of limit values indicating that harmful effects on the environment may occur if they are exceeded. These limit values depend on the noise source, on the time of the day, and on the area where the noise exposure is existing (Table 1).

Area	Limits for noise exposure in dB(A)			
	road & rail, day/night	air traffic	industry, military installations, water ways, leisure, day/night	sports fields, day/rest period/night
mixed areas	64/54	62	60/45	60/55/45
residential areas	59/49	62	55/40	55/50/40
areas for dwellings only	59/49	62	50/35	50/45/35
spa areas, hospitals, etc.	57/47	62	45/35	45/45/35

Table 1: Noise limits of the ”Joint Guideline Concerning Noise Abatement Plans” (one source).

These noise limits are taken from German legislation defining the values characterizing the starting of considerable nuisance due to noise exposure from the respective noise source. In addition the guideline lays down the procedure to be used implementing the provisions of § 47a of the Federal Immission Control Act. Three steps are to be taken:

Step 1

In the first step the (physical) noise exposure has to be assessed. The noise exposure is determined by calculation of the rated energy equivalent sound pressure level L_r of the different noise sources both for day- and night-time. Calculation methods laid down in the various legal regulations concerning noise of the different source (i.e. Air Traffic Noise Act, Traffic Noise Ordinance, Sports Fields Noise Ordinance,

TA Lärm) have to be used. These calculation methods in general are equivalent to the method of ISO 9613 Part 2, however they all are slightly different concerning details of the calculation. The results of the assessment shall be presented in form of noise maps. The rated sound pressure levels are classified in steps of 5 dB(A) width. The German Standard DIN 18005 Part 2 gives guidance for the drawing up of noise maps, especially it lays down which colors should be used for which range of rated sound pressure levels.

Step 2

Evaluating whether harmful effects may occur the noise maps are compared with maps where the limit values indicating harmful effects on the environment (see table 1) are shown depending on the respective area. The difference between calculated exposure values and limit values is determined for each noise map (different rating times and different noise sources) and again presented in a map. In areas where the difference between calculated value and limit value is higher than zero, harmful effects are to be feared. These maps are called conflict plans. Conflict plans in a very simple way show where the noise exposure caused by one noise source is higher than the limit values (and than Government thinks it should be). Now two overall conflict plans – one for the night-time, the other for the day-time – are calculated simply summing up arithmetically all the differences of the separate source related conflict plans (from -5 dB(A) to the highest values). This is a very simple but pragmatic and straight forward way to evaluate the most exposed areas.

Step 3

In all areas where the sum of the differences shown in the overall conflict plan exceeds zero a noise abatement plan shall be drawn up in the responsibility of the local authorities. On the other hand local authorities have to communicate with the local authorities of other municipalities and with the Federal Government. The latter because motorways and rail tracks are built in the responsibility of the Federal Government and therefore measures only may be taken by the Federal Government itself.

Drawing up noise abatement plans other criteria like density of population affected and actual planning for the next future should be taken into account. Where nobody is affected by the exposure a noise abatement plan is meaningless and not useful. The number of affected people may be useful for a ranking of noise abatement plans. This is especially true in times where the financial resources are poor and money has to be spent as economically as possible.

3 - NOISE ABATEMENT PLANS

Since 1992, in Germany 350 noise maps as the first step in noise abatement planning have been drawn up. Costs are estimated to lie between 0.25 and 1 ECU, if a simplified method of assessment is used and around 1 to 2 ECU if a detailed noise map is elaborated. But of course noise maps are only the first step in order to reduce the noise exposure of the citizens. The noise abatement plan itself is much more important. Noise abatement plan shall contain:

- the current noise exposure in the area (noise maps, conflict plans)
- the noise exposure to be achieved
- a detailed description of the area
- a detailed description of the noise sources (installations, roads, rail tracks, airport etc.)
- a detailed description of the short, medium and long term measures foreseen
- a detailed description of the noise reduction striven for
- a time table
- data concerning the financing of the measures
- all other relevant data to evaluate the noise abatement in the area.

As noise abatement plans were a new instrument in noise control no experience how to handle this instrument was available. Therefore the Federal Environmental Agency and the State of Lower Saxony jointly funded drawing up noise abatement plans in several selected model towns and cities (50,000 – 100,000 inhabitants). Monitoring the way measures were planned and implemented by the administration proved

- that the preparation of noise abatement plans takes 1 – 3 years and that the implementation may extend over a period of 10 – 15 years because short, medium and long term measures including their financial consequences are to be considered;
- that annual extra costs for noise abatement in these towns and cities amounted to approximately 200,000 DM;
- that local conditions are so much different that no general rules can be given which measures should be applied; noise abatement plans must be made-to-order for each situation;
- that noise measures exist on a huge scale and that they in principle are known;
- that sometimes single measures may have a great effect, that in general, however, only an integrated concept combining different measures is likely to lead to good results;
- that if a number of adapted measures concerning road traffic were applied the exposure due to traffic noise could be reduced by 1 – 5 dB(A), without increasing noise in other locations;
- that traffic noise (road, rail and air) is the predominant source;
- that, as traffic is the predominant source of noise, in practice it will be helpful to link noise abatement plans with traffic and transport development plans; in this way traffic and transport measures may be planned in such a way as to reduce existing noise exposure and related effects wherever possible and to prevent new noise generation;
- that in general for the setting up of noise abatement plans the co-operation of various authorities and of acoustical experts is needed to get an optimal solution