

Review of environmental noise policies and actions in 2017-2021

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Dietrich Schwela

PhD, Senior Research Affiliate, SEI

Institution: University of York, Environment Department, Stockholm Environment Institute (SEI),
York, UK

Address: Am Nachtigallental, 28, 45149, Essen

E-mail: dietrich.schwela@york.ac.uk

ABSTRACT

This report provides a continuation of the review of environmental noise policies and economics in 2014-2016, presented at ICBEN 2017 and published in a previous issue of the South Florida Journal of Health. The report addresses the international progress on noise mitigation policies and strategies, best practices, and guidelines for environmental noise management. It focuses on developments in evidence and policy by international bodies and in selected countries. There is a considerable amount of new relevant documents on these topics in international organizations and in some countries since the last ICBEN Congress in 2017. Much of this progress was made in the European Union, the Russian Federation, the United Kingdom, and Switzerland. Developing countries in Latin America, especially Chile, Costa Rica, Mexico, Paraguay, and Perú are increasingly committed to improve environmental noise policies. Also, China has continued to approach sustainable development goals with respect to noise challenges. Kazakhstan has started to address the noise problem by developing a code to mitigate noise-related impacts.

Keywords: Environmental noise legislation; noise abatement; international organizations; European; Latin American; Asian countries.

1 INTRODUCTION

Environmental noise has intensified in densely populated urban areas because of urbanization and associated growth in population mobility. International organizations, governments, and other agencies in developed and developing countries are taking action to enhance their institutional and technical capabilities to monitor and control noise exposure and implement preventive actions to reduce the risks that environmental noise poses to their citizens. This review provides an update on international progress on noise mitigation policies and strategies, best practices, and guideline documents for environmental noise management in recent years.

This review is a continuation of the report on “*Environmental noise policies and economics in 2014-2016*” that was presented at ICBEN 2017 and published in 2021 [1]. As in the previous report, activities on environmental noise policies will be discussed that are being performed by international organizations and various countries.

2 METHODOLOGY

The methodology applied in this paper was to compile the information on environmental noise policies and actions during 2017 to 2021 by

1. investigating the websites of international and supranational organizations with respect to their activities on environmental noise emissions, transmission, monitoring, noise exposure, noise-induced health impacts, and environmental noise management and abatement. This investigation included the World Bank; World Health Organization (WHO); United Nations Environment Programme (UNEP); UN-Habitat; International Civil Aviation Organization (ICAO); European Commission (EC); European Environmental Agency; and the International Standardization Organization (ISO).
2. a search by Google using the algorithm (country) and (noise) and ((policies) or (legislation) or (public health)) and ((2017 or (2018) or (2019) or (2020) or (2021)). The search was limited to major countries on all continents.

Policies, legislation, and reports were analysed and compiled with respect to the objective of giving a transparent review of the recent issues regarding environmental noise.

3 INTERNATIONAL BODIES

3.1 WORLD HEALTH ORGANIZATION (WHO)

In 2018 the Regional Office for Europe (WHO/Europe) published the Environmental Noise Guidelines for the European Region (ENGER) [2] as a regional update to the WHO Community Noise Guidelines (CNG) published in 1999 [3] and a supplement to the Night-Noise Guidelines for Europe (NNGE) [4]. The main purpose of these new environmental noise guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway, and aircraft) noise, wind turbine noise and leisure noise. Leisure noise in the ENGER refers to noise sources such as at nightclubs, pubs, fitness classes, live sporting events, concerts, or live music venues and when listening to loud music through earphones. The guidelines focus on the WHO European Region and provide policy guidance to EU Member States that focus on the most used noise indicators L_{den} (the day-evening-night-weighted sound pressure level) and/or L_{night} as defined in the Environmental Noise Directive (END). The L_{den} and L_{night} indicators are those generally reported by Member States to the European Union (EU) and are widely used for exposure assessment in health effect studies in the EU and elsewhere.

The evidence on the health outcomes of exposure to environmental noise that emerged since 1999 was systematically reviewed in the ENGER, including: cardiovascular and metabolic effects;

hearing impairment; cognitive impairment; quality of life; mental health and wellbeing; sleep disturbance; annoyance; tinnitus and adverse birth outcomes.

The process of developing these guidelines applied a rigorous methodology following the WHO approach of Grading of Recommendations Assessment, Development and Evaluation [5]. The recommended guideline values for transport noise (road, railways, aircraft), leisure noise and wind turbine noise are rated as strong, i.e., adoptable in most situations, or conditional, i.e., performing a policy-making process with substantial debate among all stakeholders.

The 2018 environmental noise guidelines state that the ENGER “supersede the CNG from 1999”. The document, however, also recommends “that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and noise in shopping areas) should remain valid”. Both statements are slightly incompatible. In the author’s opinion the new Environmental Noise Guidelines do not supersede the Guidelines for Community Noise, but rather complement them.

In a recent report the WHO states that during the COVID 19 pandemic public health and social measures have resulted in a significant decline in noise pollution, among others [6]. The WHO emphasizes that “as noise pollution is a known causative factor in the development of numerous medical conditions, including myocardial infarction, cardiovascular diseases, hypertension, sleep disorders and psychiatric disorders, the potential beneficial effects of noise pollution reduction are clear “.

3.2 INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO)

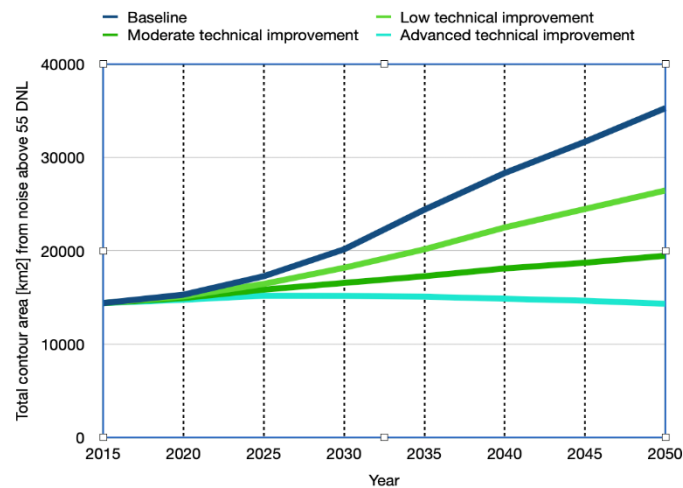
Since 2010 the ICAO regularly updates the ICAO Global Environmental Trends by developing a range of scenarios to assess future noise trends, the most recent issue being published in 2019 [7]. The total contour area and population inside the yearly average day-night level (DNL) of 55 dB contours of 315 airports worldwide are used as noise indicators in business-as-usual and better scenarios. The four scenarios investigated are described in Table 1 and their results depicted in Figure 1 [8].

Table 1: Scenarios on aircraft technologies or operational improvements after 2015.

Scenario No.	Technology	Aircraft noise level reduction [EPNdB/a]	Reduction of affected population due to rerouting of aircraft [%]
1	Baseline (BAU)	0	0
2	Low	0.1	2
3	Moderate	0.2	2
4	Advanced	0.3	2

BAU = Business as usual. EPNdB = Effective Perceived Noise measure of human annoyance to aircraft noise

Figure 1: Scenario estimates of 55 dB noise contour areas 2015-2050



In 2015, the total 55 dB DNL noise contour area of Figure 1 was 14,400 km², and the population inside that area was approximately 30 million people. By 2050, the area is estimated to grow by a factor of approximately 2.5, 1.8, and 1.4 times for baseline (BAU), low technical improvement, and moderate technical improvement scenarios, respectively. The advanced aircraft technology scenario has a maximum area in 2025 and decreases to slightly less the 2015 value.

In the context of ICAO's balanced approach on aircraft noise management one of the pillars of aircraft noise mitigation is the application of less noise operational procedures [9]. ICAO's Committee on Aviation Environmental Protection is currently developing a guidance document on noise mitigation opportunities during aircraft operation at departures and arrivals. This ICAO Guidance document is entitled "Operational opportunities to reduce aircraft noise" and will identify measures to optimize the current aircraft technology and airport infrastructure with the objective to mitigate operational noise impacts in addition to benefits on fuel consumption. These measures will include [9],[10].

- speed management during continuous descents to arrival
- application of stepped descent procedures
- performance of the final landing approach until touchdown with reduced angles of aircraft flaps
- displaced touchdowns; and
- stepped climbs instead of continuous climbs from departure.

These measures will result in the construction of "Noise Preferential Routes", which serve to avoid unnecessary exposure to aircraft noise [9]. Use and alternation of noise preferential routes can give respite to local communities in the vicinity airports.

To foster the development of new technologies, ICAO regularly sets technology goals, with the purpose of providing targets for industry research and development, in cooperation with States [11]. The latest set of noise goals, integrated with goals for air quality and carbon dioxide emissions, is detailed in ICAO Doc 10127 [12] and in a paper by Cumpsty et al. [13].

To reduce the aircraft industry's environmental footprint while the capacity demand of the flying public is increasing, ICAO strives to mitigate noise impacts associated with aircraft operations. The tool developed to improve the management of air traffic ('airspace modernization') is called "Performance Based Navigation" (PBN). For the realization of PBN ICAO considers engagement of all aviation stakeholders as a necessary ingredient. In consequence, the ICAO has published two reports on the role of community engagement for aviation environmental management [14] and for PBN [15]. Circular 351 highlights lessons learned and good practices from case studies; The PBN report reviews and assesses States' implementation of PBN action plans, complementing ICAO's Balanced Approach to Aircraft Noise Management.

In 2022 ICAO published a new report of its series of triennial Environmental Reports, which presents the progress made over the last three years across key areas of ICAO's environmental protection activities, including extensive work on aircraft noise reduction [16]. Besides proposed amendments to Annex 16 Vol I, progress has also occurred for supersonics, Emerging Technology Aircraft (ETA), operational noise, and noise research. Possible environmental issues from the operation of ETA include urban air mobility concepts, unmanned aircraft, and remotely piloted aircraft. This information will be consolidated as a potential best practice guidance for States.

3.3 UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP)

For the first time the UNEP addresses in detail the challenges posed by noise in the urban acoustic environment [17]. In describing the basics of the complex physical phenomena of sound and vibration UNEP adopts the ISO 12913-1:2014 definition of a soundscape as the "acoustic environment as perceived or experienced and/or understood by a person or people, in context". The report then summarizes the adverse effects of noise on public health, presents urban traffic-related sound pressure levels L_{Aeq} measured during daytime in different cities of the world. It then discusses the different measures for soundscape management within a broader range of environmental challenges, in particular air pollution.

3.4 EUROPEAN COMMISSION (EC)

On 30 March 2017, the EC published a report on the implementation of Directive 2002/49/EC (END). This report observed [18]:

- The implementation of the Directive is significantly delayed as more than 20% of the required noise maps, and around 50% of the action plans have not yet been reported.
- EU citizens are not always aware of the noise situation and their related health effects.
- Comments given in stakeholder consultations have not necessarily been considered in action plans.
- Reasons for the observed implementation delays include lack of priority setting; absence of centralized and consistent input data; ineffective co-ordination among responsible authorities, and poor comparability of noise maps among jurisdictions.
- Recommendations for activities to reduce the delays in the implementation of the END include, among others, to reconsider implementation arrangements; to better inform policy options in transport; to have a common approach to avoid, prevent, or reduce harmful effects of noise; to implement noise mitigation measures within their action plans; and to raise awareness of all stakeholders on the adverse effects of transportation noise.

On 24/04/2017 the EC organized the "Noise in Europe Conference" to raise awareness on the adverse impacts of noise from transport on human health [19]. The conference participants recommended, among other issues, to strengthen stakeholder involvement; broaden the scope of the END beyond transport and industry sources; lower the thresholds for noise mapping, i.e. below 55 dB L_{den} and 50 dB L_{night} , by including currently excluded significant sources of noise; raise public funding for noise reduction measures, covering the full life cycle costs; avoid operating restrictions at airports but considering citizens' requests for undisturbed sleep; and enhance interconnections between noise and urban planning actions.

In April 2017, the EC published a Brief on noise abatement approaches in issue 17 of its „Science for Environment Policy” series [20]. After an overview of the human health effects and a discussion of the policy context of noise pollution as a growing environmental concern, the brief discusses noise mitigation measures for road traffic noise, railway noise, aircraft noise, and environmental noise due to sound pressure levels and vibrations emitted from industrial sites, shipping ports, construction sites, landfills, and wind turbines.

The Commission's Future Brief of 2019 addresses cross-functional noise abatement approaches such as noise barriers, building design and building sound isolation, land-use planning, and sonic crystals used to absorb sound of specific frequencies [20]. By combining mitigation at source and noise abatement at the end of the receiver the EC hopes that these measures -together with robust legislation will lead to a quieter situation in the Member States of the European Union and associated countries.

The various options available for mitigation of road traffic noise include quieter engines, low-noise road surfaces by pavement groups of different surface density (dense, semi dense, semi porous, open porous), low noise tyres, electric vehicles, and intelligent traffic management and engineering. For railways rolling noise (interaction of wheels with the rails, leading to vibrations that are perceived as noise) is the major source of noise emissions, while engine noise takes over when trains are moving slowly or stop [20].

For trains traveling faster than 300 km/h, aerodynamic noise dominates. Mitigation of rolling noise of freight trains can be achieved by reducing the wheel roughness by low-noise brake blocks. Noise emitted from track roughness can be reduced by acoustic grinding and keeping rails in good maintenance.

Aircraft noise originates from mainly from three sources:

- i. The airflow around the main body of the aircraft
- ii. Jet engines during take-off and climb; and
- iii. Auxiliary power units used to start engines and to move aircraft on the ground.

Despite of the noise-reducing measures designed in ICAO's Balanced Approach and other potential mitigation approaches such as high-bypass turbofan engines and aerodynamic construction changes, the EC feels that new technological developments to reduce aircraft noise are needed because the number of people exposed to noise from European airports is forecast to increase by 15% by 2035 as compared to 2014 levels [20].

Directives 2002/49/EC Environmental Noise Directive, (END) and 2000/14/EC (Noise emission by outdoor equipment) have both been amended with respect to adaptation to technical and scientific progress by Regulation (EU) 1219/1243 [21]. In addition, a supporting study for an evaluation and impact assessment of Directive 2000/14/EC was completed in October 2018 with respect to different types of equipment used outdoors [22].

3.5 EUROPEAN ENVIRONMENT AGENCY (EEA)

The EEA, in collaboration with the European Union Aviation Safety Agency (EASA) and the European Organization for the Safety of Air Navigation (EUROCONTROL), published the third European Aviation Environmental Report (EAER_3) in 2022 [23]. The EAER provides an updated assessment of the environmental performance of the aviation sector published in the first report of 2016 and the second one in 2019 (EAR_2) [24]. The EAR_2 found that the number of people inside L_{den} 55 dB noise contours at 47 major EU airports increased to 2.58 million people, an increase by 14 per cent and 12 per cent as compared to 2014 and 2005, respectively, while the passenger kilometres flown by commercial flights, departing from member states of the EU28 and the European Free Trade Association

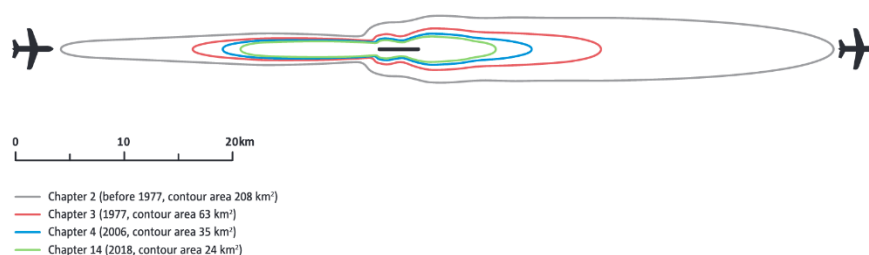
(EFTA) increased by 20 per cent and 60 per cent, respectively. Similarly, the average noise energy per flight decreased by 14 per cent compared to 2005 and one per cent compared to 2014 [24].

During the COVID-19 pandemic the number of departures and arrivals in EU27 + EFTA airports decreased from 9.25 million in 2019 to 4.14 million and 5.07 million in 2020 and 2021, respectively [23]. Correspondingly, passenger kilometres decreased from 1,484 billion to 389 and 509 billion in 2020 and 2021, respectively. Consequently, the number of people inside L_{den} 55 dB noise contours at 98 major European airports decreased from 3.16 million to 1.05 million and 1.00 million in 2020 and 2021, respectively.

The EAER_2 observes that the average noise level of the twin-aisle aircraft category in the European fleet has been significantly reduced since 2008 due to the introduction of the Airbus A350 and the Boeing 787 [24].

Jet and heavy 4-propeller-driven aircraft must comply with noise certification requirements and the associated noise limits prescribed in ICAO Annex 16 Volume 1 Chapters 2, 3, 4, and 14. In order to demonstrate the influence of the various noise limits the EAER_2 has estimated for four hypothetical 75-metric ton jet aircraft the noise contour areas in which people are exposed to noise levels greater than 80 dB during one landing and take-off [24]. The contours illustrated in Figure 2 show the reduction over time from the first Chapter 2 limit applicable before 1977 to the latest Chapter 14 limit applicable in 2018.

Figure 2: Single landing and take-off 80 dB noise contours for four hypothetical aircraft that just meet the noise limits of the various ICAO Annex 16, Volume I, Chapters 2, 3, 4, and 14



Source: [23]

Three scenarios have been considered in EAR_3 to estimate the total number of people in the L_{den} 55 dB noise contours at 98 major European airports in 2050. In a low traffic scenario, base traffic scenario, and high traffic scenario it is assumed that the number of arrivals and departures in 2050 at EU27 + EFTA airports rises from 9.25 million to 10.1, 12.2, and 15.0 million, respectively. The low traffic scenario estimates the number of exposed people to range between 0.79 and 1.29 million; the base traffic scenario estimate lies between 1.09 and 1.44 million; and the high traffic scenario estimates the number of exposed people in 2050 to range between 1.44 and 2.44 million, substantially lower than the

number of people of 3.16 million in the $L_{den} \geq 55$ dB noise contours at 98 major European airports in 2019 [23].

The latest database under the END on noise exposure information (number of people exposed to each of the noise sources inside and outside urban areas to 5 dB bands $L_{den} \geq 55$ to >75 dBA and $L_{night} \geq 50$ to >70 dBA) published by the EEA covers member country data until 1 January 2021 [25]. Correspondingly, EEA's Noise most recent fact sheets, published on 8 December 2021, exist for 24 EU Member States and 3 non-EU countries [25]: Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, United Kingdom. The most recent fact sheet of Germany is a typical example that shows the number of people exposed to $L_{den} \geq 55$ dBA and $L_{night} \geq 50$ dBA for road, rail, aircraft and industrial noise sources, as seen in Table 2 [26].

Table 2: Number of people exposed to sound pressure levels above the EU reporting thresholds

	$L_{den} \geq 55$ dBA			$L_{night} \geq 50$ dBA		
	2007	2012	2017	2007	2012	2017
Road	4,261,100	5,931,200	5,717,100	2,761,200	3,860,000	3,778,000
Rail	1,920,400	3,220,800	3,131,800	1,492,200	2,499,000	2,428,500
Air	401,600	516,900	561,600	106,700	118,500	150,100
Industry	32,200	44,800	49,000	14,100	19,700	19,300

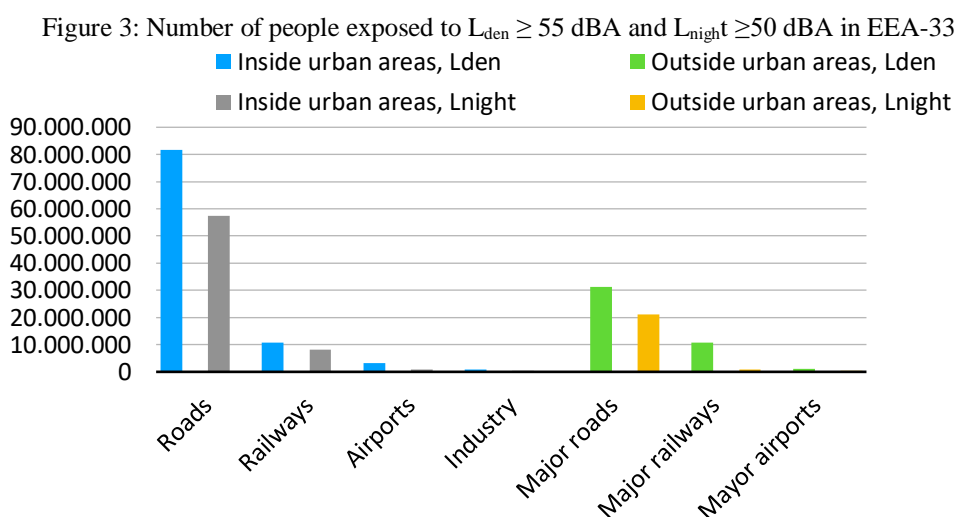
In 2017 the EEA published an overview report on environmental noise management in Europe. This report and its briefing were last modified in 2020 [27;28;29]. Its key messages include:

- An estimated 113 million people are affected by long-term $L_{den} \geq 55$ dBA traffic noise. In most European countries, more than 50 per cent of inhabitants within urban areas are exposed to road noise levels of $L_{den} \geq 55$ dBA, numbers that are likely increase in future because of future urban growth and increased demand for mobility.
- Based on the ENGER, the EEA estimates that such exposure causes 12,000 premature deaths and contributes to 48,000 new cases of ischaemic heart disease per year across Europe. It

is also estimated that 22 million people suffer long-term high annoyance, and 6.5 million people suffer long-term high sleep disturbance.

- Policy objectives on environmental noise have not yet been achieved.
- More progress is needed on the designation and protection of 'quiet areas' in cities, countries, and regions.
- Examples of the most popular measures to reduce noise levels in cities include replacing older paved roads with smoother asphalt, better management of traffic flows and reducing speed limits to 30 kilometres per hour.
- There are also measures aimed at raising awareness and changing people's behaviour in using less-noisy modes of transport like cycling, walking or electric vehicles.

Figure 3 shows the number of people exposed to $L_{den} \geq 55$ dBA and $L_{night} \geq 50$ dBA at inside and outside urban areas in Europe, EEA-33, respectively [30].



3.6 INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

Between 2017 and 2020 the ISO published four new and one update of ISO standards: ISO 1996-2:2017; ISO 26101:2017; ISO/TS 12913-2: 2018; ISO/TS 12913-3:2019; and ISO/TR 17534-4:2020.

ISO 1996-2:2017 revises ISO 1996-2:2007 and describes how sound pressure levels intended as a basis for assessing environmental noise limits or comparison of scenarios in spatial studies can be determined [31]. Sound pressure levels can either be directly measured or extrapolated from measurements. The standard can be applied on all kinds of environmental noise sources, such as road and rail traffic noise, aircraft noise and industrial noise. Some guidance is given for indoor measurements as well.

ISO 26101:2017 specifies for a variety of acoustical measurement purposes discrete-frequency and broad-band test methods for quantifying the performance of anechoic and hemi-anechoic spaces, defines the qualification procedure for an omni-directional sound source suitable for free-field qualification, and gives details of how to present the results and describes uncertainties of measurement [32].

ISO/TS 12913-2:2018 and ISO/TS 12913-3:2019 provide requirements and supporting information on data collection and reporting [33] and on analysis of data collected in situ [34], respectively, for detailing the conceptual framework of soundscape studies, investigations and applications developed in ISO 12913-1:2014. Both documents identify and harmonize the collection of data by which relevant information on the key components, people, acoustic environment, and context is obtained, measured, and reported.

ISO/TR 17534-4:2020 facilitates a standardized interpretation and a verifiably consistent software implementation of the sound propagation part of the Common NOise aSSessment methOdS (CNOSSOS-EU) for road, railway, aircraft, and industrial noise according to ISO 17534-1:2015. It provides a set of illustrative test cases along with reference solutions, and an example of a template form for the declaration of conformity for software manufacturers [35]. The Standard does not incorporate the improvement of the calculation method proposed by RIVM in 2019 [36].

In 2021, the ISO updated two standards related to environmental noise: ISO/TS 15666:2021 - assessment of noise annoyance; and ISO 10052:2021 - field measurement of airborne and impact sound insulation [37; 38].

ISO/TS 15666:2021 updates ISO/TS 15666:2003 concerning the acceptability of environmental noise exposure. The standard specifies questions on noise annoyance for socio-acoustic surveys and social surveys. It includes questions to be asked, response scales, key aspects of conducting the surveys, and reporting the results. It is restricted to surveys conducted to obtain information about noise annoyance “at home”, thus excluding application in other areas such as recreational areas and spaces inside vehicles [37].

ISO 10052:2021 replaces ISO/TS 10052:2004 and implements ISO/TS 10052:2010. The standard describes survey field test methods which can be used for surveying the acoustic characteristics of the airborne sound insulation and of impact sound insulation. Among other methods for field surveys, the standard specifies a survey method for measuring airborne sound insulation of façades of rooms of dwellings or of rooms of other kind of maximum size of 150 m². For airborne sound insulation of façades and impact sound insulation the values given by the survey method are frequency dependent. For heavy/soft impact sound insulation, the results also are given as A-weighted maximum impact sound pressure level [38].

4 ACTIVITIES IN EUROPEAN COUNTRIES

4.1 ACTIVITIES IN RUSSIA

The government of Russia now recognizes increased noise as one of the most dangerous and harmful threats for public health. Within the scope of a programme of smart city development the Ministry of Construction and Housing and Communal Services of the Russian Federation implemented in 2017 two national standards for protecting people against noise at residential and public buildings [39]. The standards establish the methods for evaluation of noise sources in building elements, following ISO 717-1:2013 and ISO 717-2:2013, and three codes of rules for sound reduction of air heating, ventilating and air conditioning systems; sound insulation of enclosing structures of residential and public buildings; and protection from road traffic noise (except motorcycles) emitted in the vicinity of residential, public, and commercial buildings and recreational areas.

4.2 ACTIVITIES IN SWITZERLAND

In 2017, the Government of Switzerland has promulgated the Federal Law on protection of public health against hazards from the use of sound emitting products in conjunction with non-ionizing radiation (NISSG) [40]. It authorizes the Swiss Federal Council to enforce the law by setting limits for sound pressure levels at events using sound emitting products; defining the duties of organizers of such events; setting fees for controls and measures of the executive organs; imposing penalties for offences and violations [41]. The Swiss Federal Council has established the regulations to implement and enforce the NISSG in 2019. Sound pressure levels at such events must not exceed an equivalent sound pressure level of $L_{Aeq,1h}$ of 100 dBA, never exceed the maximum sound level of 125 dBA, and not exceed the equivalent sound pressure level of $L_{Aeq,1h}$ of 93 dBA, if the audience are persons under 16 years of age.

In 2019, the Federal Office for the Environment (FOEn) published a brief on the situation in Switzerland regarding noise and vibrations [42]. Its main statements include

- Mobility continues to increase in Switzerland as motorized passenger transport has doubled since 1970 and commercial traffic has trebled.
- Road traffic is the source of noise that affects most people in Switzerland.
- Rail traffic is the main source of vibrations and structure-borne noise.
- Protection provided to the population is still inadequate as one in seven people (1.1 million people) are exposed to noise levels that exceed the exposure limit values specified in the Noise Abatement Ordinance.

In March 2021, the Swiss National Council adopted a resolution of the Environment Commission on more intensive controls of and higher fines on drivers of vehicles with sound pressure levels above

95 dB in noise protection zones [43]. It was also agreed on the the possibility of driving license revocation and vehicle confiscation. The proposed resolution, however, must pass the Council of State before a bill can be drafted and promulgated. As a strong opposition against noise protection zones is being organized, it is an open question if there will be noise protection zones before the end of 2022 [43].

4.3 ACTIVITIES IN THE UNITED KINGDOM

The United Kingdom government, in 2019, has published another policy paper on its noise actions plans as a framework to manage environmental noise and its effects in urban areas [44]. This policy document comprises four documents, viz. noise action plans for (i) agglomerations (large urban areas) including (ii) detailed agglomeration data; (iii) for railways; and (iv) for roads. These plans also aim to protect quiet areas in agglomerations (large urban areas) where the sound pressure levels are low.

The set of noise action plans aims to promote good health and good quality of life (wellbeing) through the effective management of noise. It will assist the management of environmental noise in the context of Government policy on sustainable development. It will be relevant to the Department for Transport, to the various highway and rail authorities responsible for transport in the agglomerations, local authorities, including those with environmental, transport and planning responsibilities, and other interested stakeholders.

The UK Ministry of Housing, Communities & Local Government has revised the National Planning Policy Framework of 2012 in 2019. The updated version sets out the government's planning policies for England and how these are expected to be applied [45].

The same Ministry updated the guidance document on noise, published in 2014, in July 2019. This document advises on how planning can manage potential noise impacts in new developments [46]. The questions addressed in the document practically boil down to an environmental impact assessment approach.

The Department for Environment, Food & Rural Affairs has published a document to inform the drafting of noise action plans for road, rail, agglomerations, and individual airports by use of the data generated by the noise mapping process required by the END [47].

Four agencies in the UK - the Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency - have produced a guidance document to help industrial and commercial operators to help control noise and vibration emissions [48]. This document covers the following issues:

- i. How the four agencies will assess noise from certain industrial processes.
- ii. How operators must manage noise and vibrations according to the law; and

- iii. How to carry out a noise impact assessment; and
- iv. what operators should be included in a noise management plan.

This guidance document has been developed because the four agencies are responsible to regulate noise and vibrations from certain industrial processes to protect and improve the environment, public health, and wellbeing.

5 ACTIVITIES IN LATIN AMERICAN COUNTRIES

5.1 ACTIVITIES IN CHILE

The Chilean Ministry of Environment is currently revising the regulation for noise emissions from stationary industrial sources of 2011 regarding the day and night limits in four urban zones - areas, residential, commercial, and industrial - and rural areas. The revision is expected to be finalized by December 2020 [49] but it is unknown if this task has been achieved.

A regulation on noise generated from new light and medium vehicles and motorbikes was promulgated in 2015 and implemented in July 2019 [50].

5.2 ACTIVITIES IN COSTA RICA

The Presidency of the Republic of Costa Rica and the Ministry of Health were formulating four versions of the Regulation No 39428-S for noise control between January 2016 and January 2019 [51]. The regulation classifies the zones - residential, commercial, mixed residential-commercial, industrial/agricultural and stock farming, and silence areas, for which permissible sound pressure levels are set.

These limits are compiled in Table 3.

Table 3: Permissible sound pressure levels in dBA

Zone	Day (6:00-20:00)	Night (20:00-6:00)
Residential	65	45
Commercial	70	55
Industrial/Agricultural/Stock farming	70	60
Silence area	50	45
Mixed area	70	45

5.3 ACTIVITIES IN MEXICO

In November 2019 the Environmental and Land Management Office (PAOT) launched a campaign to reduce the noise generated in commercial establishments such as clubs, restaurants, pharmacies, and industries [52]. The objective of this programme is to raise awareness and be able to promote, impel and strengthen compliance with regulations on noise in commercial and industrial

establishments. PAOT measurements during the first campaign in the Center of Coyoacán have observed sound pressure levels up to 80 dBA from merchant establishments exceeding the maximum limit allowed of 62 dBA. This campaign was intended to be informative, but if in future operations the maximum limit is exceeded sanctions will be applied, which can lead to fines, closures, and even jail.

5.4 ACTIVITIES IN PARAGUAY

On 18 September 2019 the Paraguay Chamber of Deputies approved a bill that protects the public from exposure to annoying sound pressure levels [53]. The document establishes that the National Police Command must provide sound pressure monitoring instruments to officers in each police station for noise controls. The action also aims to manage noise emission situations capable of affecting other living beings and the environment and to prevent value deterioration of people's property. In addition, the police must seize noisy equipment, vehicles, or machinery, as appropriate, and impose sanctions with fines according to the existing legislation on the prevention against noise.

In January 2020 the National Congress of Paraguay promulgated the Law No 6390, which regulates the permissible emission of sound levels for all kinds of sources [54]. Among other tasks Municipalities are requested to enforce the law by setting emission standards for various source categories, formulating policies to minimize noise, develop low noise emission plans, and establish reference procedures for the monitoring, analysis, and evaluation of noise levels.

5.5 ACTIVITIES IN PERU

The Ministry of Environment of Perú (MINAM) has established maximum permissible sound pressure levels for national and international aircraft operating over the Peruvian territory [55]. This decree refers to the reduction-at-source element of ICAO's Balanced Approach. The regulation is based on a broad consensus of relevant stakeholders including representatives of private sector entities and from all levels of government. Permissible limits are set for subsonic jet and propeller-driven aircraft type of different dates of certification and different masses, and for helicopters.

The MINAM is now also strongly promoting electric mobility "that goes hand in hand with government and state policy, since electric vehicles do not generate noise emissions" [56].

The National Institute for Quality Assessment has accredited the leading laboratory in inspection, verification, testing, and certification, SGS del Perú, as the first and only laboratory for environmental noise monitoring, analysis, and reporting, according to ISO 1996-1: 2016 and ISO 1996-2: 2017 standards [57].

In 2019, the Municipality of Lima, approved the development of the “Sound Pollution Surveillance and Monitoring Programme” with the aim to supervise noise emissions of the establishments that exist in Lima’s historic centre [58] and in the 42 districts [59].

The same year, the Municipality of Lima launched the “Stop the Horn” campaign, which promotes the responsible use of horns by public transport bus companies [60]. The objective of the campaign is to measure the sound pressure levels of the horns and to sensitize operators through informational leaflets on the harmful effects of the indiscriminate use of the horn on health, as well as to inform about the scale of fines.

Based on Law No. 30011/2013, the municipalities of Peru are requested to develop annual plans for environmental protection called “Annual plan for environmental assessment and inspection” (PLANEFA, Plan Anual de Evaluación y Fiscalización Ambiental) [61]. The PLANEFA contains five components [62]:

1. Supervision, including assessment and test of compliance with standards.
2. Performance of the task by the responsible authority.
3. Environmental quality assessments, of various components (air, noise, etc.).
4. Determination of relevant instruments for evaluation, supervision, or sanctions.
5. Summary of all environmental control activities to be carried out.

6 ACTIVITIES IN ASIAN COUNTRIES

6.1 ACTIVITIES IN CHINA

The Environmental Impact Assessment Law (EIAL) of the People’s Republic of China was promulgated in 2002 and extended several times to better approach the goals of sustainable development by expanding it to include an environmental assessment of certain types of government plans in addition to the comprehensive legal regime of environmental impact assessment (EIA) for construction projects (including noise as part of air pollution) [63]. In 2018 the most recent version of the EIAL of 2016 was amended to ensure the accountability of project managers and EIA professionals for the quality and accuracy of EIA documents.

On 24.12.2021 the People’s Republic of China has promulgated an update of the “Law of the People’s Republic of China on Noise Pollution Prevention and Control” of 2008 [64]. The update law came into force on 5 June 2022. The revised law has the following main features [65]:

- i. Increasing the object of noise prevention and control by generalizing the definition of ‘industrial noise’ to "sound generated in industrial production facilities.
- ii. Expanding the scope of application of the law to rural areas.

- iii. Strengthening the monitoring responsibilities, more clear division of responsibilities of monitoring and administrative departments.
- iv. Strengthening prevention and control at source for construction machinery, automobiles, civil aircraft, motorized ships, and electronic and electrical devices.
- v. Strengthening the implementation of noise standards for all kinds of sources of sound pressure levels.
- vi. Improving operability and enforcement; and
- vii. Reinforcing industrial noise regulations by a provision to prohibit the establishment of new industrial companies that generate noise in areas with high concentrations of noise-sensitive buildings.

With the promulgation of this updated law the „Law of the People's Republic of China on Prevention and Control of Environmental Noise Pollution“, adopted on October 29, 1996, and entered into force as of March 1997, was to be repealed [66].

6.2 ACTIVITIES IN KASAKHSTAN

The Republic of Kazakhstan adopted a Code on public health and healthcare systems on 7 July 2020 [67]. In this Code, noise and vibrations are included in the basic concepts of Article 1, section 106 in the context of physical effects on human health in preliminarily defined sanitary protection zones. In Article 95, section 27, permissible noise levels in residential and public buildings and around residential development must be within the number of sanitary-epidemiological requirements. Local executive bodies are requested to ensure favourable conditions to reduce noise levels in recreational areas in Article 113, section 7. Noisy activities in such areas are permitted only during daytime for eight hours. According to Article 113, section 8, activities accompanied by increased noise may not be carried out in the premises of residential buildings and in areas of residential development between 22:00 and 09:00, in entertainment establishments between 22:00 and 09:00 on weekdays, and between 23:00 and 10:00 on weekends and holidays. A „state body for sanitary -epidemiological welfare“ is responsible for assessment of sound pressure levels, and local executive bodies must develop noise maps in residential areas and ensure the enforcement of permissible sound pressure levels [68].

7 CONCLUSIONS

This report addresses international and national progress on noise mitigation policies and strategies, best practices, and guidelines for environmental noise management. A milestone of this progress is the WHO Environmental Noise Guidelines for the European Region, which update and complement the WHO Community Noise Guidelines and the WHO Night-Noise Guidelines for Europe.

A lot of work has also been performed by ICAO with respect to lowering noise technology goals and environmental community engagement in aviation issues. The European Commission convened a conference in 2017 with the aim of a better noise policy in the European Union. The European Environmental Agency published an overview report on environmental noise management in Europe, the latest database on noise exposure information under the Environmental Noise Directive and updated the Noise Fact sheets for 24 EU Member states and three non-EU countries. It also published, the second European Aviation Environmental Report. The International Organization for Standardization published seven updates of standards relating to soundscapes, test methods for the qualification of anechoic and hemi-anechoic free-field environments, a software implementation of the CNOSSOS-EU sound propagation part, assessment of noise annoyance, and field measurement of airborne and impact sound insulation.

Activities on the national level included normative and technical documents for the protection of people against noise in buildings from both inside and outside sources in Russia; the promulgation of a law and an implementing regulation against hazards from sound and in Switzerland; and a brief on the noise and vibration situation in this country; and noise action plans in the United Kingdom to promote good health and wellbeing. Activities in Latin American countries included regulations for noise control of stationary and mobile sources in Chile; the setting of permissible sound pressure levels in Costa Rica; the creation of a programme to reduce noise generated in commercial establishments in Mexico; a bill to control sound pressure levels in Paraguay; and the setting of maximum sound pressure levels for aircraft following the balanced approach of the International Civil Aviation Organization in Perú, the promotion of electric mobility, and the accreditation of a centre of excellence for sound pressure level monitoring in this country. Municipalities in Perú increasingly implement the noise pollution surveillance and monitoring programme and develop annual environmental assessments. In contrast to China, which has addressed noise challenges already since the promulgation of its “Law of the People’s Republic of China on Noise Pollution Prevention and Control” in 2008 and updated it in 2021, Kazakhstan only very recently has adopted a “Code on public health and healthcare system”, which includes noise and vibration as basic issues for public health. In addition, China has also regularly updated its legislation of 2002 on environmental impact assessment, and last in 2018.

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