Erheblichkeit von Lärmimmissionen aus dem Straßenverkehr

Grenzwerte für Lärmimmissionen von OÖ Landesstraßen aus umweltmedizinischer Sicht

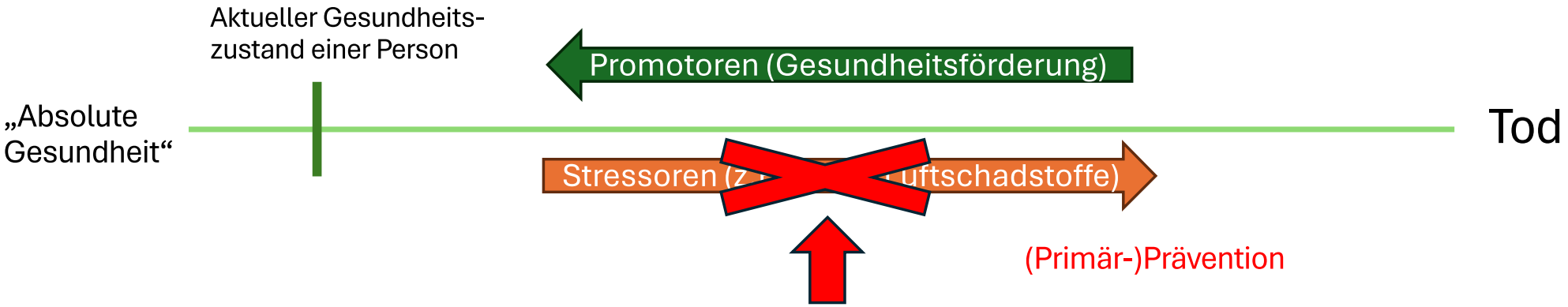
Dr. Götz Nordmeyer
Facharzt für Sozialmedizin
Facharzt für Public Health

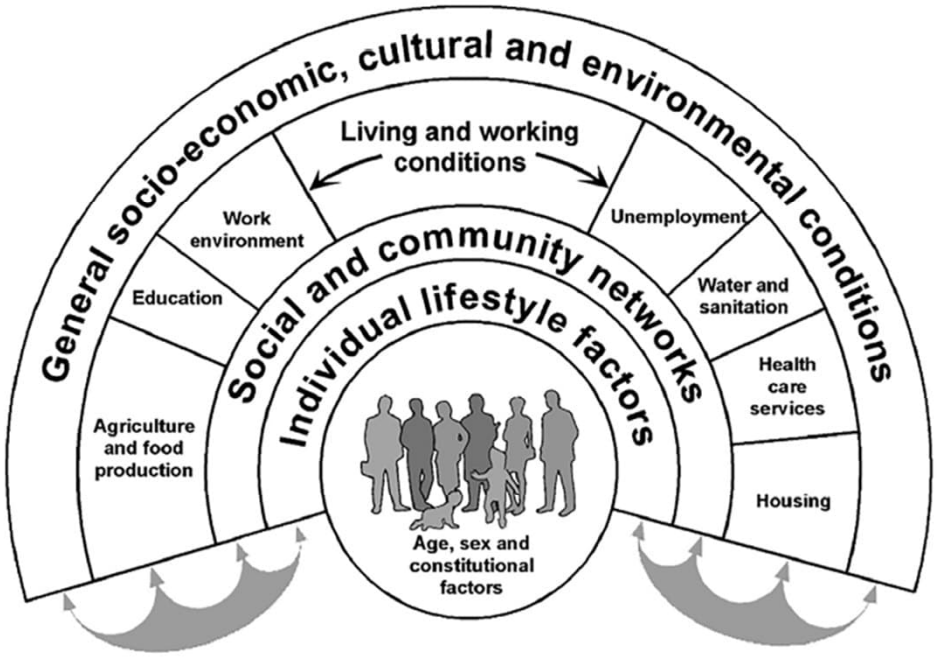
„Der Gesundheitszustand als Kontinuum“

CONSTITUTION OF THE WORLD HEALTH ORGANIZATION (1946)

THE STATES Parties to this Constitution declare, in conformity with the Charter of the United Nations, that the following principles are basic to the happiness, harmonious relations and security of all peoples:

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.





Source: adapted from Dahlgren and Whitehead, 1991

Fig. 1. The main determinants of health.

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Review Paper

The Dahlgren-Whitehead model of health determinants: 30 years on and still chasing rainbows

Göran Dahlgren, Margaret Whitehead*

Department of Public Health, Policy, and Systems, University of Liverpool, Whelan Building, The Quadrangle, Liverpool, L69 3GB, UK

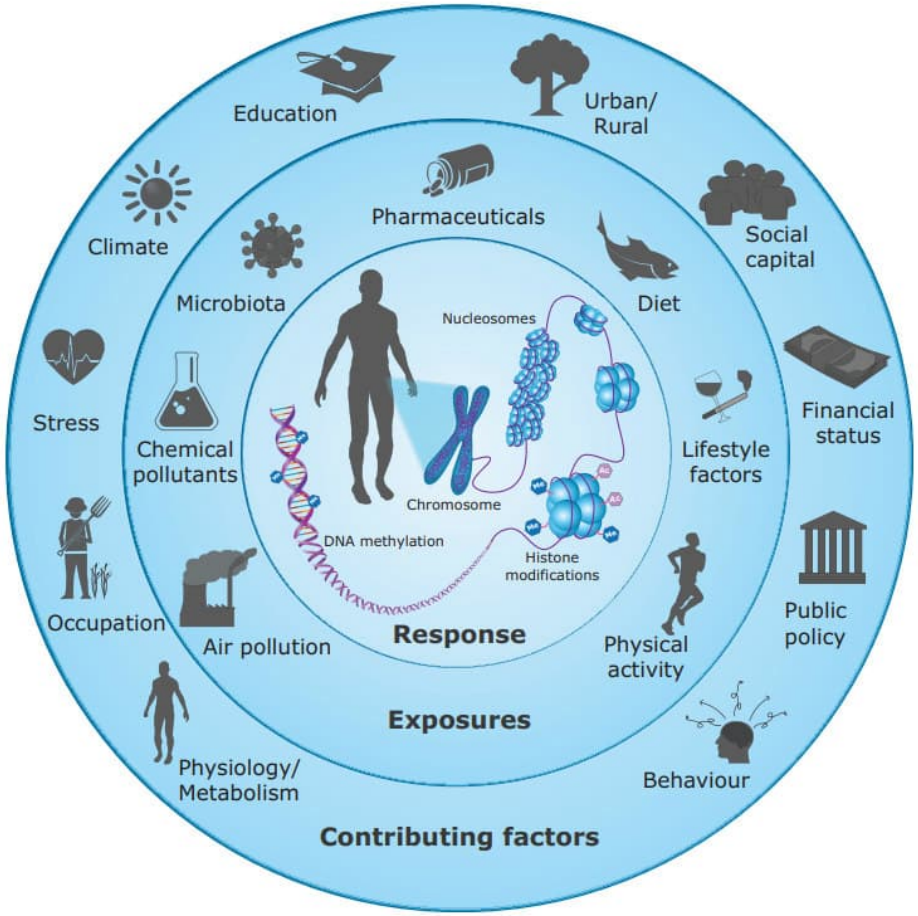


Figure 3 The human exposome. Environmental exposures are major risk factors for human diseases, and only a small proportion of chronic illness can be attributed to genetic factors alone. Systematic information on the human exposome—the lifetime sum of environmental exposures—is therefore important to reduce the overall burden of disease. Humans are continuously exposed to many contaminants and other stressors that can induce adverse effects, independently or when they interact. For example, the consequences of climate change include adverse health effects through heatwaves and increased vector-borne infectious outbreaks and the potential to alter environmental concentrations and biological effects of pollutants. The individual response to current exposures and susceptibility to disease are influenced by genetics, epigenetics, physiology and health status, which involve changes in biological pathways caused by earlier exposures. Epigenetic mechanisms such as DNA methylation, histone modifications and non-coding RNA are important pathways for effects of the exposome. The exposures can alter epigenetic modifications and thereby turn on, or off, genes. Investigating the effects on epigenetic processes by using omics tools can therefore provide evidence of responses to a set of exposures and improve the understanding of human disease

IEA International Epidemiological Association

International Journal of Epidemiology, 2021, 378–389
doi: 10.1093/ije/dyaa231
Advance Access Publication Date: 8 December 2020
Opinion

Opinion

The human exposome and health in the Anthropocene

Oskar Karlsson,[1]* Joacim Rocklöv,[2] Alizée P Lehoux,[3] Jonas Bergquist,[4] Anna Rutgersson,[3] Martin J Blunt[5] and Linda S Birnbaum[6]

[1]Science for Life Laboratory, Department of Environmental Science, Stockholm University, Stockholm, Sweden, [2]Department of Public Health and Clinical Medicine, Section of Sustainable Health, Umeå University, Umeå, Sweden, [3]Department of Earth Sciences, Uppsala University, Uppsala, Sweden, [4]Department of Chemistry-BMC, Analytical Chemistry and Neurochemistry, Uppsala University, Uppsala, Sweden, [5]Department of Earth Science & Engineering, Imperial College London, London, UK and [6]National Institute of Environmental Health Sciences, National Toxicology Program, Durham, NC, USA

Welche gemietete Wohnung lässt hier die Ruhe zu?

Nur der Reiche und Vornehme kann des Schlafes sich freuen.

Das Rasseln der Karren und Wagen in dem engen Gewirr der Gassen, das Fluchen und Schimpfen, das der Fuhrmann erhebt – all das kann selbst General Drusus den Schlaf rauben (...).

Juvenal (60-127 n. Chr.)

Die Seuche der Zukunft, wird der Lärm sein. Und die Menschheit wird den Lärm eines Tages ebenso bekämpfen müssen wie die Pest und die Cholera.

Robert Koch 1910

Wirkungen von Lärm

Aural

- Hauptsächlich Arbeitsmedizinisch relevant
- Ausnahme z.B. In der Nähe besonders lauter Quellen
  - Z.B. Brecher (in der Regel nur für sehr kurze Zeit); Pranger Stutzen (Schützen, bis zu 186 dB)

Wirkungen von Lärm

Nicht aurale Wirkungen

- Schlafstörungen und deren Folgen
  - Siehe Tabelle Night Noise Guidelines
  - Fenster gekippt, keine Barriere für Luftaustausch, ansonsten Störung durch den mangelhaften Luftaustausch (siehe night noise guidelines)
  - In Kombination mit anderen Immissionen (Licht)

- Metabolisch: Übergewicht, Diabetes
- Cardiovasculär: Hypertonie, Arteriosklerose, VHF, Arrhythmie, Schlaganfall

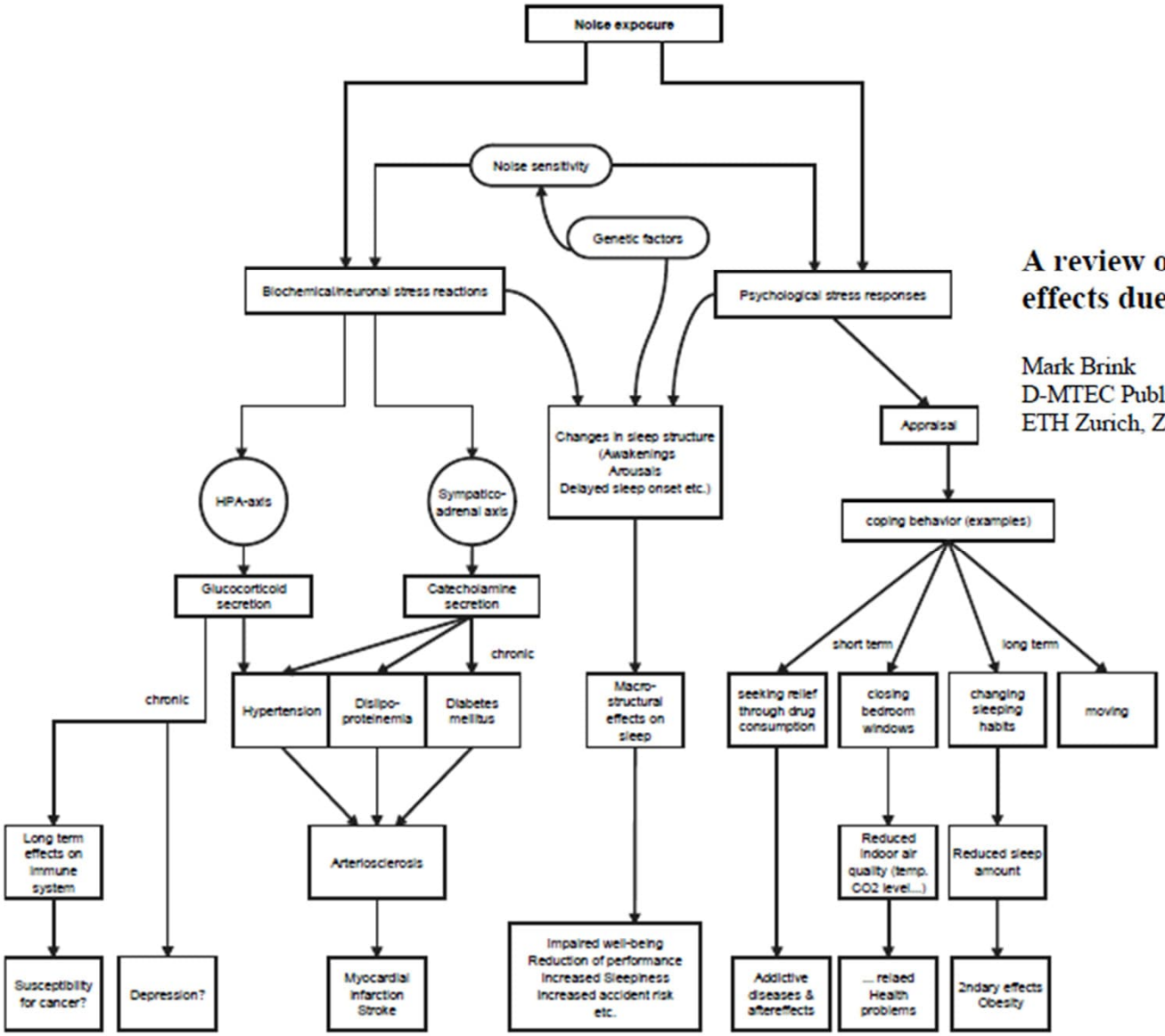


Fig. 1 – Schematic view of hypothesized pathways for night-noise induced short term and long term health effects

inter.noise 2012 august 19-22 new york city, usa
Quieting the World's Cities

A review of potential mechanisms in the genesis of long-term health effects due to noise-induced sleep disturbances

Mark Brink
D-MTEC Public and Organizational Health, Ergonomics & Environment, WEP H17
ETH Zurich, Zurich, Switzerland

ESC European Society of Cardiology

European Heart Journal (2024) **45**, 4019–4062
https://doi.org/10.1093/eurheartj/ehae466

SPECIAL ARTICLE
Epidemiology, prevention, and health care policies

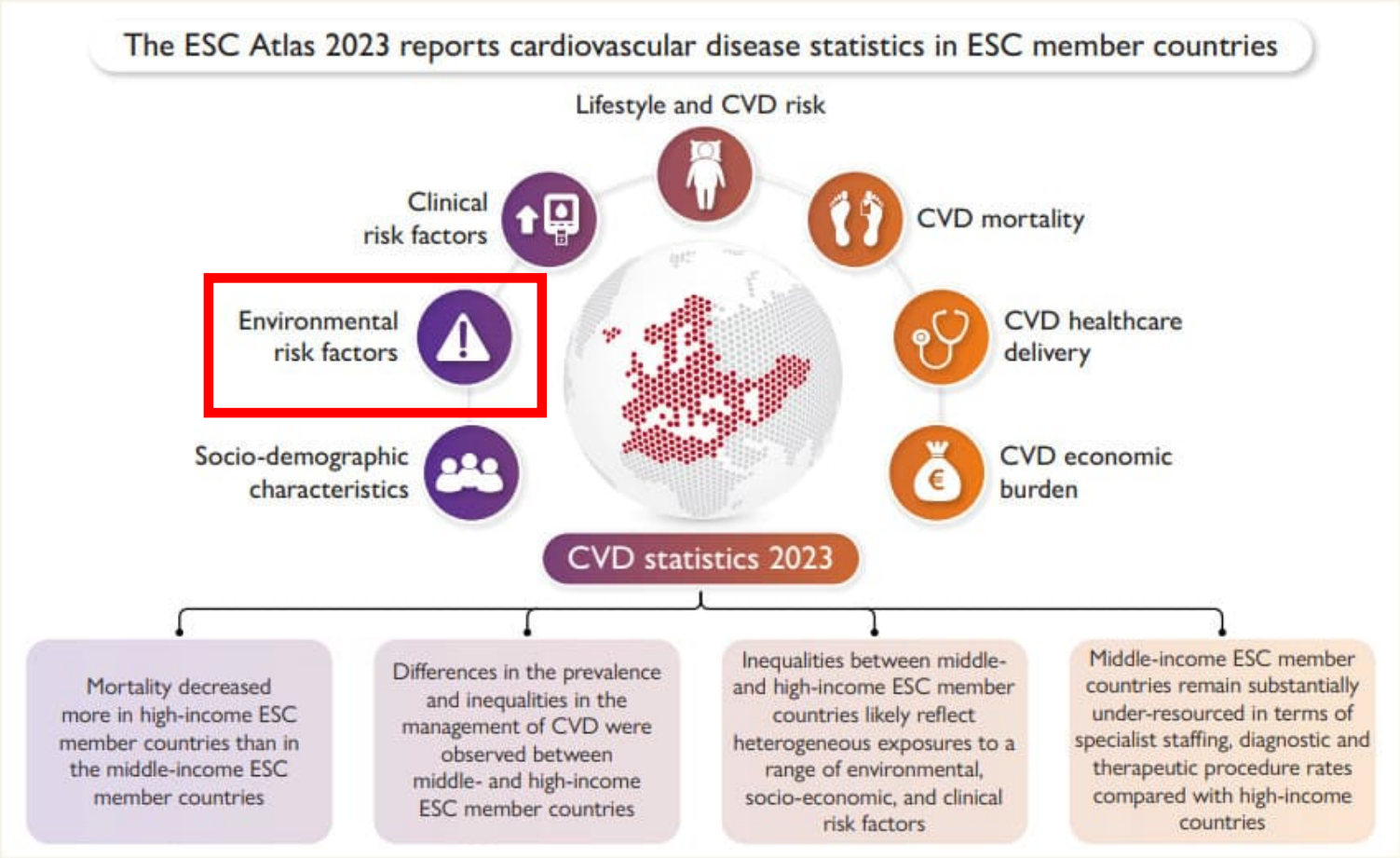
European Society of Cardiology: the 2023 Atlas of Cardiovascular Disease Statistics

Adam Timmis [1]*, Victor Aboyans [2], Panos Vardas [3,4], Nick Townsend [5], Aleksandra Torbica [6], Maryam Kavousi [7], Giuseppe Boriani [8], Radu Huculeci [4], Denis Kazakiewicz [4], Daniel Scherr [9], Efstratios Karagiannidis [10], Marta Cvijic [11], Agnieszka Kapłon-Cieślicka [12], Barbara Ignatiuk [13], Pekka Raatikainen [14], Delphine De Smedt [15], Angela Wood [16], Dariusz Dudek [17], Eric Van Belle [18], and Franz Weidinger [19]

[1]The William Harvey Research Institute, Queen Mary University London, London E1 4NS, UK; [2]Department of Cardiology, Dupuytren University Hospital, and EpiMaCT, Inserm 1098/IRD270, Limoges University, Limoges, France; [3]Biomedical Research Foundation Academy of Athens and Hygeia Hospitals Group, HHG, Athens, Greece; [4]European Society of Cardiology, European Heart Agency, European Heart Health Institute, Brussels, Belgium; [5]Centre for Exercise, Nutrition and Health Sciences, School for Policy Studies, University of Bristol, Bristol BS8 1TZ, UK; [6]Centre for Research on Health and Social Care Management (CERGAS), Bocconi University, Milan, Italy; [7]Department of Epidemiology, Erasmus MC University Medical Center Rotterdam, Rotterdam, The Netherlands; [8]Cardiology Division, Department of Biomedical, Metabolic and Neural Sciences, University of Modena and Reggio Emilia, Policlinico di Modena, Modena, Italy; [9]Division of Cardiology, Medical University of Graz, Graz, Austria; [10]Second Department of Cardiology, General Hospital 'Hippokration', Aristotle University of Thessaloniki, Thessaloniki, Greece; [11]Department of Cardiology, University Medical Centre Ljubljana, and Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia; [12]1st Chair and Department of Cardiology, Medical University of Warsaw, Warsaw, Poland; [13]Department of Cardiology, Humanitas Gavazzeni University Hospital, Bergamo, Italy; [14]Heart and Lung Center, Helsinki University Hospital, Helsinki, Finland; [15]Department of Public Health and Primary Care, Ghent University, Ghent, Belgium; [16]Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK; [17]Instytut Kardiologii, Uniwersytet Jagielloński, Collegium Medicum, Kraków, Poland; [18]Cardiologie, Institut cœur–poumon, CHU de Lille, Lille, France; and [19]Department of Cardiology and Intensive Care Medicine, Landstrasse Clinic, Vienna, Austria

Received 23 February 2024; revised 22 May 2024; accepted 3 July 2024; online publish-ahead-of-print 27 August 2024

Graphical Abstract



2023 Cardiovascular Disease Statistics. The 2023 ESC Atlas Project report provides contemporary cardiovascular disease (CVD) statistics for the European Society of Cardiology (ESC) member countries. The updated CVD statistics are presented in a consistent and assertive approach with the aim of advancing knowledge and reducing the burden of CVD.

Keywords Cardiovascular disease • Statistics • European Society of Cardiology • Health infrastructure • Service provision • Risk factors • Mortality

Wirkungen von Lärm

Environmental noise

….

Associations between noise exposure and CVD have been widely reported with noise pollution responsible for an estimated 48 000 new cases of CHD per year as well as 12 000 premature deaths across Europe. **A 2015 meta-analysis found a 6% increase in CHD** (Coronary heart disease) **risk for every 10 dB(A)** increase in traffic noise, starting as low as 50 dB(A). The EU has set permissible noise levels in residential areas of 55 and 50 dB during daytime and night-time, respectively. These limits are often exceeded and noise exposure above 55 dB(A) might affect up to 40% of the population of the EU.

Wirkungen von Lärm

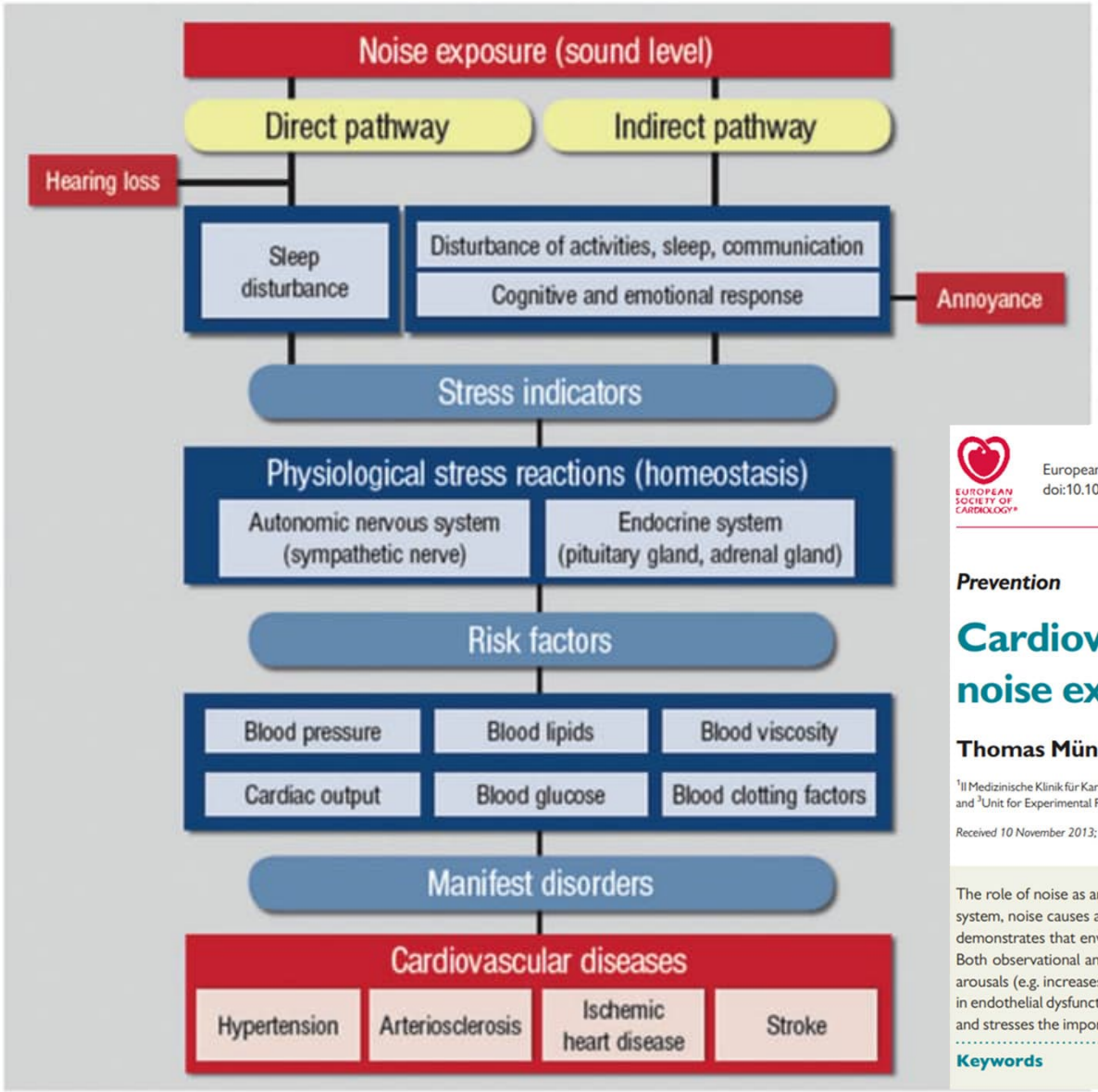


Figure 2 Noise effects reaction scheme. Adapted from Babisch.[71,94]

European Heart Journal (2014) **35**, 829–836
doi:10.1093/eurheartj/ehu030

REVIEW

Prevention

Cardiovascular effects of environmental noise exposure

Thomas Münzel[1]*, Tommaso Gori[1], Wolfgang Babisch[2], and Mathias Basner[3]

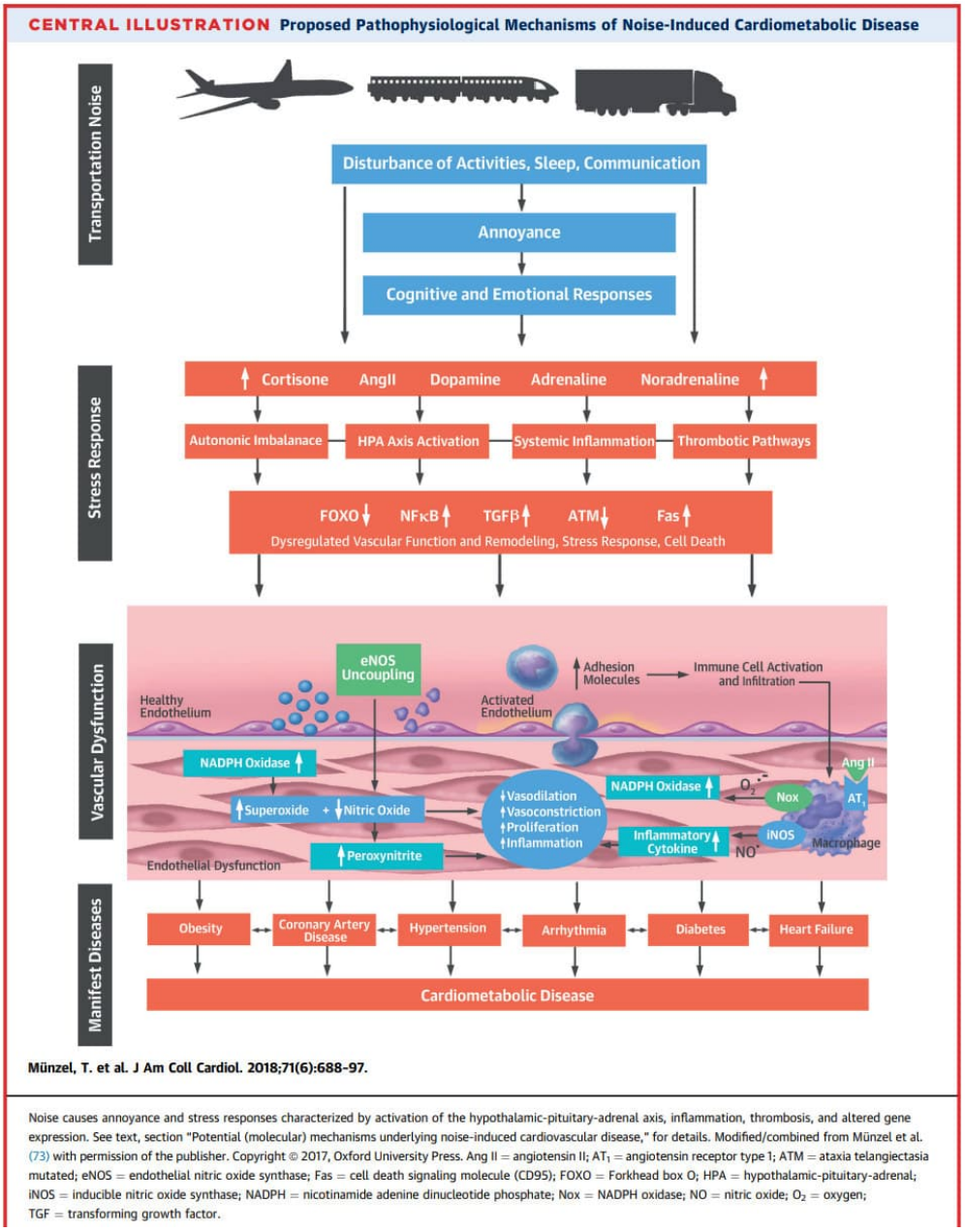
[1]II Medizinische Klinik für Kardiologie, University Medical Center Mainz, Mainz, Germany; [2]Department of Environmental Hygiene, Federal Environment Agency, Dessau/Berlin, Germany; and [3]Unit for Experimental Psychiatry, Division of Sleep and Chronobiology, Department of Psychiatry, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

Received 10 November 2013; revised 7 January 2014; accepted 13 January 2014

The role of noise as an environmental pollutant and its impact on health are being increasingly recognized. Beyond its effects on the auditory system, noise causes annoyance and disturbs sleep, and it impairs cognitive performance. Furthermore, evidence from epidemiologic studies demonstrates that environmental noise is associated with an increased incidence of arterial hypertension, myocardial infarction, and stroke. Both observational and experimental studies indicate that in particular night-time noise can cause disruptions of sleep structure, vegetative arousals (e.g. increases of blood pressure and heart rate) and increases in stress hormone levels and oxidative stress, which in turn may result in endothelial dysfunction and arterial hypertension. This review focuses on the cardiovascular consequences of environmental noise exposure and stresses the importance of noise mitigation strategies for public health.

Keywords Cardiovascular disease • Noise • Pollutants • Sleep • Hypertension • Myocardial infarction • Stroke

Wirkungen von Lärm



Münzel, T. et al. J Am Coll Cardiol. 2018;71(6):688-97.

Noise causes annoyance and stress responses characterized by activation of the hypothalamic-pituitary-adrenal axis, inflammation, thrombosis, and altered gene expression. See text, section "Potential (molecular) mechanisms underlying noise-induced cardiovascular disease," for details. Modified/combined from Münzel et al. (73) with permission of the publisher. Copyright © 2017, Oxford University Press. Ang II = angiotensin II; AT_1 = angiotensin receptor type 1; ATM = ataxia telangiectasia mutated; eNOS = endothelial nitric oxide synthase; Fas = cell death signaling molecule (CD95); FOXO = Forkhead box O; HPA = hypothalamic-pituitary-adrenal; iNOS = inducible nitric oxide synthase; NADPH = nicotinamide adenine dinucleotide phosphate; Nox = NADPH oxidase; NO = nitric oxide; O_2 = oxygen; TGF = transforming growth factor.

Environmental Noise and the Cardiovascular System

Thomas Münzel, MD,[a] Frank P. Schmidt, MD,[a] Sebastian Steven, MD,[a] Johannes Herzog, MD,[a] Andreas Daiber, PhD,[a] Mette Sørensen, PhD[b]

ABSTRACT

Noise has been found associated with annoyance, stress, sleep disturbance, and impaired cognitive performance. Furthermore, epidemiological studies have found that environmental noise is associated with an increased incidence of arterial hypertension, myocardial infarction, heart failure, and stroke. Observational and translational studies indicate that especially nighttime noise increases levels of stress hormones and vascular oxidative stress, which may lead to endothelial dysfunction and arterial hypertension. Novel experimental studies found aircraft noise to be associated with oxidative stress-induced vascular damage, mediated by activation of the NADPH oxidase, uncoupling of endothelial nitric oxide synthase, and vascular infiltration with inflammatory cells. Transcriptome analysis of aortic tissues from animals exposed to aircraft noise revealed changes in the expression of genes responsible for the regulation of vascular function, vascular remodeling, and cell death. This review focuses on the mechanisms and the epidemiology of noise-induced cardiovascular diseases and provides novel insight into the mechanisms underlying noise-induced vascular damage. (J Am Coll Cardiol 2018;71:688-97)

Wirkungen von Lärm

The need to promote sleep health in public health agendas across the globe

Diane C Lim, Arezu Najafi*, Lamia Afifi, Claudio LA Bassetti, Daniel J Buysse, Fang Han, Birgit Högl, Yohannes Adama Melaku, Charles M Morin, Allan I Pack, Dalva Poyares, Virend K Somers, Peter R Eastwood†, Phyllis C Zee†, Chandra L Jackson†, on behalf of the World Sleep Society Global Sleep Health Taskforce*

Healthy sleep is essential for physical and mental health, and social wellbeing; however, across the globe, and particularly in developing countries, national public health agendas rarely consider sleep health. Sleep should be promoted as an essential pillar of health, equivalent to nutrition and physical activity. To improve sleep health across the globe, a focus on education and awareness, research, and targeted public health policies are needed. We recommend developing sleep health educational programmes and awareness campaigns; increasing, standardising, and centralising data on sleep quantity and quality in every country across the globe; and developing and implementing sleep health policies across sectors of society. Efforts are needed to ensure equity and inclusivity for all people, particularly those who are most socially and economically vulnerable, and historically excluded.

Lancet Public Health 2023; 8: e820–26

*Contributed equally

†Contributed equally

Miami Veterans Affairs Healthcare System, Miami, FL, USA (D C Lim MD); **Division of Pulmonary, Critical Care and Sleep Medicine, University of Miami, Miami, FL, USA**

Wirkungen von Lärm

- Cardiometabolic disorders

The loss of even 1 h of sleep during the transition to Daylight Saving Time is followed by a significant increase in risk of a heart attack over the next 3 days, which supports recommendations to adopt permanent standard time in countries that engage in clock changes, such as the USA.

- The immune system, infections, and cancer

Sleep supports a healthy, balanced immune response, including the innate response, which is the first line of defence against bacteria and viruses. Sleep deficiency has been associated with impaired immune response to vaccinations, and increased risk of COVID-19, tuberculosis, and the common cold. Conversely, COVID-19, HIV, tuberculosis, and malaria can cause sleep deficiency. Furthermore, because the immune system has an important role in fighting cancer, sleep deprivation can lead to an impaired immune response that might result in increased cancer progression or mortality.

Wirkungen von Lärm

- Neurological disorders

Sleep is essential for memory consolidation—a fundamental requirement for survival and high-level functioning. Sleep disturbances contribute to **cognitive decline and increased risk of Alzheimer's disease and related dementia**, with potential mechanisms, including sleep insufficiency, that decrease clearance of amyloid β waste, possibly via an impaired glymphatic pathway.

- Psychiatric and psychological disorders

Sleep is important in regulating emotions and maximising psychosocial wellbeing. Not only do underlying psychiatric disorders disrupt sleep, but sleep deficiency also increases the risk of anxiety disorders, major depression, post-traumatic stress disorder, bipolar disorder, substance use disorders, and suicide.

- Traffic and occupational accidents

…. Uncontrolled microsleeps while driving a vehicle might result in serious or fatal accidents. Furthermore, sleep deficiency can also result in slowed reaction times, impaired judgement, and cognitive impairment. Together, these deficits lead to suboptimal productivity and more accidents in the workplace.

Neurochem Res
DOI 10.1007/s11064-015-1581-6

ORIGINAL PAPER

The Glymphatic System: A Beginner's Guide

Nadia Aalling Jessen[1] · Anne Sofie Finmann Munk[1] · Iben Lundgaard[1] · Maiken Nedergaard[1]

Received: 26 January 2015 / Revised: 6 April 2015 / Accepted: 10 April 2015

Abstract The glymphatic system is a recently discovered macroscopic waste clearance system that utilizes a unique system of perivascular tunnels, formed by astroglial cells, to promote efficient elimination of soluble proteins and metabolites from the central nervous system. Besides waste elimination, the glymphatic system also facilitates brain-wide distribution of several compounds, including glucose, lipids, amino acids, growth factors, and neuromodulators. Intriguingly, the glymphatic system function mainly during sleep and is largely disengaged during wakefulness. The biological need for sleep across all species may therefore reflect that the brain must enter a state of activity that enables elimination of potentially neurotoxic waste products, including β-amyloid. Since the concept of the glymphatic system is relatively new, we will here review its basic structural elements, organization, regulation, and functions. We will also discuss recent studies indicating that glymphatic function is suppressed in various diseases and that failure of glymphatic function in turn might contribute to pathology in neurodegenerative disorders, traumatic brain injury and stroke.

Keywords The
Perivascular spac
Cerebrospinal flu
Neurodegenerati

Introduction

Clearance of exce
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Glymphatisches System

- Nächtliches „Reinigungssystem“
- V.a. Demenzbegünstigung bei Schlafmangel

Glymphatisches System

PNAS

β-Amyloid accumulation in the human brain after one night of sleep deprivation

Ehsan Shokri-Kojori[a,1], Gene-Jack Wang[a,1], Corinde E. Wiers[a], Sukru B. Demiral[a], Min Guo[a], Sung Won Kim[a], Elsa Lindgren[a], Veronica Ramirez[a], Amna Zehra[a], Clara Freeman[a], Gregg Miller[a], Peter Manza[a], Tansha Srivastava[a], Susan De Santi[b], Dardo Tomasi[a], Helene Benveniste[c], and Nora D. Volkow[a,1]

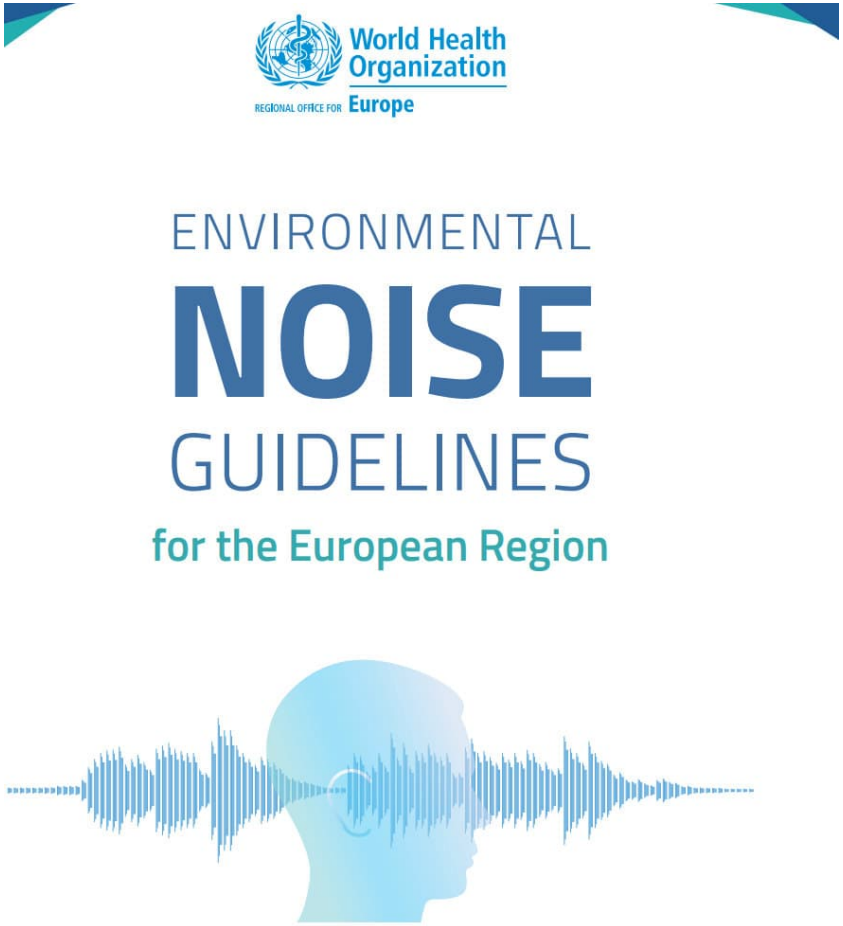
[a]Laboratory of Neuroimaging, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Bethesda, MD 20892; [b]Piramal Pharma Inc., Boston, MA 02108; and [c]Department of Anesthesiology, Yale School of Medicine, New Haven, CT 06510

Edited by Michael E. Phelps, University of California, Los Angeles, CA, and approved March 13, 2018 (received for review December 14, 2017)

The effects of acute sleep deprivation on β-amyloid (Aβ) clearance in the human brain have not been documented. Here we used PET and 18F-florbetaben to measure brain Aβ burden (ABB) in 20 healthy controls tested after a night of rested sleep (baseline) and after a night of sleep deprivation. We show that one night of sleep deprivation, relative to baseline, resulted in a significant increase in Aβ burden in the right hippocampus and thalamus. These increases were associated with mood worsening following sleep deprivation, but were not related to the genetic risk (APOE genotype) for Alzheimer's disease.

In summary, our findings show adverse effects of one-night sleep deprivation on brain ABB and expand on prior findings of higher Aβ accumulation with chronic less sleep.

Environmental Noise Guidelines



Environmental Noise Guidelines

3.1 Road traffic noise

Recommendations

For average noise exposure, the GDG **strongly** recommends reducing noise levels produced by road traffic below **53 dB** L_{den}, as road traffic noise above this level is associated with adverse health effects.

For night noise exposure, the GDG **strongly** recommends reducing noise levels produced by road traffic during night time below **45 dB** L_{night}, as road traffic noise above this level is associated with adverse effects on sleep.

To reduce health effects, the GDG **strongly** recommends that policy-makers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure.

Table 6. Average exposure levels (L_{den}) for priority health outcomes from road traffic noise

Summary of priority health outcome evidence	Benchmark level	Evidence quality
Incidence of IHD The 5% relevant risk increase occurs at a noise exposure level of 59.3 dB L_{den}. The weighted average of the lowest noise levels measured in the studies was 53 dB L_{den} and the RR increase per 10 dB is 1.08.	5% increase of RR	High quality
Incidence of hypertension One study met the inclusion criteria. There was no significant increase of risk associated with increased noise exposure in this study.	10% increase of RR	Low quality
Prevalence of highly annoyed population There was an absolute risk of 10% at a noise exposure level of 53.3 dB L_{den}.	10% absolute risk	Moderate quality
Permanent hearing impairment	No increase	No studies met the inclusion criteria
Reading skills and oral comprehension in children	One-month delay	Very low quality

Environmental Noise Guidelines

Table 7. Night-time exposure levels (L_{night}) for priority health outcomes from road traffic noise

Summary of priority health outcome evidence	Benchmark level	Evidence quality
Sleep disturbance 3% of the participants in studies were highly sleep-disturbed at a noise level of **45.4 dB** L_{night}	3% absolute risk	Moderate quality

Based on the evidence of the adverse effects of road traffic noise on sleep disturbance, the GDG defined a guideline exposure level of 45.4 dB L_{night}. The exact exposure value was rounded to 45 dB L_{night}. As the evidence was rated moderate quality, the GDG made the recommendation strong.

The GDG also considered the evidence for the effectiveness of interventions. The results showed that:

- addressing the source by improving the choice of appropriate tyres, road surface, truck restrictions or by lowering traffic flow can reduce noise exposure;
- path interventions such as insulation and barrier construction reduce noise exposure, annoyance and sleep disturbance;
- changes in infrastructure such as construction of road tunnels lower noise exposure, annoyance and sleep disturbance;
- other physical interventions such as the availability of a quiet side of the residence reduce noise exposure, annoyance and sleep disturbance.

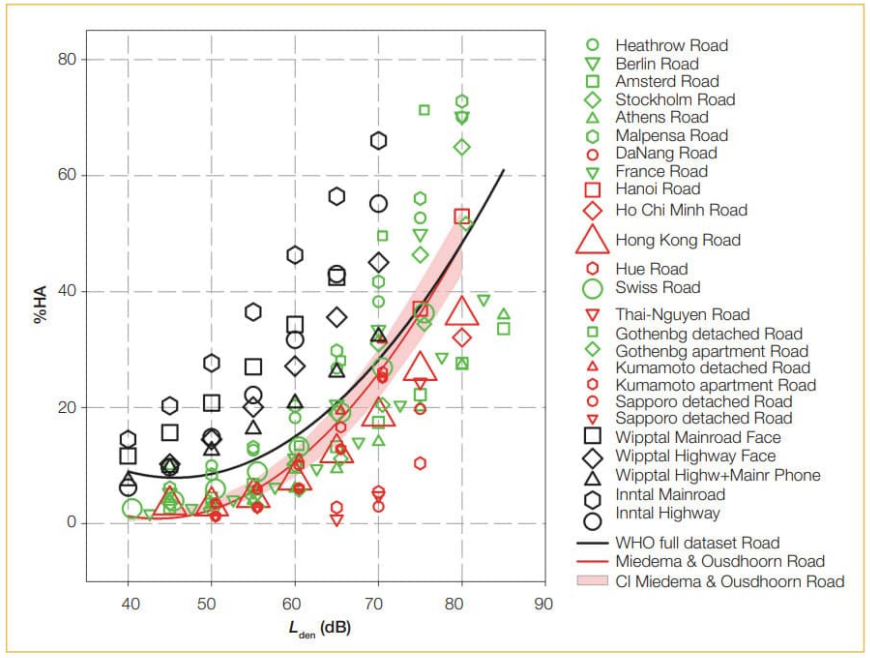
Given that it is possible to reduce noise exposure and that best practices already exist for the management of noise from road traffic, the GDG made a strong recommendation.

Table 9. Summary of findings for health effects from exposure to road traffic noise (L_{den})

Noise metric	Priority health outcome measure	Quantitative risk for adverse health	Lowest level of exposure across studies	Number of participants (studies)	Quality of evidence
Cardiovascular disease					
L_{den}	Incidence of IHD	RR = 1.08 (95% confidence interval (CI): 1.01–1.15) per 10 dB increase	53 dB	67 224 (7)	High (upgraded for dose-response)
L_{den}	Incidence of hypertension	RR = 0.97 (95% CI: 0.90–1.05) per 10 dB increase	N/A	32 635 (1)	Low (downgraded for risk of bias and because only one study was available)
Annoyance					
L_{den}	%HA	Odds ratio (OR) = 3.03 (95% CI: 2.59–3.55) per 10 dB increase	40 dB	34 112 (25)	Moderate (downgraded for inconsistency)
Cognitive impairment					
L_{den}	Reading and oral comprehension	Not estimated	N/A	Over 2844 (1)	Very low (downgraded for inconsistency)
Hearing impairment and tinnitus					
L_{den}	Permanent hearing impairment	–	–	–	–

Environmental Noise Guidelines

Fig. 6.Scatterplot and quadratic regression of the relationship between road traffic noise (L_{den}) and annoyance (%HA)



Notes: The ERF by Miedema & Oudshoorn (2001) is added in red for comparison.
The size of the data points corresponds to the number of participants in the respective study (size = SQRT(N)/10).
If two results from different studies fall on the same data point, the last point plotted may mask the former one.
The black curve is derived from aggregated secondary data, while the red one is derived from individual data.
There is no indication of 95% CIs of the WHO full dataset, as a weighting based on the total number of participants for each 5 dB L_{den} sound class could not be calculated; weighting based on all participants of all sound classes proved to be unsuitable. The range of data included is illustrated by the distribution of data points.
For further details on the studies included in the figure please refer to the systematic review on environmental noise and annoyance (Guski et al., 2017).

Table 10. The association between exposure to road traffic noise (L_{den}) and annoyance (%HA)

L_{den} (dB)	%HA
40	9.0
45	8.0
50	8.6
55	11.0
60	15.1
65	20.9
70	28.4
75	37.6
80	48.5

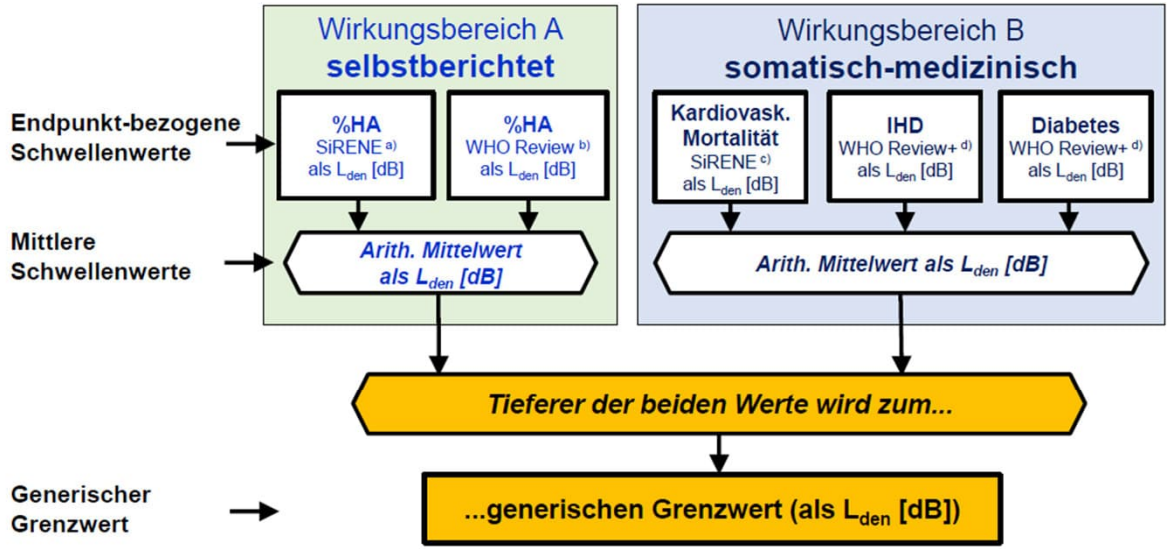
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössische Kommission für Lärmbekämpfung EKLB
Commission fédérale pour la lutte contre le bruit CFLB
Commissione federale per la lotta contro il rumore CFLR
Cumissiun federala per il cumbat cunter la canera CFCC

Grenzwerte für Strassen-, Eisenbahn- und Fluglärm

Empfehlungen der Eidgenössischen Kommission für Lärmbekämpfung EKLB

Herausgegeben von der Eidgenössischen Kommission für Lärmbekämpfung EKLB
Bern, 2021



Quellen: a) [13]; b) [23]; c) [30, 31]; d) [66]

Abbildung 3.1: Schematische Darstellung des Ablaufs zur Ermittlung des generischen L_{den}-Grenzwerts anhand der Endpunkt-bezogenen Schwellenwerte für jeweils den Wirkungsbereich A (mittels Selbstbericht erhobene Wirkungen) und B (somatisch-medizinische Wirkungen).

Lärminfo.at
Lärmschutz für Österreich

Dashboard Umgebungslärm - Kurzinfo

Umgebungslärmkartierung

Die EU-Umgebungslärmrichtlinie (Richtlinie 2002/49/EG) sieht die Kartierung der Lärmbelastung an hochrangiger Verkehrsinfrastruktur und in Ballungsräumen vor. Die von Lärm betroffenen Gebiete werden in Karten dargestellt und die Zahl der betroffenen Einwohner:innen tabellarisch erfasst. Die Ermittlung der Lärmbelastung erfolgt rechnerisch.

Die Umgebungslärmkartierung wird seit 2007 alle fünf Jahre von den für die Verkehrsinfrastruktur zuständigen Bundes- und Landesbehörden durchgeführt.

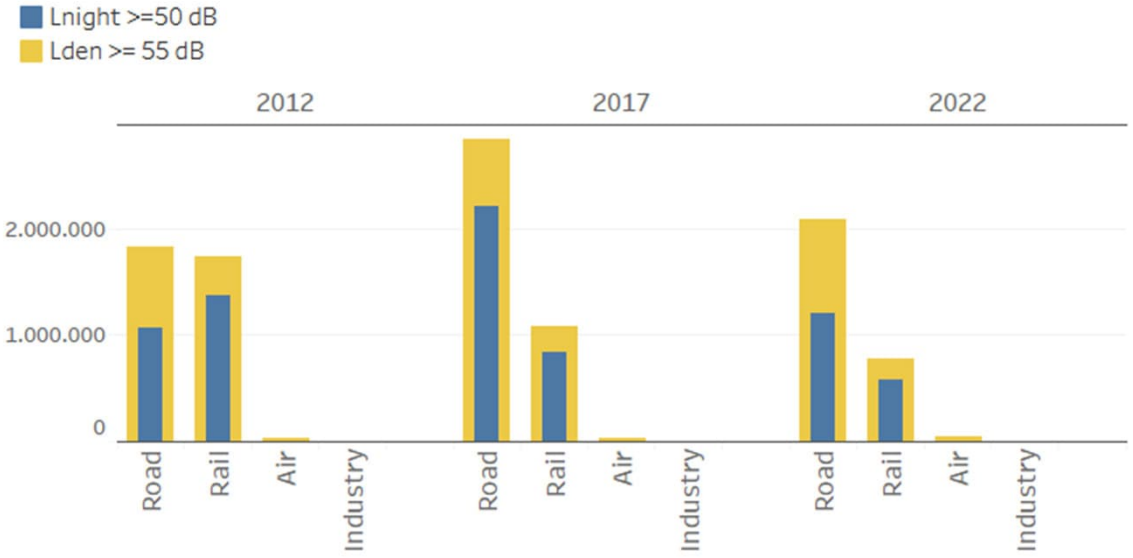
Number of people exposed to high noise levels - Austria

Select area

- (Alle)
- Inside Urban Areas
- Outside Urban Areas

The information below shows the number of people exposed to high levels of noise above the EU reporting thresholds for various environmental noise sources such as road, rail, aviation and industry.

	Lden >= 55 dB			Lnight >=50 dB		
	2012	2017	2022	2012	2017	2022
Road	1.833.500	2.842.900	2.081.700	1.071.000	2.215.000	1.204.200
Rail	1.732.400	1.081.900	780.700	1.373.100	837.900	578.500
Air	30.700	35.900	39.200	600	500	2.900
Industry	5.200	5.200	5.300	700	700	700



https://www.eea.europa.eu/en/analysis/maps-and-charts/austria-noise-fact-sheet-2022

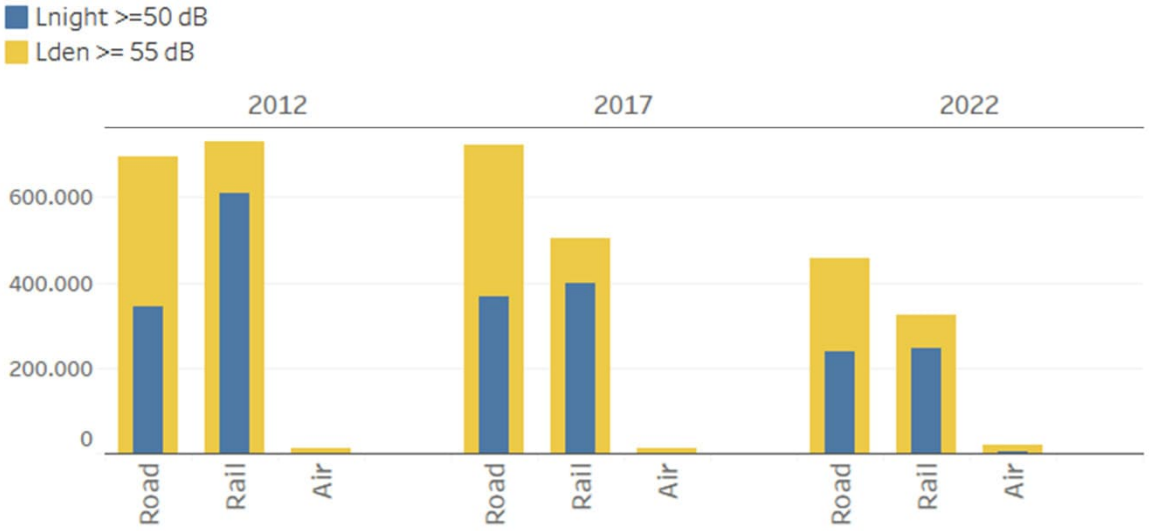
Number of people exposed to high noise levels - Austria

Select area

- ○ (Alle)
- ○ Inside Urban Areas
- ◉ Outside Urban Areas

The information below shows the number of people exposed to high levels of noise above the EU reporting thresholds for various environmental noise sources such as road, rail, aviation and industry.

	Lden >= 55 dB			Lnight >=50 dB		
	2012	2017	2022	2012	2017	2022
Road	694.400	720.500	456.600	344.300	365.800	238.400
Rail	728.600	502.100	323.200	608.000	397.000	247.200
Air	10.400	10.300	19.700	500	500	2.600



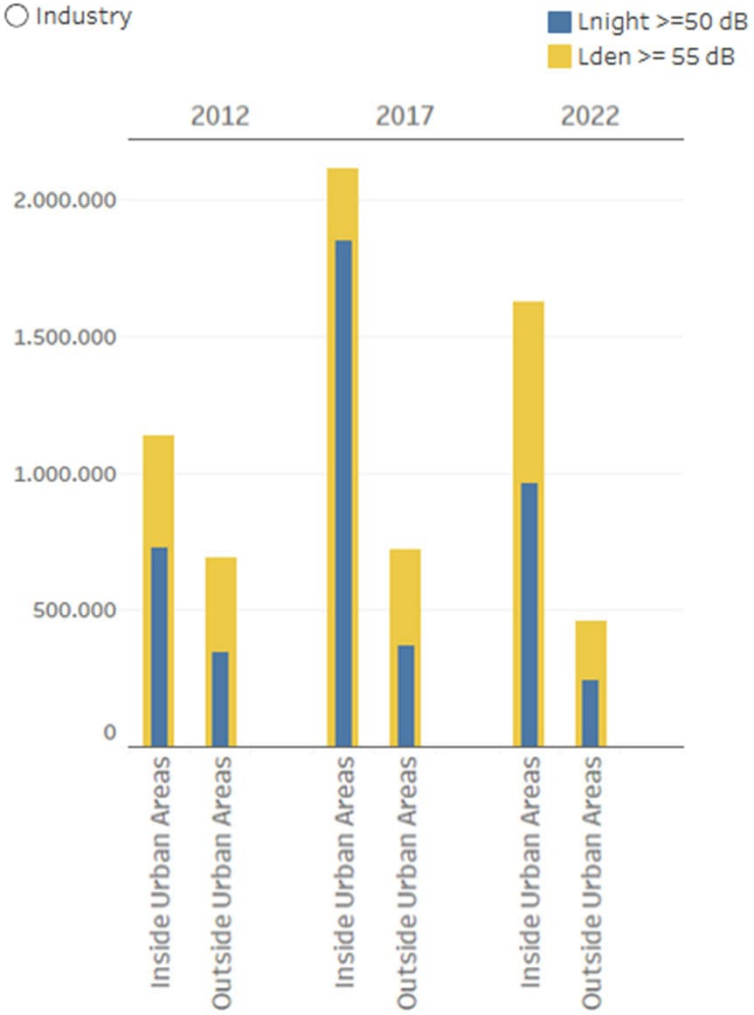
https://www.eea.europa.eu/en/analysis/maps-and-charts/austria-noise-fact-sheet-2022

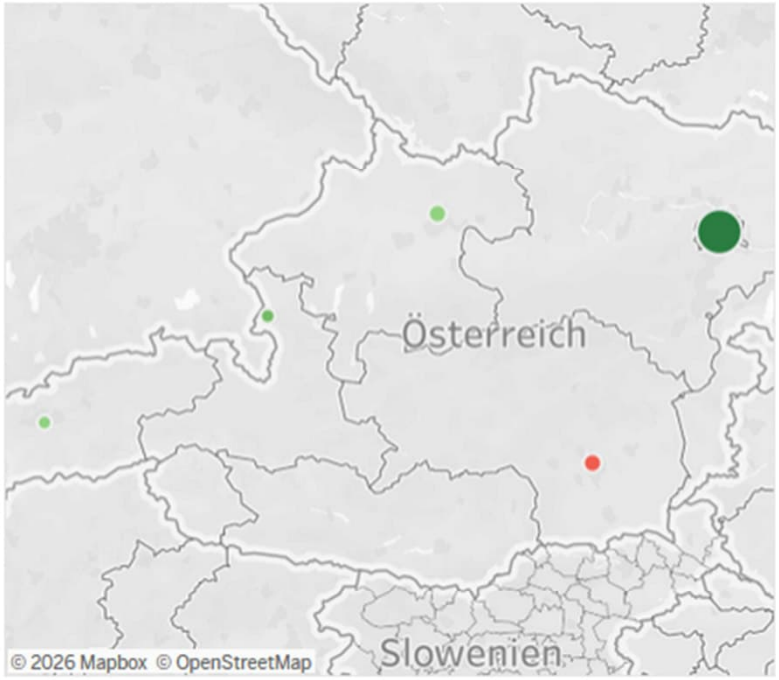
Trends on number of people exposed to high noise levels - Austria

Select source

- (•) Road
- ( ) Rail
- ( ) Air
- ( ) Industry

The number of people exposed to environmental noise has changed over time. It is important to note that, as explained in the "About the data" page, the numbers reported over the different reporting years may not always be comparable.





All cities	2017	2022	% Change 2017-2022
Number of people exposed to Lden >=55 dB	2.122.400	1.625.100	-23%
Number of people exposed to Lnight >=50 dB	1.849.200	965.800	-48%

Jahr: 2017

Lärmquelle: Straße

Hauptverkehrsinfrastruktur außerhalb von Ballungsräumen

Ballungsräume

Betroffene durch Hauptverkehrsinfrastruktur

Bundesland	Lden>55dB	Lnight>50dB
Burgenland	9.700	5.000
Kärnten	67.000	38.000
Niederösterreich	190.500	105.700
Oberösterreich	98.600	53.900
Salzburg	82.600	39.600
Steiermark	92.800	45.200
Tirol	93.400	36.000
Vorarlberg	85.900	42.400
Gesamt	**720.500**	**365.800**

Jahr: 2022

Lärmquelle: Straße

Hauptverkehrsinfrastruktur außerhalb von Ballungsräumen

Ballungsräume

Betroffene durch Hauptverkehrsinfrastruktur

Bundesland	Lden>55dB	Lnight>50dB
Burgenland	10.100	6.500
Kärnten	38.900	21.400
Niederösterreich	86.400	45.600
Oberösterreich	81.600	46.200
Salzburg	46.500	22.400
Steiermark	59.000	27.400
Tirol	69.000	31.400
Vorarlberg	64.300	37.000
Gesamt	**455.800**	**237.800**

Von 2017 auf 2022 Reduktion Lärmbelästigte Tag L_{den} > 55 dB
720.500 – 455.800 = 264.700 (ca. 36 %) Gesamtösterreich
98.600 – 81.600 = 17.000 (ca. 17 %) Oberösterreich

Von 20217 auf 2022 Reduktion Lärmbelästigte Nacht L_{night} > 50 dB
365.800 – 237.800 = 128.000 (ca. 35%) Gesamtösterreich
53.900 – 46.200 = 7.700 (ca. 14%) Oberösterreich

Bundesland

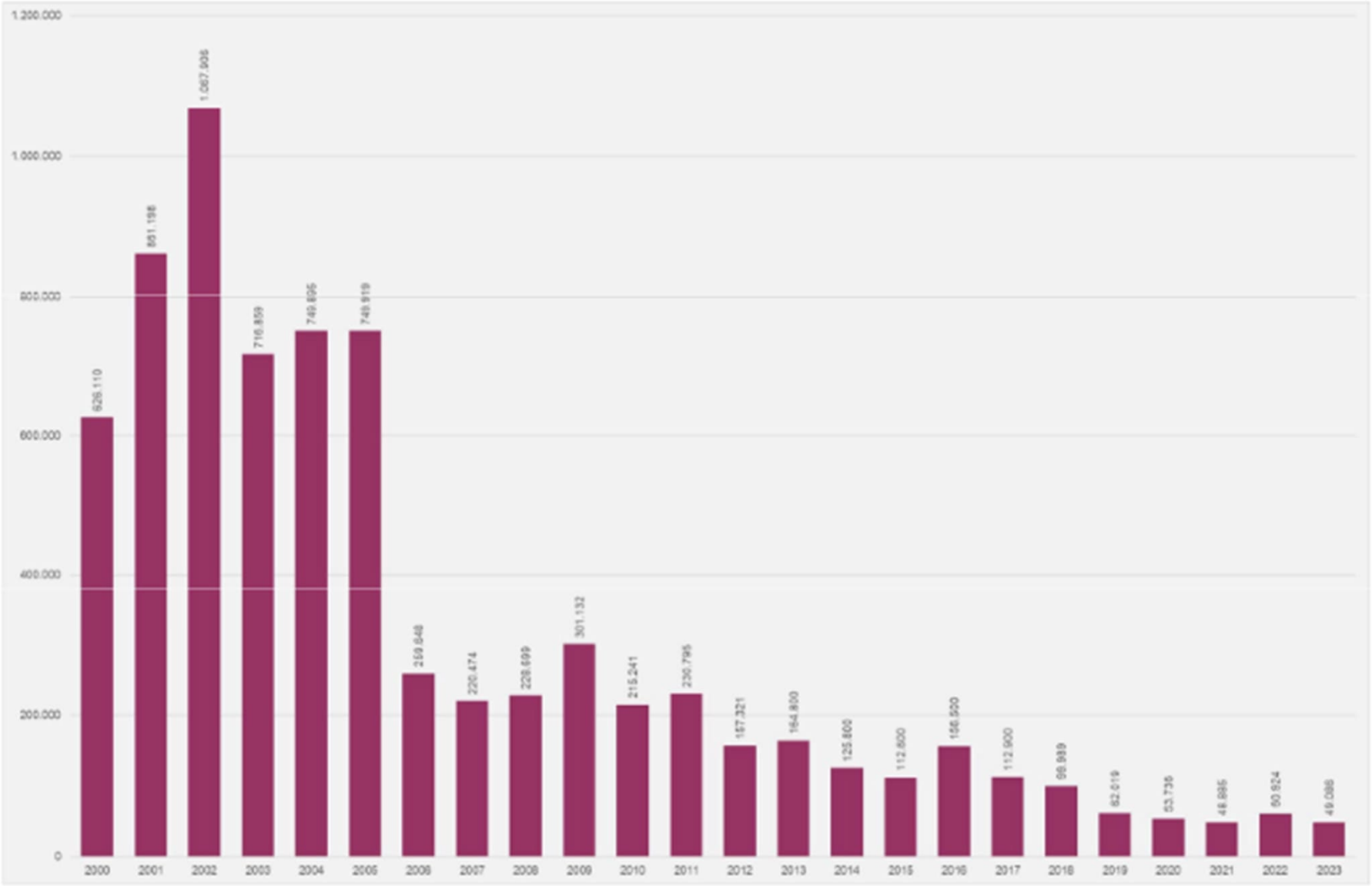
- [ ] Alle auswählen
- [ ] Burgenland
- [ ] Kärnten
- [ ] Niederösterreich
- [x] Oberösterreich
- [ ] Salzburg
- [ ] Steiermark
- [ ] Tirol
- [ ] Vorarlberg
- [ ] Wien

Straßenverkehr 2022

Lärmquelle	Stark Belästigte	Stark Schlafgestörte	Ischämische Herzkrankheiten
Autobahnen und Schnellstraßen	5.592	2.309	7,1
Landesstraßen	7.617	2.668	11,2
Straßen in Ballungsräumen	17.555	6.162	26,4
Gesamt	**30.764**	**11.139**	**44,7**

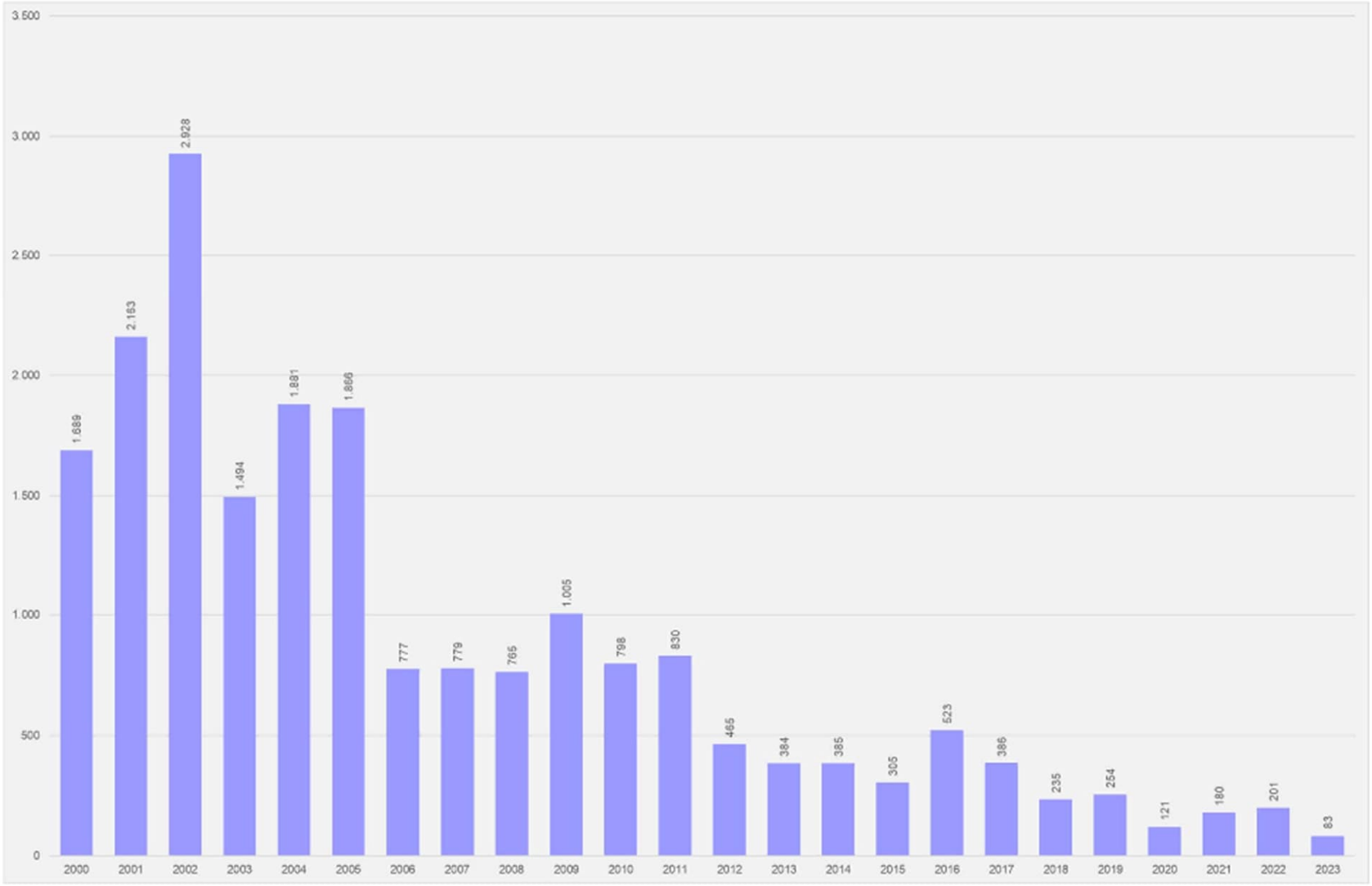
Schienenverkehr 2022

Lärmquelle	Stark Belästigte	Stark Schlafgestörte
Eisenbahnen	9.168	6.237
Eisenbahnen in Ballungsräumen	4.202	2.899
Straßenbahnen in Ballungsräumen	680	293
Gesamt	**14.050**	**9.429**

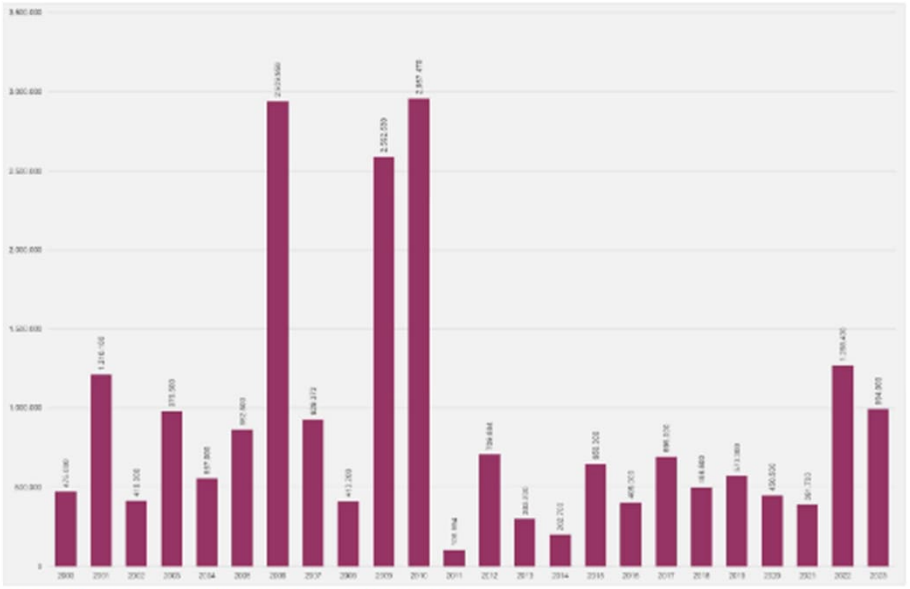


Aufwendungen für passive Lärmschutzmaßnahmen pro Jahr seit 2000

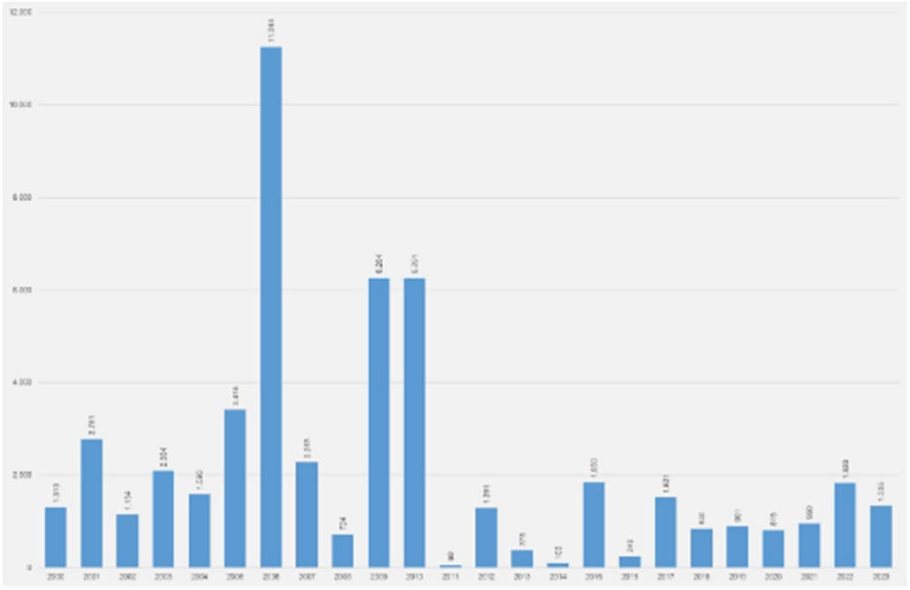
Mit diesen Mitteln wurde der Einbau von mehr als 23.000 Schallschutzfenstern und -türen gefördert.



Geförderte Schallschutzfenster pro Jahr seit 2000



Aufwendungen für Lärmschutzwände pro Jahr seit 2000



Länge der errichteten Lärmschutzwände pro Jahr seit 2000 in Meter

UMGEBUNGSLÄRM-AKTIONSPLAN

ÖSTERREICH 2024

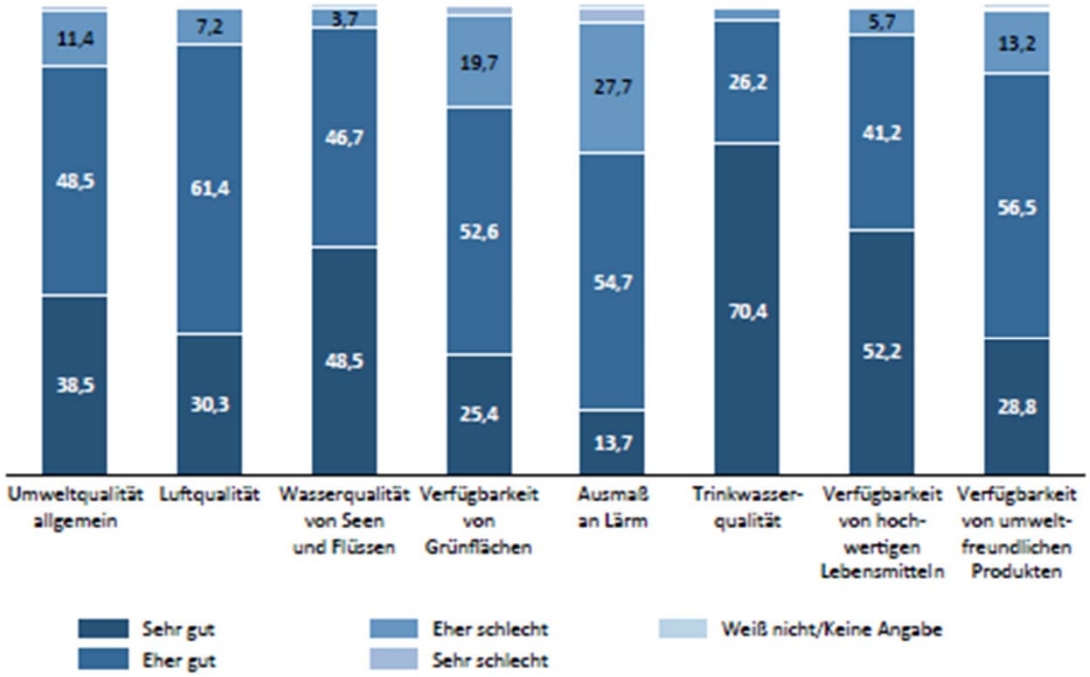
LAND OBERÖSTERREICH

Straßen außer A&S in Oberösterreich inklusive Ballungsraums Linz

Mikrozensus

Grafik 1

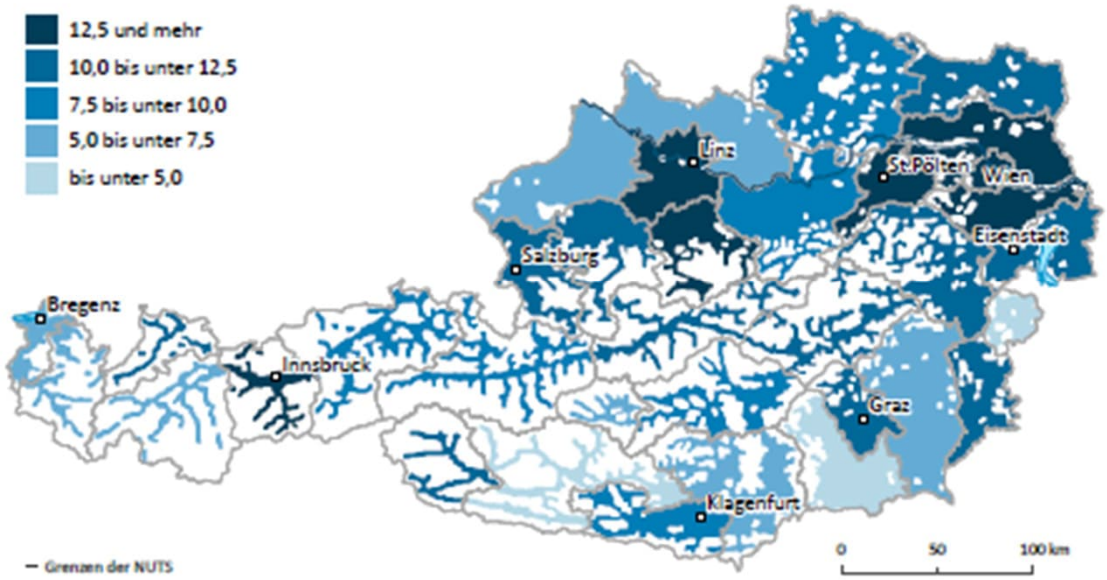
Einschätzung der Umweltqualität in Österreich – in Prozent



Q: STATISTIK AUSTRIA, Mikrozensus 3. Quartal 2023. – Wohnbevölkerung ab 15 Jahren. – Fragestellung: „Wie gut oder schlecht ist Ihrer Meinung nach in Österreich die/das ...?"

Grafik 31

Lärmstörung nach NUTS 3-Regionen – sehr starke oder eher starke Störung durch Lärm am Tag und/oder in der Nacht in Prozent



Q: STATISTIK AUSTRIA, Mikrozensus 3. Quartal 2023. – Wohnbevölkerung ab 15 Jahren. – Fragestellung: „Wie stark wurden Sie tagsüber/nachts von Lärm gestört?"

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Full length article

Impact of road traffic noise on annoyance and preventable mortality in European cities: A health impact assessment

Sasha Khomenko [a,b,c], Marta Cirach [a,b,c], Jose Barrera-Gómez [a,b,c], Evelise Pereira-Barboza [a,b,c], Tamara Iungman [a,b,c], Natalie Mueller [a,b,c], Maria Foraster [a,b,c,d], Cathryn Tonne [a,b,c], Meelan Thondoo [a,b,c], Calvin Jephcote [e], John Gulliver [e], James Woodcock [a,f], Mark Nieuwenhuijsen [a,b,c,*]

[a] Institute for Global Health (ISGlobal), Barcelona, Spain
[b] Department of Experimental and Health Sciences, Universitat Pompeu Fabra (UPF), Barcelona, Spain
[c] CIBER Epidemiología y Salud Pública (CIBERESP), Madrid, Spain
[d] PHAGEX Research Group, Blanquerna School of Health Science, Universitat Ramon Llull (URL), Barcelona, Spain
[e] Centre for Environmental Health and Sustainability (CEHS), University of Leicester, Leicester, United Kingdom
[f] MRC Epidemiology unit, University of Cambridge School of Clinical Medicine, Cambridge, United Kingdom

We estimated that approximately 11 million adults were highly annoyed by road traffic noise and that 3608 deaths from IHD (95% CI: 843–6266) could be prevented annually with compliance of the WHO recommendation.

International Journal of
Environmental Research and Public Health

MDPI

Review

Road Traffic Noise Exposure and Depression/Anxiety: An Updated Systematic Review and Meta-Analysis

Angel M. Dzhambov [1,*] and Peter Lercher [2]

[1] Department of Hygiene and Ecomedicine, Faculty of Public Health, Medical University of Plovdiv, 4002 Plovdiv, Bulgaria
[2] Institute for Highway Engineering and Transport Planning, Graz University of Technology, 8010 Graz, Austria; peter.lercher@tugraz.at or peter.lercher.at@gmail.com

We found 4% (95% CI: 3%, 11%) higher odds of depression and 12% (95% CI: 4%, 30%) of anxiety associated with a 10 dB(A) increase in day–evening–night noise level (Lden). Both models suered from moderate heterogeneity (55% and 54%), but there was evidence of publication bias only in the depression model. These findings were robust with no evidence of study-level moderators.

Journal of Exposure Science & Environmental Epidemiology www.nature.com/jes

REVIEW ARTICLE OPEN

Check for updates

Noise and mental health: evidence, mechanisms, and consequences

Omar Hahad[1,2,7]✉, Marin Kuntic[1,2,7], Sadeer Al-Kindi[3], Ivana Kuntic[1], Donya Gilan[4,5], Katja Petrowski[6], Andreas Daiber[1,2] and Thomas Münzel[1,2]

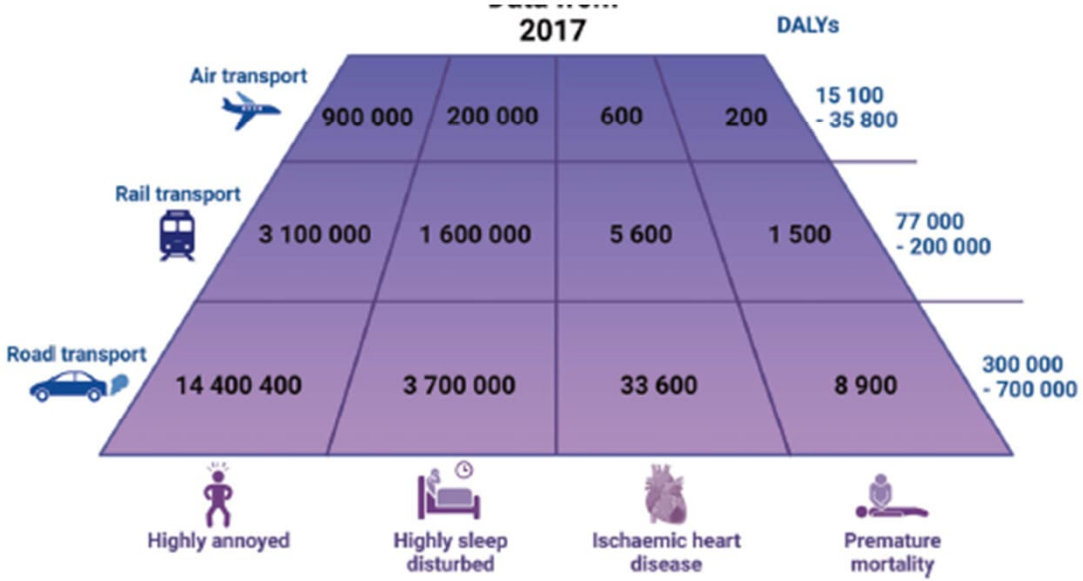
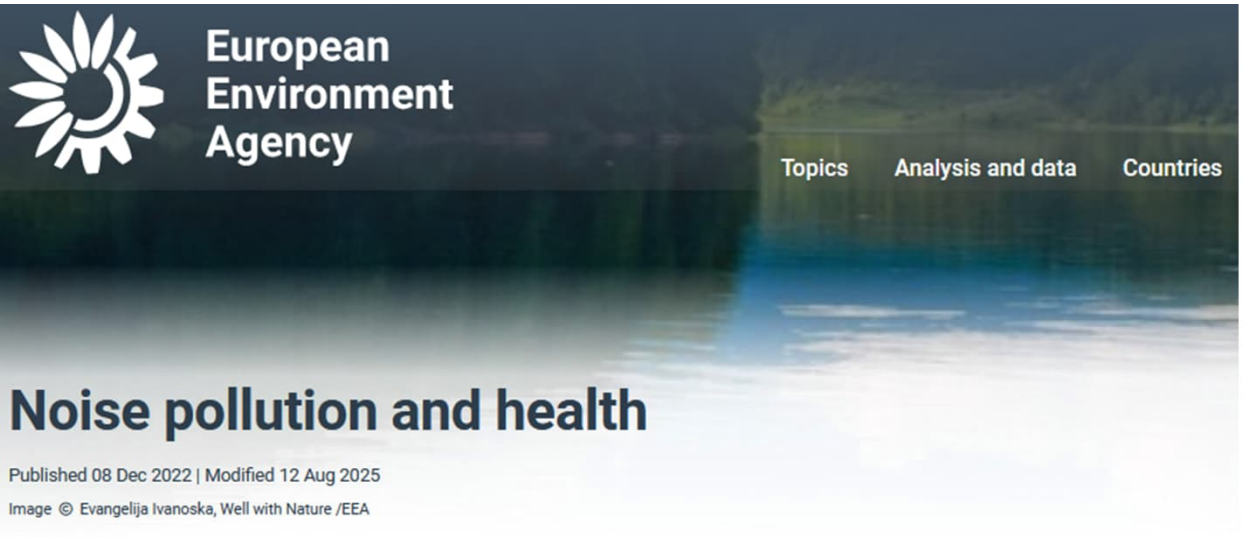


Fig. 1 Key impacts of exposure to unhealthy noise levels, based on the Environmental Noise Directive (END) thresholds, in the European Union in 2017. One DALY equals to the loss of 1 year of healthy life attributed to morbidity, mortality, or both. The most important contributors to the total burden of disease of environmental noise are annoyance and sleep disturbance because of the large number of people affected. Adapted from [70]. DALYs disability-adjusted life years.



Noise pollution and health

Published 08 Dec 2022 | Modified 12 Aug 2025

Image © Evangelija Ivanoska, Well with Nature /EEA

This section of the zero pollution monitoring assessment presents available knowledge and trends on noise pollution and associated impacts on health, and assesses progress towards achieving relevant zero pollution targets and policy objectives.

Key messages

- No significant decrease in the number of people exposed to harmful noise levels has been observed between the two most recent years for which country data are reported — 2012 and 2017.
- More than one in every five EU citizens is exposed to chronic harmful levels of road traffic noise. This percentage is much higher in many urban areas.
- The number of people 'highly annoyed' and 'highly sleep disturbed' must be reduced by 5.4 million and 1.5 million, respectively, in order to meet the 2030 zero pollution targets for noise pollution. Based on levels and measures currently in place, the prospect of meeting these targets is low.
- Health impacts for Europe's population still occur at noise levels below the thresholds set in the Environmental Noise Directive

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Lärmschutz für Österreich

Bundesministerium
Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie

umweltbundesamt
PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT

Ergebnisse der Strategischen Lärmkartierung 2022

Helfried Gartner, BMK
Roman Ortner, Umweltbundesamt