NOISE MAPPING AND NOISE ACTION PLANNING IN GERMANY

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The Environmental Noise Directive requires the member states of the European Union to determine the noise exposure of the population. In addition, the noise action plans should contain appropriate measures to reduce high noise exposure. The noise maps for Germany show high exposure to traffic noise, especially road traffic noise. Therefore, the focus of the noise action plans is on measures like speed reductions, noise barriers, low-noise road surfaces and traffic management. The Directive also require wide public participation in the development of action plans. The competent authorities have therefore taken into account the requests of the public, the legal framework for such measures, the financial framework and the technical requirements. Moreover, the competent authorities for the action plans and the authorities for the implementation of the measures are often not the same. Close coordination between all authorities is therefore necessary for successful noise action planning.

Keywords: Environmental Noise Directive, noise map, noise action plan

1. Introduction

Many people are exposed to high levels of noise that adversely affect their health and quality of life. Noise is now experienced virtually everywhere and around the clock, in towns and in the country. As a result of large-scale infrastructure projects, such as the construction of new airports or the expansion of existing ones, there is much greater political, scientific, and public awareness of the issue of noise.

To a certain degree, noise is a pollutant, which has only a localised effect unlike other pollutants, but which can be found virtually everywhere as there are so many areas in Germany that are affected by it. One of the primary reasons for this is the increase in the volume of traffic. Furthermore, people in general are much more aware of environmental issues, especially regarding noise. Even low levels of noise can result in strong reactions if it becomes known that they are avoidable.

The German Environment Agency regularly conducts representative surveys to assess the impact of noise in Germany. According to the survey carried out in 2016, around 76% of those interviewed complained of being disturbed or annoyed by road traffic in the vicinity of their homes. Aircraft traffic was the second most common source of noise generated by transport. Nationally, more than forty percent of the people complained of being affected by noise from air traffic. Slightly more than one third of the population is disturbed by rail noise. According to the survey, however, noisy neighbours are also an important source of noise. Just under 60% of people complained of being affected by noise from their neighbours (see Fig. 1).
Noise does not just affect subjective well-being and quality of life, but also sleep. This results not only in changes in sleeping patterns and in an increase in the number of times people wake up, but also in increased secretion of stress hormones and in elevated cardiovascular risk factors.

Finally, the cost implications also need to be considered. Noise causes considerable financial loss, for example from health expenditure. The European Commission estimates the cost of traffic noise in the EU at around 40,000 million euro annually, 90% of which is due to road traffic.

### 2. Environmental Noise Directive

In 2002, to improve the noise situation in Europe, the EU issued the Environmental Noise Directive (2002/49/EC). It became law in Germany in 2005. The aim of the Directive is to reduce environmental noise, and to prevent an increase in noise in areas which are traditionally quiet. This first requires mapping the level of noise pollution in different areas and then introducing specific measures to reduce it. The EU Directive envisages progressive implementation of its provisions. The first stage involved initially only motorways and major trunk roads, major railway lines, and various major airports with a high volume of traffic as well as large conurbations. Since 2012, noise levels in all conurbations and on all major transport routes in Europe need to be recorded. In Germany, this involves 70 conurbations, 49,000 kilometres of motorways and major trunk roads, 14,000 kilometres of major railway lines, and all eleven major airports.
In each case, the noise levels need to be determined over the course of the entire day, and separately at night-time. To ensure comparability of the results, uniform pan-European indicators are used, the day-evening-night noise indicator ($L_{DEN}$) and the night noise indicator ($L_{Night}$).

In order to avoid negative impacts on health, the World Health Organization (WHO) recommends that night-time noise exposure should not exceed a time-average level of 40 decibels (dB(A)). There is evidence that the risk of cardiovascular diseases increases when the average night-time noise rises to more than 55 dB(A), or if the average noise level during the day is more than 65 dB(A). These two values were therefore used as threshold values for further discussion.

In 2012, 4.6 million people were affected by excessive traffic noise (over 55 dB(A)) around major transport routes and major airports, and in agglomerations. Throughout the day, around 3.3 million people were exposed to traffic noise that exceeded 65 dB(A). This means that nearly 6% of the German population was affected by night-time noise, and 4% by daytime noise.

The different types of transport produce different noise problems. The main noise source is road traffic. Rail traffic tends to be a problem at night, and few people are affected by aircraft noise.

3. Noise Actions Plans

The noise maps serve as a basis for establishing noise action plans with the active collaboration of the general public. In other words, they help to plan and implement specific noise mitigation measures as broadly as possible. This primarily involves communities targeting the most widespread source of noise,
road traffic. The range of measures adopted is very broad. Measures range from long-term strategic approaches to traffic reduction to measures that can be taken in the short term such as local speed limits or bans on heavy freight vehicles driving through specific areas. Figure 3 shows the frequency of measures mentioned in the noise action plans.

Drawing up noise action plans can involve other areas. Many noise mitigation measures, for example, also have an impact on traffic safety, traffic flow, and road network capacity. Moreover, traffic control measures frequently have a positive effect on particulate or nitrogen oxide pollution. For these reasons, even closer collaboration between town and traffic planners as well as environmental organisations is required. It should be their common purpose to enable movement, especially in towns, that requires the least possible use of motorised individual transport, i.e. to design movement within an area that is more sustainable. It is well known that finances are restricted and so, wherever possible, towns and communities should form alliances specifically to deal with these issues in their area. This would allow joint management of infrastructure and so would result in cost savings.

![Figure 3: Frequency of noise mitigation measures specified in noise action plans [3]](image)

Apart from the reduction of existing noise pollution, however, the Environmental Noise Directive 2002/49/EC has a further important aim, to protect “quiet areas.” At present, however, there are no clear
criteria to define such areas, either at EU level or at a national level. This is a source of concern in many communities. It is also the reason why discussion of this issue is still not very widespread. At the same time, access to nearby recreational areas in which people can “find peace and quiet” is an important consideration in selecting accommodation in densely populated towns and cities. Other factors apart from noise pollution also play a role in the subjective perception of what constitutes a “quiet area.” For this reason, communities which designate areas as quiet areas do not usually base their decision solely on the level of noise pollution.

4. Integration of planning levels for noise action plans

Under the EU’s Environmental Noise Directive and Section 47d of Germany’s Federal Immission Control Act (BImSchG), many towns and municipalities are required to draw up noise action plans and inform the European Commission of them. At the same time, noise abatement is also playing a role in many other plans. However, previous experience shows that planning and implementation of noise reduction measures often takes place on a sectoral basis. Better integration of planning levels is required to recognise potential conflicts in objectives at an early stage and to better exploit joint potential for action. The following questions are to be examined in this respect: How can the noise action plan be considered in land-use planning, in informal urban development planning and in transport planning, and how can synergistic effects be created across these plans? These plans interact with the noise action plan in the areas of planning density and land-use allocations, accessibility and the resulting traffic flows. Furthermore, urban planning objectives are also relevant at the level of local building and construction plans.

Although many town and transport plans have included legal provisions on noise control for some time, this is often considered unimportant in practice or only dealt with in a formal planning process (e.g., in the binding land-use plan), even though a fundamental course has already been set during informal planning. As it embraces a comprehensive approach, the noise action plan can be a suitable instrument for viewing noise pollution across the municipality and for developing coherent noise abatement concepts on this basis. Ideally, urban development planning could draw on the noise action plan as a knowledge and concept resource. The noise action plan must also, however, be capable of fulfilling this role.

Experience to date has shown that the closest links to noise action planning are found in the transport development plan, the land-use plan and the clean air plan. Most of the literature also describes these plans as sensible linkage points. From data provision through to realisation, synergistic effects are expected from closer cooperation between these planning levels.

But there are also problems preventing closer integration of planning levels. The deadlines for giving notification of noise maps and noise action plans are too tight for many towns to be able to produce integrated plans. These deadlines also differ from those for clean air planning. Since noise action plans are to be reviewed at least every five years and revised if necessary, it is not always possible or sensible to create a link with planning procedures that take place less regularly such as for the zoning plan or transport development plan. This is compounded by the fear of increased coordination and labour costs for integrating noise reduction strategies into other planning procedures.

5. Recommendations for integrating noise action planning into spatial planning

The development of integrated locations (brownfield development taking priority) is an objective of urban development policy that is anchored in the Federal Building Code. Although building law and
The aim of the noise action plan is to reduce noise in areas with high levels of noise pollution and to prevent further increases in noise pollution. Lower noise pollution levels also support brownfield development in this respect, providing high indoor and outdoor environment quality. To achieve this goal, the implementation of noise reduction measures should fundamentally be intensified, among other things. It should be possible for the noise action plan to lay down binding rules. Furthermore, financing or support should be available for measures in the noise action plan. For each relevant plan, possible noise conflicts should also be considered, and efforts made to reduce noise pollution.

The land-use plan, informal municipal planning and the noise action plan should be linked together more closely.

- At town level, zoning could be linked more closely with environmental considerations at the level of the zoning plan.
- Linking the noise action plan more closely with urban development and urban planning can make an important contribution to developing integrated locations with high indoor and outdoor environment quality.

The Berlin Recommendations for considering environmental concerns in spatial planning are one example of better integration. It is also clear from efforts in other cities that, particularly in larger centres with growing net populations, structural development in densely populated areas is being pursued where the present noise pollution situation and potential land-use-related increases in noise must be dealt with.

Against this background, the following recommendations for improved integration of noise action planning in urban development are put forward.

At the federal level, the basic conditions for closer integration should be reviewed and obstacles to an interdisciplinary approach broken down.

- Collation of the various suggestions, recommendations and guidelines from the municipalities and states by central government would be welcomed as well as summarisation of the evidence that is relevant at federal level (meta study). The results could be brought together as a tool, even for medium-sized and small municipalities.
- A nationwide collection of examples on the integration of spatial planning and environmental concerns should be built up and maintained. Initial attempts have been made by means of the study ‘Good examples of noise reduction in urban development’. These should be updated and additional subjects added (e.g., overarching planning levels). This could conceivably be in the form of a web-based database.
- The recommendations and suggestions provide inspiration for changing thought processes and assistance on evaluating pollution situations and environment-relevant plans. However, suitable instruments are often lacking to be able to adequately respond to pollution. In order to integrate environmental concerns into land development at an early stage, the basic conditions should therefore be created to facilitate a closer link between land development and environmental protection. In this context it should be investigated, for example, how the control options in land development can be extended to prevent or to reduce any associated environmental pollution.
- Further development of funding options for noise reduction measures in urban development (e.g., under a national Traffic Noise Control Package III or urban regeneration programmes) with funding eligibility based not only on technical or passive noise abatement measures should be examined and pursued. This could help to ensure that environmental concerns are more closely integrated in urban development.

At municipal level, issues relating to concrete cooperation between individual disciplines locally are significant for closer integration, alongside assistance from federal and state government.
To better integrate noise action planning in urban development/urban planning, the interdisciplinary preparation of town-specific guidelines on ‘Noise reduction and urban planning’ can be a key component. This is the case in terms of content itself and as a launch-pad for more intensive cooperation (see the digression below on the possible content of such guidelines). The guidelines should not be a static document, rather the opportunity presents itself here to design them as an instrument that can be updated.

Efforts should be made for more intensive cooperation in terms of urban development and urban planning, and noise action planning. The integrated approach should not be a one-way street. Considering population centres and areas where brownfield development is desired, the noise action plan can, for example, provide good framework conditions for urban development.

The long-term integration of urban development, urban planning and noise action planning is to be pursued in terms of content and at staff level. With the aim of developing a planning culture for better integration, this should be ritualised, e.g., through regular working group meetings where the issues at hand, projects, etc. are discussed. This ensures mutual exchange of information and participation at an early stage.

6. Recommendations for integrated transport development, noise action and clean air planning

The analysis shows that integrated guide plans have many advantages from a professional point of view. However, these are countered by disadvantages, which primarily relate to organisation and the available resources of the authorities drawing up the plan. Integrated planning is also hampered by different deadlines, areas of responsibility and the differing degrees of readiness to embrace integrated thinking. In this context, central government can support integrated guide plans by providing the basic legal framework and funding programmes.

- An integrated approach should be rooted more firmly in legislation. Environmental considerations should therefore be integrated further into the legal provisions of other plans.
- At European level, the German government could work towards adapting and harmonising the deadlines for noise action and clear air plans to aid practice. Planning timeframes and binding noise limits that must be met by certain deadlines would seem appropriate.
- Funding programmes for transport infrastructure could consider noise action and clean air plans as a basis for fund applications. Funding should not simply serve to ‘improve transport conditions’ but explicitly also to incorporate measures for reducing noise and air pollution.

The municipalities can likewise contribute to successful integrated planning at different levels.

- Political will, formulated in advance, and demand for an integrated approach can encourage success. The administration should therefore inform politicians of the advantages of an integrated approach, the necessary planning timetables and required budgets before plans are drawn up. During planning, the expert political committees should be regularly informed of how work is progressing. If possible, the guide plan should be started and completed within one legislative period.
- Because of the different areas of responsibility, all authorities involved must participate at an early stage and on a regular basis. This is expensive, but experience has shown that this encourages the readiness of all participants to jointly find a solution.
- Continuity within such an extensive process is important. The clear appointment of a person in charge (‘face’ of planning), regular involvement of politicians, as mentioned above, and consistent personnel in the associated committees help to ensure such continuity. The last point
can be supported for example by self-imposed rules of procedure, etc. Otherwise there is a risk that approvals granted previously will be subsequently called into question.

- If there is a risk that a guide plan will fail or will be severely delayed because of its complexity or differences of opinion on individual aspects, it is advisable to effectuate separate decisions for the clean air plan, noise action plan and transport development plan (it should be noted here that formal approval decisions are to be made separately anyway). This concern situations where the delays could prompt EU penalties.

- The municipal decision for or against a common guide plan must take account of various criteria and requires thorough preliminary inspection. Such criteria include the requirement for a clean air plan and/or a transport development plan, the will for cooperation between state and municipality or between different specialist offices, and enough human and financial resources.

7. Conclusions

Under the EU’s Environmental Noise Directive and Section 47d of Germany’s Federal Immission Control Act (BImSchG), many towns and municipalities are required to draw up noise action plans. At the same time, previous experience shows that planning and implementation of noise reduction measures often takes place on a sectoral basis. Although many town and transport plans have included legal provisions on noise control for some time, this is often considered unimportant in practice, or only dealt with in a formal planning process, even though a fundamental course has already been set during informal planning. As it embraces a comprehensive approach, the noise action plan can be a suitable instrument for viewing noise pollution across the municipality and for developing coherent noise abatement concepts on this basis.

Better integration of planning levels is required to recognise potential conflicts in objectives at an early stage and to better exploit joint potential for action.

REFERENCES

