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Jens E. Laursen

Indholdsfortegnelse

1. Baggrund og formål

Miljøstyrelsen har ønsket, at en del af Referencelaboratoriets aktiviteter i 2009 skulle være at formidle ny viden til Miljøstyrelsen. Referencelaboratoriet har gennemgået tidsskrifter og overvåget årets kongresser for at identificere ny viden af betydning for måling og administration af ekstern støj. Notatet udsendes to gange om året. Søgningen i tidsskrifter er afsluttet i oktober 2009.

Indholdsfortegnelser for de valgte tidsskrifter findes på de respektive hjemmesider på Internettet. Links til disse hjemmesider er angivet i Bilag 1.

2. Afgrænsning

Valg af emner og vægtning af stoffet er rettet mod Miljøstyrelsens sagsbehandlere.

3. Tidsskrifter

3.1 Journal of the Acoustical Society of America (JASA)

Årgang 2009: Vol. 125, no.6, June

Vol. 126, no.1–5, July – Nov.

Et link til dette tidsskrift findes i Bilag 1. Følgende artikler er udvalgt:

Acoustical model and theory for predicting effects of environmental noise on people

Vol. 125, Nr. 6, pp. 3707–3721, Karl D. Kryter

Undersøgelser af de objektive parametre til beregning trafikstøj: Day/evening/night-level, DNL, som benyttes i USA og DENL (eller L_{den}), som benyttes i Europa. Disse parametre giver i mange tilfælde ikke en entydig sammenhæng med antallet af stærkt generede personer (%HA). I artiklen gennemgås bl.a. det neurologiske, psykologiske og fysiologiske grundlag for at benytte disse objektive parametre. Der opstilles en teori om geneoplevelsen som værende en udelukkende fysisk betinget og dermed næsten uafhængig af højere erkendelsesmæssige hjerneaktiviteter. De begivenhedskorrigerede ekstern-støjparametrene EDNL henholdsvis EDENL, som indeholder korrektioner for lokale støjforhold, anses for markant bedre til beregning af %HA end DENL og DNL.

Annoyance from environmental noise across the lifespan

Vol. 126, Nr. 1, pp. 187–194, Pascal W. M. Van Gerven, Henk Vos, Martin P. J. Van Boxtel, Sabine A. Janssen and Henk M. E. Miedema

Forfatterne har indsamlet mange data fra Europa, USA og Asien, for at undersøge, hvordan alderen indvirker på geneoplevelsen af trafikstøj (fly-, vej- og togstøj). I denne undersøgelse indgik resultater (selvrapporterede) fra i alt 62.983 personer i alderen 15 – 102 år. I resultaterne indgik støjparametre som støjeksponering (L_{dn}), støjgeneoplevelse og støjfølsomhed, samt demografiske parametre som køn, uddannelse og alder. Undersøgelsen viser, at støjgene/alders–kurven har en omvendt U-form, som topper ved 44 års alderen. I forhold til de 44 årige findes 10 % færre stærkt generede 20-årige og op til 20 % færre stærkt generede 80-årige. For de 80-årige kan aldersbetinget høretab forklare en del af denne tendens. På den anden side falder taleforståeligheden også med alderen, hvilket forhøjer nødvendigheden af et tilstrækkeligt højt signal/støjforhold for at sikre en god taleforståelighed. For denne aldersgruppe kan trafikstøjen derfor godt være generende.

Forfatterne nævner andre undersøgelser, hvis resultater går i modsat retning, fx forhold omkring udviklingen af pandelapperne i hjernen. Disse hjerneområder modnes relativt sent og aftager relativt tidligt i livet. Udviklingen i pandelapperne påvirker fx evnen til at modstå forstyrrelser, når vi er optaget med tænkearbejde. Dette indebærer, at de unge og de ældre snarere end de midaldrende grupper var lettere at forstyrre og dermed ville rapportere en større andel af stærkt gererede. Dette er i modstrid med den observerede omvendte U-kurve. Undersøgelser, der understøtter den fundne omvendte U-kurve, viser, at den aldersbetingede støjgeneoplevelse afhænger af personens gennemsnitlige daglige arbejdsbyrde. De midaldrende har mere udviklede pandelapper og dermed en bedre evne til at magte forstyrrelser. Men denne aldersgruppe har ofte en stor arbejdsmængde og mange sociale forpligtelser, hvilket trækker på de samme ressourcer i pandelapperne. Jo færre mentale ressourcer desto højere vil geneoplevelsen af trafikstøjen være. Andre undersøgelser, som omhandlede aldersbetinget sammenhæng mellem trafikstøj og højt blodtryk, viste samme tendens som i denne undersøgelse.

Policy discourse, people's internal frames, and declared aircraft noise annoyance: An application of Q-methodology

Vol. 126, Nr. 1, pp. 195–207, Maarten Kroesen, Christian Bröer

Undersøgelse af folks holdning til flystøj i forhold til støjpolitikken. Undersøgelsen er baseret på Q-metoden (Brown, 1980), hvor forsøgspersonerne får spørgeskemaer, hvor de skal rangordne forskellige udsagn. Genstanden for undersøgelsen var Amsterdam Schiphol lufthavn. Hypotesen er, at rammen for folks holdninger sættes af lufthavnsmyndighedernes politik. I teorien betyder det, at hvis lufthavnsmyndighederne offentligt erkender støjen som et vigtigt problem, påvirker det borgernes opfattelse af lydforholdene i retning af en negativ indstilling til

støjen. Det ses bl.a., at flystøjen i dag – ved samme støjniveau – generer flere mennesker end for flere årtier siden, hvor lufthavnsmyndighederne havde en anden offentlig mening.

Long-term road traffic noise exposure is associated with an increase in morning tiredness

Vol.126, Nr. 2, pp. 626–633, Yvonne de Kluizenaar, Sabine A. Janssen, Frank J. van Lenthe, Henk M. E. Miedema, Johan P. Mackenbach

I artiklen undersøges sammenhængen mellem vejtrafikstøjen om natten (L_{night}) og selvrapporterede søvnproblemer på basis af data fra GLOBE-undersøgelse, der involverede 18.000 personer. Der var en klar sammenhæng mellem en stigning i støjniveauet og øgning af risikoen for at være træt og ikke-udhvilet om morgen. Der blev ikke observeret en signifikant forbindelse med hyppigheden i brug af sovemedicin. For L_{night} > 50 dB, sås et lille fald i antallet af personer, der ikke var veludhvilet om morgenen. Dette kan skyldes, at folk har en tendens til at lukke vinduet om natten, når L_{night} overstiger 50 dB.

Response to noise from modern wind farms in The Netherlands

Vol. 126, Nr. 2, pp. 634–643, Eja Pedersen, Frits van den Berg, Roel Bakker, Jelte Bouma

Undersøgelse af dosis/respons-forhold for vindmøller. Undersøgelsen omfattede spørgeskemaer fra 725 personer i Nederlandene. Det A-vægtede niveau ved beboerne blev beregnet i henhold til ISO-standard (ISO 9613-2) på basis af vindmøllernes oktavopdelte kildestyrke. Vindmøllestøjen fandtes mere generende end tilsvarende støjniveauer fra transportstøj og industristøj. Geneoplevelsen af støjen fra vindmøller overgås kun af støjen fra jernbanerangerterræn. Årsagen til genen kan sandsynligvis tilskrives vingernes karakteristiske vingesus, lydens variation og det forhold at støjen ikke mindskes om natten. Vindmøllens synlighed i landskabet forstærker negativ respons, og genen forværres, hvis vindmøllen er synlig fra boligen. Personer, som har økonomiske interesser i vindmøllerne, har betydelig mindre risiko for genevirkninger fra møllen, selv om de udsættes for tilsvarende støjniveauer. Forsøgspersonerne karakteriserede vindmøllestøjen som en ”susen”, og kun få personer beskrev støjen som lavfrekvent.

A procedure for the assessment of low frequency noise complaints

Vol. 126, No. 3, pp. 1131–1141, Andy T. Moorhouse, David C. Waddington, and Mags D. Adams

Artiklen fremlægger en guide, som kan hjælpe miljømyndigheder med at skelne mellem de LF-støj sager, hvor årsagen til støjen kan være ekstern støj og de sager, hvor dette kan udeluk-

kes. Artiklens forfattere erkender, at guiden kan løse problemet for miljøsagsbehandleren, men at klageren stadig står tilbage med sit problem. De foreslår, at miljørådgivere/sagsbehandlere skal kunne henvise til audiometricentre, og at der her uddannes personale med kendskab til LF-støj, der kan varetage den videre rådgivning af klageren.

I et forsøg deltog 18 forsøgspersoner, og der blev foretaget måling af høretærskel og acceptabilitetstærskel overfor stationære toner, fluktuerende toner og alm. LF-støj. På basis heraf blev der opstillet kriteriekurver for henholdsvis dag- og natperioden.

Guiden indeholder en 7-punktsplan til vurdering af lavfrekvent støj på basis af målinger udført over 3-5 dage hos klager. I hele måleperioden skal klager føre logbog over støjens omfang. Guiden sigter ikke på at lokalisere støjkilden. Metoden blev testet i felten på 6 "rigtige" støjklager. Af disse var der 4 tilfælde, hvor der ikke kunne findes eksterne støjkilder, der kunne forklare den oplevede støjgene.

Modeling subjective evaluation of soundscape quality in urban open spaces: An artificial neural network approach

Vol. 126, Nr. 3, pp. 1163–1174, Lei Yu and Jian Kang

Artiklen er ikke fundet relevant.

Engineering modeling of traffic noise in shielded areas in cities

Vol. 126, No. 5, pp. 2340-2349, Erik M. Salomons, Henk Polinder, Walter J. A. Lohman, Han Zhou, Hieronymous C. Borst, and Henk M. E. Miedema

Ved støjkortlægning af støj i byer med mange gaderum overvurderer gængse softwareværktøjer ofte høje bygningers skærmning af støjen til de bagvedliggende gårdrum. Forfatterne præsenterer en alternativ algoritme til beregning af lydudbredelsen af trafikstøj i byområder. Algoritmen tager hensyn til mange refleksioner og efterklangsforholdene i både gaderummet og i baggårdene. Forfatterne har anvendt modellen til at beregne støjen i Amsterdam og sammenlignes med gængs støjkortlægningssoftware. Der ses store afvigelser for den skærmende virkning fra bygninger, hvor facadeniveauet mod gaden ligger i området 40-60 dB (L_{den}). Resultaterne viser også, at støjen i gårdrummet ofte har et niveau, der kun er 15-20 dB lavere end støjen ved den mest støjbelastede facade mod gaden.

3.2 Applied Acoustics

Årgang 2009: Vol. 70, No. 8 – 12, Aug. – Dec.

Årgang 2010: Vol. 71, Nr. 1, Jan.

Et link til dette tidsskrift findes i Bilag 1. Følgende artikler er udvalgt:

The development of a practical framework for strategic noise mapping

Vol. 70, No. 8, pp. 1116-1127, E.A. King, H.J. Rice

Abstract læst. Ikke umiddelbart fundet relevant.

3.3 Journal of Low-Frequency Noise, Vibration and Active Control

Årgang 2009: Vol. 28, No. 2 (Juni)

Et link til dette tidsskrift findes i Bilag 1. Følgende artikler er udvalgt:

Review: Low Frequency Noise. What we know, what we do not know, and what we would like to know

Vol. 28, No. 2, pp. 79-104, Author: Geoff Leventhall

Artiklen gennemgår problemstillingerne indenfor lavfrekvent støj og dets genevirkninger. I de tilfælde af klager over LF-støj, hvor støjkilden ikke kan findes, peges på mulige forklaringer bl.a. udvikling af øget følsomhed, alternative (ikke hørlige) receptorer ved meget lave frekvenser og falsk perception (tinnitus, elektromagnetiske bølger og synaestesia, dvs. det at stimuli af én sans kan bevirke, at andre typer af sanser stimuleres). Selve metoden til måling af LF-støj kan medvirke til problematikken, når der midles over måleperioden, idet fluktuationer herved midles ud. Lavfrekvent støj fluktuerer ofte – især hvis støjkilden er langt fra modtageren – og denne fluktuation kan have betydning for geneoplevelsen.

Low Frequency Noise and phantom sounds

Vol. 28, No. 2, June 2009, pp. 105-116, Frits van den Berg

Artiklen omhandler de lavfrekvente lyde, som ikke kan tilskrives egentlige lydkilder. I mange sager om LF-støj kan årsagen til støjen ikke findes som en fysisk lyd. Mange normalthørende oplever lyde i helt stille omgivelser, eller hvis de lige har været udsat for kraftig støj. *Phantom sensations* er sanseoplevelser, som ikke er forårsaget af en udefrakommende stimulus, og som generelt kan kaldes hallucination eller sansebedrag. Der opstilles en model for tinnitus og gennemgås parametre, som har betydning for geneoplevelsen. Forfatterne kommer med forslag til måder at leve med genen. Der henvises til hjemmesiden www.copingwithnoise.org.

3.4 Noise Control Engineering Journal

Årgang 2008: Volume 56, No. 6 (November)

Årgang 2009: Volume 57, No. 1-5 (Jan - Sept)

Indholdsfortegnelser og abstracts kan nu findes på hjemmesiden for Scitation på Ince digital Library. Link hertil findes i Bilag 1.

Følgende artikler er udvalgt:

Improved procedure for correlating blast noise events with complaint logs at U.S. Army installations

Vol. 56, No. 6, pp. 451-459, Edward T. Nykaza, Larry L. Pater, and George A. Luz

Kun abstract læst. Artiklen er ikke umiddelbart fundet relevant.

Dependence of predictive skill for outdoor narrowband and broadband sound levels on the atmospheric representation

Vol. 56, No. 6, pp. 465-477, D. Keith Wilson, Matthew S. Lewis, John W. Weatherly, and Edgar L. Andreas

Kun abstract læst. Artiklen er ikke fundet relevant.

A fuzzy set based approach for the estimation of loudness of environmental noise

Vol. 57, No. 5, pp. 551-568, M. Ferri, J. A. Martínez, J. Alba, J. Ramis, and C. Llinares

Kun abstract læst. Artiklen er fundet relevant.

Validity of aircraft noise induced awakening predictions

Volume 57, Issue 5, pp. 524-535, Mathias Basner

Artiklen er ikke læst.

3.5 Acta Acustica

Årgang 2009: Vol. 95, No. 3 – 5, May/June – Sept./Oct.

Et link til dette tidsskrift findes i Bilag 1. Følgende artikler udvalgt:

Using Noise Mapping to Evaluate the Percentage of People Affected by Noise

Vol. 5, No.3, pp. 550-554, Miguel Arana, Ricardo San Martín, Iñaki Nagore, David Pérez

Kun abstact læst. Facadestøjberegninger udført i henhold til EU direktiv 2002/49/EC overestimerer ofte antallet af personer, fordi beregningen udføres i 4 meters højde, og fordi den værst belastede facade ligger til grund for optællingen. Estimatet er præcist nok for åben lav boligbebyggelse, men ikke for lange og høje bygninger i bymiljøer. Der anbefales optællinger på basis af netværkssberegninger og støjniveauet i det nærmeste netværkspunkt.

Measuring Community Annoyance from Aircraft Noise

Vol. 5, No.3, pp. 573-577, Peter Brooker

Kun abstract læst. Artiklen er ikke fundet relevant.

Prediction Method for Wind-Induced Vegetation Noise

Vol. 95, No. 4, pp. 607-619, Karl Bolin

Forfatteren har udviklet en støjmodel til beregning af vindgenereret støj i vegetation. Ved sammenligning med en tidligere støjmodel, fås bedre overensstemmelse med feltmålinger især under 1.000 Hz med vindhastigheder op til 8,5 m/sek.

Model Calculations With a Fast Field Programme and Comparison With Selected Procedures to Calculate Road Traffic Noise Propagation Under Defined Meteorological Conditions

Vol. 95, No. 5, pp. 941-949, Rainer Matuschek, Volker Mellert, Stylianos Kephalopoulos

Forfatterne har undersøgt støjudbredelse fra liniekilder (vejtrafik) ved hjælp af numeriske metoder og sammenlignet resultaterne med mange Europæiske støjberegningsværktøjer og de tilhørende vejledninger. Fælles for beregningerne var følgende forhold: medvind, fladt porøst terræn og lydudbredelsesafstande op til 1 kilometer. Efter justering for de nationale vejledningers forskelligheder fandtes en god overensstemmelse med de Europæiske støjberegningsværktøjer.

4. Kongresser

4.1 Euronoise

Afholdtes sidst den 26.-28. oktober 2009 i Edinburgh, Skotland. Udvalgte abstracts er medtaget i Bilag 2.

Links:

www.euronoise2009.org.uk

4.2 Inter-Noise

Afholdtes sidst den 23.-26. august 2009 i Ottawa, Canada. Inter-Noise afholdes næste gang den 13.-16. Juni 2010 i Lissabon, Portugal.

Links:

www.internoise2009.com

http://www.internoise2010.org

4.3 International Conference on Noise as a Health Problem

Afholdes hvert 5. år, sidst den 21.-25. juli 2008 i Mashantucket, Pequot Tribal Nation (CT, USA), som en del af "The 9th Congress of the International Commission on the Biological Effects of Noise (ICBEN)". Papers fra denne konference kan hentes på nedenstående link.

Link: www.icben.org

4.4 Forum Acusticum

Afholdes hvert 3. år, sidst den 29. juni - 4. juli 2008 i Paris, Frankrig (5th European Congress on Acoustics). Afholdes næste gang den 27. juni – 1. juli 2011 i Aalborg, Denmark.

Links:

www.acoustics08-paris.org

http://www.fa2011.org

4.5 Baltic-Nordic Acoustics Meeting

Afholdes hvert 2. år, sidst den 18.-19. august 2008 på Island (BNAM2008). Afholdes næste gang 10.-12. maj 2010 i Bergen, Norge.

Links:

www2.vfi.is/events/BNAM-2008 (abstracts fra Island kan hentes herfra)

4.6 Low Frequency Noise and Vibration and its Control

Afholdtes sidste gang 21.-23. oktober 2008 i Tokyo, Japan. Konferencen afholdes næste gang i Danmark i Aalborg den 9.-11. juni 2010 (14. internationale lavfrekvensstøj-konference).

Links:

www.lowfrequency2008.org

www.lowfrequency2010.org

4.7 Wind Turbine Noise 2009

Afholdes hvert 2. år, sidste gang den 17.-19. juni 2009 i Aalborg (3rd International Conference on Wind Turbine Noise). Den næste konference foregår i april 2011, sandsynligvis i Rom, Italien. Tidspunktet kendes endnu ikke.

Links:

www.windturbinenoise2009.org

www.windturbinenoise2011.org

Bilag 1

Links til tidsskrifters hjemmesider

Journal of the Acoustical Society of America (JASA)

http://scitation.aip.org/jasa/

Applied Acoustics

http://www.sciencedirect.com/science/journal/0003682X

Journal of Low-Frequency Noise, Vibration and Active Control

http://www.ingentaconnect.com/content/mscp/lfnv

Noise Control Engineering Journal

http://scitation.aip.org/dbt/dbt.jsp?KEY=NCEJD5

Acta Acustica

http://www.ingentaconnect.com/content/dav/aaua;jsessionid=2hrx8pvp3nh7.victoria

Bilag 2

Udvalgte abstracts fra EuroNoise konferencen 2009, Edinburgh

Noise policy and regulation

EU-Noise Maps: analysis of submitted data and comments, Martin van den Berg, Gaetano Licitra.

Nearly all EU member states have submitted noise map data as required by EU Directive 2002/49. All the submitted data was published on the EU-web site, which makes it possible to compile and analyze the data.

As could be expected, not all data was usable as published. Even when the EU-data format was used (which most did), confusion could arise on the figures. After scrutiny, data for 72 million people was obtained with respect to road traffic noise in agglomeration, and for significant lower part of the population for the other noise sources. This is 59% of the data to be reported, and 17% of the EU27 population.

Apart from some unexpected glitches, the overall impression is that the quality of the data is fair and yields important information on the exposure of the EU-population to noise. The rough estimates from the Green-paper from 1996 are largely confirmed.

How European noise policies can support actions at a local level, Henk Wolfert.

Nowadays a lot of the competent bodies as meant in the Environmental Noise Directive have finalized their Noise Maps and most of them have set up their action plans. Provisional data en data from the Noise Questionnaire that was set out by the Working Group Noise of EUROCITIES give a global insight in the noise situation in European agglomerations. As generally known most of the noise exposed people are living in cities. This is not surprising because more than 70% of the European citizens are living in cities and their numbers are still increasing [EUROSTAT]. This means that the number of exposed and annoyed people in Europe will increase as well if measures stay behind. The percentage of people that is exposed to 55 dB LDEN amounts 50 per cent and the percentage of people that is exposed to noise levels above 65 dB L_{DEN} amounts 15 per cent. This is based on the EUROCITIES Noise Questionnaire that was set out among 130 large cities in Europe. Approximately 44 per cent of the cities responded which means that the outcomes of the analysis are well founded and can be used for an estimation of exposed people in urbanized areas in Europe. In this paper some suggestions will be done towards the European Commission and European Parliament about how to support the actions that must be taken at local level.

Industrial noise

Environmental noise caused by building activities, Piet Sloven.

Constantly renewing cities will build at times not disturbing regular activities. But avoiding noise in the evening and at night. While construction noise ranks the third place of environmental noise problems in The

Netherlands regulations are poor. Attention given to environmental noise from building and demolition grows. A guide with directions is to be published, but in practice building noise will stay a matter of local authorities. They protect citizens against annoyance and sleep disturbance. Constructors and civil servants has to work together to reduce this noise. Best results are made when there is a willingness to change things in the way of building, used installations and planning schemes. Once the construction is on the way it is difficult to reduce noise. And what's more, this stimulates resistance of the surrounding inhabitants. Diminishing nuisance isn't reducing noise-levels. Not working at night, avoiding impulsive and lowfrequent noise, acting with silent machinery are helpfull. Good communication has the same importance. Transparency of considerations about the environmental impact of building, taking care for a directly responding phonenumber, a personal way in dealing complaints are very helpfull to accept noise. To reduce this kind of nuisance acoustical monitoring construction projects, combined with evaluating the process and figures makes quick progresses possible. This is supported when it is accompanied with a little pressure and fair requirements of the local authorities. The intention: building in cities is nice, the first aim is consciousness and better understanding of noise. In extreme circumstances a small license-structure will force this.

Auditory filters at low-frequencies: Filter shape in the range 50 Hz to 1000 Hz, Carlos A. Jurado, Christian S. Pedersen, Henrik Møller.

Prediction and assessment of low-frequency noise problems requires information about the auditory filter characteristics at low-frequencies. Unfortunately, data at low frequencies is scarce and practically no information exists for frequencies below 100 Hz. Extrapolation of previous results indicates the filter bandwidth would keep decreasing below 100 Hz, although at a low-rate and finally stabilizing. In this study, main auditory filter characteristics were obtained for center frequencies in the range 50 Hz to 1000 Hz. The notched-noise method was used, with the masker at moderate levels. Data from a total of 7 subjects is discussed. Considering the system as a whole (i.e. without removing the assumed middle-ear transfer function), the asymmetry of the auditory filter tended to change from steeper right-side slopes at 1000 Hz to steeper left-side slopes below 100 Hz. This effect was explained as due to increasing steepness at low-frequencies of the middle-ear high-pass filter. The dynamic range of the auditory filter steadily decreased with decreasing center frequency. The filter bandwidth at 63 Hz was about 36% of the center frequency, its value being smaller than at 125 Hz in all cases, confirming expectations from extrapolating previous findings. However, at 50 Hz results were much more subject dependent: while a decrease in bandwidth was observed in some cases, in most cases selectivity was very small, i.e. the bandwidth was found to increase again.

Noise evaluation of sound sources related to port activities, Johannes Hyrynen, Panu Maijala, Velipekka Mellin.

Port activities generate sound that is propagated to the environment. In some cases the people affected by the noise are very close to the port and are highly disturbed by the activities. There is a large number of sound sources in the port area and the nature of noise generated can vary a lot depending on the source. The sound sources very often depend on the operating mode of the machine and one piece of machinery can include various sound sources located apart from each other. The sound emitted can be either continuous or intermittent.

This study deals with sound power measurements and results of typical sound sources in the port area. The sound sources include operation of various mobile machinery, reefers, container handling and ship loading events and sound sources related to berthing ships.

The results are presented as sound power levels and a ranking of the sources has been made. In addition, annoyance indicators are presented for some of the sources.

Ports and Noise

Noise control of harbours, Jürgen Hünerberg, Dieter Knauss

Harbour areas are often sources of noise complains especially during night-time, since the noise from harbours consists of short noise pulses caused, for example, by the handling of containers. The levels from such activities strongly depend on the operation modus making standard noise reduction measures impossible. One method to reduce the noise from such sources is to implement an active noise control. The noise control system consists of various measurement locations inside or close to the harbour area, noise measurements at the residential area and a central unit. In the central unit the data from the sensors will be processed and information about the noise status can be immediately send to the noise control manager if a given noise level threshold is exceeded. In this way immediate action can be taken to reduce the noise from the identified activity or area. For the identification of the noise sources a correlation analysis of the different signals as well as pattern recognition is used. This paper will report on the special requirements of a harbour noise monitoring system and the experience with an existing system, which is now running for the past 6 years at a harbour site in North Germany.

Noise in the spotlights. Research on noise coming from remote Rotterdam-port areas, Piet Sloven.

In the Netherlands noiselimits obstruct expansions. Importance grows to know which elements influence the upper decibells on annoyance. Aspects of time, noise character , acoustical climate and virtual noise are studied.

Since the originate of the western harbours of Rotterdam, inhabitants at 3 km tell recognisable noise "falls down". Investigations were done in the past. On low-frequency noise and other measurements. Without connecting nuisance and noise, but leading to doubts about noise transmission. Hours with strange sounds exist, but inhabitants indicate also an incongruous situation in their natural area, where in their perception "it should be quiet".

Authorities and industry work together to mitigate nuisance learning which factors influence annoyance. With participation of villagers. In a unique setting because the diversities of participants, size, duration and broad of research.

Subprojects are: analysis of complaints related to time and meteorological circumstances, involvation of inhabitants and companies, development of new meteo-acoustical model (see contribution F. van den Berg: A View on Sound), measuring transmissions of artificial noise from industrial terrain to village plus a four-

months monitoring campaign. Monitoring comprises permanent measurements of: noise from harbours to village, industrial activities, atmosphere, complaints, other sounds.

The project took two years. Much analysis is done. On traffic (land, rail, water), variations in industrial emissions, shift of frequencies and temporal effects. Often variations in noiselevels are small. Complaints can partially be related to atmospherical circumstances - not necessarily downwind. Calculations show even vaste measures reduce just of a few decibells. An acoustical forecast is a new thought.

Urban development in the port area of Rotterdam: challenging noise constraints, Miriam Weber. DCMR Environmental Protection Agency, Netherlands.

The city of Rotterdam is facing economic and environmental challenges in strengthening employment, mobility and housing in the next decades. One of the major projects until 2020 is reconstructing and redesigning former harbours into areas assigned for clean activities (education and offices) and living; the so-called "Cityharbour" project (Stadshavens).

The Netherlands, academically reckoned for its spatial planning system, has been a forerunner in integrating noise and spatial planning. Its Noise Abatement Act contains the principle of zoning and - rather unique - even sets (immission) limits for various noise sources. However, operationalisation of urban environmental planning at the local level encountered various challenges, as regional and local spatial planning initiatives faced strict noise limits set at national level.

Example instruments for integrating environmental policy and spatial planning are ROM-projects (process tool); MILO (environmental aspects of living conditions) and City-and-Environment (legally embedded process tool).

Noise from industries and transport of Rotterdam's port has been one of the major issues to be addressed in urban development projects during the last decades. In this presentation a short overview of the instruments for (noise) policy integration used in the Rotterdam port area during the last decades will be presented. Furthermore, noise and spatial planning challenges for the coming years and possible mechanisms, identified in the "Cityharbour" project, will be focussed on. Varying instruments, with a basis on noise (zone) management and permitting, through innovation projects and early involvement and integration of noise in spatial planning initiatives are assessed and discussed.

Urban planning in port noise dominated conflict areas - the HafenCity solution, Christian Popp, Marion Bing (Laermkontor GmbH, Hamburg, Germany)

A lot of ports experienced a development in their border areas of a conversation of industrial uses to residential uses. In the same time the port uses itself expanded noticeably. The HafenCity in Hamburg is situated in a conflict area of road, railway and port noise. In Germany the national noise regulations are very complex and differ from source to source. While urban planning in regard to residential uses in conflict areas of road and railway noise is a comparatively common and manageable problem, the management of port noise turns out to be not as easy to handle.

Dealing with this impact situation, Hamburg has worked out a solution, based on definite specifications:

1. during the day-time (6 - 22 h) the limit values are not exceeded significantly and

2. in bedrooms during the night-time a noise level of less than 30 dB(A) [with slightly opened window] can be guaranteed.

3. quality of life is safeguarded through

- permanent supply of fresh air and if

- residents are not cut off acoustically from the outside world.

This solution combines both contribution of the port and the city. This means on the one hand the allocation of noise shares as contribution of the port. This is necessary to reduce ore state noise to a definite level. On the other hand recommendations on innovative noise protection on buildings in the HafenCity have been worked out by the City.

Sustainable strategy and noise solutions in urban development and infrastructure

Sound Transmission Loss through Naturally Ventilated Residential Facades, Tim Waters-Fuller, Daniel Lurcock (Edinburgh Napier University)

The sustainability agenda promotes natural ventilation as the preferred means of providing fresh air for residential development. There is however a deficit of published sound transmission loss data for naturally ventilated residential facades; beyond an 'open-window' approximation of 10 - 15 dBA.

A program of laboratory measurements have been undertaken to address this imbalance, through acoustic transmission loss measurements across naturally ventilated residential façades i.e. ventilated using either window openings or window frame ventilators.

The measurements were undertaken using an anechoic chamber (with demountable rear wall) as the source room into which a cavity masonry 'façade' wall was installed to partition the adjacent reverberation chamber. A residential sized receiver room was built adjoining the separating wall. Seven sets of window frames were installed in the test partition allowing the investigation of a number of variables i.e. window size, opening style and open area.

Urbines – Roof top urban wind turbines- A comparison between horizontal and vertical axis designs, Stephen Dance[1], Linda Liviani[2], Salih Hassan[1]. ([1]London South Bank University, [2]Capita Symonds, London)

The current planning guidance in London requires that all new large buildings being designed or refurbished should include 20% renewables. As part of a study two urbines have been erected on a residential building in central London to determine the effectiveness of locally generating electricity using wind power. The two urbines are a Proven 6 kW traditional turbine and an experimental vertical axis Quiet Revolution 5 turbine. The investigation includes long term wind, weather, noise, electricity and vibration monitoring. The effect on

the residents, the local community and the building structure has been determined. The electricity utilization has been calculated over 2 years for the Proven urbine and 1 year for the QR urbine.

Wind Turbine Noise

Exposure-response relationships for annoyance by wind turbine noise: a comparison with other stationary sources. Sabine Anne Janssen[1], Henk Vos[1], Arno R Eisses[1], Eja Pedersen[2]. [1]TNO, Delft, Netherlands, [2]Halmstad University, Halmstad, Sweden

There are indications that, given a certain level of noise exposure, the expected annoyance by wind turbine noise is higher than that by noise from other sources such as industrial noise or transportation noise. The aim of the present study was to establish the exposure-response relationship between wind turbine noise exposure and the expected percentage annoyed residents on the basis of available data. Data from two surveys in Sweden (N=341, N=754) and one survey in the Netherlands (N=725) were combined to achieve relationships between Lden and annoyance indoors as well as annoyance outdoors at the dwelling. In addition, the influence of several individual and situational factors was assessed. In particular, annoyance was lower in residents who received economical benefit from wind turbines, and higher in residents for whom the wind turbine was visible from the dwelling. Age and noise sensitivity had similar effects on annoyance to those found in research on annoyance by other sources. The exposure-response relationship for wind turbine noise is compared to previously established relationships for industrial noise.

Acoustic propagation in variable sound speed profiles. Andrew Peplow, Hoare Lea Acoustics, Bristol, United Kingdom

Acoustic waves in variable sound speed profiles An important topic in the area of airborne sound propagation is the prediction of sound propagation above an impedance ground with an atmospheric profile whose sound speed varies with height. Even if this problem is simple in concept, it leads to complications for general velocity profiles. This work illustrates the existence of a large class of realistic atmospheric profiles for which analytical solutions exist to be used as benchmark solutions for numerical methods. Spectral finite element results are discussed for sound propagation in a half-space situated above a ground surface impedance.

Wind turbine sound - how often is it heard by residents living nearby? Eja Pedersen[1], Kerstin Persson Waye[2]. [1]Halmstad University, Halmstad, Sweden, [2]University of Gothenburg, Gothenburg, Sweden

Sound power levels of wind turbines and consequently also the immission sound pressure levels at nearby residents vary with the wind speed. A standard meteorological situation is therefore commonly used when the immission levels are discussed; wind speed 8 m/s at 10 m height downwind. There is a need for a more comprehensive description of the sound that could be included in the Environmental Impact Assessment. The objectives of this study were to explore if it is possible to measure how often the sound is heard, and if the occurrence could be related to the standardized immission levels or the performance of the wind turbine. Twenty four people living in three wind turbine areas (A-weighted sound pressure levels 29.6 - 45.9 dB) filled in diaries for three weeks, noting when they were at home, when they were outdoors, and when they

could hear sound from wind turbines. The incidents when the wind turbines were heard varied largely from 0% to 100% of the times spent outdoors. The percentage increased with increasing standardized immission levels ($r = 0.56$, $p < 0.01$). In two of the areas it was possible to get data from the nearest turbines for the study period. The sound was more easily heard at wind speeds above 5 m/s than at lower wind speeds. No indication of a decreased possibility to hear the sound when the wind increased further was found. Possibility to hear the sound was most closely related to the electrical power generation.

Health – psychological, cardiovascular

Medical, psychological and genetic aspects of noise sensitivity, Marja Heinonen-Guzejev, Heikki Vuorinen, Helena Mussalo-Rauhamaa, Kauko Heikkilä, Markku Koskenvuo, Jaakko Kaprio. University of Helsinki, Department of Public Health, Helsinki, Finland

The study was based on the Finnish Twin Cohort of same-sex twin pairs. In 1988 a questionnaire was sent to twin pairs discordant for hypertension. 1495 individuals (688 men, 807 women) aged 31-88 years replied, including 573 twin pairs. 218 of the subjects lived in the Helsinki Metropolitan Area. Self-reported noise sensitivity, lifetime noise exposure and hypertension were obtained from the questionnaire study in 1988 and other somatic and psychological factors from the questionnaire study in 1981 for the same individuals. In addition, noise map information from the Helsinki Metropolitan Area and mortality follow-up 1989-2003 were used. To evaluate the stability and validity of noise sensitivity, a new questionnaire was sent in 2002 to a sample of the subjects who had replied to the 1988 questionnaire.

Of all subjects 38 % were noise sensitive. Noise sensitive subjects reported transportation noise exposure outside the environmental noise map areas almost twice as often as non-sensitive subjects. Noise sensitivity was associated with hypertension, emphysema, use of psychotropic drugs, ex-smoking, stress and hostility, even when lifetime noise exposure was adjusted for. Monozygotic twin pairs were more similar with regards noise sensitivity than dizygotic twin pairs and quantitative genetic modeling indicated significant familiality. The best fitting genetic model provided an estimate of heritability of 36 %. Follow-up of subjects showed that cardiovascular mortality was significantly increased among noise sensitive women, but not among men. For coronary heart mortality the interaction of noise sensitivity and lifetime noise exposure was statistically significant in women.

The effects of road-traffic noise on blood pressure of children aged 7-11 years in Belgrade, Katarina Paunovic[1], Goran Belojevic[1], Branko Jakovljevic[1], Vesna Stojanov[2], Jelena Ilic Zivojinovic[1]. [1]Institute of Hygiene and Medical Ecology, School of Medicine, Belgrade, Serbia, [2]Clinical Centre of Serbia, Belgrade, Serbia

Background: The aim of this study was to investigate the effects of urban road-traffic daytime noise around schools and nighttime noise near residences on blood pressure of school children.

Methods: A cross-sectional study was performed on 856 school children (413 boys and 443 girls) aged 7-11 years, who attended 8 primary schools in Belgrade. A residence was regarded noisy if L_{eq} exceeded 45 dB(A) during night and quiet if $L_{eq} \leq 45$ dB(A). School was regarded noisy if L_{eq} exceeded 60 dB(A) during day and quiet if $L_{eq} \leq 60$ dB(A). Four groups were created: quiet residence and quiet school, quiet residence and noisy

school, noisy residence and quiet school and noisy residence and noisy school. A medical doctor measured blood pressure with mercury sphygmomanometer. The parents completed a questionnaire on children's noise sensitivity, physical activity, sitting by TV or computer and eating crisps.

Results: Systolic pressure was significantly higher among children from noisy schools and quiet residences, compared to children from both noisy environments (1.5 mmHg on average) or from both quiet environments (2 mmHg on average) ($p<0.001$). Multiple linear regression, after allowing for gender, age, BMI-for-age percentile, family history of hypertension and noise insulation at school, showed significant positive correlation between noise exposure at school and children's systolic pressure ($B=0.566$, $t=2.681$; $p<0.001$), and diastolic pressure ($B=0.110$, $t=1.994$; $p<0.05$).

Conclusion: High level urban road-traffic noise ($L_{eq}>60$ dB(A)) around schools is associated with higher systolic and diastolic pressure in school children.

Noise disease burden: DALYs might be the answer, but what was the question? Guus de Hollander[1], Irene van Kamp[2], Anne Knol[2]. [1]Netherlands Environmental Assessment Agency, Bilthoven, Netherlands, [2]National Institute of Public Health and the Environment (RIVM), Bilthoven, Netherlands.

Quantitative health impact assessment to support public health policies more and more involves estimation of the so-called attributable disease burden. As they aggregate different dimensions of health (morbidity as well as mortality), disease burden measures such as 'disability-adjusted life-years' (DALYs) enable comparison between different environmental and public health risks. Furthermore, in economic evaluation of environmental policies an aggregate public health indicator is also required to compare the health benefits of different options and establish the best deals in health risk management. Nonetheless, there is still a vivid debate going on whether, when and where the use of DALYs in environmental health risk management is suitable. Using a Dutch 'noise related burden of disease' study as an example this paper will discuss the DALY-method, the rationale behind it, as well as several methodological, economical and ethical challenges behind the 'appealing' concept of attributable disease burden.

Environmental noise and health in the elderly;an Australian case study, Irene van Kamp[1], Julie Hatfield[1], Jessica Santos[1], Wei Du1. [1](RIVM) National Institute of Public Health and the Environment, Bilthoven, Netherlands, [2]NSW Injury Risk Management Research Centre, University of NSW, NSW, Australia, Sydney, Australia, [3]Medical Faculty,University of NSW, NSW, Australia, Sydney, Australia, [4]The George Institute for International Health, University of Sydney, NSW, Australia, Sydney, Australia

The project "Ageing well in Australian cities" addresses knowledge gaps regarding the relationship between residential environment and the health of older residents, at the neighbourhood level. The projecct extents the LARES project conducted by the WHO (EU) to Australia (Sydney), and to focus on older people (aged 60+), and their particular health problems. The present paper focuses on the influence of road traffic noise on health outcomes in the context of key residential and personal characteristics. Five localities in the City of Sydney council area were selected based on having a large proportion of elderly residents, heterogeneity of residential amenity, housing design/condition and socioeconomic status. Following focus groups discussions 124 elderly residents were interviewed in their homes using a structured protocol, and housing features were recorded on-site. Data regarding road type and distance to road were used as a proxy for levels of noise exposure. Poisson regression analyses showed relationships of noise and housing features, annoyance and sleep disturbance that are comparable to previous findings in adult populations. There was no direct association of

noise and housing features with diagnosis or medication use for hypertension/CVD. Our findings do not indicate that the elderly are more vulnerable to noise in terms of annoyance and sleep disturbance, but health effects were, as previously found in general populations, mediated by length of residency and annoyance due to different noise sources. Results provide insight into the noise health relationship amongst the elderly, which warrant future attention especially in view of inner city housing and traffic policies.

Road traffic noise, sensitivity, annoyance and self-reported health, Ronny Klæboe, Aslak Fyhri, Astrid H Amundsen. Institute of Transport Economics, Oslo, Norway.

To shed light on the relationships between noise exposure, exposure to air pollution, noise sensitivity, demographic and lifestyle factors and self-reported health, alternative explanatory models are explored. Using structural equation models, the empirical support for different causal models are assessed. The analyses are performed on cross-sectional data consisting of questionnaire responses from 1842 respondents and the calculated noise exposure on the most exposed façade of their dwellings, along with air pollution indicators for each dwelling based on 6 months of hourly calculated exposure data using real meteorology. Results from the analyses indicate that only sensitivity to noise is related to hypertension and chest pain. No relationships between road traffic noise annoyance and health complaints were identified. Instead of a traditional ambient stressor model of noise and other environmental exposures being the causal agent of stress that in turn induces health problems, the results suggest that noise annoyance -- health relationships in these studies may be spurious. It is conceivable that individual vulnerability is reflected both in ill health and in being sensitive to noise. The benefit of including contextual variables in a model of noise-health relationships is supported.

Health and Sleep

Nocturnal transportation noise - its effects on heart rate. Barbara Griefahn1, Mathias Basner, Peter Bröde, Anke Marks

Noise-induced alterations of autonomic functions during sleep are suspected to bear a pathogenetic potential. If so, this is highly relevant for people living near airports, along major roads or railway tracks. This paper concerns heart rate (HR) responses to transportation noise and the impact of acoustic parameters, situational and individual influences. 12 women and 12 men (19-28 yrs) slept in 3 consecutive weeks 4 nights each in the laboratory. The 4 nights each week consisted of a random sequence of a quiet night (L_{Aeq} = 32 dBA) and 3 nights where either aircraft, rail or road traffic noises occurred with L_{Amax} of 45-77 dBA. The polysomnogram and the electrocardiogram were recorded during all nights.

If the participants did not wake up, HR-responses were biphasic with initial accelerations and maxima of +9 bpm followed by a decrease below baseline values. These responses were influenced by traffic mode, acoustic parameters and momentary sleep stage. If the subjects woke up, the HR-alterations consisted of elevations for more than one minute with maxima of +29 bpm. Though obviously triggered by noise events, awakenings per se rather than the acoustical parameters determined the extents and the patterns of the responses.

The observed alterations revealed moderate increases during the course of the night. This suggests that these responses play a key role in the genesis of noise-induced cardiovascular diseases. If so, this is more likely for responses accompanied by awakenings than for situations without awakenings.

Effects of long-term road traffic noise exposure on sleep in a large population study. Yvonne Kluizenaar de, Sabine A. Janssen, Frank J. Lenthe van, Henk M.E. Miedema, Johan P. Mackenbach

We investigated the association between night-time road traffic noise exposure (L_{night}) and sleep problems. Baseline questionnaire data were linked to detailed road traffic noise exposure, for a large population based cohort study (GLOBE) (~ 18 000 subjects), in a large urban region in the Netherlands. Logistic regression was conducted to study the association between exposure at the most exposed façade of the dwelling and sleep problems. For individual exposure assessment detailed spatial data (e.g traffic characteristics, buildings, screening objects) were used together with geographical information systems (GIS) and state-of-the-art modeling techniques. Measures of sleep problems were collected by questionnaire with questions on morning tiredness and use of sleep or tranquillizing medication. After adjustment for confounders a significant association was found between road traffic noise exposure and the risk of getting up tired and not feeling rested in the morning. Although the prevalence of sleep or tranquillizing medication use was higher at higher noise levels compared to the reference category ($L_{night} < 35$ dB), after adjustment for confounders this association was not significant. Long-term exposure to road traffic noise is found to be associated with an increased risk of getting up tired and not feeling rested in the morning in the general population. This result extends the earlier established relationship between long-term noise exposure and sleep disturbance assessed with questions that explicitly referred to disturbance caused by noise.

Human response to vibration – in transportation and buildings

Investigations to Measure Human Exposure to Vibration in Residential Environments. James Woodcock, Eulalia Peris, Gennaro Sica, Andrew Moorhouse, David Waddington

The University of Salford is currently engaged in work to derive exposure-response relationships for human vibration in residential environments. The vibration sources to be considered are those affecting residents that are outside their control, such as construction, road and rail activities. The protocol involves the measurement of vibration outside and inside residences and a social study questionnaire based on face-to-face interviews with adults. This paper deals with the measurement of vibration, i.e. the ‘exposure' part of the required exposure-response relationship, and describes the development and practical implementation of the vibration measurement protocol. Reported here are findings obtained in preliminary field measurements made to investigate the feasibility of the proposed method. In addition, controlled tests performed to determine the suitability of the vibration mounting for various practical situations are described. On the basis of the findings of the preliminary field measurements, recommendations for the full study are made. [Work funded by the Department for Environment, Food and Rural Affairs (Defra) UK]

Human exposure to low frequency horizontal motion in buildings and offshore structures: an assessment of guidance in BS 6611 and ISO 6897, Henrietta Howarth, Michael Griffin

Building vibration produced by external sources (e.g. road and rail traffic) and internal sources (e.g. domestic equipment and footfalls) is usually within the frequency range 1 to 80 Hz. The excitation of structures by wind or waves can induce horizontal motion at frequencies less than 1 Hz. This paper reviews guidance on the measurement, evaluation and assessment of human exposure to horizontal motion over the frequency range 0.063 to 1.0 Hz as provided in British Standard 6611 (1985) and the equivalent International Standard

6897 (1984). The guidance is compared with standards applicable to exposure to vibration at higher frequencies. It is concluded that BS 6611 and ISO 6897 do not adequately allow for the effects of exposure duration or for differences in the effects of motion on different tasks. Acceleration limits for buildings proposed in BS 6611 and ISO 6897 for the worst 10 minutes of a wind storm with a return period of 5 years or more are similar to satisfactory magnitudes in BS 6472-1 (2008) and BS 6841 (1987) for 10-minute daily exposures. Mean thresholds for the perception of motion in BS 6611 and ISO 6897 are a little higher than those in ISO 2631-1 (1997), BS 6472-1 (2008), and BS 6841 (1987). The acceleration magnitudes expected to impair task performance in BS 6611 and ISO 6897 are lower than the magnitudes impairing hand control in BS 6841. Possible revisions to BS 6611 and ISO 6897 are discussed.