Noise abatement in Switzerland: Present projects and perspectives

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Introduction

Noise abatement has a long history in Switzerland. After some preliminary but effective measures like the night-time and Sunday bans on heavy goods vehicles, the recognition of noise as a public health problem led to a parliamentary report in the sixties and finally to a noise abatement policy which was laid down in the Environmental Protection Law [1] and in the Noise abatement ordinance [2] in 1983 and 1986, respectively. In the subsequent years, this policy was further put to concrete forms by introducing exposure limits for roads, railways, shooting ranges, industry and trade installations, civil and military airports as well as by legal regulations for the Swiss railway noise remediation project [3,4].

Noise abatement strategy

The strategy of the noise abatement policy is illustrated in Figure 1. It consists of six basic principles covering the most problematic aspects of noise abatement.

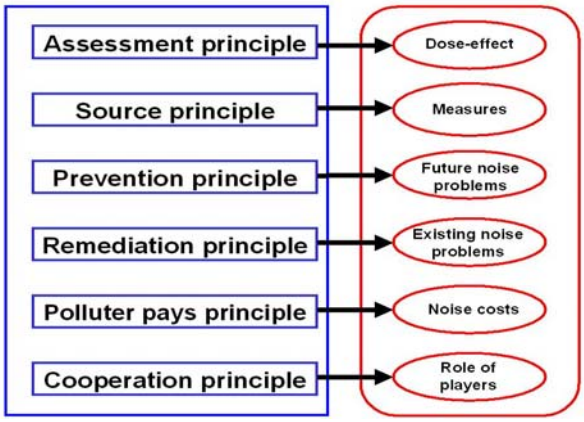

Figure 1: Overview of basic principles of noise abatement strategy.

The assessment principle quantifies the level for the most frequent types of noise by using the rating sound level Lr. Exposure limits consist of a set of three values, Impact Threshold (IT), Planning Values (PV) and Alarm Values (AW), defined for day and night time as well as for four different sensitivity zones, accounting for the already existing background noise. The IT are specified to ensure that the well-being of the population is not substantially affected according to current technology or experience. The PV are about 5dB lower and are used to specify the level of precaution in connection with the planning of new building zones and new noisy installations. The AW are about 10dB higher than the IT and are a criterion to assess the urgency of remediation of noisy installations.

The source principle requires that noise abatement takes place primarily at source. If this should prove impracticable or would lead to unacceptable costs, substitution measures in the form of noise protection of the buildings must be applied as a second option. The prevention principle is intended to avoid noise problems from installations and at residential buildings at the stage of construction. On the causation side, there is the fundamental obligation to limit the noise emitted from vehicles, appliances and installations to the degree that this is technically and operationally feasible and economically acceptable. For installations, more stringent measures must be taken if the exposure limits are exceeded. For vehicles and appliances, prevention is assured through type approval. For the construction of residential buildings there exist preventive restrictions for the designation and development of building zones in areas affected by noise above the PW and restrictions for construction in areas with noise above the IT. In designing new buildings, noise from within and outside the building must be considered from a preventive standpoint by applying sufficient insulation to both the building envelope and internal partitions. The remediation principle compels installations constructed before 1985 to comply with the impact thresholds. While most of the installations of industry and trades as well as shooting ranges has been remediated, there remains much to be done in the field of noise from street and roads as well as railways and airports (Figure 2).

Figure 2: Remediation of noisy installations.

An important aspect of remediation concerns the costs of measures, which is handled according to the polluter pays principle. Private installations have to fully cover their costs of measures, but they can shift the burden to their clients, as it is e.g. more and more done by airports by means of noise charges. Public installations can also cover the costs by indirectly charging the noise perpetrator via oil product taxes or road fees. However, this does not completely cover all noise costs and some external costs usually remain.

As noise abatement is a highly interdisciplinary field, the cooperation principle intends to bring together players from various specialist areas in order to solve noise problems. This approach is best reflected by the close collaboration between the various local authorities as well as the decentralised organisation where the Confederation and the 26 cantons share the task of noise abatement.

Evaluation after 15 years

The strategy of Swiss noise abatement was evaluated in 2002, fifteen years after the noise ordinance had entered into force. The critical review [5] proposed 11 fields in which the future noise abatement strategy should focus its effort in order to effectively protect the population from hazardous or undesirable effects of noise, especially with view to the still increasing traffic and the ensuing expansion of noise from urban areas into rural landscape.

In particular, the report recommended a better national monitoring of noise abatement by means of geographical information systems, including all data along the chain-effect model (Figure 3), including demographic data and software programs to calculate sound propagation over wide areas. The monitoring should not only yield the basic data of population and area exposed to a certain level of noise, but also provide information of effectiveness and costs of the remediation measures applied. Moreover, it would be an efficient tool to apply tighter control over noisy installation. Different noise metrics like those defined in the EU-directive 2002/49 should also be considered in order to publish statistics comparable to international data.

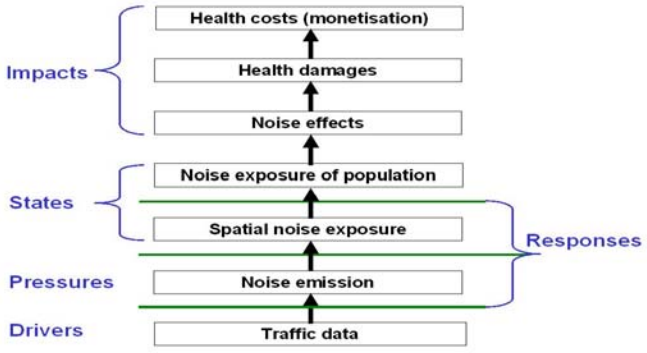

Figure 3: Monitoring along the cause-effect chain in noise abatement (DPSI-R model).

Another focus point concerns the extension of the polluter pays principle by better quantifying the health damages and economic impacts of noise and subsequently attribute them entirely to the polluter. A promising approach which closely follows the cause-effect chain is the quantification of noise effects on health by means of the DALY-principle (Disability Adjusted Life Years). Two studies [6, 7] that evaluated the noise effects and costs of a 1000km truck journey in Switzerland revealed that the health damage through sleep disturbance are about an order higher than those of communication disturbance. In addition, the damage from heart attack – even if the single case represents a much severe health impact – is small compared to the other two effects (Table 1). While the damages of diurnal noise exposition is comparable to the damage of exhaust gas, the damage of noise clearly dominates during the night.

	Day journey	Night journey
Communication disturb.	1.3E-3 DALY	-
Sleep disturbance	-	26.0E-3 DALY
Heart attack	0.1E-3 DALY	1.7E-3 DALY
Exhaust gas damage	1.1E-3 DALY	1.1E-3 DALY

Table 1: Damage from a 1000km truck journey in Switzerland.

Abatement measures to reduce noise at source represent the most efficient means of reducing noise exposure over wide areas. This requires not only incentives and regulations to promote the use of low-noise technologies, but above all active research and development of new technologies and products with the desired characteristics. Currently running projects deal with the establishing of emission limits of railway wagons [8], the construction of a low-noise goods train bogie [9] and the development of low-noise road surfaces for low speed traffic [10]. Further projects include evaluations of technical and regulative measures in order to reduce vibrations and structure born noise.

Conclusions

Despite fifteen years of effort, noise abatement is still at a rather early stage compared to other environmental issues. However, the establishing of a coherent and comprehensive noise abatement policy and its consequent implementation and execution, together with the allocation of sufficient financial resources will in the end considerably improve the quality of life and lead to substantial economic advantages.

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