



WHO Environmental noise guidelines for the European Region

Marie-Eve Héroux

WHO European Centre for Environment and Health, Bonn, Germany

Wolfgang Babisch

Federal Environment Agency, Department of Environmental Hygiene, Berlin, Germany

Goran Belojevic

Institute of Hygiene and Medical Ecology, Faculty of Medicine, University of Belgrade, Belgrade, Serbia

Mark Brink

Federal Office for the Environment, Bern, Switzerland

Sabine Janssen

Netherlands Organization for Applied Scientific Research, Delft, The Netherlands

Peter Lercher

Division of Social Medicine, Medizinische Universität Innsbruck, Innsbruck, Austria

Marco Paviotti

European Commission, Directorate-General for Environment, Brussels, Belgium,

Göran Pershagen

Institute of Environmental Medicine, Karolinska Institute, Stockholm, Sweden

Kerstin Persson Waye

Occupational and Environmental Medicine, The Sahlgrenska Academy at the University of Gothenburg, Gothenburg, Sweden,

Anna Preis

Institute of Acoustics, Adam Mickiewicz University, Poznan, Poland

Stephen Stansfeld

Barts & the London School of Medicine & Dentistry, Queen Mary University of London, London, United Kingdom

Martin van den Berg

Ministry of Infrastructure and the Environment, Den Haag, The Netherlands

Jos Verbeek

Finnish Institute of Occupational Health, Helsinki, Finland

Summary

World Health Organization (WHO) published the *Guidelines for Community Noise* in 1999 and the *Night Noise Guidelines for Europe* in 2009. Significant new research in the area of environmental noise and health has taken place since then. As well, new noise sources of concern for public health, such as wind turbines, were not addressed in previous guidelines. For these reasons, WHO is currently engaged in the revision of all pertinent literature and will provide recommendations for the protection of public health as part of *WHO Environmental Noise Guidelines for the European Region*. The guidelines will focus on the WHO European Region and provide guidance to its Member States that is compatible with the noise indicators used in the European Union (EU) Directive on Environmental Noise. We systematically review the effects of noise on the following health outcomes: effects on sleep, annoyance, cognitive impairment, cardiovascular disease, hearing impairment, tinnitus, adverse birth outcomes, and mental health and wellbeing. The guidelines will consider the evidence on health effects of environmental noise related to the following various sources: aircraft, railway, road traffic, wind turbines and leisure

noise. They will address exposure to noise in such relevant settings as residences, hospitals, learning establishments and public venues. Additionally, they will review the potential health benefits from noise mitigation and interventions to decrease noise levels. The process of developing the guidelines involves the synthesis and interpretation of the available evidence by a large group of scientists from across the world under the coordination of WHO. The Guidelines will provide up-to-date information on the health risks from environmental noise and evidence-based recommendations in order to support WHO Member States in their efforts to prevent and control exposure to excessive environmental noise.

1. Introduction

World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. Environmental noise has negative impacts on human health and well-being and is a growing concern among both the general public and policy-makers in Europe.

In 2011, the WHO Regional Office for Europe and the Joint Research Centre (JRC) of the European Commission published the report “Burden of Disease from Environmental Noise”, which quantified the healthy years of life lost in Europe due to environmental noise [1]. The burden of disease combines in one measure, the disability adjusted life years (DALYs), the time lived with disability and the time lost due to premature mortality in the general population. The burden of disease for a disease or health condition is calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with the health condition or its consequences. Sufficient information is available to quantify the burden of disease from environmental noise for effects such as cardiovascular disease, cognitive impairment of children, sleep disturbance, tinnitus, and annoyance. These results, based on a limited set of data, indicate that at least one million healthy years of life are lost every year from road traffic-related noise in the western part of Europe. Sleep disturbance and annoyance, mostly related to road traffic noise, comprise the main burden of environmental ill health. This places the burden of disease from environmental noise as the second major environmental risk after air pollution [1,2].

According to the European Environmental Agency (EEA), 125 million people in the European Union are affected by road traffic noise levels above 55 dB(A) Lden [3]. Further, more than 30 % of the population is exposed to noise levels above 55 dB(A) Lnight during the night [4]. These values exceed recommendations set by the “WHO Night Noise Guidelines for Europe” [5]. However, there is a lack of noise exposure data in the central and eastern parts of the WHO European region, making a complete assessment of the burden of disease challenging.

Environmental noise also has a significant economic impact, with an estimation of the social cost of rail and road traffic noise in the EU at EUR 40 billion per year, of which 90% was related to passenger cars and goods vehicles [6].

1.1. Context

The “WHO Guidelines for Community Noise” in 1999 [7] included scientific evidence on noise related health outcomes and recommendations for protecting human health from environmental noise exposure originating from various sources and community settings. The “WHO Night Noise Guidelines for Europe” in 2009 [5] are considered as an extension of the former guidelines.

New evidence on the health effects of environmental noise has accumulated in recent years, requiring an update of existing WHO noise guidelines. The need for health-based guidelines also originates in part from the European Union (EU) Directive 2002/49/EC relating to the assessment and management of environmental noise (commonly known as the Environmental Noise Directive), which requires EU Member States to establish action plans to control and reduce the harmful effects of noise exposure [8]. Technical guidance was also issued by the EEA on the topic of noise exposure and potential health effects under the requirements of the Directive [9].

In the Parma Declaration Commitment to Act, developed at the Ministerial Conference on Environment and Health in Parma, Italy 2010, the Member States called upon all stakeholders to reduce children’s exposure to noise, including that from personal electronic devices, recreation and traffic, especially in residential areas, at child care centres, kindergartens, schools and public recreational settings. As a consequence the Member States urged WHO to produce appropriate noise guidelines [10]. Therefore, WHO Regional Office for Europe is developing a new set of guidelines, the “WHO Environmental Noise Guidelines for the European Region” (the Guidelines) to provide suitable scientific evidence and recommendations for policy-makers of the WHO Member States in the European Region and beyond.

The Guidelines will serve as a reference for an audience made up of different groups and areas of expertise in decision-making, research, and advocacy. More specifically, this covers:

- Various technical experts and decision-makers at local, national or international level, responsible for developing and implementing regulations and standards for environmental

health, noise control, urban planning and housing;

- Health Impact Assessment and Environmental Impact Assessment practitioners and researchers;
- National and local authorities and non-governmental organizations responsible for risk communication and general awareness raising.

1.2. Guideline Development Process

WHO guidelines represent the most widely accepted set of public health recommendations and are intended to assist policy-makers, health-care providers, and other relevant stakeholders to make informed decisions for the protection of public health. WHO has adopted internationally recognized standards and methods for guideline development to ensure that guidelines are free from biases, meet public health needs and are consistent with the following principles:

- (1) Recommendations are based on a comprehensive and objective assessment of the available evidence, and
- (2) The process used to develop the recommendations is clear.

Therefore, the reader will be able to see how a recommendation has been developed, by whom, and on what basis. The entire process is conducted according to the “WHO Handbook for Guidelines” [11].

WHO initiated the process of developing the Guidelines in early 2013. The main objectives of the updated Guidelines are to systematically review the scientific literature on the health effects of environmental noise and to provide evidence-based recommendations for protecting public health from the health risks of environmental noise.

In order for experts to be involved in the Guideline process, they are required to declare all potential personal, financial, and academic interests by completing the WHO Declaration of interests form.

According to established procedures, WHO set up a Guideline Development Group (GDG) composed of leading experts and end-users responsible for the process of developing the evidence-based recommendations. The first meeting of the GDG experts took place on 14-15 November 2013, in Bonn, Germany. The GDG experts defined the scope of the Guidelines and decided on the key

questions to be addressed by the Guidelines; proposed a Table of Contents; authors for background papers, systematic reviews of the evidence and Guideline chapters; and agreed on a plan and timeline for completing the work.

Health outcomes deemed as critical or important by the GDG experts are included in the systematic literature review using a protocol developed for this purpose. In order to assess the quality of the evidence for each health outcome required for appropriate recommendations, the authors of the systematic review use the GRADE methodology which ranks the quality of evidence as high, moderate, low, or very low [12].

The second meeting of the GDG was held in Bern, Switzerland, on 2 October 2014. Evidence reviews on the specific health outcomes of environmental noise were presented and discussed. Further steps in writing the Guidelines chapters and external peer review process were agreed.

1.3. Scope of the guidelines

Environmental noise is defined in the Guidelines as “noise emitted from all sources except sources of occupational noise exposure in workplaces”.

Significant research has been undertaken in the area of environmental noise and health since the previous WHO environmental noise guidelines were published in 1999 and 2009. Therefore, in order to include these new findings, the Guidelines will review all pertinent literature on health evidence, revisit the previous guidelines and issue revised recommendations, as relevant. We systematically review the effects of noise on the following health outcomes: effects on sleep, annoyance, cognitive impairment, cardiovascular disease, hearing impairment, tinnitus, adverse birth outcomes, and mental health and wellbeing.

As well, the Guidelines will review the evidence on health benefits from noise mitigation and interventions to decrease noise levels.

Combined exposure to various noise sources as well as non-acoustical factors will be considered where relevant. In particular, the Guidelines will address combined exposure to environmental noise and: occupational noise; vibration from railway traffic (relevant especially for annoyance and sleep disturbance); air pollution (relevant especially for cardiovascular diseases); and visual aspects of wind turbines (relevant especially for annoyance).

The Guidelines will separately assess the environmental noise coming from various sources, for each relevant health outcome: aircraft, railway, road traffic, wind turbines, and leisure noise. The document will mainly consider exposure to noise in such relevant settings as residences, hospitals, educational settings and public venues.

2. Conclusions and outlook

Environmental noise is increasingly recognized as a significant public health issue. New scientific evidence in the field of environmental noise and public health has prompted WHO to revisit the recommendations issued in the previous guidelines and develop the “WHO Environmental Noise Guidelines for the European Region”. The Guidelines will provide up-to-date information on the health risks from environmental noise and evidence-based recommendations in order to support WHO Member States in their efforts to prevent and control exposure to excessive noise. The Guidelines are expected to be finalized in 2016.

Acknowledgement

WHO acknowledges the generous contribution from Switzerland for funding this activity.

References

- [1] WHO Regional Office for Europe. Burden of disease from environmental noise. Quantification of healthy life years lost in Europe. Copenhagen, WHO Regional Office for Europe. (2011) Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf?ua=1 (Accessed 6 February 2015).
- [2] O. Hänninen, AB. Knol, M. Jantunen, T.-A. Lim, A. Conrad, M. Rappolder, et al. Environmental Burden of Disease in Europe: Assessing Nine Risk Factors in Six Countries. (2014) *Environ Health Prospect*; DOI:10.1289/ehp.1206154.
- [3] EEA. Noise in Europe. Luxembourg, EEA. (2014) Available at: <http://www.eea.europa.eu/publications/noise-in-europe-2014> (Accessed 6 February 2015).
- [4] EEA. Noise Observation and Information Service for Europe. Luxembourg, EEA. (2013) Available at: <http://noise.eionet.europa.eu> (Accessed 6 February 2015).
- [5] WHO Regional Office for Europe. Night Noise Guidelines for Europe. Copenhagen, WHO Regional Office for Europe. (2009) Available at: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf (Accessed 6 February 2015).
- [6] European Commission. Report to the European Parliament and the Council on the implementation of the Environmental Noise Directive in accordance with Article 11 of Directive 2002/49/EC (COM(2011) 321final of 1 June 2011. (2011). Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0321:FIN:EN:PDF> (Accessed 6 February 2015).
- [7] WHO (1999). Guidelines for community noise. WHO, Geneva. 1999. Available at: <http://www.who.int/docstore/peh/noise/guidelines2.html> (Accessed 6 February 2015).
- [8] European Commission. Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise - Declaration by the Commission in the Conciliation Committee on the Directive relating to the assessment and management of environmental noise. (2002) Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32002L0049> (Accessed 6 February 2015).
- [9] EEA. Good practice guide on noise exposure and potential health effects. Luxembourg, EEA. (2010). <http://www.eea.europa.eu/publications/good-practice-guide-on-noise> (Accessed 6 February 2015)
- [10] WHO Regional Office for Europe. Parma Declaration on Environment and Health. Copenhagen, WHO Regional Office for Europe (2010). Available at: http://www.euro.who.int/__data/assets/pdf_file/0011/78608/E93618.pdf (Accessed 6 February 2015).
- [11] WHO. Handbook for Guideline Development. Geneva, WHO. (2012) Available at: http://apps.who.int/iris/bitstream/10665/75146/1/9789241548441_eng.pdf (Accessed 6 February 2014).
- [12] GRADE working group. List of GRADE working group publications and grants. Available at: <http://www.gradeworkinggroup.org/publications/index.htm#BMJ2008> (Accessed 6 February 2015).