

# How to Encourage Road Noise Abatement in Nordic Municipalities

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**Abstract:** *Road noise nuisance is a huge problem in the Nordic countries, and it seems difficult for Nordic countries to meet national targets for its reduction. One reason for this is the lack of municipal activities in the field. Thus the research question that this article seeks to answer in relation to already existing residential areas and roads is: which conditions in the municipal organisation and its institutional environment contribute to making municipalities provide and implement noise abatement measures? The assumption is that three factors influence how the municipalities prioritize among political issues: the municipal organisation itself, the local institutional environment (citizens, business and NGOs), and the state and trans-municipal networks. A study of the anatomy of municipal road noise abatement policy shows that conditions for implementing road noise abatement in existing residential areas are poor, though, possibly, the large municipalities represent an exception to this rule. In general, road traffic noise abatement does not seem to be institutionalised, whether it be in the municipal organisation or the institutional environment. Two case studies of municipalities involved in efforts beyond the usual are chosen for further analysis, namely the construction of a noise barrier in the Danish municipality of Hørsholm, as well as noise abatement windows in the City of Stockholm. Inspired by the case studies I highlight some conditions which seem to be important for making municipalities actively provide and implement road noise abatement measures in situations of existent residential areas and roads. For the municipal organisation, regularly mapping the noise problem and making status reports of the achievements are very important. Civil servants should also use any opportunity to stress the noise problem. In the local institutional environment patient and persistent citizens are very important, and it is important that they behave in ways which the civil servants and the politicians respect. Legislation plays a significant role with respect to state and trans-municipal networks. Finally, the state's financial support for municipalities which are abating noise is a significant condition, as are ambitious state objectives. From the case studies presented here it is possible to identify two types of strategies which can be pursued. The first is the citizen strategy, where citizens are the driving forces. A problem with this strategy might be some degree of inequality. The other strategy is the civil servant strategy, where civil servants are the driving force. A consequence of this strategy might be that it will mainly be citizens in larger cities that will benefit from noise abatement measures.*

**Keywords:** Traffic noise, implementation, municipalities, the Nordic countries.

## 1. The Gap

Noise pollution from road traffic constitutes a serious environmental problem. The WHO's recommended limit value is 55 dB on the façade of the houses, in the Nordic countries approximately five million people are exposed to road traffic noise above that level. The amount of the population exposed in each country varies between 12-16 % (Finland) and 28 % (Denmark) (Sørensen and Leite 2007, p 67). Road traffic noise is by far the most important source of noise nuisance.

Denmark, Sweden, Norway and Finland have ambitious national targets regarding the reduction of traffic noise nuisance. Most of these are quantitative and deal with reducing specific numbers of people or dwellings exposed to noise nuisance by 5, 20 or 25 % within a period of years. Despite national ambitions however, it has so far been difficult to achieve the objectives. The Danish national road traffic strategy states that "the achievement of the objective set by the previous government in 1993 has not been successful" (Road Noise Group 2003, p 6)<sup>1</sup>. In Sweden, the government proclaims that the national noise reduction objective will be "difficult to achieve" (Swedish Government 2005, p 189). In the Norwegian National Transport Plan 2006 – 2015, the government similarly asserts that the national objective "will not be achieved within the period" (Norwegian Ministry of Transport and Communications 2004, p 202). And in Finland, the Minister of Transport and Communications affirms that the aim of eliminating noise nuisance from road traffic above 65 dB "will not be achieved" without extra funding (Finnish Ministry of Transport and Communications 2004).

Hence, it seems difficult to reach these targets. A gap exists between politically determined national targets on the one hand, and performance on the other, a gap which constitutes the starting point of this article. I expect that three prerequisites should be fulfilled in order to achieve a reduction in road traffic noise nuisance:

- national political determination to reduce noise,
- knowledge of efficient means, and
- conditions which ensure implementation.

The national objectives seem to show a political determination to reduce road traffic noise, although

the objectives can also be the result of symbolic policy (Winter 2003, p 208). In this article I will not address that topic. For many years, research and development efforts have dealt with developing efficient means for reducing road traffic noise, so that will not be dealt with either. However, the existent literature hardly deals with conditions for the implementation of relevant and efficient measures, though Kolbenstvedt et al. (2001) and Danish Environmental Protection Agency and Danish Road Directorate (2004) touch upon the topic without paying much attention. Hence, implementation is the focus of the present article.

Addressing implementation is interesting not least because of a 2002 EU Directive which states that all of the member states' coherent urban areas (agglomerations) with more than 250,000 inhabitants should present noise action plans by 2008, and by 2013 they should also exist for other large, coherent, urban areas (agglomerations) (Directive 2002/49, article 8). As a consequence of the Agreement on the European Economic Area, this Directive is also in force in Norway. The effect of the Directive is, among other things, dependent on whether or not the action plans will be successfully implemented.

The conditions for implementing road traffic noise abatement measures in connection with the construction of new residential areas and new roads differ from the conditions relating to existent residential areas and roads. Road traffic noise is, to some extent, considered when planning new housing or new roads. The more difficult problem is noise nuisance in already existing residential areas and roads, including residential areas which experience traffic noise nuisance because of increased traffic.

This article concentrates on noise nuisance in existing residential areas. Hence, I concentrate on the most difficult situations which provide the poorest conditions for implementation of road noise abatement. Road traffic noise nuisance in these situations can be reduced by three basically different ways:

- (i) through measures at the source (e.g. vehicles, tyres, road surface, reduced speed, reduced traffic, and prohibition of noisy vehicles in specific areas),
- (ii) through measures connected to the diffusion of noise (e.g. through noise barriers, tunnels and vegetation,

- (iii) through measures undertaken at the individual dwelling (e.g. façade insulation, noise abatement windows, local barriers, and changed utilization of buildings).

The municipal roads are the source of a large share of road traffic noise nuisance above 55 dB in residential areas, in Denmark and Sweden the figure is approximately 85-90 %, and in Norway and Finland approximately 50 %. As both the local political entity and local environmental protection authority, the municipalities also have a responsibility connected to the abatement of noise stemming from state and regional roads which pass through the municipality (Danish Environmental Protection Agency 2008; Sørensen and Leite 2007). Focusing on the importance of the municipalities in road noise abatement efforts is in accordance with the EU Directive mentioned above. As a consequence of the Directive, a number of municipalities are designated “competent authorities and bodies responsible for implementing this Directive” (Directive 2002/49, article 4), and thus responsible for implementing actions plans, etc. Hence, municipal efforts as regards road traffic noise abatement are important. However, the municipal efforts seem to be limited. Compared to the municipalities, the states have for many years accomplished more systematic and concentrated efforts as regards road traffic noise abatement by existing residential areas (Sørensen and Leite 2007).

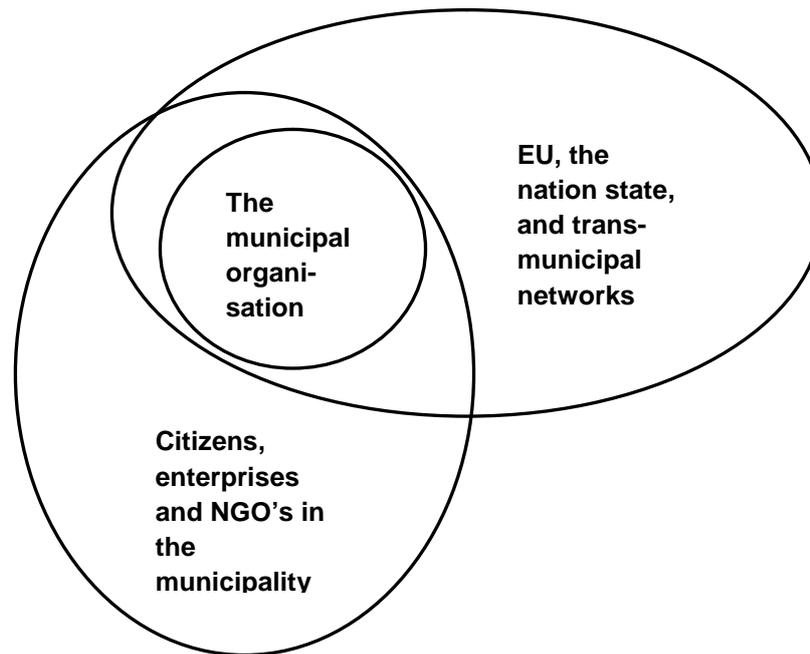
The aim of the article is to address the following research question in relation to already existing residential areas and roads: which conditions in the municipal organisation and its institutional environment contribute to making municipalities provide and implement noise abatement measures? The analyses presented in this article is based on a research project carried out at Institute of Transport Economics and published by the Nordic Council of Ministers (Sørensen and Leite 2007).

After this introduction, I will explain the approach and methodology employed (section 2), present what I see as the anatomy of municipal road noise policy (section 3), analyse two case studies (section 4), and finally conclude on the research question and put forward recommendations concerning lessons to be learned (section 5).

## 2. The Approach

A municipality is an organisational entity as well as an arena for power struggles. The municipality, however, exists in an organisational environment which also influences the decisions. In this study, the assumption is that three factors influence how the municipalities prioritize among political issues: 1) the municipal organisation (the politicians and civil servants in the municipality), 2) the local institutional environment (citizens, business and NGO's, and 3) the EU, the nation state and trans-municipal networks (Figure 1). In the article, I explain how these factors might influence the municipalities' efforts regarding road traffic noise abatement.

*The municipal organisation* consists of civil servants, but it is ruled by politicians. The parties and politicians influence the decisions. However, the civil servants are of influence too. They prepare and implement political decisions. The professions represented in and the formal organisation of the municipal administration are also significant. The existence of many competent professionals within a policy field will probably increase the likelihood of initiatives within the area (Banister 2002; Harsheim and Hovik 1995, pp 15-18; Hovik 1994, pp 192-201). Like other organisations, the municipal administration consists of formal objectives and procedures as well as informal routines and common understandings. Traditions are of consequence. Hence, one can talk about the routinized practices and path dependency, which imply that a municipality cannot easily change in whatever direction it wants (March and Olsen 1989; Sørensen 2001). Dedicated individuals are individuals committed to a specific issue. They may be found among politicians as well as civil servants, and can be significant for a municipality engaging in a specific issue (Læssøe 1991, p 55). Politicians often are seen as acting for the concerns of their constituency, while civil servants probably will attempt to increase the scope and resources of their field of work (Christensen 1999; Jacobsen 1997). The economic resources available in the municipal organisation are also important. For weak policy concerns, politicians as well as civil servants might use policy-hitchhiking, that is, argue with reference to other stronger policy concerns for measures which will benefit both concerns (Flyvbjerg et al 2003). We will return to the concept of policy-hitchhiking in the analyses.



**Figure 1.** *The municipality and the institutional environment.*

*The local institutional environment* consist of citizens, local enterprises and local NGO's. In the Nordic countries, citizens influence municipal policy through municipal elections. But in between the elections the municipal policy might also be influenced. In the local institutional environment, dedicated individuals are of importance (Læssøe 1991, pp 55-63). In some policy fields, citizens' influence is institutionalised e.g. through user councils and hearings in connection to land-use planning. Whether the local institutional environment will succeed in making the municipality engage in a specific topic can be expected to depend on some characteristics, such as (i) whether a municipal initiative will solve big problems for many citizens or it will solve minor problems for a few citizens, (ii) whether an initiative will benefit a specific group of citizens which thus will obtain evident benefits, or the benefits will be diffuse, so that no citizens really notice, and (iii) whether the costs or inconvenience of an initiative will bother a specific group of citizens which thus will experience evident costs or inconveniences, or the cost or inconveniences will be diffuse so that no citizens really notice. According to theory, it should be more likely that the municipality will engage in solving a problem if it is experienced by many inhabitants, and a specific group will receive unambiguous benefits, and thus are actively involved, while the costs are diffuse and hardly anybody will notice

them. Such policies can be labelled client policies (Winter 1994, pp 33, 50-52).

The wider institutional environment consist of *the EU, the nation state and trans-municipal networks*. Although, they are at a further distance they are of great importance. Through this environment the municipality experiences requirements, not least from the state. Due to state requirements, Nordic municipalities are often defined as experiencing a dual role, on the one hand being an instrument for the implementation of state policies, on the other hand being a local political arena expressing the will of the local population (Naustadslid 1994, p 20). State governance tools vis-à-vis the municipalities are threefold: regulative, economic and pedagogic. Regulative governance tools include the hardest tools, while pedagogic tools include the softest tools. The state utilizes these tools one by one or in combination for governing the municipalities (Anderssen et al 1992, pp 10-11). However, the requirements that municipalities meet from the wider institutional environment are not solely state requirements. The EU also establishes requirements, a type of requirement I will not address in this article. Requirements experienced by the municipalities are also formulated in different political and professional networks and in municipality networks. In such networks across the municipal borders understandings regarding content

and procedures for municipal activities are shaped and spread (Harsheim and Hovik 1995; Røvik 1998; Scott 1995).

The study consists of a literature review which includes theoretical works, and other literature which in a general manner addresses environmental policy and municipal priorities, as well as a study of national documents and guidelines regarding noise. Further, information has been compiled through contacts and interviews with, first and foremost, civil servants in Denmark, Sweden, Norway and Finland. This compilation of information has proved necessary because the existent literature on municipalities' efforts regarding noise traffic abatement is limited. In addition, two case studies have been accomplished, dealing with processes in the municipality of Hørsholm, Denmark, and in the City of Stockholm, Sweden. The cases are what can be labelled "extreme cases" in the sense that they diverge from the normal situation (Flyvbjerg 1991: 149-150). The two cases diverge from other Nordic examples because efforts beyond the usual are – or might be – carried out to reduce traffic noise. The case studies include document analyses as well as semi-structured, qualitative research interviews. Finally, dialogue with experienced practitioners has been an important instrument in the methodology. One element in this dialogue has been the research interviews. However, interviewees and other informed observers have also been invited to comment on a draft of the report.

### 3. The Anatomy

Taking my point of departure in the literature (Bendtsen 2003; Kolbenstvedt et al 2001; Lindqvist 2004; Støjmessen 2004; Sørensen and Leite 2007) as well as our interviews, I draw a picture of the anatomy of the municipal noise abatement policy. That is, characteristics of road traffic noise abatement as a policy field in municipalities. The general picture is that one should *not* expect that municipalities will deal with road traffic noise abatement in existent residential areas. In the municipal organisation, the issue seems to a limited extent only to be an object for political attention. While the issue of traffic safety is characterised as a question of "living or dying", noise abatement is characterised as "cosmetics". In many municipalities, noise abatement is influenced by the fact that it is a part time job for the civil serv-

ants involved, and furthermore, noise abatement is not seen as a core task in any of the professions. For these reasons we do not find many dedicated individuals within the noise abatement field. Lack of economic means also constitutes a reason for not picking up the problem of road traffic noise. It is not an easy task for municipalities to engage in road traffic noise abatement in existent residential areas. Only in the largest municipalities does the picture seem to be more positive.

In the local institutional environment, where we find citizens, business and local organisations, it is important that the problem of road traffic noise in existent residential areas is characterised by diffuse responsibility. Furthermore, it is not possible to determine exactly when the problem arose. Road traffic noise is a phenomenon which appears slowly and creeps. However, for the largest municipalities it seems possible to draw a more positive picture. Hence, re-urbanisation or gentrification can create circumstances where resourceful citizens take up residence in areas with traffic noise nuisance, and demand municipal abatement measures.

Regarding the states, only Norwegian legislation requires that the road authorities establish noise protection in existing residential areas, hence in cases where houses are exposed to more than 42 dB inside. In all four countries presently no or few financial state contributions are available for municipal activities in the field of road traffic noise. Furthermore, the states apply few pedagogic policy instruments vis-à-vis the municipalities. As regards trans-municipal networks, professional noise networks are demanded by Swedish municipalities at least, but few networks exist. It is only in Sweden that road traffic noise is an important topic in the national organisation of municipalities, and in all four countries, the large, national environmental NGO's do not deal with the topic.

All in all, the abatement of road traffic noise nuisance in general does not seem to be institutionalised, neither in the municipal organisation nor in the local institutional environment, though possibly, the large municipalities represent an exception to this rule.

#### 4. The Case Studies

Two case studies have been carried out. In the case studies we analyse processes that have led to - or might lead to – the establishment of noise protection facilities. The first case study regards the construction of a noise barrier in the Danish municipality of Hørsholm in the North of Zealand (a measure reducing the diffusion of noise). When we made the research in the autumn of 2005 it seemed the project would be carried through. By February 2008 the project still is not decided, and there seems to be some obstacles. Nevertheless, here I present the process until 2006 as a case of a successful process from which we can learn.

The second case is taken from the City of Stockholm, the capital of Sweden. For a period of years, the City of Stockholm has spent comparably large amounts of money on traffic noise abatement on the municipal roads. The money is most of all used for noise abatement windows (measures reducing noise by the individual dwelling).

Both cases constitute examples of municipalities which - compared to other Nordic municipalities - are involved in efforts beyond the usual to reduce road traffic noise. In the case studies I want to find out how and why it has been possible to succeed in the municipalities' road noise abatement measures, thus contributing to the article's overall research question.

##### 4.1. The Case of Hørsholm

Hørsholm is a relatively rich municipality of about 25,000 citizens not far from Copenhagen. A highway crosses through the municipality contributing to noise nuisance in some residential areas. The demand for a noise barrier along the highway started in 1990 when citizens asked the municipal council for noise protection facilities. Since the highway is a state road, the municipality contacted the National Road Directorate which, however, would not give preference to noise protection on the highway in Hørsholm compared to other state roads with more road noise nuisance. Hence, the state policy is to give priority to dwellings exposed to 65 dB or above, and only a few houses in this area of Hørsholm are exposed to this extent. Later on, the local politicians also applied to the Road Directorate for grants, but the state never contributed economically to the noise abatement project.

Nevertheless, by the end of the 1990's, the municipality had made a sketch plan for noise protection, because they expected other funding possibilities. Exploring the funding opportunities turned out negatively, and around the turn of the century the municipal council decided that co-financing by dwellers in the area was necessary. If the house owners' associations would not co-finance noise protection there would not be any. A politician responsible for this initiative explained the suggestion by saying that some politicians in the municipal council did not think that the construction of a noise barrier was by any means a municipal task. Furthermore, he underlined that the municipality had to prioritize among many problems, and in this process "noise barriers did not have much preference". Compared to, for example, the traffic safety projects in the municipality, the political involvement is limited. As one of the interviewed politicians stated, "the issue of traffic safety is a question of living or dying", while noise abatement is characterised as "a sort of cosmetics" or "face-lifting".

In the beginning, the house owners' associations were sceptical of co-financing. But some years later new dwellers which were in favour of the idea, took the initiative, and contacted constructors, other house owner associations in the area, initiated the collection of signatures for a noise barrier, and established an intensive dialogue with civil servants as well as politicians in the municipality. In this process noise reduction did not seem to hitchhike with other concerns. It was rather the other way around, namely that wishes to increase the value of the houses behind the noise barrier and the establishment of a recreational area hitchhiked with the concern for noise abatement.

All interviewees, politicians, civil servants and citizens stressed that active and persistent representatives from the house owners' associations are the ones to be credited for bringing the issue to the municipal political agenda. They behaved in an appropriate way vis-à-vis the civil servants and politicians. The number of affected people and the level of noise do not seem to be very important, contrary to what one could expect. A specific group will benefit, but since they will have to finance part of the costs, we cannot really talk about client policy (cf. section 2).

Interviewees from the house owner associations describe the municipal administration as “positive”, “co-operative” and “open” towards the noise project, but it is clear that the administration was not used to working with noise abatement. The administration lacked resources and no civil servants felt dedicated to working with noise abatement. The civil servants dealing with noise did it as a part time job. Furthermore the administration did not receive any help from professional associations or networks. Also, the national environmental NGO’s are not engaged in road noise abatement. The question of road noise abatement is definitely not institutionalised as an issue in the municipality of Hørsholm, but one can say that the dialogue which was established in the process between citizens, civil servants and politicians became institutionalised.

#### **4.2. The Case of Stockholm**

In Stockholm, municipality efforts to reduce road noise nuisance were introduced in the 1970s. A so-called noise protection group including different departments in the municipality played a key role. The group’s main function was to map the need for measures. Against this background, a 10 year plan for road noise reduction was decided in 1986. The costs were calculated at 110 millions SEK, in 1993 only 20 million had been spent. The topic was not among those with high precedence, and the allocation for 1994 was next to nothing.

However, a year earlier a package of infrastructure measures was decided, the so-called Dennis package (Sørensen & Leite 2007, p 92-93). 36 billion SEK was planned to be spent within a period of 15 years. To this package, road noise protection measures were attached. Noise protection measures were included in the package for three reasons. First, because the infrastructure measures were criticised for damaging the environment and it was necessary to establish a balance taking the environment into consideration. Second, the noise protection group’s mapping made the administration capable of suggesting necessary noise protection projects. Third, the influence of a state action plan in the field made an impact on decision making.

In the short term, the Dennis package would not result in the allocation of funds for noise protection. Hence, the municipality’s Environmental Administration acted. Swedish environmental legislation allows

the Environmental Administrations to instruct, for example, the Road Administration to engage in noise protection. The rule is seldom used, but the Environmental Administration threatened to use the rule. The threat had an effect on the municipal Road Administration and a common understanding was established to increase the allocation for noise protection.

These and other activities were important for the further development of noise abatement. Hence, in 1997, the City Council decided to spend 200 million SEK on noise protection between 1997 and 2005. A huge Environmental Administration with more – and some indeed enthusiastic – civil servants, a dedicated municipal politician being in charge of environmental affairs at this moment, national ambitions, relatively many municipal resources for investment, and national subsidies were important for the outcome of the process.

In fact, not quite as much money was spent (1997 – 2005: 140.2 million SEK), but this was a huge amount compared, for instance, to other Nordic capitals. Most of all the funding was used for noise abatement windows. Each year road noise nuisance has been reduced for 4 -5,000 inhabitants. Part of the money has been reimbursed by the state. Today, the departments in the municipality which are involved are co-operating on noise protection. The efforts are hardly ever questioned and when they are, the Environmental Administration can reject the questions by referring to continuous mapping and status reports. In addition, many citizen complaints over noise issues contribute to keeping the issue on track. Hence, the issue of road noise abatement to a large extent is institutionalised, and it is not dependent on the political orientation of the politicians in power. In this case study too, noise abatement does not seem to hitchhike with other concerns. On the contrary, the reduction of costs for heating hitchhikes with concerns for noise reduction. (Outside the specific case study noise abatement might be seen as hitchhiking with traffic safety in the case of reduction of speed limits in Stockholm).

The main driving forces in the Stockholm case have been a national framework (legislation, funding and a national action plan) in combination with an active and enthusiastic Environmental Administration, doing “lobbyism” as one of the civil servants expressed it.

## 5. The Conclusions

The report's two case studies constitute examples of municipalities which - in spite of the anatomy of municipal noise abatement policy - are involved in efforts beyond the usual to reduce road traffic noise. Inspired by the case studies, I highlight some conditions which seem to be important for making municipalities actively provide for and implement road noise abatement measures in situations of existent residential areas and roads.

In the *municipal organisation*, the following conditions seem to impact positively:

- that the municipality is in good economic situation;
- enthusiastic politicians are in power and pay attention at decisive phases of the process;
- that the municipal administration possesses solid competences within the field;
- that the municipal administration comprise dedicated individuals which are committed to the issue, and that they are active and persistent;
- that the municipal administration continuously conducts mapping of the need for initiatives, and prepares status reports to the politicians. Mapping makes the administration capable of placing noise abatement on the political agenda, and status reports ensure that the politicians remember the need for abatement of road traffic noise in existent residential areas;<sup>2</sup>
- that the municipal administration is capable of using any opportunity to advance road noise abatement measures;
- that the municipal administration is open towards noise abatement projects, and thus, functions as a catalyst;
- that road traffic noise abatement in existent residential areas attains a high level of institutionalisation, the consequence being that the need of abatement efforts is hardly ever questioned.

In the *local institutional environment*, the following conditions seem to impact positively:

- that citizens complain of noise nuisance and hence emphasise the need for abatement efforts;
- that citizens over a number of years patiently and persistently continue to stress the need of noise abatement policies and/or measures;
- that citizens are capable to express themselves

and behave in ways which politicians and civil servants respect;

- that a positive dialogue is obtained between citizens, civil servants and politicians - this dialogue can imply co-financing as an element;
- that citizen participation is institutionalised, the consequence being that citizens, politicians and civil servants in cooperation develop noise abatement policies and measures.

Regarding the *national state and trans-municipal networks* the following conditions seem to impact positively:

- that the municipality as a regulatory authority and due to environmental legislation can instruct road authorities to provide noise abatement measures;
- that financial state contributions are available for municipal activities in the field of road traffic noise - this in particular is important at initial phases;
- that state action plans and state publications exist which can function as pedagogic policy instruments;
- that the state heads for ambitious policies in the field of road traffic noise in situations of existent residential areas and roads. Such policies might stimulate municipal efforts;
- that the state over a period of years has paid attention to the issue. For the municipalities, persistent state efforts function as a pedagogic policy instrument.

Against this background it is possible to outline two different strategies which the states can pursue to increase municipal provision for and implementation of road noise abatement measures in existent residential areas, hence, the citizen strategy and the civil servant strategy. Within the citizen strategy the main driving force is organised citizens in the local institutional environment. Hence, a precondition for the strategy is the existence of citizens who want to engage in the issue. Though the strategy can be utilized in individual municipalities, it might not be possible for the state to choose this strategy if engaged citizens cannot be expected in the areas with the largest problems. Within the civil servant strategy enthusiastic civil servants are the main driving force, and a precondition is that a section of the municipal administration can be expected to engage

in the issue. In both strategies, local politicians are important, but they cannot be expected to be initiating driving forces. In both strategies the municipal organisation, the local institutional environment as well as the state and trans-municipal networks play important roles, although the roles vary within the two strategies.

A consequence of the citizen strategy can be that engaged citizens with plenty of resources achieve noise protection, while citizens with less resources do not. Hence, one might expect residential areas exposed to a high level of noise nuisance not achieving protection, while residential areas less exposed do achieve protection. Regarding the civil servants strategy, it probably will most of all be large municipalities with huge departments which can utilize the strategy, because the volume of civil servants makes it more likely to find the right professions and dedicated civil servants. Hence, a consequence probably will be noise abatement in large municipalities, and less in smaller municipalities.

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### Notes

- 1 All Danish, Swedish and Norwegian quotations have been translated by the author.
- 2 Noise mapping is also demanded in the previously mentioned EU Directive (Directive 2002/49).

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