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FUTURE NOISE POLICY

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Green Paper

EXECUTIVE SUMMARY

Environmental noise, caused by traffic, industrial and recreational activities is one of the main local environmental problems in Europe and the source of an increasing number of complaints from the public. Generally however action to reduce environmental noise has had a lower priority than that taken to address other environmental problems such as air and water pollution.

The 1993 Fifth Environmental Action Programme started to remedy this and included a number of basic targets for noise exposure to be reached by the year 2000, while the recent proposal on the review of the Fifth Action Programme (COM(95)647) announces the development of a noise abatement programme for action to meet these targets.

This Green Paper is the first step in the development of such a programme and aims to stimulate public discussion on the future approach to noise policy. It reviews the overall noise situation and Community and national action taken to date followed by the outline of a framework for action covering the improvement of information and its comparability and future options for the reduction of noise from different sources.

The Noise Situation in the European Union

The data available on noise exposure is generally poor in comparison to that collected to measure other environmental problems and often difficult to compare due to the different measurement and assessment methods. However it has been estimated that around 20 percent of the Union's population or close on 80 million people suffer from noise levels that scientists and health experts consider to be unacceptable, where most people become annoyed, where sleep is disturbed and where adverse health effects are to be feared. An additional 170 million citizens are living in so-called 'grey areas' where the noise levels are such to cause serious annoyance during the daytime.

A wide variety of studies have examined the question of the external costs of noise to society especially transport noise. The estimates range from 0.2% to 2% of GDP. The Commission's Green Paper 'Fair and Efficient Pricing in Transport' used the lower estimate of 0.2% of GDP which represents an annual cost to society of over 12 billion ECU.

Analysis of Existing Noise Abatement Actions in the European Union

For more than twenty years Community environmental noise policy has essentially consisted of legislation fixing maximum sound levels for vehicles, aeroplanes and machines with a single market aim, or to implement international agreements in the case of aircraft, linked to certification procedures to ensure that new vehicles and equipment are, at the time of manufacture complying with the noise limits laid down in directives.

Thanks to this legislation and technological progress significant reductions of noise from individual sources have been achieved. For example the noise from individual cars has been reduced by 85% since 1970 and the noise from lorries by 90%. Likewise for aircraft the noise footprint around an airport made by a modern jet has been reduced by a factor of 9 compared to an aircraft with 1970s technology.

However data covering the past 15 years do not show significant improvements in exposure to environmental noise especially road traffic noise. The growth and spread of traffic in space

and time and the development of leisure activities and tourism have partly offset the technological improvements. Forecast road and air traffic growth and the expansion of high speed rail risk exacerbating the noise problem. In the case of motor vehicles other factors are also important such as the dominance of tyre noise above quite low speeds (50 km/h) and the absence of regular noise inspection and maintenance procedures.

For some sources such as railways and a wide range of noisy equipment used outdoors there are no Community or international standards setting emission limits. A number of Member States are planning national legislation for these products, which could cause problems for the functioning of the single market.

Most Member States have adopted legislation or recommendations setting immission limits for noise exposure in sensitive areas. These are often integrated into national abatement laws and used in land use plans especially for new infrastructure developments. A survey done for the Commission has shown a considerable degree of convergence between Member States in the establishment of such quality criteria for road, rail and industrial noise. The situation for aircraft noise indices and exposure levels is more divergent.

A New Framework for Noise Policy

In the light of the poor state of data on noise exposure and the shortcomings identified in the analysis of existing policy measures, the Commission believes that changes in the overall approach are required if a noise abatement policy is to be successful. This requires a framework based on shared responsibility involving target setting, monitoring of progress and measures to improve the accuracy and standardisation of data to help improve the coherency of different actions.

The local nature of noise problems does not mean that all action is best taken at local level, as for example generally the sources of environmental noise are not of local origin. However effective action is very dependent on strong local and national policies and these need to be more closely related to the measures to be decided at Community level. In this context there is scope for cooperation across the Community to improve the data situation and the comparability of information and in addition the Community could assist in the exchange of experience in noise abatement between Member States. The main area for Community involvement will remain linked to the reduction of noise from products. Here the Commission will be looking to broaden the range of instruments applied and paying particular attention to the potential of economic instruments, whose use to date is not widespread in noise abatement.

The proposed new framework outlines options for future action :

1. A proposal for a directive providing for the harmonization of methods of assessment of noise exposure and the mutual exchange of information. The proposal could include recommendations on noise mapping and the provision of information on noise exposure to the public. In a second stage consideration could be given to the establishment of target values and the obligation to take action to reach the targets.

2. The next phase of action to reduce road traffic noise will address tyre noise and look at the possibilities of integrating noise costs into fiscal instruments, amending Community legislation on road-worthiness tests to include noise and at the promotion of low noise surfaces through Community funding.

3. More attention needs to be paid to rail noise where some Member States are planning national legislation and where there is considerable opposition to the expansion of rail capacity due to excessive noise. In addition to supporting research in this field the Commission will investigate the feasibility of introducing legislation setting emission limit values, negotiated agreements with the rail industry on targets for emission values and economic instruments such as a variable track charge.

4. In air transport the Commission is also looking at a combination of instruments. These would include greater stringency in emission values and the use of economic instruments to encourage the development and use of lower noise aircraft, as well the contribution local measures such as land use planning could make. A specific framework directive on airport charges is planned for 1996. A consultation paper on stringency in emission values is to be presented in the near future.

5 The Commission plans to simplify the existing legislation setting emission limits for a limited range of outdoor equipment and will propose a framework directive covering a wider range of equipment including construction machinery, garden equipment and others and incorporate the existing seven directives. The principal feature of the new legislation will be the requirement to label all equipment with the guaranteed noise level. Limit values will only be proposed for equipment for which there is already noise legislation and a limited range of highly noisy equipment.

Conclusion

One of the main aims of this paper is to help to give noise abatement a higher priority in policy making. It is focusing on the areas where Community action in cooperation with Member States and local authorities can be of added value. The options for action on measurement methods and exchange of information cover important steps for the establishment of an overall framework for action. More work is required to assess the best combination of instruments to be applied to the different modes of transport.

1. INTRODUCTION

Many Europeans consider environmental noise, caused by traffic, industrial and recreational activities as their main local environmental problem especially in urban areas. It has been estimated that around 20 percent of inhabitants in western Europe suffer from noise levels that scientists and health experts consider to be unacceptable, where most people become annoyed, sleep is seriously disturbed and even adverse effects on the cardiovascular and psychophysiological systems are to be feared. The increasing number of complaints from the public about noise is evidence of the growing concern of citizens. For example the 1995 Eurobarometer environment survey showed that noise was the fifth most important area of complaint about the local environment (after traffic, air pollution, landscape and waste) but was the only issue about which the public's complaints had increased since 1992. The same survey showed a significant rise in the public's willingness to take action to reduce noise. A number of recent publications on the problem - such as those by WHO, EEA,and the Nordic Council show that greater attention is being paid to noise issues at international level.

European Community measures to address environmental noise problems have been in existence for over twenty five years and have essentially consisted of legislation fixing maximum sound levels for vehicles, aeroplanes and machines with single market aims and as such have not been conceived as part of an overall environmental noise abatement programme. The Member States have enacted a multitude of supplementary regulations and other measures aiming to reduce environmental noise problems and although there is some evidence to show that noise levels in the worst 'blackspots' have been reduced, recent data show that the overall noise problem is worsening and the numbers of people living in so-called 'grey areas' has increased. In particular the continuing growth in traffic volume in all modes coupled with suburban development have led high levels of noise exposure to be spread ever wider over both space and time and are part of the reason for this worsening. In addition over the past two decades leisure activities and tourism have created new spots and new sources of noise. As a result of these developments the impact of the policy measures implemented to date to address the noise problem are being offset.

Generally action by the Community and the Member States on environmental noise has had a lower priority than that taken to solve other problems such as air and water pollution despite the fact that opinion polls show that noise is considered one of the main causes of declining quality of life. Some of the reasons may be that decision makers are not aware of the problems or familiar with the effects of noise, which are unspectacular: noise is insidious not catastrophic. As far as the Community is concerned, the lower priority accorded to noise has in part been due to the fact that noise is very much a local problem with very varied perceptions in different parts of the Community as to the acceptability of the problem. However the sources of many of the causes of environmental noise are not of local origin. In addition despite the local dimension to environmental noise problems there is a general international consensus on the levels of unacceptable noise to which the public should not be exposed in order to protect health and quality of life.

In 1993 the European Community announced the beginings of a change to environmental noise policy in line with the major changes to Community environment policy included in the Fifth Environmental Action Programme. For noise the Programme established as a basic objective the situation where no person should be exposed to noise levels which endanger health and quality of life. It puts forward a a number of targets for noise exposure levels to be reached by the year 2000 (see annexe 1).

In order to meet the targets the Fifth Action Programme lists a number of measures for implementation by the different actors in the Community, depending on their responsibilities and competencies, covering information, technological, planning, economic and educational issues. There is a clear recognition as in other areas of environment policy that the Community needs to broaden the range of instruments to be applied, rather than relying solely on legislation of emissions at source if progress is to be made in protecting people from increasing noise exposure.

The recent progress report on the Fifth Action Programme (COM(95)624) called for more intensified efforts. Following on from the progress report, the proposal on the review of the Programme (COM(95)647) announces that particular attention will be given to the development of a noise abatement programme, which will address comprehensively the provision of information to the public, common noise exposure indices, targets for noise quality and noise emission from products.

To this end the Commission's 1996 work-programme announces the first step in the development of such a programme through a Green Paper to stimulate public discussion on future noise policy. It is focusing on the areas where the Commission believes the Community's involvement in cooperation with Member States and local authorities can bring added value and be of particular benefit for the public at large.

The Green Paper includes in Chapter 2 some basic information on the problem of environmental noise and its effects followed by a brief review of the noise situation in the Community and estimates of external costs to society of noise pollution. Chapter 3 analyses the approach taken to noise abatement to date in the Member States and the Community. Chapter 4 outlines options for action covering a framework for the assessment and reduction of noise exposure and future action to reduce noise from different sources.

This paper is addressing noise as an environmental problem and therefore does not directly deal with the issue of noise control in workplaces for which legislation has been in place since 1986 (Directive 86/188/EEC) and whose revision is pending at Council level. Furthermore it does not deal with neighbourhood noise. Here the provisions of the Construction Products Directive (89/106/EEC) can be of relevance as far as technical solutions are concerned. A large part of the solutions for such 'social' noise however are educational and these problems are generally regulated locally.

2. THE ENVIRONMENTAL IMPACT OF NOISE AND THE NOISE SITUATION IN THE EUROPEAN UNION

Noise is often defined as 'unwanted sound' or 'sound that is loud, unpleasant or unexpected'. Its origins are in human activities and it is especially associated with the process of urbanization and the development of transport and industry. Although primarily an urban problem, due to topographic conditions it can also be a source of annoyance in rural areas.

Annex 2 describes the main indices used in this paper for the measurement of noise, namely the decibel (dB), the most commonly used index to express noise exposure the 'A' weighted sound pressure level dB(A) and the method of averaging results over time the so-called equivalent continuous sound pressure level L_{Aeq}.

The Sources of Environmental Noise

All the Member States have similar classifications of the sources of environmental noise related to the different human activities: road traffic, rail traffic, air traffic, industry, civil engineering and building site activities, recreational activities, outdoor equipment (such as gardening equipment). These classes differ from a phenomenological point of view and as the public's attitudes to noise from the different sources vary, are perceived differently. (Annex 3 describes the nature of noise in more detail).

Effects of noise

The effects of noise are difficult to quantify as people's tolerance to noise levels and different types of noise vary considerably. However there is a large amount of scientific literature analysing and assessing the effects of noise on human beings. The most recent and most comprehensive is the WHO report (soon to be published) 'Community Noise - Environmental Health Criteria' which points out that environmental noise may have a number of direct adverse effects on exposed people including disturbance of sleep, auditory and non-auditory physiological - basically cardiovascular - effects, interference with communication and general annoyance (more details are included in annex 4). Environmental noise exposure does not normally cause noise induced hearing loss except where exposure is exceptionally high over a long period.

Magnitude of the environmental noise problem

Exposure

Generally data on the overall exposure of the population of European countries is patchy and often difficult to compare due to the use of different methods of obtaining the data and different descriptors. The most comprehensive data on exposure to noise in Europe has been collated by the OECD in 1993 and includes data from 14 European countries.

A variety of studies carried out recently have built on this work and estimate that between 17 and 22% (close on 80 million people) of the Union's population are exposed to continuous day-time outdoor noise levels caused by transport above what are generally considered to be acceptable - more than 65 dB(A) (INRETS 1994, von Meier 1994, INFRAS/IWW 1994). An additional 170 million citizens are exposed to noise levels between 55-65 dB(A), which is the level at which people become seriously annoyed during the daytime.

Road transport noise is the dominant source accounting for nine tenths of the proportion of the Union's population exposed to levels of noise over 65 dB(A). As for rail 1.7% of the population and air transport a further 1% of the population are exposed to these high levels.

Annoyance

Data for expressed annoyance are even more insufficient than those for exposure. National surveys do not always use the same wordings of questions to enable assessment of the way in which noise is perceived (disturbed, annoyed or affected). Comparable data are only available for four countries - Germany, France, Netherlands, United Kingdom. This shows that road traffic seems to annoy between 20 and 25% of the population and railway noise between 2 and 4%. Data from a number of countries indicate that people have a greater tolerance of rail noise than road noise and in some countries this is taken into consideration

in the setting of standards, guidelines or recommendations, which are set around 5 dB(A) higher for rail than for roads.

Recently investigations have started looking at the effect-dose relation, whereby a certain percentage of the annoyed population is related to a given noise exposure. The effect-dose relation will depend on the noise source causing the exposure and it should make it possible to compare the annoyance caused by different noise sources. Another aim of this research is to investigate the cumulative effects of exposure to different noise sources.

Trends:

Data over the past 15 years do not show significant improvements in exposure to environmental noise especially road traffic noise. Although exposure levels remained fairly stable at beginning of 1980s and action on 'black spots' over 70 dB(A) has been successful, as indicated above the proportion of the population exposed to levels above 65 dB(A) remained high and increases have been experienced by the end of the decade in many western European countries in the range 55-65 dB(A) the so-called 'grey' zone apparently as the result of fast growing volume of road traffic (INRETS 1994). The data show that the numbers of those acutely exposed are decreasing but the overall problem is getting worse. In many urban areas, traffic noise peaks are not increasing but the period of high noise exposure is increasing. Whereas in the past the day-time period between 800 and 1800 was the noisiest time, now the night-time period is also becoming more and more noisy (CEST 1993).

In the case of air traffic, there is some evidence of improvements in exposure to aircraft noise since the 1970s. This is due largely to the introduction of stricter noise certification standards but also due to other non technical measures (restrictions on night time movements, controlled take-off and landing flight paths, air traffic control procedures). For example the population around Heathrow exposed to noise levels above 60 dB(A) has more than halved between 1975 and 1989, when there has been a significant growth in traffic over the same period. Large decreases have also been experienced at Copenhagen, Schipol (Amsterdam).

Noise emissions from individual trains have also fallen and is associated with the changeover from diesel to electrically powered passenger trains, the gradual introduction of welded rails to replace jointed rail and the greater use of disc braked rolling stock.

The development of high speed rail is an issue of particular concern as far as future railway noise is concerned and is the main subject of complaint from the public, when new lines are under discussion. Current practice is to include noise abatement measures in the planning and construction of such lines.

Available data on the current state and forecasts of the noise environment, which have serious shortcomings, show that in the absence of ambitious abatement policies, the noise environment risks remaining unsatisfactory or even deteriorating especially exposure to road traffic noise. The main general trends influencing the current and future situation are:

- The increase in vehicles and vehicle mileage; the forecasts to 2010 indicate a near doubling of road freight transport (in tonne-kilometres) and an increase in aviation traffic by over 180%;
- The development of high speed rail;
- The spread of traffic noise spatially to affect rural and suburban areas;
- The spread of noise over time as the period of annoying levels of transport noise

expands with 24 hour freight distribution.

Estimates of the external costs of noise

The economic costs of noise have been examined in numerous different ways and there are no benchmarks for standardised evaluation of costs. Almost all this research is limited to transportation noise. The most common methods used have been (INFRAS/IWW 1994):

- Willingness to pay based on surveys
- Change of the market value of properties; hedonic pricing
- Cost for abatement measures
- Cost of avoidance or prevention
- Cost of medical care and production losses

An overview of these studies produced in 1993 (Quinet 1993) found that the estimated costs of noise pollution vary between 0.2% and 2% of GDP. Generally studies based on the avoidance cost approach give low values for noise costs - below 0.1% of GDP, while studies using the willingness to pay approach give higher values. All the studies on willingness to pay have been carried out in countries with a high per capita income. Willingness to pay is undoubtedly dependent on the ability to pay and therefore noise would probably not be valued so high in less rich countries.

In Germany a number of studies have been based on the willingness to pay for a better noise environment approach and show that on average an individual would be prepared to pay around 10 ECU per 1 dB(A) improvement per person per year if the noise levels exceed 43 dB(A). On this basis the annual costs of traffic noise in Germany were estimated to be 7.8 - 9.6 Billion ECU.

The study carried out for the UIC by IFRAS/IWW (1994) made an overall estimate for 17 European countries based on the willingness to pay approach which shows the total cost of transport noise to be 38 billion ECU per year (EUR15 plus Norway and Switzerland) or 0.65% of GDP. The cost figures for each country were adjusted to individual national situations using purchasing power parities.

These annual costs related to transport volume break down as follows:
Passenger transport - cars 4.5 ECU/1000 passenger kilometre compared to 4.2 ECU/1000 pkm for buses, 3.1 ECU/1000 pkm for rail and 3.0 ECU/1000 pkm for air transport. The figure calculated for two wheelers gave the highest cost coefficient of all modes of 60.3 ECU/1000 pkm.
Freight transport - 12.7 ECU/1000 tonne kilometre for road transport and 4.7 ECU/1000 tkm for rail transport.

Studies into the decrease in housing value depending on noise exposure for a variety of countries over the past 25 years have shown that in the 1980s the average rate of depreciation can be estimated at approximately 1% per dB(A) if the noise exceeds 55 dB(A), whereas the studies covering the 1970s show a depreciation rate of 0.3 to 0.8% per dB(A) (INRETS 1994). On the basis of these depreciation rates global evaluations of total damage caused by road traffic noise have been undertaken for cities and countries. For France this was estimated to be 800 million ECU per year or an average of around 30 ECU per inhabitant exposed to over 55 dB(A).

Data on the noise costs caused by aviation noise often relate to the costs of insulation schemes in properties around airports. These costs vary widely depending on local labour and materials costs, the scope of the insulation scheme, the actual indoor noise level to be reached and the technical measures used. This is illustrated by the following data: for Schipol the average cost per apartment is around 23650 ECU, for Frankfurt around 3800 ECU, Köln/Bonn 6600 ECU (for 3 bedrooms) and Manchester 2300 ECU.

There is little data on actual damage costs of noise in terms of monetary estimates of health costs. Some work in Germany has estimated that the annual cost of noise on public health is of the order of 500 to 1900 million ECU per annum for road noise and 100 million ECU for rail noise.

3. EXISTING POLICIES TO REDUCE NOISE EXPOSURE AND THEIR APPLICATION

3.1 Methods and Instruments for Reducing Noise Exposure

There are three basic approaches to reducing environmental noise exposure:

i. Reducing noise at source - from machines, engines, tyres and surface, reducing speeds and reducing traffic volume and use of equipment.
ii. Limiting the transmission of noise by placing barriers between the source and people affected.
iii. Reducing noise at the reception point such as through noise insulation of buildings.

The policy instruments developed to implement these methods include: Emission standards for individual sources generally laid down in legislation, immission standards based on noise quality criteria, land use planning, infrastructure measures, economic instruments, operational procedures, research and development and education and information actions. Annex 5 contains a more detailed outline of the different policy instruments.

Analysis of Existing Noise Abatement Actions in the European Union

The following sections of this chapter analyses use of these policy instruments in the European Union and briefly assesses the impact their application has had on the noise situation. Most of these instruments have been developed and implemented at the national and local level. The European Community and international involvement has essentially been in the establishment of emission standards to control noise from individual sources although there is increasing cooperation at the Community and at international level in research into the effects of noise, noise abatement methods and in the determination of noise exposure levels.

3.2 Legislation on Emission Standards

For more than twenty years Community environmental noise policy has essentially consisted of legislation fixing maximum sound levels for vehicles, aeroplanes and machines with a single market aim linked to third party certification procedures to ensure that new vehicles and equipment are, at the time of manufacture complying with the noise limits laid down in directives. The evolution of the emission limits over time is shown in tables in annex 6.

Transport sources

Road Transport

Motor Vehicles: The original legislation governing sound levels for motor vehicles (Cars, Lorries and Buses) was adopted in 1970 (directive 70/157/EEC) and has since been amended nine times. The latest amendment by directive 92/97/EEC comes into force in 1996. The type approval test for this directive seeks to limit noise produced in a typical urban traffic situation. All vehicles must meet the limits and therefore production models need to be designed to -1dB(A) below the limits to allow for production tolerances. As the limits have fallen, tyre noise has become more significant and with the new limits will be the main source at speeds above 50 km/h.The point has now been reached where without action to address tyre/road noise, a further lowering of the limits would not be effective. The 1992 amendment therefore calls on the Commission to present a proposal to address the problem of tyre/road noise.

Two and Three Wheelers: Legislation setting limits for the permissible sound level of motorcycles has been in existence since 1978 (78/1015/EEC) and since amended on several occasions in order to introduce lower limit values, the latest being in 1989 (89/235/EEC). In 1993 the Commission proposed a draft amendment to the directive as part of an overall proposal concerning type approval of two and three wheel vehicles (COM(93)449). This would make the optional second stage limit values set out in the 1989 amendment mandatory as of 1 January 1997 and would also introduce provisions concerning anti-tampering of silencers. The Council reached a common position on this proposal in November 1995 and final adoption is expected in 1996.

Assessment of the impact of the legislation

Following implementation of the latest amendment this year, the legislation will have resulted in a reduction of noise of 85% for individual cars (8 dB(A)) and over 90% for individual heavy lorries (11 dB(A)). However studies have shown that the reduction in actual road traffic noise levels thanks to this legislation has been much less: only 1-2 dB(A). The reasons for this low level of effectiveness have been identified as: relaxed limits in the early years, a slow replacement of older noisier vehicles, significant growth in traffic and a lower threshold to achievable noise reductions caused by the interaction of tyre and road (Sandberg 1993). In addition the test procedure (ISO R 362) doesn't reflect realistic driving conditions and without a regular inspection procedure to ensure maintenance of the acoustical design features the noise levels of the vehicle may increase over time. For example tampering with the exhaust silencers on motorcycles can increase noise levels by 10 dB(A).

Directive 77/143/EEC sets out the basic provisions for roadworthiness tests and includes noise as one of the items to be part of the test. However this is generally only a subjective check to ensure that the exhaust silencers are intact and there is no specific legislation as there is for air pollution. Some countries outside the Union have had success with roadworthiness testing for noise. In Japan for example there are periodic noise inspections for in-use vehicles in the street, while in some Australian states vehicles are subject to on-road 'spotting and subsequent testing (OECD 1991). In New South Wales thousands of vehicles are tested each year and average reductions of emission of 9 dB(A) have been achieved at a relatively low cost.