Developments in Environmental Noise Policies

Tor Kihlman
Chalmers Univ. of Technology, Applied acoustics, SE-412 96 Goteborg, Sweden tk@ta.chalmers.se

A Technical study group within the International Institute of Noise control Engineering has recently finished a draft report. This report contains an excellent and broad overview of environment noise policies, which organizations that are involved and what is important in an environmental noise policy. With this background, the plenary paper will concentrate upon the EU Directive on environmental noise and one of the main problems related to the Directive; road traffic noise affecting a high fraction of the EU population and the lack of a reasonable balance between 1) noise emission regulations and 2) reasonable demands upon limits for noise immissions corresponding to a sustainable development. The environmental noise problem obviously has very low priority in the EU political process and progress is extremely slow.

1 Introduction

Noise is defined as unwanted sound. In analogy, I define the noise issue as an unwanted issue – among those who could and should do something about it. This is very remarkable, as noise is considered by WHO to be the 3rd most hazardous pollution (air, water, noise) in large cities. Also, it is stated in several EU documents: “Noise is one of the environmental pressures that is closest to the citizens. In public surveys, problems with noise are rated at the highest level together with global warming.”

A Technical study group within the International Institute of Noise control Engineering has recently finished a draft report [1]. This report contains an excellent and broad overview of environment noise policies, which organizations that are involved and what is important in an environmental noise policy.

Therefore, in the plenary paper, I will concentrate upon the EU Directive on environmental noise [2] and recommend for reading the mentioned report which is very comprehensive.

2 EU policy on environmental pollutants

2.1 Background

Many environmental problems have been solved or can be solved entirely by emission reductions. (The distinction between emission and immission is clarified in section 2.2.) This has also been the general approach in the EU environmental legislation. But this approach is seldom sufficient to solve noise problems. Contrary to many other pollutants, noise does not come solely through a pipe where an effective muffler can be inserted or as a product that can be substituted by another product which can provide the wanted service. There exist no end of the pipe solutions other than in a few special cases. To reduce noise emissions from different machines or vehicles is a difficult and time-consuming engineering task for each dB. It is easier to construct a car that is faster than one that is quieter! Typical noise levels in urban streets are $L_{Aeq}=60-65 \, \text{dB}$, in very busy streets or roads up to 75 or 80 dB. A very high fraction of the European population is exposed to noise levels that jeopardize their health and well-being and we get more and more research results showing the seriousness of the adverse effects [3]. Nevertheless, the present policies are quite weak and ineffective. Most countries have adopted the WHO definition of health, but the governments are not prepared to accept the consequences.

Whereas a common level outside buildings facing urban streets and roads is 65 dB, a good acoustic environment outside dwellings is 45 dB. There is a gap of 20 dB, sometimes 30 dB between common environments and the good environment. There are very few examples where the noise emitted from an otherwise well designed and developed product has been reduced by 20 dB. This is why noise problems have to be tackled through measures both on the emission and the immission side. Further, due to the practical difficulties, immission goals are mostly set as technical/economic compromises. A common goal in a number of European countries is an equivalent outdoor level of the order of 55 dB. The good acoustic environment is seldom defined in policy documents.

The development towards quieter road vehicles has been extremely slow. During the last three decades the noise reduction from road vehicles in ordinary traffic has been only 1-3 dB [4], which does not even compensate for the increased traffic during the same time period. Reasons for this lack of progress are conflicts with traffic safety, that the responsibility is shared between three parties – the car manufacturer, the tyre manufacturer and the road keeper – and a very active lobbying from industry with no counteracting
lobbying from those who have to deal with the immissions. Persons driving sport cars or two wheelers or wanting to have wider tyres because they look fancier are legally allowed to cause more annoyance when driving.

Many politicians refer to noise as a local problem. This is very misleading as the problem cannot be solved by local actors. Even worse, local measures to decrease the noise may instead increase the total noise. Local measures against noise are often contra-productive when regarded from the strategic level.

Traditional guidelines on solving traffic noise often suggest (increased) distance between source and receiver as a good means to decrease the problems. This is the noise equivalent to tall chimneys to decrease air pollution. The tall chimneys did not reduce the amount of pollutants but only decreased the concentrations. That solution is no longer accepted for air pollution – reductions of the emissions have become compulsory - but for noise we still accept the equivalent approach. Increased distance as a general approach to decrease noise disturbances is very ineffective. It leads to urban sprawl resulting in more traffic as well as other negative consequences. As a matter of fact, due to common human behavior, the sprawled city is not quieter than the compact one. In urban areas, we fill all streets and roads with traffic. The emitted traffic noise power per unit urban area is surprisingly equal in major European as well as in American cities. It is almost independent of population density [5], [6]! The result is that we annoy each other. A rough figure is that we get one or two annoyed persons per 100 vehiclekm/day in urban areas in Europe. The road vehicles are so noisy that we cannot build dwellings with acceptable – and definitely not good – acoustic environment in the vicinity of the roads. The purpose of which is to serve the dwellings!

To solve or at least decrease the noise problem, we have to work with measures both on the emission side and the immission side.

To decrease the immissions, we often use noise barriers. We can also get benefit of the spatial variations of the noise that we have in built up areas and make best use of quiet areas and “quiet facades”. See e.g. the research program www.soundscape.nu. However, we have in urban areas 10 dB too much traffic noise power per unit area to get reasonable levels on the exposed side and a good acoustic environment in shielded areas behind buildings or barriers.

2.2 Emission and immission

When dealing with environmental issues, especially noise, we have to distinguish very clearly between two concepts: emission and immission. (Cf emigration and immigration)

The emission describes the noise output from the source. The immission (originally a concept from Roman law related to real estate property rights) describes how much noise that is received at the receiver. The immission is a function of the emission (in case of road traffic noise determined by the amount and speed of the traffic, the vehicles’ properties, the road surfaces), the city structure (the road network, building sizes and positions), the type of ground between traffic routes and buildings, the plans of the dwellings and - for indoor noise – the sound insulation of the building facades (when windows are closed!). It is the immission that determines which adverse effects we get.

On the immission side, environmental noise is mostly characterized by an A-weighted equivalent level, L_Aeq. The time period for the averaging is mostly 24h or 8h. An additional descriptor sometimes used, is L_Amax. L_Aeq, with a day/evening/night weighting of +5 dB for the evening and +10 dB for the night, called L_d, is used in the EU. In the US, mostly Ldn is used. Ldn has a +10 dB weighting for the night. Relations for typical traffic distributions over the 24 hours:

\[ L_{dn} = L_{eq} + 1 \mathrm{dB} \]

The actual immission levels also depend upon reflections from building facades close to the receiver. Therefore, in many noise regulations, limit or guideline values are given as free field levels, i.e. the levels as if there were no close by buildings, with the approximate relation that the level at some distance from a facade \((>2m)\) is 3 dB higher than the free field level.

When dealing with environmental noise regulations, measurements, predictions or mapping it is important to distinguish very clearly between these concepts. Unfortunately, this is not always the case, resulting in some uncertainty and confusion in comparisons between data from different publications.

2.3 The EU Directive

The shortcomings of noise emission legislation was the background to the EU Directive on environmental noise [2]. The original idea was that by adopting common indicators and enforcing a unified noise mapping it would be possible to follow the development over time on the immission side and if the development would be slow or even negative this would lead to pressure to introduce more effective legislation on the emission side.

Article 1 in the directive is a clear declaration of the intent. It emphasizes both the immission side and the emission side. (However, it does not use the term
immission but instead exposure.) But it must be noted that whereas there is some (but insufficient) emission legislation within EU, the directive does not contain any legislation, guidelines or even advice on immission levels.

Article 1
Objectives
1. The aim of this Directive shall be to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. To that end the following actions shall be implemented progressively:
(a) the determination of exposure to environmental noise, through noise mapping, by methods of assessment common to the Member States;
(b) ensuring that information on environmental noise and its effects is made available to the public;
(c) adoption of action plans by the Member States, based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.
2. This Directive shall also aim at providing a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft, outdoor and industrial equipment and mobile machinery. To this end, the Commission shall submit to the European Parliament and the Council, no later than 18 July 2006, appropriate legislative proposals. Those proposals should take into account the results of the report referred to in Article 10(1).

(Article 2
Scope
1. This Directive shall apply to environmental noise to which humans are exposed in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise sensitive buildings and areas.

2. This Directive shall not apply to noise that is caused by the exposed person himself, noise from domestic activities, noise created by neighbours, noise at work places or noise inside means of transport or due to military activities in military areas.)

3 Some experiences of the work with the directive
3.1 The organization of the work
The directive has been worked out within EU’s DG Environment. A Steering committee with representatives from the member states has met once or twice a year. The influence of this steering committee upon the organization of the work has been minor. A number of working groups have been tackling different aspects such as common indicators, dose/response relations, prediction and mapping methods, costs and benefits. The economic resources for these working groups have been very limited. Separate working groups have been working with emission problems, for road traffic vehicles, trains and civil aircraft. These working groups have been appointed by DG Enterprize

3.2 The immission side
The work on the immission side, as defined in the directive, article 1, section 1, has followed the plans even though better economic resources would have made the work more effective. Position papers have been worked out. Noise mapping work is under way in the member states. It is regrettable that much of the work now seems to have come to an end. Several tasks would need further work but the working group dealing with health and socio-economic questions has no longer any funding. The work on noise mapping and methods to determine the number of exposed persons within different noise level intervals continues. A critical problem will be to arrive at sufficiently accurate methods that will enable to distinguish whether the number of Europeans suffering from too high immission levels increases or decreases over time as the changes are slow. Noise abatement plans are probably under way in many cities in Europe as a consequence of the directive. The important issue to improve the information to the public and to get the public involved should be much improved thanks to the mapping activities.

3.2 The emission side
Progress on the emission side is, however, very slow or almost non-existing. As said above, these parts are dealt with by DG Enterprize whose main task is to promote the free movement of goods and services. There is a total lack of balance between pressure and activities on the immission side and the emission side,
creating the wide gap between actual acoustic environment and a good and sustainable one.

Some progress is under way on lowering the emissions from freight wagons by the introduction of a new type of brakes that will be less harmful to the railway wheel surfaces.

The emissions from aircraft are handled by ICAO. Very little has happened since the so-called Chapter 3 noise emission requirements were introduced 30 years ago. A further tightening of the requirements has recently taken place. It was then announced that the new emission requirements would be 10 dB lower than Chapter 3. What was not announced with equal emphasis is that the 10 dB is the sum of measurements in the three certification points, so the average in sharpened requirements is 3.3 dB. Further, practically all new aircraft already fulfill these lower limits so the effect on noise emission from each aircraft will be negligible. Increased air traffic will therefore increase the emission problems around airports. But the announcement of the 10 dB has led to misinterpretations.

Most severe is the slow progress on lowering the emission from road vehicles. The EU Commission does not seem very anxious to get stricter requirements nor are there any signs of any other political interest to act. My own experience is that every attempt to get anything to happen on the emission side is blocked. The lobbying from the industry seems much too effective.

The test method for type approval of new road vehicles, ISO 362, has been much criticized ever since its introduction four decades ago even though some amendments have been made. A test method should ideally fulfill three basic requirements. It should be relevant, accurate and cheap/simple. The test method for road vehicles only fulfills the last requirement. It is very irrelevant. While the limit values for type approval have been lowered by $10 - 15$ dB (different numbers for different vehicle categories) the effect on the real emission from the individual vehicle in ordinary traffic has only been $1 - 3$ dB [4]. Quite too often, politicians believe or at least argue that their decisions have led to lowered noise emissions by the $10 - 15$ dB.

The situation is complicated by the fact that the responsibility for the vehicle noise emission is shared between the car manufacturer, the tyre manufacturer, the local/regional/national road authority and the driver. At present, tyre/road interaction noise is dominating already from 50 km/h for cars and for trucks from 70 km/h roughly.

There are now noise limit requirements on the vehicles tested in a drive by test. The method is rather strange in the way measurement data are evaluated and used. Inaccuracies and production safety margins are “given” to the car manufacturer. The test road surface is not sufficiently well standardized.

In 2001 we got an EU Directive on tyre noise [7]. Practically all tyres on the market fulfilled the directive when it was introduced so its effect in terms of reduced emission levels has so far been very minor.

The work on test methods and limit values is now organized under UNECE and carried out by the Working Party on Noise (GRB) which sorts under WP29. At present, work on a changed test method is going on. It is said to be more relevant than the present one. The progress on the work seems to take very long time. Its goal appears to be a somewhat more relevant test method but not any lower noise emission from the vehicles.

### 4 European research policy

During the last decade European research policies has become an important factor in research and development. While at the beginning the main intention was to promote cooperation between research and industry in different European countries (the composition of the consortia with respect to nationalities was very important), today European research policy is clearly oriented towards the big challenges identified for the nearer future (i.e. the next 20 to 30 years). The research is organized in so-called frameworks. The sixth framework is running from 2003 to 2007. The seventh framework is in preparation. This means that already today the contents (so-called working programmes), the areas that are considered as especially important, and the forms of projects (reaching from “small projects” with a few partners and typically an budget between 1 to 2 million Euros to for instance so-called integrated projects with 30 to 40 partners and maybe 20 million Euros) are defined. The definition of the working programmes is a political process where different parties with interests in special questions (so-called stakeholders) are included in the discussions. Having in mind the complexity of the world we live in, it is obvious that the Commission has to rely on the input from external experts in the field, helping to identify the most important research needs to be included in the working programmes.

For this task so-called advisory councils have been launched by the Commission. The Advisory Council for Aeronautics Research in Europe (ACARE) has been established in 2001. It includes representations from Member States, the Commission and stakeholders such as manufacturing industry, airlines, airports, service providers, regulators, research establishments and academia (see www.acare4europe.com). A similar organisation, the European Road Transport Research Advisory Council (ERTRAC, see www. Ertrac.org), has recently been established.
Checking their internet pages one learns that “ACARE’s main focus will be to establish and carry forward a Strategic Research Agenda (SRA) that will influence all European stakeholders in the planning of research programmes, particularly national and European programmes, in line with the VISION 2020 and the goals it identifies”. A similar statement can be found for ERTRAC.

How is the vision 2020 formulated with respect to noise? ERTRAC names as one of the major aspects of a “cleaner, quieter and more energy efficient road transport system” that by 2020 “noise from the road traffic system has been reduced. Noise levels are appropriate to individual locations including quiet zones”. This is an ambitious goal having in mind the little progress during the last twenty years.

Of course noise can only be a small segment in the SRA having in mind the multitude of aspects of road transport research. In addition, economy has received an overall priority. Already in the introduction of ERTRAC’s vision 2020, this has been emphasized by declaring that “this process (i.e. the activity of ERTRAC) will provide the transport sector with the right framework so as to contribute to the Union’s goal to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion”.

It will be interesting to observe during the upcoming years how these advisory councils will set priorities with respect to reduction of noise at the sources. Having a look at the members of ERTRAC one might feel a certain doubt concerning the success in this aspect. A clear dominance of industry and especially vehicle industry is obvious. Two questions arise.

Firstly, are the common people, those who have to live in noise-polluted areas, represented on an adequate level (POLIS, FEHRL and the University of Southampton are the only non-industrial non-commercial members in the council)?

Secondly can we really expect from the industrial members in ERTRAC, that they will put the burden on themselves to reduce the noise emissions beyond the low ambition they had shown until today? With “low” I am referring to the present noisy situation for the citizens.

This leads to the conclusion that for an efficient research policy, leading to a reduction of traffic noise, independent experts are urgently needed. Otherwise noise issues (similar to other environmental issues) might not receive the required attention in European research policy in order to achieve a clear reduction of traffic noise in the nearer future.

5 Proposals

In order to get a better balance between the emission and immission standards/requirements/guidelines it is needed to get strong lobbying groups organized from the immission side. One such lobby NGO should be formed by the European cities that have to deal with the noise immission problems.

It is possible and important to identify and promote win/win solutions with simultaneous positive effects on traffic safety, fuel consumption, land use, etc. Certainly, there are also demands on environmental issues and natural resource use that work in opposite directions.

Activities to reach a more effective situation demands that independent research organizations - the universities - get resources to build up an independent knowledge on noise emission from different types of products. Such research often has to be performed in close contact and cooperation with the industry but the independent groups must be given a much stronger voice in groups responsible for the allocation of resources. Independent researchers need to have resources to participate actively in the international standardization work.

GRB, responsible for the development of new test methods for road vehicle noise, should be given the following task formulation: Develop a test method and give information on required limit values linked to the test methods such that the emission from the vehicles in ordinary traffic at different speeds gets lowered by 3 dB in a first step and in later steps by 6 and 9 dB. This should be combined with follow-up programs to check the outcome and carried through by independent bodies.

Set limit values without any relief for sport cars, two wheelers, wider tyres, etc.

Introduce relevant and effective limit values for tyres and introduce a labelling system so that it can be checked at the regular test of vehicles in use that the prescribed tyres are used.

Develop acoustic test methods for the noise road surfaces and develop methods to get them in frequent use.

A few and very important dBs would be gained if speed limits were strictly kept. This would also be of great benefit to traffic safety. Today, we use more and more bumps in the road to get low speed limits better respected. Such bumps often lead to driving patterns that may even increase the noise emission. It is time to introduce external electronic speed control, which would also be beneficial for traffic safety, petrol use, a.

Related to this question is the very unfortunate effect of the free speed on German motorways. This has a
very bad effect upon the car market where all prestigious manufacturers produce cars with speed resources that are of no use in most countries but which limit the possibilities to design quieter tyres and reach lower levels of tyre/road noise.

A decrease of the emissions by 10 dB over some decades seems attainable, but it requires efforts far beyond the present. But a decrease of 10 dB from the traffic is what is needed to give the citizens a reasonably good acoustic environment.

6 Summary

The environmental noise causes severe adverse effects on the EU citizens. This is realized on the local community level by its politicians and administrations. However, it is difficult to solve the problems on this level and to provide the citizens with a healthy environment. It is demanded to have stricter requirements on a. o. the transport vehicles and to have a transport policy on the strategic level that takes the noise environment sufficiently into account. On this level in the policy system, the interest for the noise issue is much too low resulting in a severe unbalance between requirements on the emission side and the immission. What concerns the road vehicle legislation there is an urgent need to organize strong NGO groups to balance the effective lobbying from the industry. This also demands strong research groups in independent organizations such as in the universities giving them economic resources and incentives to participate in the European and international working groups dealing with emission standards and limit values. The EU research funding system needs to be less influenced by organizations close to the industry, more influenced by independent intellectual bodies. This demands several changes compared to today's system and a political leadership that we have not yet seen in this area. Otherwise, the responsible politicians should openly tell the public that we will get increasing environmental noise levels in Europe.

7 Acknowledgment

This paper is partly based on work performed within the research program "Soundscape support to health", sponsored by the Swedish foundation for strategic environmental research (MISTRA).

References


