



## CURRENT RESEARCH TOPICS AND PROBLEMS: THE ROLE OF IC BEN

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The structure and work of the International Commission on Biological Effects of Noise (ICBEN) are briefly presented. The current and future priorities of ICBEN Noise Team 6 “Community Response to Noise” are discussed in detail. These priorities comprise studies of good sound environments and assessment methods for noise annoyance in multi-source environments.

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### 1. ICBEN STRUCTURE

The International Commission on Biological Effects of Noise (ICBEN) is an independent institution of noise experts from all over the world. The main goal of the ICBEN is to promote a high level of scientific research concerning all aspects of noise-induced effects on human beings and on animals, including preventive regulatory measures, and to maintain lively communication among the scientists working in the field. The means to achieve this ambitious goal are mainly based on the unique structure of the ICBEN.

The founders of ICBEN were wise enough not to concentrate responsibility to the Chairperson but to delegate it primarily to the International Noise Teams (INT), in particular, to the very experts who are appointed at the beginning of each five-year term and who may hold the post for a maximum of a second term. As these experts are familiar with the state of the art in their respective research areas, they are expected to build and to chair a team of highly qualified scientists actively working in that field. Apart from themselves, they shall appoint not more than 10 additional members, and not more than two shall be from the same country.

‘Permanent’ membership (i.e., reappointment every new 5-year term) is possible only in the case the person in question is actively working in the field on a high scientific level. The International Noise Teams are renewed every 5 years.

A primary reason for which the ICBEN has been successful is its truly international representation. At present, the four office bearers come from four different countries, and the members of the Executive Committee from a total of 10 countries on four continents.

The ICBEN is currently organized around nine teams:

- Team 1: Noise-induced hearing loss.
- Team 2: Noise and communication.
- Team 3: Non-auditory physiological effects induced by noise.

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- Team 4: Influence of noise on performance and behavior.
- Team 5: Effects of noise on sleep.
- Team 6: Community response to noise.
- Team 7: Noise and animals.
- Team 8: Combined agents.
- Team 9: Regulations and standards.

Since the Noise Team members are appointed from among peers, they are responsible towards the “international scientific community” only. They can, therefore, act independently of economic and national interests. This guarantees the quality of the work published by the different Noise Teams.

An IC BEN conference is held every 5 years, at which each Noise Team presents current knowledge and an overview of the state of the art within the different INT areas.

## 2. NOISE TEAM 6: COMMUNITY RESPONSE TO NOISE

### 2.1. RECENT RECOMMENDATIONS

Noise Team 6 has recently completed a document that recommends the use of two standardized questions in all new social surveys on community noise problems. These questions have so far been translated into nine different languages using identical procedures. Results of different surveys can be readily compared by means of these two questions. The recommendation has been submitted for publication in this journal and has been proposed as a committee draft, ISO/CD15666, from ISO/TC43/SC1/WG49.

The recommendation also includes “standardized annoyance modifiers”, i.e., words that express the same degree of noise annoyance in different languages. The background documents, furthermore contain a classification of about 20 modifiers in each language. The meaning of these words has been assessed by natives so that not only their rank order but also their magnitude have been established. Using this magnitude scale the results of earlier surveys in which any of these modifiers have been used can be interpreted in more detail.

### 2.2. CURRENT PRIORITIES

IC BEN Noise Team 6 will now focus on two main topics: establishing the basis for good sound environments as opposed to merely acceptable ones and establishing methods to predict and assess noise annoyance in multi-source environments.

#### 2.2.1. *Good sound environments*

Until recently, community noise standards and recommendations have been limited to minimizing negative effects. Typical study issues have focused on “acceptable exposure” and “tolerable limits”.

Most social surveys have addressed questions concerning annoyance and similar negative aspects, using unipolar scales ranging from “NOT annoyed or bothered” to the worst imaginable negative impact.

Modern thinking calls for a more varied and positive approach. Our urban environment should not only be “acceptable” but also be one that triggers positive reactions and prompts expressions of pleasure and content. In other words, we should start to focus on the positive side of the “annoyance scale”. A *good sound environment* is characterized not only by the absence of “complaints” and negative reactions but promotes a feeling of contentment and

satisfaction. Referring to absolute noise levels, we are probably talking about outdoor noise levels, LEQ or LDN, in the order of 35–45 dB(A), depending on the time of day. This is typically 20–25 dB below current recommendations for community noise limits.

Simple calculations show that it is impossible to achieve such low noise levels in an urban environment in general if the present way of living and especially the present modes of transportation are maintained. However, through careful planning and design, it is possible to achieve this standard in large areas, even in densely populated communities. This may imply that it will be necessary to tolerate high noise levels in other areas, perhaps even higher than what is now regarded as *just acceptable*.

### 2.2.2. *Workshop on noise management for supportive sound environments*

Shortly after the Japanese–Swedish Symposium, an international workshop was held in Nice. The participants of this workshop, organized by Prof. Birgitta Berglund and Prof. Thomas Lindvall, Stockholm University, issued a consensus document that gives a foundation and background for ICBEN Noise Team 6 future work on *good sound environments*. This document states:

A supportive sound environment should promote health and is therefore characterized not only by the absence of disease or infirmity, but it is an environment that provides complete physical, mental and social well-being. It should trigger good feelings, safety and positive and desirable activities. All groups of people and their respective environments should be of concern.

It should support sustainable development and generate benefits such as:

- improved health, productivity and performance
- lower health care costs
- improved educational conditions
- better sleep
- enjoyable perceptions of natural and man-made environments and music
- orientation in space and time
- lowered aggressiveness

A supportive sound environment should strengthen sustainable development and promote:

- health and rehabilitation
- safety
- social interaction as well as privacy
- sleep, rest, recreation and psychological restoration
- education, learning, and creativity
- performance and productivity
- esthetic values and perception
- orientation and personal confidence

In order to guarantee these rights to everyone, a supportive sound environment should support vulnerable groups such as hearing impaired persons, infants, etc., and it should not be in conflict with other demands on health and well-being. It should be emphasized that the present situation in most places is far from ideal, but a “good” sound environment is within reach. Its achievement is a long term project. The ideal situation can be reached at low or no additional costs through careful planning.

This document supports IC BEN Team 6's initiative. The practical implementation of this new approach to community noise issues opens several new topics that need to be studied further.

- What are the characteristics of a *good noise environment*?
- What is the trade-off between exposure to a combination of high/low noise levels or a steady intermediate level?
- Can access to truly quiet areas, both outdoors and indoors, compensate occasional exposure to very high noise levels?

Social surveys that will be sufficiently accurate to reveal such details must be designed and conducted.

If this line of attack proves promising, it is also necessary to develop tools and methods for predicting noise emission in urban areas. Noise propagation in densely built areas and screening effects of houses and building elements must be studied further. Architects and city planners will face new challenges: how can buildings and other constructions be used actively to create quiet areas in the midst of a busy city? How can façade elements such as balconies, etc., be used to improve the noise insulation of dwellings, and how can building façades be made with absorption to reduce traffic noise?

This new way of looking at community noise problems implies that noise limits and noise regulations must be more specific than setting only one level. In addition to limits for what is and what is not acceptable, we should have recommended target levels that will secure a safe and healthy environment that promotes positive living conditions for all members of the community.

### 2.2.3. *Assessment of noise annoyance in a multi-source environment*

Inhabitants of modern urban environments are seldom exposed to one type of noise source only. The total noise environment typically consists of a number of different sources, and the noise exposure normally consists of a series of more or less distinct noise events in a more steady background. Typical noise events involve a heavy truck or motor cycle, an aircraft take-off, the passing of a train, etc.

It is known from previous studies that people react differently to different noise sources. Aircraft noise, for instance, seems to be found as more annoying than road traffic noise. Correction factors are currently being used to compensate for the time at which the noise events occur and for the characteristics of the sound, such as impulse sounds, etc. These correction factors have been introduced under the assumption that certain characteristics are more annoying than other ones: a noise event at night is assumed to be as annoying as a similar event 10 dB lower during the day and so on.

A new assessment method for noise annoyance has been introduced. This method is based on the same principle: the noise contribution from each separate source is transformed into an *equally annoying* contribution from a common reference source before all the contributions are added on an energy basis. Dose-response curves for single sources are used for this transformation. IC BEN Noise Team 6 will study this method further and assess its applicability for various community noise situations.