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Shush! Stop that noise!

Noise is one of the greatest and most neglected environmental problems

Growing problems with damaged hearing >

Noise is the most common environmental problem >

Low noise causes stress, and hinders children's acquisition of language and social skills >

Lay panel calls for political action >

Every tenth Dane is hearing-impaired, and the problem is increasing. Ever more children's hearing is damaged because of noise in day care institutions. And the Health and Safety at Work Act does not prevent damage to the sense of hearing. Disturbing noise from traffic, construction, other people and machines is the environmental problem that affects most people. Even though the unwanted noise is not particularly loud, it may cause high blood pressure, more stress hormones in the blood, and fraying nerves. Even low levels of noise cause problems for children in their acquisition of language and other complicated social skills. Still, there is only little political awareness of the problem. A lay panel at the Danish Board of Technology Conference on Noise recommended that a much more ambitious political plan for the prevention of noise be carried out in Denmark.

This "From Board to Parliament" reports on the Board's consensus conference on noise, which took place on 12-13 and 15 May at Christiansborg

Noise is an increasing problem

Good health is not just staying out of hospital.

When WHO defines good health, it is "a state of physical, mental and social well-being, and not only a state free from disease and illness." It is with this definition as a foundation that the lay panel at the Board's consensus conference on noise concludes that noise is an increasing health problem for the Danes.

Children are particularly exposed. Every day they move in a cacophony of noise in day care institutions, which may be directly detrimental to their hearing. But also outside the noisiest institutions, noise is a problem for the growing child. Children need calm surroundings when they learn to talk.

Even the moderate background noise found in many institutions, schools and homes makes it more difficult for them to develop their language and other skills.

Children are by far the most vulnerable, but adults as well experience increasing problems with noise. There are no exact figures for how many people in Denmark are hard of hearing. Many people with hearing impairments do not come into contact with the health services. It is estimated that about 500.000 people in Denmark are hard of hearing. Between 250.000 and 300.000 use a hearing aid. But many of the problems of a hearing impairment are not removed by a hearing aid. Even a slight hearing impairment can make it difficult to participate in a conversation, if there is just a bit of noise in the

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room. This is often the case in the typical open office environment, where computers and the voices of other people can make conversation difficult for the hard of hearing.

The problem grows. The number of children and young people with hearing impairments grows. And they are getting younger. It is not unusual for adults in their thirties to be diagnosed with hearing impairments which were normally found in people 20 years older. No investigations to explain why have been carried out. But it is assumed that people to a large extent incur these impairments in their private life, for example at concerts.

Hearing impairments from institutions

In 1998 an investigation of the noise levels in 187 day care institutions was published by The Danish Federation of Early Childhood Teachers and Youth Educators (BUPL) and The National Union of Day-care and Nursery School Assistants (PMF). It showed that in 50% of the institutions, the noise levels were so high that educators ought to have earplugs available (more than 80 decibel (dB) on average during a working day). In every fifth after school recreation center, the noise levels were so high that The Danish Working Environment Service noise limits were exceeded (more than 85 dB on average during a working day, which is 50% louder than an average of 80 dB).

At sound levels of 80 to 85 dB on average (which were found in every other day care institution in the investigation) there is a risk for hearing impairment for both children and adults, if subjected to this noise for several years. Children are more at risk than the educators are, as they typically spend more hours a day at the institution.

Stress, irritation and bad lives

However, the loud noise, which is detrimental to the sense of hearing, was only one of the noise problems noted by the lay panel. The constant, irritating 'low' noise, from traffic, machines, noisy neighbors, food processors, cell phones, etc., can be just as detrimental. Low noise is not dangerous as such to the sense of hearing, but there is a long range of other unfortunate effects on human health.

In adults it has been found that those who live in a

The consensus conference is a participatory conference for lay people.

The conference takes place as a dialogue between experts and a lay panel of 14 randomly chosen Danes. The role of the experts is to inform the lay panel about a given technology and its consequences. The role of the lay panel is to ask the experts questions, and produce a concluding document that contains an elucidation of and attitude towards the subject. On the third day, the concluding document is presented to politicians, the press and the audience. The purpose of this type of conference is to build a bridge between lay people, experts and politicians, while at the same time contributing to an open, public and democratic debate. Read more about the Board's methods for technology assessment at www.tekno.dk

constant low noise - as a great deal of the population, especially in the cities, does - develop a range of stress symptoms after a longer period of exposure to noise. High blood pressure and fraying nerves are also acknowledged effects of the constant low noise that surrounds most of us.

A series of investigations (1) have shown a correlation between low noise and children's ability to acquire speaking, writing and other complex skills. The effect is increased the longer children have been exposed to the noise. And the general rule is that the more demanding a task is, the more disturbing noise is to the children.

Call for political attention

On that background it is the recommendation of the lay panel, which consists of seven women and seven men (2), that a lot more attention should be paid to noise as a serious and very prevalent environmental problem.

The panel appeals to the government and Parliament to take the WHO recommendations on the reduction of noise seriously in Danish jurisdiction and administrative practice.

However, the panel has had to conclude that noise is a difficult entity to pin down and raise consciousness about. Because it is harder to measure the long-term effects of noise than for example chemical pollution, which can be measured in the ground or in the water.

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"An important cause of the absence of noise on the political agenda is that noise is perceived as an individual problem, which citizens do not address collectively. Noise is not visible, and when it stops, it is gone," the concluding document goes. But the problems do not disappear just because they can no longer be measured. Stress, irritation, hearing impairments and insomnia are all effects of noise that do not go away when the source of the noise has disappeared or momentarily stopped. "Noise is not stored in the external environment, but in the individual," the lay panel notes in the concluding document from the consensus conference.

Control is sporadic

Sixteen Danish and two Swedish experts participated in the conference, and gave the specialist presentations and answered the questions of the lay panel. On the background of their accounts the lay panel identified a series of problems in the prevention of noise. The most important are:

The regulation and control of noise is divided between different authorities. The legal foundation for the prevention of noise can be found at all levels, from EU jurisdiction to police regulations. In other words, it is difficult for lay people to know where to address their complaint, and cases may become very protracted, as they are shunted from office to office. Or, in the words of the lay panel: "We picture it as a jigsaw puzzle, with several pieces missing".

The scanty attention paid to noise problems is especially pronounced for the problems that noise causes for children. In spite of the knowledge of children's learning problems caused by even low levels of noise, there are no special rules for noise levels in schools or institutions

Political action wanted

The lay panel made a long series of recommendations. The following have been singled out:

- WHO recommendations on the prevention of noise should be taken seriously, for example by inclusion in a children's environmental act. Background noise in schools and institutions should not exceed 35 dB on average.

'S' and 't' are the first to go

It can be difficult to participate in a perfectly ordinary conversation at the work place or at a party if you have a hearing impairment. These are typically caused by the destruction of some of the approximately 16,000 small hair cells in the ear. The hair cells are located in the part of the inner ear called the cochlea. This is where sound waves are converted into nervous signals, which can be decoded by the brain. Sound is oscillations in the air. Their strength is measured in decibel (dB). The tone is measured in oscillations per second (Hertz): the more oscillations, the higher the tone. A hearing impairment most often affects the hair cells that intercept sounds between 3,000 and 6,000 oscillations per second. The human voice causes air molecules to oscillate between 125 and 4,000 times per second. That means that at typical hearing impairment will affect the ability to hear the higher tones in human speech. These are for example the sounds made by the letters 's' and 't'. Unless the conversation is one on one in calm surroundings, these sounds will disappear.

Furthermore, the human ear has the ability to focus on one sound source among many. An important part of our ability to communicate is the ability of our hearing to zoom in on one person's speech, even though he or she is in a group of talking people. This ability depends on the normal functioning of both ears. People with hearing impairments often lose some of this ability. And a hearing aid cannot set it right.

- The many different laws that regulate noise should be gathered in a proper noise law, which should address marginal levels, lodging of complaints, information duties and liability for damages. The law should cover noise at work, in the home, in 'the external environment' – including traffic noise – and noise conditions for children.
- A responsible body should be put in charge of noise issues. An environmental ombudsman and local environmental councils could serve as complaints board.
- Dwellings should have a noise certificate, so buyers can see what they buy. New buildings should be built using noise muffling materials. There should also be a classification of new machinery and products so it is easy for consumers to choose a noiseless product.

Notes:

(1) **Selected bibliography:**
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Further reading is recommended in the report from the consensus conference at www.tekno.dk

(2)

Lay panel at The Danish Board of Technology Consensus Conference on Noise:

Anne Nygaard: age 46, warehouse worker, Sønderød

Jette Hjortshøj: age 56, retired teacher, Højbjerg

Jørn Broder Kongsted: age 56, chief sergeant, Varde

Keld Andersen: age 47, electronics engineer, Værløse

Lone Nygaard Folkmann: age 28, student, Frederiksberg

Michael Flindtberg Hansen: age 19, motor mechanic apprentice, Vordingborg

Peter Vinsbøl: age 36, farmer, Give

Randi Bjørndal Jensen: teachers' trainer, Copenhagen

Sara Larsen: age 20, student, Odense

Tanja Lang Hermansen: age 28, sales consultant, Tranbjerg J.

Tue Witt: age 26, student, Århus

William Præstegaard Pedersen: age 49, shipping agent, Odense

(3)

Speakers at The Danish Board of Technology Consensus Conference on Noise:

Ture Andersen: specialist, otorhinolaryngology. Employed at Odense Universitetshospital, *Audiologisk Afdeling* (Odense University Hospital, The Centre of Audiology)

Staffan Hygge: research professor at Statens Byggeforskningsinstitut, *Hørsholm* (The Danish Building Research Institute)

Evy Öhrström: professor Ph.D. Lecturer, environmental medicine, Göteborgs Universitet (Gothenburg University)

Henrik Møller: professor and manager of *Afdeling for Akustik ved Aalborg Universitet* (Department of Acoustics, Aalborg University.)

Jens Tølbøll Mortensen: medical superintendent at *Forskningsenheden for Klinisk Epidemiologi, Aalborg sygehus Nord* (Clinical Epidemiology, Aalborg Hospital North) and research lecturer at *Institut for Epidemiologi og Socialmedicin, Aarhus Universitet* (The Department of Epidemiology and Social Medicine, Aarhus University)

Flemming Serup: working environment consultant. Project employee at *Arbejdsmiljøsekretariatet i Branchearbejdsmiljørådet* (The Secretariat for the Working Environment in The Environmental Council for Work Associations)

Palle Voss: MSc Engineering, acoustics and dynamics. Regional manager at *INGEMANSSON TECHNOLOGY*

Jan Gybel Jensen: MSc Engineering, and special consultant on noise for *Arbejdstilsynet* (The Danish Working Environment Service)

Thora Brendstrup: specialist, work medicine, Ph D. Medical consultant for *SID* (The General Workers' Union in Denmark)

Per Reichstein: chief consultant (work environment) for *Dansk Industri* (The Confederation of Danish Industries)

Dan Hoffmeyer: DELTA Akustik & Vibration, MSc Engineering, building acoustics

Ove Jensen: head of department in *Miljøkontrollen* (Environmental control) (area: Businesses, noise, pests)

Hans Bendtsen: senior researcher in *Vejdirektoratets afdeling for Trafiksikkerhed og Miljø* (The Road Directorate Department for Road Safety and Environment)

Arne Lund: NOAH-trafik. Translator and author of: *Miljøhensyn eller bedrag* (Environmental Considerations or Fraud? (1995), *Biler og ozon* (Cars and Ozone) (1995) og *Sporene skræmmer* (The Tracks deter) (1996). Co-founder of *NETVÆRK mod overflødige motorveje* (NETWORK Against Superfluous Highways)

Helen Amundsen: *Forbrugerrådet* (The Danish Consumer Council), *Chair of Forbrugerrådets Børnesikkerhedsudvalg m.v.* (The Danish Consumer Council's Childrens' Safety committee a.o.)

Jens Stensberg: Former Health Inspector

Jørgen Jakobsen: *Miljøstyrelsen, industrikontoret* (The Danish Environmental Protection Agency, Industry Office), MSc Engineering, acoustics

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Kurt Jeritslev: *president of Landsforeningen for Bedre Hørelse* (The Danish Association of the Hard of Hearing)

Literature:

Concluding document from the consensus conference is available at www.tekno.dk. (in danish) The concluding document also contains the WHO guidelines for the prevention of noise (in english).

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