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USE OF GEOGRAPHIC INFORMATION SYSTEMS IN NOISE ABATEMENT STRATEGIES

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ABSTRACT

As a result of the increasing noise-load at housing areas the urgency of a comprehensive noise abatement strategy became obvious. In Germany the responsible authorities have to draw up noise-immission-plans. In order to calculate these plans a computing model with emittents, topography and buildings is necessary. The calculation will be more effective by using a Geographic-Information-System (GIS). The procedure will be illustrated by a realised planning in the federal state of Hessen. Beside the technical dimension of the planning appeared problems in the cooperation between the different administrations, politicians and the public. From this actual situation result recommendations for future development of noise abatement planning and also in the planning procedure.

1 - NOISE ABATEMENT PLANNING

In the last decades the noise-load at housing areas increased. Therefore the urgency of a comprehensive noise abatement strategy became obvious. In Germany's Federal Act for Immission Protection (Bundes-Immissionsschutz-Gesetz, BImSchG) [1] from 1990 was established § 47a "Noise Abatement Strategy". The responsible authorities, usually the communities, have to draw up noise-immission-plans with the value of noise pollution and conflict-plans with the exceeding of threshold values. But in Germany the local authorities often hesitate in implementing this planning. Not knowing the costs and benefits is mostly the reason.

The sources of noise are in particular transportation (road, railway, air transport) and industrial noise but also in sport and leisure areas and other sources of noise. In order to calculate the noise emission the basic data must be known. They are often given to Geographic Information Systems (GIS) which were established in the responsible administrations.

The result of the calculation is the noise-immission-plan. By deducting the threshold values, the conflict-plan will be received. Measures for reducing the noise-load (regulations, planning policies, structural barriers) are included in the plan of measures.

The general procedure for noise abatement planning is described in [2].

2 - ESSENTIAL DATA AND STANDARDS

Using the GIS-data the planning procedure will be simplified, the handling will be improved and the resume is more efficient. GIS are used in most of local and state authorities, general informations in [3]. In summary the costs can be reduced in comparison with the conventional procedures.

In order to calculate these plans a computing model with emittents, topography and buildings is necessary. The efforts for this work can be reduced by using the data of the national surveying authority.

The following files were used:

- Official Topographical – Cartographic Information System (ATKIS) with the emittents road, railway, parking, light and heavy industry, sports, leisure,...
- Automatically Map of Real Estate (ALK) with buildings etc.

- Digital Height Model with topography.
- Special files including levels of emission, heights of buildings and other relevant objects.

The calculation is done by computer programs, mainly with approved programs. Computing models and also the conflict plan have to obey different standards which are shown in figure 1 for german conditions.

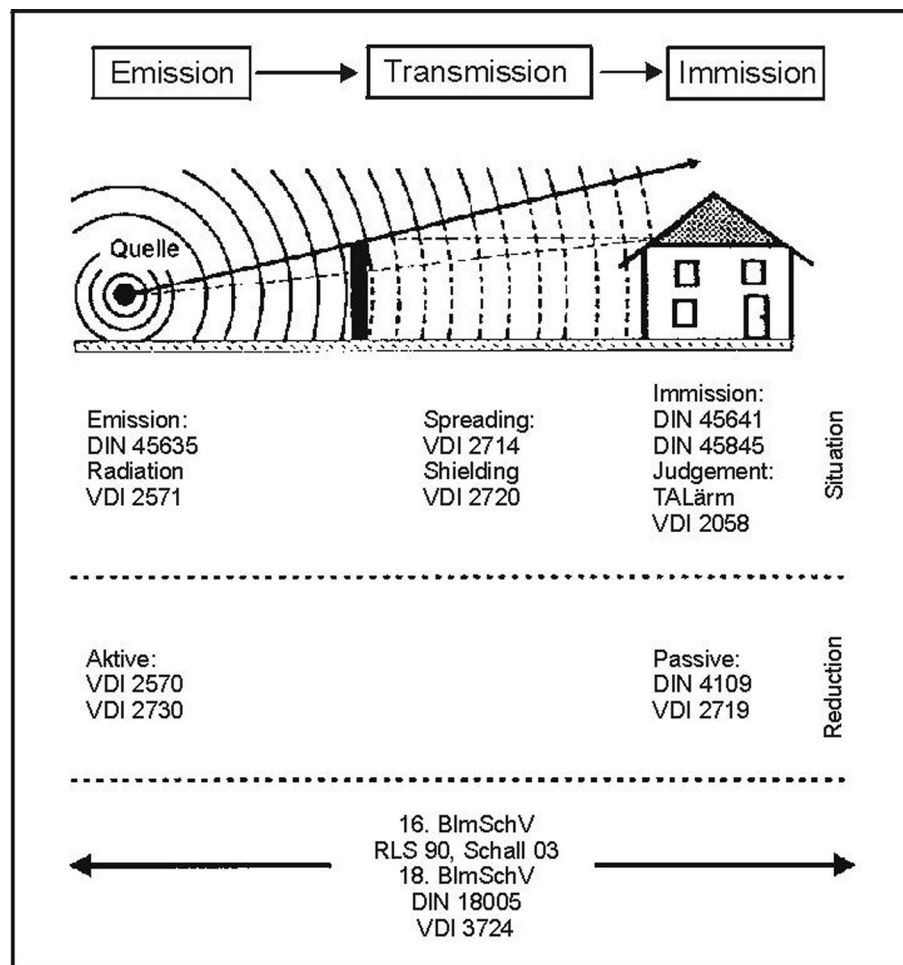


Figure 1: Noise spreading and technical standards in Germany [4].

In figure 2 an exemplary detail from a noise-immission-plan obeying [5] is shown. Threshold values and guidance values differ, they depend on the situation and the land use at the place of immission. In tables 1, 2 and 3 the values are shown. They are taken from [1], [6], [7], [8], [9], [10] and [11]. The conflict plan results as the difference between the actual noise load and the threshold / guidance value.

Category	Area, building	Threshold value in [dB (A)]	
		Day (6-22h)	Night (22-6h)
1	Hospitals, Schools,...	57	47
2	Housing areas	59	49
3	Down town, village areas,...	64	54
4	Industrial estates	69	59

Table 1: Threshold values for noise providing.

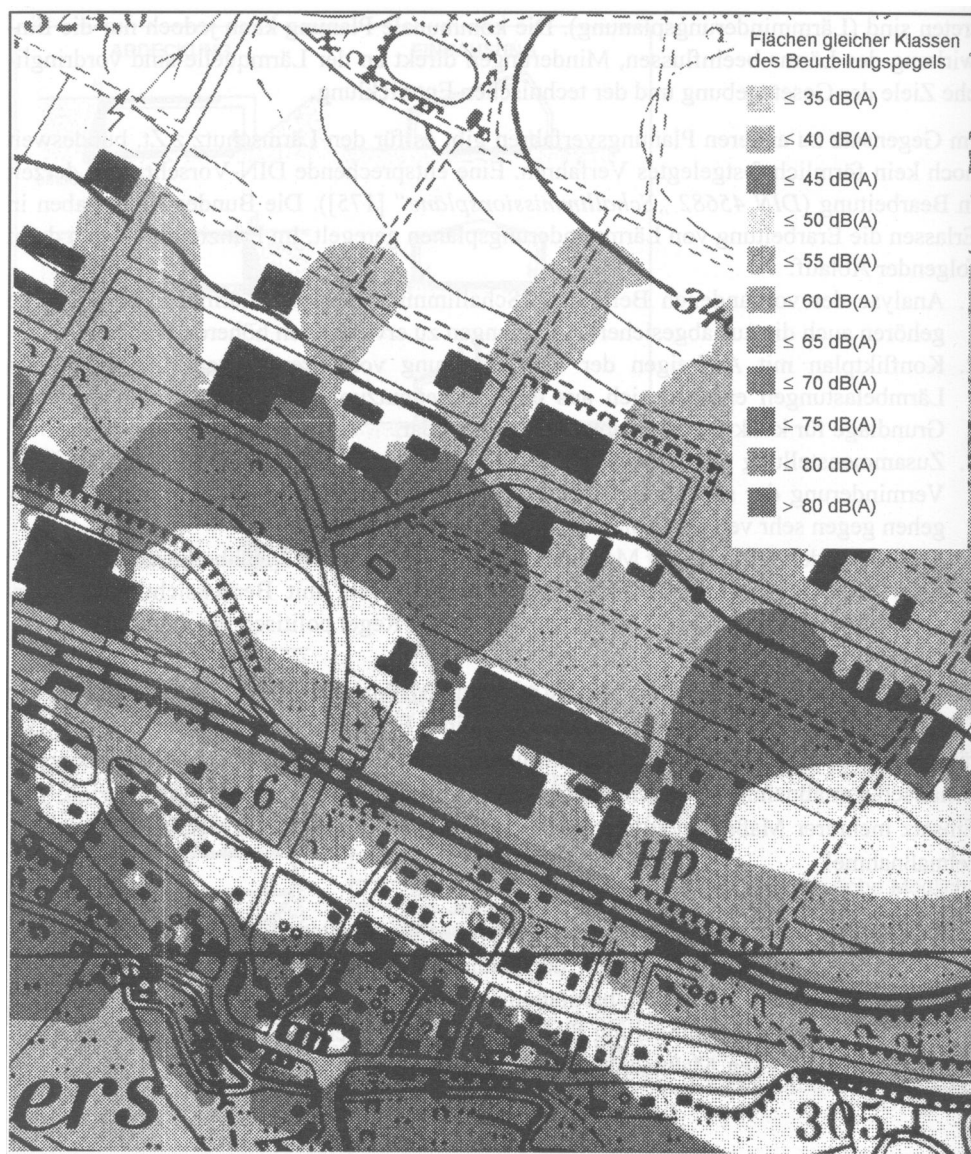


Figure 2: Detail from a noise-immission-plan.

Category	Area, building	Immissionsgrenzwert in [dB (A)]	
		Day (6-22h)	Night (22-6)
1/2	Hospitals, Schools,..., Housing areas	70	60
3	Down town, village areas,...	72	62
		(Hessen, NRW: 70)	(60)
4	Industrial estates	75	65
		(NRW: 70)	(60)

Table 2: Threshold values for noise rehabilitation.

Area	Orientierungswert in [dB (A)]	
	Day	Night
Housing areas,..., recreation areas	70 – 55	35 – 45
Park areas, cemeteries	55	55
Village areas,...	60	50 – 45
Industrial estates,...	65	50 – 55

Table 3: Guidance values.

3 - DEMANDS IN FUTURE

The formal procedure and the calculation of noise abatement planning is regulated by decrees and technical standards. In future the inquiry of the data and the access to all relevant data has to be improved. Here are the local and the state surveying authorities important partners.

The configuration of the local GI-Systems must consider the use for noise abatement planning. This is also important for the efficient and economic use of financial funds from the public purse.

4 - EXAMPLES FOR USE AND BENEFITS

The use of the noise abatement planning is a very important tool for land use planning and development planning. The categorising of area use and noise emission has a better handling, building of modern flats, but industrial estates can also be organised with consideration for the needs of noise minimising and the rehabilitation of disadvantaged areas can be carried out efficiently.

Other important themes are the planning of transport schemes and transportation arterials and the planning of the environmental protection.

5 - EXPERIENCES

The procedure will be illustrated by a realised planning in Hessen. Beside the technical dimension of the planning appeared problems in the cooperation of administration and politicians in the phase of implementation and with the inhabitants in gaining acceptance.

From this actual situation result recommendations for future development of noise abatement planning and also in the planning procedure.

6 - REMARKS

ALK and ATKIS are abbreviations for "Automatische Liegenschaftskarte" (Automatically Map of Real Estate) and "Amtliches Topografisch-Kartografisches Informationssystem" (Official Topographical and Cartographic Information System) both have been given in digital version.

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