Environmental Sound
looking back (and forward) 50 years

25 November 2024

R. M. Thornely-Taylor

Rupert Taylor Ltd

RUPERT TAYLOR
ACOUSTICS ▫ NOISE ▫ VIBRATION

Institute of Acoustics

1974

Edward Heath was British Prime Minister
Richard Nixon Was President of the USA
Leonid Brezhnev was Russian Premier
UK had joined the EU the year before

The Local Government Act 1972 came into force, creating a new local authority structure. The Greater London Council (GLC) existed.

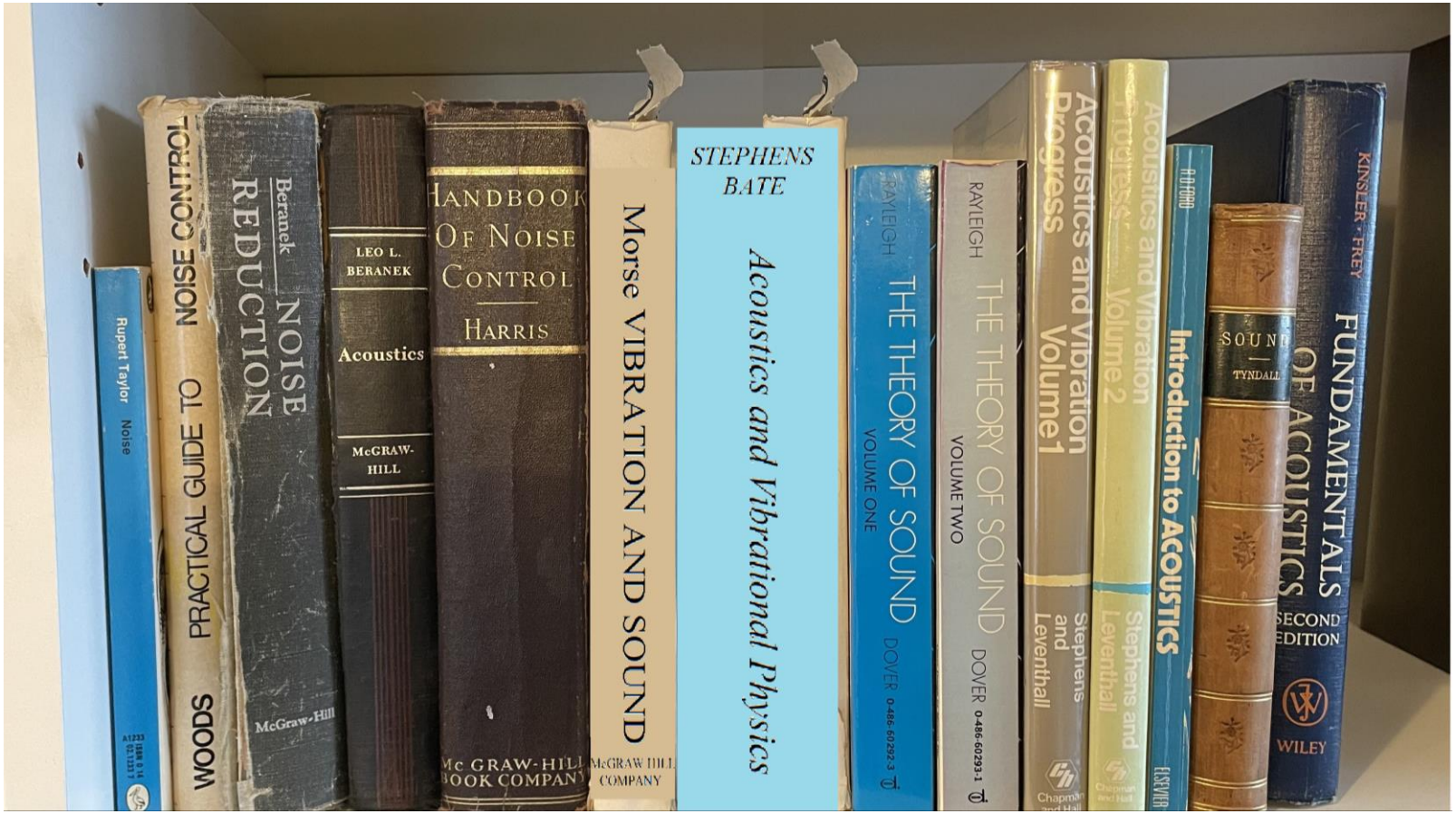
The Control of Pollution Act 1974 was enacted
The Health and Safety at Work etc Act 1974 was enacted

The Noise Abatement Society had been formed in 1959
The Noise Advisory Council was set up in 1969
The Victoria Line to Brixton had opened in 1971.

A new 850cc Mini cost £1027
The rate of inflation was 16.4%

In April 1973 the average weekly wage for full time manual men was £38.10 and for women was £19.70. By October 1974 these had gone up to £48.63 and £27.01.

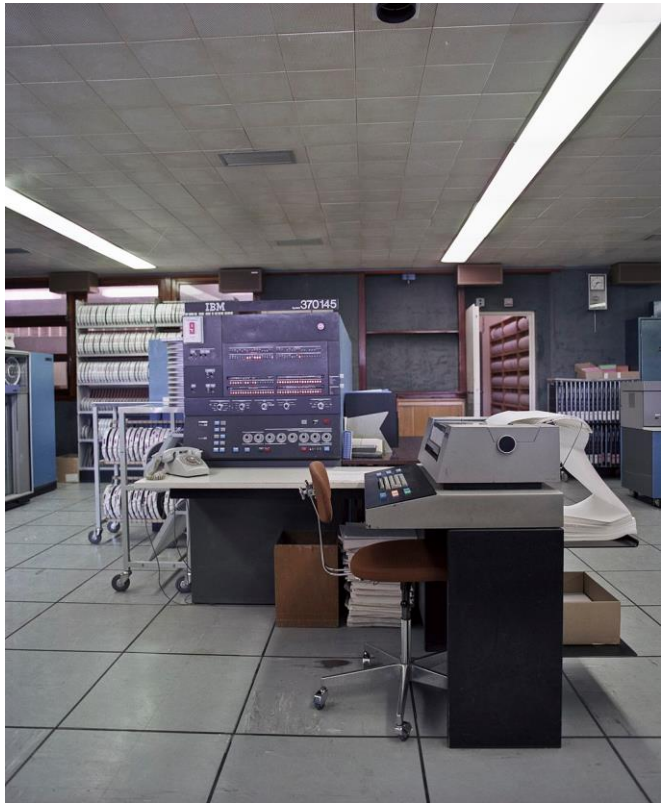
An acoustician's bookshelf, 1974



An acoustician's bookshelf, 2024

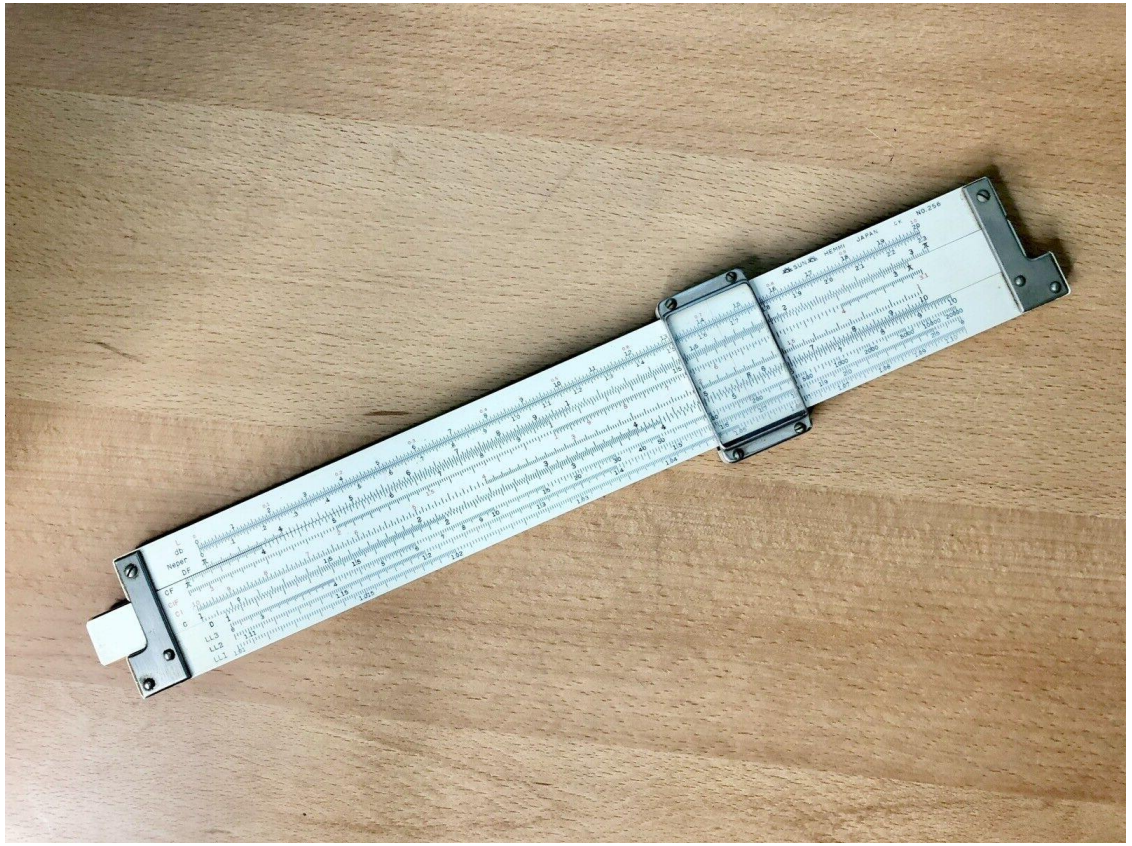
Computers

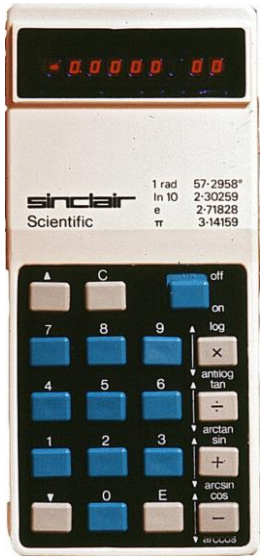
Computing was done by mainframes like the IBM 370 or the HP 3000 “minicomputer”



Computers

Calculating devices in 1974





Computers

The first micro-computer, the Altair, came out in 1974

Computers

It would be six more years before the IBM PC came out

Computers

A precursor to the PC - the HP 9845 came out in 1978 running interpretive BASIC

Computers

The BBC Micro Model B announced in 1981

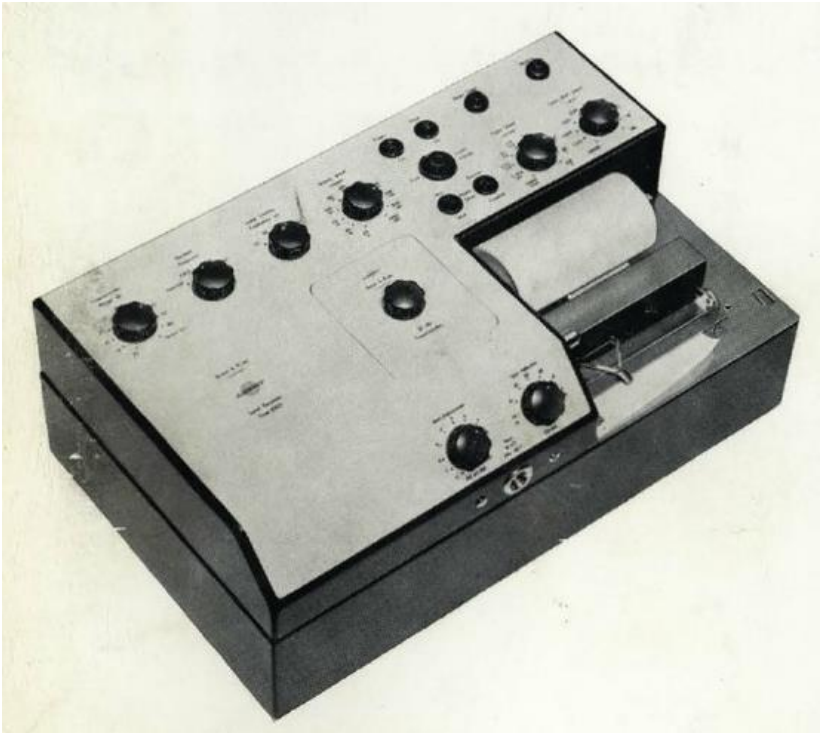
Instrumentation 1974

Analogue tape recorders

Instrumentation 1974

The statistical distribution analyser

Fig. 4.21. Photograph of the Statistical Distribution Analyser Type 4420.



Instrumentation, pre 1979

The Open University CRL 2.22

Issued to students on the T100 module “The man-made world: a foundation course” (1971-1979).

RUPERT TAYLOR
ACOUSTICS ▫ NOISE ▫ VIBRATION

Institute of Acoustics

Noise Measurement 1970s

NNI, PNdB

dBA, B, C and D weighting (D from 1977) not necessarily “fast” or “slow”, depending on writing speed when graphic level recorder used

NR, NC and other octave band criteria

TNI and NPL (more of which later)

L_{10} (often with full statistical distribution analysis)

L_{eq} began to move from occupational noise assessment to environmental noise but did not replace NNI until 1985

Law, Standards, Policy and Guidance - 1974

Noise Abatement Act 1960

Kosten & Van Os, Community Reaction Criteria for External Noises NPL Symposium No 12, 1962

BS 4142:1967

ISO R 1996 1971

Motor Vehicles (Construction and Use) Regulations 1969

ICAO Annex 16 1971

Code of Practice for Reducing the Exposure of Employed Persons to Noise, 1972

Noise Insulation Regulations 1973

Circular 10/73 Planning and Noise

Control of Pollution Act 1974

Health and Safety at Work etc Act 1974

Law, Standards, Policy and Guidance post 1974

BS 4142 amended/superseded 1975, 1980,1982, 1990, 1997, 2014, 2019

Noise Advisory Council L_{eq} Guide 1978

Environmental Health Criteria 12: Noise, World Health Organization, 1980

The Town and Country Planning (Assessment of Environmental Effects) Regulations 1988

BS 4142:1990

PPG 24 1994

Community Noise, Stockholm Institute and Karolinska Institute 1995

WHO Guidelines for Community Noise 1999/2000

The Control of Noise at Work Regulations 2005

Night Noise Guidelines for Europe 2009

Good Practice Guide on Noise Exposure and Potential Health Effects (EEA) 2010

BS 4142-2014 (+A1 2019)

Noise Policy Statement for England 2012

Aviation Policy Framework 2013

Survey of Noise Attitudes 2014 (SoNA) Second Edition 2017 (CAA)

Planning Practice Guidance 2016

ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise 2017

WHO Environmental Noise Guidelines for the European Region 2018

Law, Standards, Policy and Guidance since1974

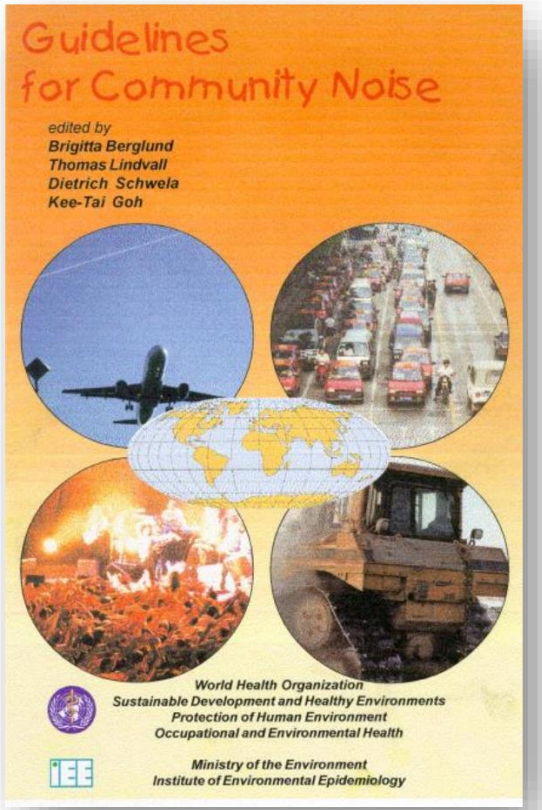
Environmental Health Criteria 12: Noise, World Health Organization

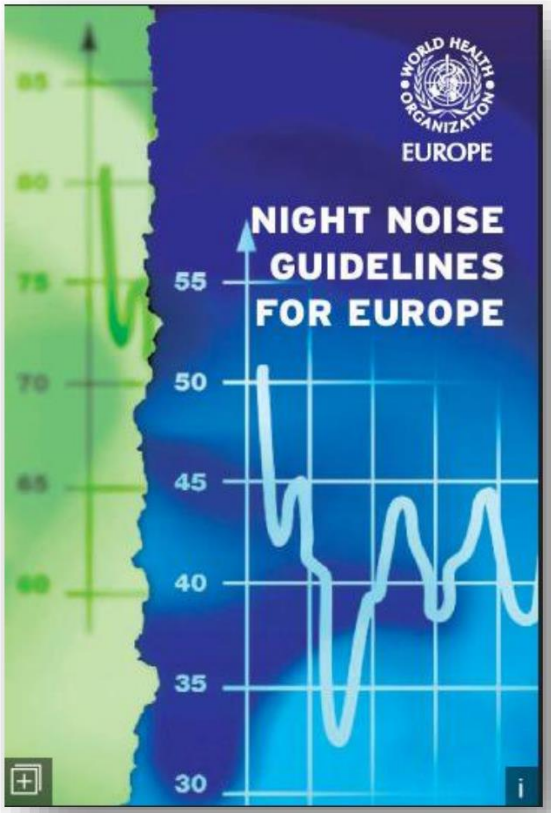
“At night, sleep disturbance is the main consideration and available data suggest a bedroom noise limit of 35 dB(A) Leq.

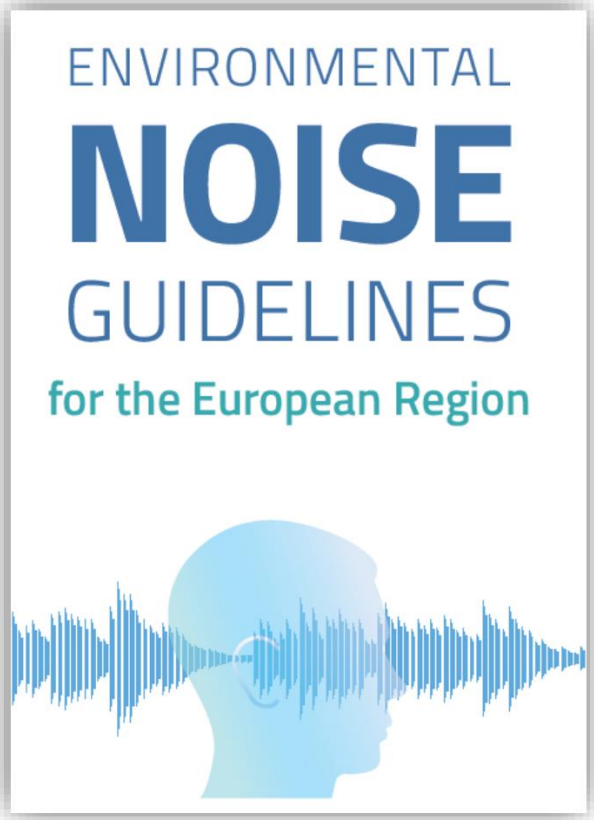
Data from surveys of community noise annoyance lead to the recommendation that general daytime outdoor noise levels of less than 55 dB(A) Leq are desirable to prevent any significant community annoyance. This is consistent with speech communication requirements.

At night, a lower level is desirable to meet sleep criteria; depending upon local housing conditions and other factors this would be in the order of 45 dB(A) Leq.”

World Health Organization







The sound of the environment in 1974

No windfarms

No heat pumps

Simple audio sound systems – no iPods

Many more large industrial sites

Aircraft noise levels were much higher

Concorde began flying

Aircraft movement numbers were lower

Area within airport noise contours was ~4 times greater

No high speed trains (Mk I coaching stock – 10 dB noisier than Mk III))

Few electric vehicles

No low noise road surfaces

Fewer motorways (1000 miles compared to 2300 now)

Lower traffic volumes

Fewer noise barriers

Occupational hearing loss more prevalent

Assessing the sound environment in 1974

Little consideration of noise and health except for hearing conservation

"Soundscape" an unknown word

No noise modelling or mapping software

No spreadsheets (No Microsoft or Lotus)

All predictions done by hand or on mainframe/minicomputers using software written by the user in Fortran or BASIC, or using programmable calculators from about 1975

Practitioners had to know their acoustics in order to do calculations – no packages to do the work for them

Noise indices that did not survive

Noise Pollution Level $L_{NP} = L_{Aeq} + 2.56\ \sigma$

The Concept of Noise Pollution Level. D. W. Robinson. *NPL Aero Report Ac 38* Mar. 1969. (National Physical Laboratory, Teddington, England.)

One of the chief problems in predicting the annoyance of noises is how to take into account fluctuations in noise level, steady noises in general being less annoying than varying ones. Robinson proposes that L_{NP}—the "noise pollution level"—be defined as equal to $L_{eq} + K(\delta)$, where L_{eq} is the sound level corresponding to the average sound energy over time, K is a constant, and δ is the standard deviation of the instantaneous level. Fitting this equation to data gathered by others on community annoyance associated with automobile and aircraft noise, he finds that if L_{eq} and δ are expressed in dBA, the constant K has a value of about 2.56. —*W.D.W.*

Noise indices that did not survive

Traffic Noise Index

$TNI = L_{A90} + 4(L_{A10}-L_{A90}) – 30$

Noise and Number Index

NNI = PNdB + 15 1og N - 80

Noise law that fell by the wayside

Noise Abatement Zones:

Sections 63-67 of the Control of Pollution Act 1974

Biggest changes since 1974

BS 4142-1967 transformed to BS 4142-2014/19

Assessment of Environmental Effect Regulations

Environmental Noise Directive – Noise Mapping – Noise Action Plans

Noise Policy Statement for England and Planning Practice Guidance

The profession of Acoustics has grown enormously

IoA has 3000 Members and there are 20 times as many consultants than there were in 1974

Software packages available to do most prediction and design work

Biggest changes since 1974

Noise monitoring instrumentation and telemetry

The internet

PCs and tablets

Smart phones

Audio systems

Building Regulations and domestic sound insulation

Silent discos

Artificial Intelligence (AI)

Technology changes since 1974

Aircraft engine noise reduction

Electric road vehicles

Quieter rail vehicles
(composite brake blocks - then disc brakes)

Resilient track support for underground railways

Quieter construction plant

Wind farms

Changes in the next 50 years?

Technology:

3D noise cancelling (including openable sound insulating windows)

Metamaterials

Quieter tyres?

Policy and practice:

More attention given to non-auditory health effects of noise

More attention given to “wanted” as well as “unwanted” environmental sound, and to tranquility

Lower community tolerance of environmental noise

Improved noise indices and measures of environmental sound

New noise sources:

Drone usage and personal air taxis will increase

Electric aircraft will proliferate, including eVTOL

Hydrogen-fuelled IC engines will become more numerous

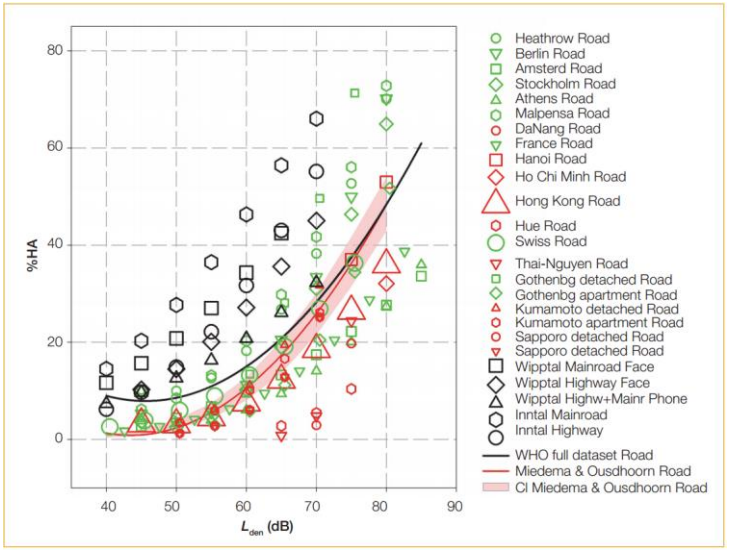
Changes in the next 50 years?

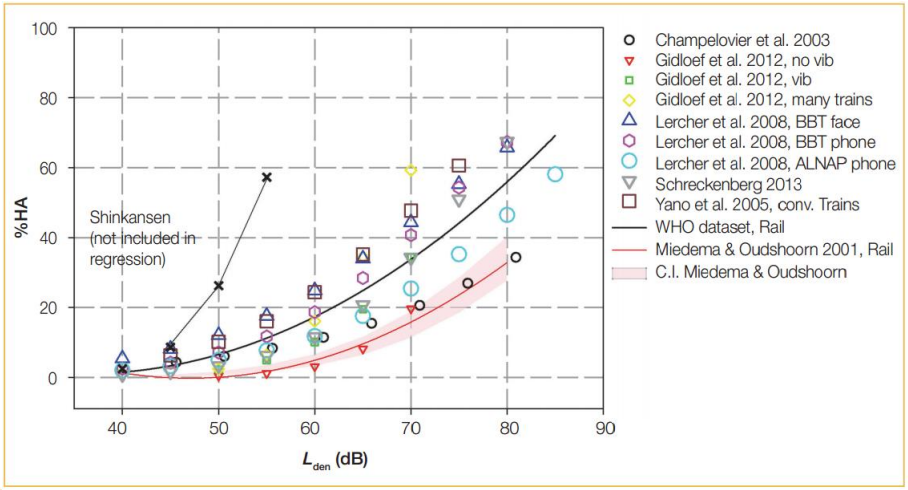
Noise assessment:

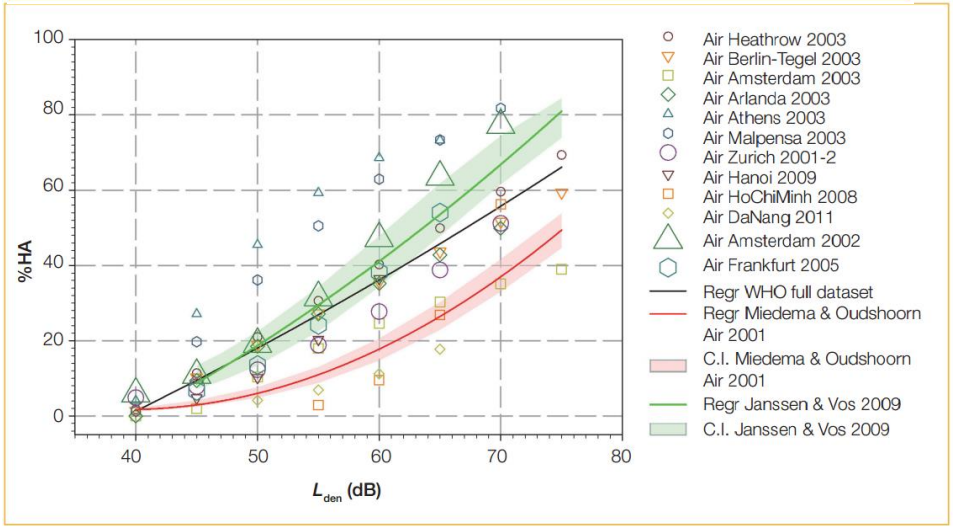
AI-based noise quantification
Better noise indices and rating methods
Quantification of tranquillity

Growth of citizen science – smartphone noise surveys

Changes in the next 50 years?







RUPERT TAYLOR
ACOUSTICS ▫ NOISE ▫ VIBRATION

Institute of Acoustics

Questions?