Organized Move towards Noise Administration

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Abstract- The goal of noise administration is to maintain low noise exposures, such that human health and well-being are protected or enhance the quality of acoustic environment while allowing for ecological sustainable development. Sustainable development that improves the total quality of life, both now and in the future in a way that maintains the ecological process upon which life depends. A legal framework is needed to provide a context for noise management. Noise exposure should be mapped for all noise sources impacting a community and at noise sensitive places. Modeling is a powerful tool for the interpolation prediction and optimization of control strategies. However, models need to be validated by monitoring data. An integrated noise policy should include several control procedures such as: measures to limit at the source, noise control within the sound transmission path, protection at the receiver's, land use planning, education and raising of public awareness to yield complete acoustic treated environment.

Keywords –Noise administration, human health, sustainable development, modeling, public awareness.

I. INTRODUCTION

The specific objectives of noise management are to develop criteria for the maximum safe noise exposure levels, and to promote noise assessment and control as part of environmental health programmes. To support a number of environmental management principles on which government policies, including noise management policies, can be based. These include:

- **a.** *The precautionary principle*- In all cases, noise should be reduced to the lowest level achievable in a particular situation. Where there is a reasonable possibility that public health will be damaged, action should be taken to protect public health without awaiting full scientific proof.
- **b.** *The polluter pays principle*- The full costs associated with noise pollution (including monitoring, management, lowering levels and supervision) should be met by those responsible for the source of noise.
- **c.** *The prevention principle*- Action should be taken where possible to reduce noise at the source. Land-use planning should be guided by an environmental health impact assessment that considers noise as well as other pollutants. The government policy framework is the basis of noise management. Without an adequate policy framework and adequate legislation it is difficult to maintain an active or successful noise management programme. A policy framework refers to transport, energy, planning, development and environmental policies. The goals are more readily achieved if the interconnected government policies are compatible and if issues which cross-different areas of government policy are co-coordinated.

II. STAGES IN NOISE ADMINISTRATION

A legal framework is needed to provide a context for noise management. While there are many possible models. When goals and policies have been developed, the next stage is the development of the strategy or plan. Specific abatement measures are listed in Table 1. [1]

National noise standards can usually be based on a consideration of international guidelines, such as these Guidelines for Community Noise, as well as national criteria documents, which consider dose-response relations for the effects of noise on human health. National standards take into account the technological, social, economic, political and other factors specific for the country.

Table 1. Recommended noise management measures.

Examples	Legal measures
Emission standards for road and off-road vehicles; emission standards for construction equipment; emission standards for plants; national regulations	Control of noise emissions
Emission standards for road and off-road vehicles; emission standards for construction equipment; emission standards for plants; national regulations	Control of noise emissions
Regulations on sound-obstructive measures	Control of noise transmission
Initiation of monitoring and modeling programmes	Noise mapping and zoning around roads, airports, industries
Limits for exposure levels such as national immission standards; noise monitoring and modeling; regulations for complex noise situations; regulations for recreational noise	Control of noise immissions
Residential areas; hospitals	Speed limits
Low Noise Implementation Plan	Enforcement of regulations
Construction codes for sound insulation of building parts	Minimum requirements for acoustical properties of buildings

Examples	Engineering Measures
Tire profiles; low-noise road surfaces; changes in engine properties	Emission reduction by source modification
Road vehicles; aircraft; construction machines	New engine technology
Enclosures around machinery; noise screens	Transmission reduction
Design and structuring of tranquilly uses; using buildings for screening purposes	Orientation of buildings

Speed limits; guidance of traffic flow by electronic means	Traffic management
Ear plugs; ear muffs; insulation of dwellings; façade design	Passive protection
Minimum distance between industrial, busy roads and residential areas; location of tranquility areas; by-pass roads for heavy traffic; separating out incompatible functions	Implementation of land-use planning
Examples	**Education and information**
Informing the public on the health impacts of noise, enforcement action taken, noise levels, complaints	Raising public awareness
Publication of results	Monitoring and modeling of sounds capes
Monitoring and modeling of soundscapes	Publication of results
Sufficient number of noise experts	University or high school curricula
Initiation of research and development	Funding of information generation according to scientific research needs
Initiation of behaviour changes	Speed reduction when driving; use of horns; use of loudspeakers for advertisements

III. NOISE EXPOSURE MAPPING

A crucial component of a low-noise implementation plan is a reasonably quantitative knowledge of exposure. Exposure should be mapped for all noise sources impacting a community; for example, road traffic, aircraft, railway, industry, construction, festivals and human activity in general. For some components of a noise exposure map or noise exposure inventory, accurate data may be available. In other cases, exposure can be calculated from the characteristics of the mechanical processes. While estimates of noise emissions are needed to develop exposure maps, measurements should be undertaken to confirm the veracity of the assumptions used in the estimates. Sample surveys may be used to provide an overall picture of the noise exposure. Such surveys would take account of all the relevant characteristics of the noise source. For example motor vehicle emissions may be estimated by calculations involving the types of vehicles, their number, their age and the characteristic properties of the road surface. [2]

IV. NOISE EXPOSURE MODELING

Modeling is a powerful tool for the interpolation, prediction and optimization of control strategies. However, models need to be validated by monitoring data. Strength of models is that they enable examination and comparison of the consequences for noise exposure of the implementation of the various options for improving noise. However, the accuracy of the various models available depends on many factors, including the accuracy of the source emissions data and details of the topography (for which a geographical information system may be used). For

transportation noise parameters such as the number, type and speed of vehicles, aircraft or trains, and the noise characteristics of each individual event must be known. [5]

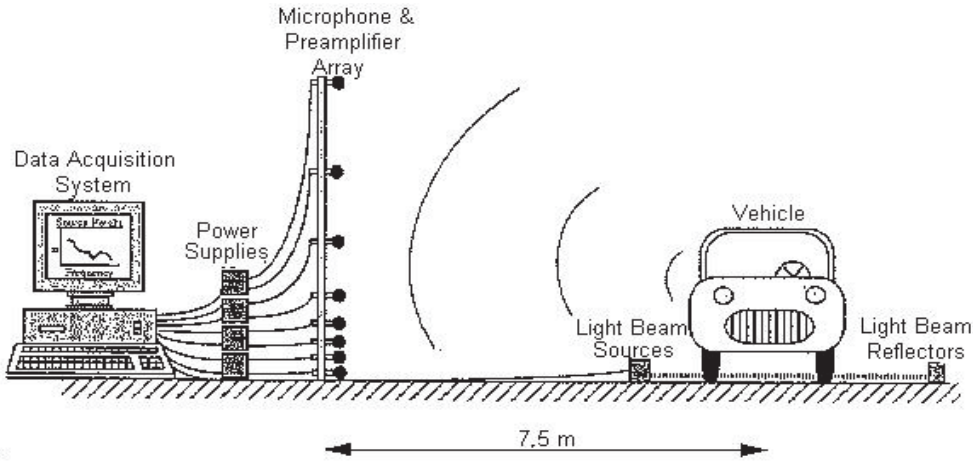

Figure1.Schematic sound measurement set up

V. NOISE CONTROL APPROACHES

An integrated noise policy should include several control procedures: measures to limit the noise at the source, noise control within the sound transmission path, protection at the receiver's site, land-use planning, education and raising of public awareness. Ideally, countries should give priority to precautionary measures that prevent noise, but they must also implement measures to mitigate existing noise problems.

1. mitigation measures: The most effective mitigation measure is to reduce noise emissions at the source. Therefore, regulations with noise level limits for the main noise sources should be introduced.

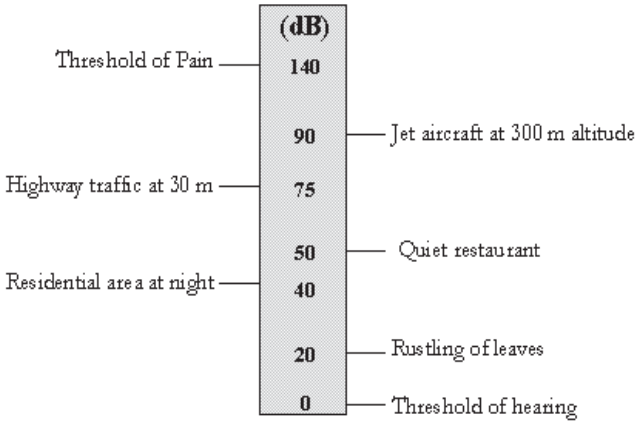

Figure2. Decibel scale.

road traffic noise-Limits on the noise emission of vehicles have been introduced in many countries. Such limits, together with the relevant measuring methods, should also be introduced in other regions of the world. Besides these limits a special class of "low-noise trucks" has been introduced in Europe. These trucks follow state-of-the-art noise control and are widely used in Austria and Germany. Their use is encouraged by economic incentives, and their associated taxes are lower than for other trucks.

However, the main noise from traffic on highways is rolling noise. This may be reduced by quiet road surfaces (porous asphalt, "drain asphalt") or by selection of quiet tires. Road traffic noise may also be reduced by speed limits, provided the limits are enforced. For example, reducing the speed of trucks from 90 to 60 km/h on concrete roads would reduce the maximum sound pressure level by 5 dB, and the equivalent sound pressure level by 4 dB. Decreasing the speed of cars from 140 to 100 km/h would result in the same noise reduction (WHO 1995a). In the central parts of cities a speed limit of 30 km/h may be introduced. At 30 km/h cars produce maximum sound pressure levels that are 7 dB lower, and equivalent sound pressure levels that are 5 dB lower, than cars driving at 50 km/h. [2]

railway noise and noise from trams- The main noise sources are the engine and the wheel-rail contact. Noise at the source can be reduced by well-maintained rails and wheels, and by the use of disc brakes. Sound pressure levels may vary by more than 10 dB, depending on the type of railway material. Replacement of steel wheels by rubber wheels could also reduce noise from railways and trams substantially. Other measures include innovations in engine and track technology. [6]

aircraft noise- The use of low-noise aircraft may also be encouraged by setting noise-related charges (that is, landing charges that are related not only to aircraft weight and capacity, but also to noise emission). Nighttime aircraft movements should be discouraged where they impact residential communities. Particular categories of aircraft (such as helicopters, rotorcraft and supersonic aircraft) pose additional problems that require appropriate controls. [6]

machines and equipments- Noise emission has to be considered a main property of all types of machines and equipment. Control measures include design, insulation, enclosure and maintenance. Consumers should be encouraged to take noise emission into account when buying a product. A second step would be the introduction of limits on the sound power levels for certain groups of machines, heating and ventilation systems (e.g. construction machines, household appliances). Law, in recommendations and by consumers, using state-of-the-art measurements, may set these limits. [4]

noise control within the sound transmission path- The installation of noise barriers can protect dwellings close to the traffic source Measuring and calculation methods for deriving the equivalent sound pressure level of road or railway traffic, and schemes for determining the effectiveness of the barrier.

a. The sound pressure limits that are to be achieved by installing barriers.
b. The budgetary provisions.
c. The responsible authority.

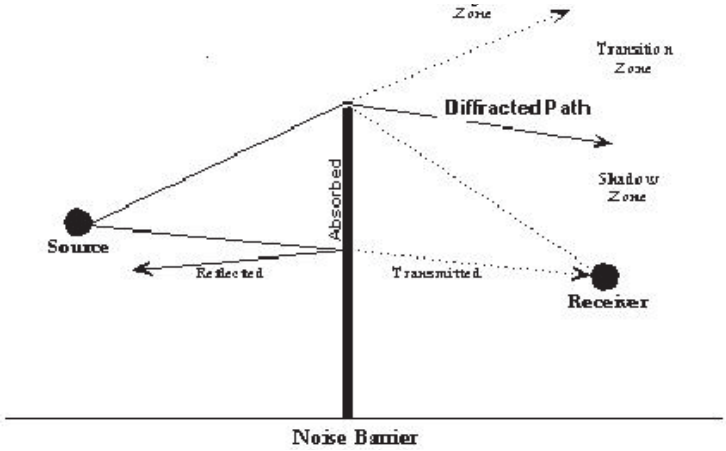

Figure 3.Noise barrier absorption, reflection, transition and diffraction of noise path.

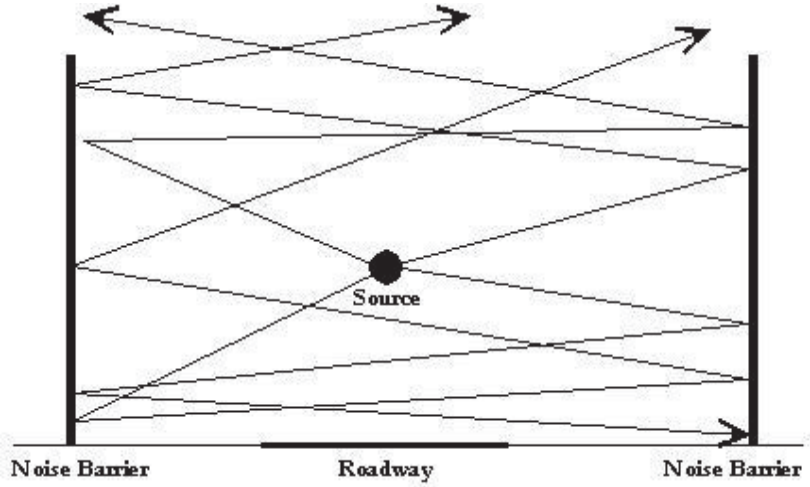

Figure 4.Reflective noise paths due to parallel noise barriers.

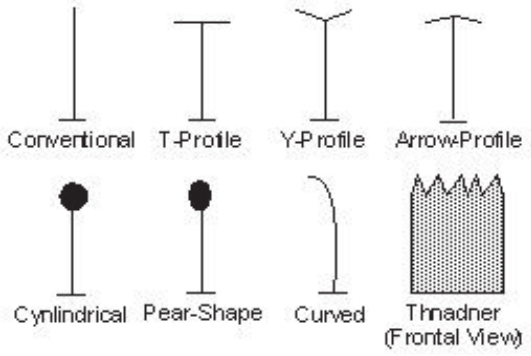

Figure 5.Various types of noise barriers.

noise protection at the receiver's site- This approach is mainly used for existing situations. However, this approach must also be considered for new and, eventually, for old buildings in noisy areas. Residential buildings near main roads with heavy traffic, or near railway lines, may be provided with soundproofed windows.

2. Precautionary measures- With careful planning, noise exposure can be avoided or reduced. A sufficient distance between residential areas and an airport will make noise exposure minimal, although the realization of such a situation is not always possible. Additional insulation of houses can help to reduce noise exposure from railroad and road traffic. For new buildings, standards or building codes should describe the positions of houses, as well as the ground plans of houses with respect to noise sources. The required sound insulation of the façades should also be described. Various countries have set standards for the maximum sound pressure levels in front of buildings and for the minimum sound insulation values required for façades.

land use planning- Land use planning is one of the main tools for noise control and includes:

a. Calculation methods for predicting the noise impact caused by road traffic, railways, airports, industries and others.
b. Noise level limits for various zones and building types. The limits should be based on annoyance responses to noise.
c. Noise maps or noise inventories that show the existing noise situation. The construction of noise- sensitive buildings in noisy areas, or the construction of noisy buildings in quiet areas may thus be oided.

It is recommended that countries adopt the precautionary principle in their national noise policies.

education and public awareness- Noise abatement policies can only be established if basic knowledge and background material is available, and the people and authorities are aware that noise is an environmental hazard that needs to be controlled. It is, therefore, necessary to include noise in school curricula and to establish scientific institutes to study acoustics and noise control. People working in such institutes should have the option of studying in other countries and exchanging information at international conferences. Dissemination of noise control information to the public is an issue for education and public awareness. Ideally, national and local advisory groups should be formed to promote the dissemination of information, to establish uniform methods of noise measurement and impact assessment, and to participate in the development and implementation of educational and public awareness programmes.

VI. EVALUATION OF CONTROL OPTIONS

Unless legal constraints in a country prescribe a particular option, the evaluation of control options must take into account technical, financial, social, health and environmental factors. The speed with which control options can be implemented, and their enforceability, must also be considered. Although considerable improvements in noise levels have been achieved in some developed countries, the financial costs have been high, and the resource demands of some of these approaches make them unsuitable for the poorer developing countries. [1]

technical factors- There needs to be confidence that the selected options are technically practical given the resources of the region. It must be possible to bring a selected option into operation, and maintain the expected level of performance in the long term, given the resources available.

financial factors- The selected options must be financially viable in the long term. This may require a comparative cost-benefit assessment of different options. These assessments must include not only the capital costs of bringing an option into operation, but also the costs of maintaining the expected level of performance in the long term.

social factors- The costs and benefits of each option should be assessed for social equity, and the potential impact of an option on people's way of life, community structures and cultural traditions must be considered. Impacts may include disruption or displacement of residents, changes of land-use, and impacts on community, culture and

recreation. Some impacts can be managed; in other cases, the impacts of an option can be mitigated by substitution of resources or uses.

health and environmental factors- The costs and benefits of each option should be assessed for health and environmental factors. This may involve use of dose-response relations, or risk assessment techniques.

effect-oriented and source-oriented principles- Noise control requirements are typically determined from the effects of noise on health and the environment (effect oriented). Increased noise emissions may be permitted if there would be no adverse health impacts, or if noise standards would not be exceeded. Action may be taken to reduce noise levels when it is shown that adverse health impacts will occur, or when noise levels exceed limits. Other countries base their noise management policies on the requirement for best available technology, or for best available techniques that do not entail excessive cost (source-oriented). Most developed countries apply a combination of both source-oriented and effect-oriented principles.

VII. MANAGEMENT OF INDOOR NOISE

In modern societies, human beings spend most of their time in indoor environments. Pollution and degradation of the indoor environment cause illness, increased mortality, loss of productivity, and have major economic and social implications. Problems with indoor noise affect all types of buildings, including homes, schools, offices, health care facilities and other public and commercial buildings. Protection against noise generated within a building, or originating from outside the building, is a very complex problem. Soundproofing of ceilings, walls, doors and windows against airborne noise is important . [4]

policy on indoor noise- Many of the problems associated with high noise levels can be prevented at low cost if develop and implement an integrated strategy for the indoor environment, in concert with all social and economic partners. Should establish a "National Plan for a Sustainable Indoor Noise Environment", that would apply to new construction as well as to existing buildings.

guidance/education - Because our understanding of indoor noise is still developing, activity should be focused on raising the awareness of various audiences. This education can take the form of providing general information, as well as providing technical guidance and training on how to minimize indoor noise levels. General information presented in the form of documents, videos, and other media can bring indoor noise issues to the attention of the general public and building professionals, including architects.

research support. Research is needed to develop technology for indoor noise diagnosis, mitigation and control. Efforts are also required to provide economical and practical alternatives for mitigation and control. Better means of measuring the effectiveness of absorption devices are needed; and diagnostic tools that are inexpensive and easy to use also need to be developed to help facility personnel. There is a particular need, too, for improving soundproofing methods, their implementation and for predicting the health effects of soundproofing techniques.

Support problem assessment and surveys of indoor noise conditions. Building surveys are also necessary to provide baseline information about building characteristics and noise levels. When combined with occupant health surveys, these studies will help to establish the correlations between noise levels and adverse health effects. Surveys should To provide accurate information for use in setting priorities for public health problems, be conducted to identify building types or vintages in which problems occur more frequently. The results of these studies will support effective risk reduction programmes.

development of standards and protocols- Efforts should also be made to incorporate noise-related specifications into building codes. Areas to target with building codes include ventilation design, building envelope design, site preparation, materials selection and commissioning. Standards and other regulations governing the use of sound proofing materials should also be developed.

VIII. NOISE POLICY AND LEGISLATION

Noise is both a local and a global problem. Governments in every country have a responsibility to set up policies and legislation for controlling community noise. There is a direct relationship between the level of development in a country and the degree of noise pollution impacting its people. As a society develops, it increases its level of urbanization and industrialization, and the extent of its transportation system. Each of these developments brings an increase in noise load. In general the following issues can be taken into consideration:

a. Identification of the adverse public health effects that are to be avoided.
b. Identification of the population to be protected.
c. The type of parameters describing noise and the limit applicable to the parameters.
d. Applicable monitoring methodology and its quality assurance.
e. Enforcement procedures to achieve compliance with noise regulatory standards within a defined time frame.
f. Emission control measures and emission regulatory standards.
g. Emission standards (limits for sound pressure levels).
h. Identification of authorities responsible for enforcement.
i. Resource commitment.

Regulatory standards may be based solely on scientific and technical data showing the adverse effects of noise on public health. But other aspects are usually considered, either when setting standards or when designing appropriate noise abatement measures. These other aspects include the technological feasibility, costs of compliance, prevailing exposure levels, and the social, economic and cultural conditions. [6]

IX. CONCLUSIONS ON NOISE ADMINISTRATION

Successful noise management should be based on the fundamental principles of precaution, the polluter pays and prevention. The noise abatement strategy typically starts with the development of noise standards or guidelines, and the identification, mapping and monitoring of noise sources and exposed communities. A powerful tool in developing and applying the control strategy is to make use of modeling. These models need to be validated by monitoring data. Noise parameters relevant to the important sources of noise must be known. Indoor noise exposures present specific and complex problems, but the general principles for noise management hold. The main means for noise control in buildings include careful site investigations, adequate building designs and building codes, effective means for addressing occupant complaints and symptoms, and building diagnostic procedures.

a. Noise control should include measures to limit the noise at the source, to control the sound transmission path, to protect the receiver's site, to plan land use, and to raise public awareness. With careful planning, exposure to noise can be avoided or reduced.
b. Control options should take into account the technical, financial, social, health and environmental factors of concern. Cost-benefit relationships, as well as the cost-effectiveness of the control measures, must be considered in the context of the social and financial situation.
c. A framework for a political, regulatory and administrative approach is required for the consistent and transparent promulgation of noise standards.

REFERENCES

[1] Anisa B.Khan, "Impact of Noise Pollution on Community Health-A Study At Pandicherry", Publication of Indian Association of Biomedical Scientists ,18(3), pp: 183-190, 1998,

[2] Onuu M.U., "Road Traffic Noise In Nigeria: Measurement, Analysis and Evaluation of Nuisance'', Journal of Sound And Vibration 233(3), pp: 391-405.,2000.

[3] Braj B.Singh And V.K.Jain, "A Comparative Study of Noise Levels In Some Residential, Industrial And Commercial Areas of Delhi", Environmental Monitoring And Assessment, Nethelands), 35,pp: 1-11,1995.

[4]] D.B.Das, P.Arya, P.P.Bakre, A.Bhargava, And A.B.Gupta, "Environmental Noise: A Psychological, Physiological And Ambient Assessment At Industrial And Commercial Places of An Urban Area In Rajasthan", Indian Journal of Environmental Protection , 19(7), pp: 481-487,1998.

[5] Transport And Mobility Leuven NV, "Review of The Suitability of Traffic Model for Noise Modelling", SSPI-CT-2003-503549-IMAGINE, Belgium.(www.imagine-project.org),2003.

[6] Gregg G.Fleming, Robert E.Armstrong,"Transportation-Related Noise in The United State", AIF-04: Committee on Transportation-Related Noise And Vibration, pp: 6-11,1970.