Review of environmental noise policies and economics in 2020-2022

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ABSTRACT

This report provides an update and expansion of a previous review of environmental noise policies and actions in 2017-2021. It addresses the international progress on noise mitigation policies and strategies, best practices, guidelines, and economics for environmental noise management during 2020 to 2022. It focuses on developments in evidence and policy by international and in selected countries in Europe, North America, Asia and Oceania. Much of this progress was made by the World Health Organization, the International Civil Aviation Organization, the International Standardization Organization, and the United Nations Environment Programme. The European Commission and its associated Agencies also published many important reports and analyses of environmental noise issues including noise challenges in urban air mobility. Spain has developed technical guidance on the protection of human health and the environment against significant adverse noise effects from recovery and resilience measures. In Switzerland, the responsible authority has made a conservative estimate of the transport-related noise costs. Canada and Mexico expanded or updated their legislations and regulations on environmental noise, and the American Public Health Association performed a critical analysis of the United States negligence of environmental noise as a public health hazard which costs are considerable. In the Asian region, notable progress was made in India, Indonesia, Kazakhstan, the Philippines and Vietnam. In Australia, the environmental authorities of three states updated their regulations related to environmental noise and published relevant guidance documents, and New Zealand published a manual on estimating the benefits of reducing noise from highway transport.

Keywords: Environmental noise abatement; noise economics; international organizations; European countries, North American countries, Asian countries; Australia and New Zealand

INTRODUCTION

Environmental noise has intensified in densely populated urban areas because of urbanization and associated growth in population mobility. International organizations, national 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. It is a continuation and extension of the report on "*Environmental noise policies and actions in 2017-2021*" that was presented at ICBEN 2021 and published in 2022 [1]. As in the previous report, activities on environmental noise policies and economics will be presented.

METHODOLOGY

The methodology applied in this paper was to compile the information on environmental noise policies and economics during 2020 to February 2023 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); International Civil Aviation Organization (ICAO); International Standardization Organization (ISO); European Commission (EC); European Environment Agency (EEA); European Environment Information and Observation Network (EIONET), and the European Union Aviation Safety Agency (EASA).
2. A search by Google using the algorithm (country) and (noise) and ((policies) or (legislation) or (public health)) and ((2020) or (2021) or (2022)) and (economics)). The search was limited to major countries on all continents.

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

ACTIVITIES OF INTERNATIONAL AND SUPRANATIONAL ORGANIZATIONS AND AGENCIES

According to the **WHO**, more 1.1 billion people worldwide, mostly teenagers and young adults aged 12-35 years in middle- and high-income countries are at risk of hearing loss due to exposure to high sound pressure levels and/or such levels for long durations. This information was strongly advertised during an information session, held by WHO in 2021, on safe listening at recreational venues and when using personal auditive devices [2].

In 2022, **WHO** developed recommendations for safe exposure to amplified sound pressure levels at recreational events, which are aiming at prevention of hearing impairment by six provisions [3]:

1. Limiting exposure to $L_{Aeq,15\ min}$ of 100 dB(A).
2. Continuous sound pressure level monitoring following a standard operating procedure.
3. Optimizing sound sources and venue acoustics.
4. Promoting and providing hearing protection devices free of charge to target audience and staff upon request.
5. Making available quiet areas for recovery from excessive sound pressure level exposure.
6. Ensuring awareness of target audiences and staff of the risks of hearing impairment.

Also in 2022, **WHO**, in collaboration with International Telecommunication Union, developed under the catchword “be he@lthy, be mobile” the MakeSafeListening (mSafeListening) handbook [4]. This provides evidence-based information for promoting safe listening behaviours and preventing hearing loss within national mSafeListening programmes.

UNEP, in its Frontiers report, has addressed noise in urban areas as a public health challenge for the first time [5]. The report presents urban traffic-related sound pressure levels L_{Aeq} measured during daytime in different cities of the world and summarizes the adverse effects of noise on public health.

The **ICAO** triennial report in 2022 discusses the progress on setting environmental standards for noise from new and emerging technology aircraft such as supersonic aircraft [6]. It also refers to the updated and upgraded version of the NoisedB database developed by the French civil aviation authority under the auspices of ICAO [7].

ISO updated its standards ISO 362-1:2022 and 362-3:2022 on methods for measuring emissions from vehicles in outdoor acoustical environments and in a semi anechoic chamber to discriminate the differences between outdoor and indoor measurements. The updated standard ISO/TS 20065:2022 describes a method for the objective determination of the

audibility of tones (defined as the difference between the tone level and a just audible masking sound level) in environmental noise [8].

In its effort to make the European Union (EU) climate-neutral by 2050 (the "European Green Deal") the **EC** adopted an action plan 'towards zero pollution for air, water and soil' in 2021 [9, 10]. To reduce environmental noise, one of the key targets in the action plan is the reduction by 2030 of the number of people highly annoyed by long-term exposure to noise from transport by 30 per cent compared with 2017. The EC has commissioned an investigation if this goal can be achieved (for results see below).

The **EC** has also committed the project 'Phenomena' to assess the potential of health benefits to be achieved during 2020-2035 of transport-related abatement measures, investigating the measures reported in 300 action plans by the Member States [11]. Phenomena's expectation is to achieve a reduction of the health burden due to exposure of the public to environmental noise from transport by 20-50 per cent in this period. Various noise abatement measures were examined and their health impact quantified in the framework of WHO's DPSEEA approach [12]. Two scenarios each for road traffic noise and aircraft operation noise, and three scenarios for railway noise were used to estimate the potential health burden reduction in 2030 and the benefit to cost ratios for 2020-2035. Six policy options have been developed from the analysis of noise action plans, stakeholder consultations and noise abatement scenarios. These include:

- Standardization, streamlining and verification of noise action plans.
- Extending the scope of the END to urban planning, infrastructure planning and land use.
- EU Recommendation for reception limits or health burden reduction target.
- Better matching of prediction models and type test data.
- Including noise requirements in public procurement for fleets and infrastructure

Within the EU's Horizon 2020 programme a research project - ANIMA (Aviation Noise Impact Management through novel Approaches) - was created to better understand the relationships between exposure to aircraft noise and annoyance and sleep disturbance [13]. ANIMA seeks to improve the lives of people directly affected by aviation noise, with consideration of economic and regulatory requirements in a balanced approach. In 2022, ANIMA collaborators published an open access book which discusses relevant aircraft noise topics including [14]**:**

- Airport noise and related burden of disease.
- Regulating and reducing noise in Europe.
- Land-use planning around airports.
- Stakeholder commitment and engagement.
- Mapping of noise impacts.

The **EEA** published the third European Aviation Environmental Report which enumerates the number of people within the L_{den} = 55 dB(A) contours of 98 European airports in 2019 to 2021 and estimated this number in 2050 using three scenarios [15]. Based on the data to be collected under the Environmental Noise Directive, the Agency also published in 2021 factsheets on the number of people exposed to sound pressure levels above the EU reporting limits. In 2022, the Agency published a report on the outlook for 2030, tackling the question if the number of people exposed to transport noise can be cut by 30 per cent in that year. The key message of this report is that it is unlikely that this target will be met.

The **EIONET** published in 2021 the percentages of measures - at the source, at the transmission path, others - to reduce noise exposure at urban area roads, major roads, major railways, and major airports reported in 315 noise action plans of 17 European countries [16]. Unfortunately, the information from these noise action plans is quite fragmented, since noise action plans are missing from 12 EU Member States.

The **EASA** has studied the confidence in and acceptance of the EU public in Urban Air Mobility (UAM) [17]. While a majority sees in it a new and attractive means of mobility, there are concerns of citizens' exposure to safety risks and the abuse of UAM by individual instead of serving public interests.

Notable progress on environmental noise activities in Europe was made in France, Italy, Spain, Switzerland, and the United Kingdom.

In **France**, the French Ecological Transition Agency has estimated the costs of health impacts from environmental noise amount to approximately €136.3 billion per year, with 60.5 per cent being linked with road transport, 17 per cent emerging from residential noise, 10.5 per cent being attributed to aircraft operations, eight per cent being due to exposure from railways, and 3.5 per cent coming from other sources such as leisure-related noise [18]. In addition to the cost estimates for noise and air pollution, the study proposes the analysis of measures for mitigating exposure to both types of pollution, the source of which is often common, with the aim to reduce the social costs.

Spain has developed technical guidance on the protection of human health and the environment against significant adverse effects from recovery and resilience measures (principle of "do no significant harm") [19]. In the context of noise, any national recovery and resilience plan must consider measures to reduce noise during renovation works, construction works, works maintenance and operations, and noise from road use and related charging and refueling infrastructure, applying the best available techniques. Another notable activity is the development of the Strategic Health and Environment Plan 2022-2026 in Spain, which elaborates the objectives and actions for five interventions to protect people from environmental noise [20]:

1. Prevention and health protection.
2. Management, organization, and co-ordination.
3. Training and risk communication.
4. Investigation.
5. Monitoring, evaluation, and indicators.

For each intervention, objectives and several actions are compiled.

Switzerland is aiming to implement measures of suitable traffic planning that should help secure noise-free areas [21]. In this context, the city of Zurich is reducing the speed limit from 50 km/h to 30 km/h in a substantial part of its road network to relieve many of its citizens from exposure to excessive noise [22].

A 2022 report from the Swiss Federal Office for Territorial Development detailed the traffic-related costs due to noise to amount to CHF 2.830 billion in 2019, with more than 80 per cent due to road traffic, more than 15 per cent attributable to rail traffic, and more than four per cent caused by aircraft operations [23].

Four environmental agencies in the **United Kingdom** produced a guidance document in 2022 to help industrial and commercial operators to control noise and vibration emissions and develop a noise management plan [24]. The document provides a suggested structure for a noise impact assessment report, which clarifies the level of information the agencies need for decisions on permits. It advises on risk assessment for noise sensitive receptors (NSRs), NSR-

related monitoring surveys, assessment of audible or detectable sources, and use of best available technologies.

On 20 October 2022, the Environment Committee of the London Assembly convened two panels to discuss the impact of road, tube, and aviation noise on the population of London [25]. The activity aims to will help the Mayor of London to develop policies to mitigate the impact of noise on public health.

The Department for Environment, Food & Rural Affairs (DEFRA), in 2021, has appointed a consultancy to develop a database for noise modeling and exposure assessment during the next four years [26].

ACTIVITIES IN NORTH AMERIC*A*

The Impact Assessment Agency of **Canad**a published in 2022 guidelines for impact statements tailored for specific designated projects which will help the proponent of a project to consider all requirements needed for an impact assessment [27].

The Canada Energy Regulator published the Electricity Filing Manual in 2022 which provides guidance as to the extent and type of information the Regulator would need to decide on the issuance of a permit or certificate for projects of constructing and operating international power lines [28].

The British Columbia Oil and Gas Commission produced in 2021 a revised noise control best practices guideline document, related to recommended best practices for noise control and management of operations associated with wells and processing facilities in the province of British Columbia [29].

In 2021, the Congress of **Mexico** City approved to add an article to the Environmental Law for the Protection of Land, which among other topics regulates the preparing of noise maps in Mexico City and update them periodically, establish maximum permissible noise limits, enforce compliance by means of inspection and surveillance, and determine administrative sanctions for non-complying [30, 31]. Other States and cities in Mexico are developing noise control laws and are starting to enforce noise ordinances.

In the **United States**, the American Public Health Association, in its Policy Statement 202115 refers to environmental noise as a public hazard for the first time since its Policy Statement of 1968 - 'Environmental noise pollution control'- [32]. The statement observes that the promises of legislation since 1972 remain unfulfilled until now. Moreover, approximately 5.2 million children and 26 million adults have hearing damage from excessive noise exposure, and approximately 145 million Americans are at risk of noise-related hypertension. In addition, a full accounting of noise-related health costs in the United States does not exist, but studies suggest that those costs are considerable ($3.3 billion to $12.8 billion annually for hearing loss; $1.8 billion to $194 billion annually for lost productivity). The inclusion of noise-related ischaemic heart disease and mental health disturbances would increase those cost estimates considerably.

The National Aeronautics and Space Administration (NASA) addressed noise issues related to the development and operation of UAM vehicles with the aim to summarize the current practice in UAM development, identify its gaps, certification procedures, existing permissible noise limits, and makes recommendations with regards to overcome the gaps, consider

environmental constraints, develop additional noise metrics, and ensure stakeholder and community engagement [33].

ACTIVITIES IN ASIAN COUNTRIES

India is continuing to monitor sound pressure levels on 70 stations in ten cities and has started, in 2020, to set fines for violation of the permissible limits for noise pollution [34, 35]. In 2021, the Delhi Pollution Control Committee has implemented the new fines and ordered the enforcement of compliance with the rules by responsible executive authorities [36].

A decree of the Ministry of Environment and Forestry of **Indonesia** promulgated permissible sound pressure level limits and methods for test procedures for new passenger vehicles, light duty trucks, and motorcycles, to be implemented and enforced by 1st January 2020 [37]. The Ministry of Transportation set up a decree to implement permissible sound pressure levels which must be complied with in the process of type certification and tests of aircraft airworthiness [38]. The decree includes sound pressure level standards for propeller-driven aircraft, jet aircraft, supersonic aircraft, helicopters, and tiltrotors, and the application of the necessary test methods.

The Republic of **Kazakhstan**, in 2021, promulgated a law, in which the requirements for public and environmental health protection against noise and vibration exposure are regulated, moreover, requirements for urban planning for reduction of noise impacts on health and the environment [39].

The **Philippines** is in the process of creating a Noise Pollution Control Board and regulate noise from leisure activities [40].

Although **Vietnam** has promulgated a decree to control leisure noise from karaoke singing, beer stalls, pubs, loudspeakers, as well as production activities and set penalties for non-compliance with permissible noise limits, several districts are doubtful if the objectives of the decree can be achieved [41, 42].

3. ACTIVITIES IN OCEANIA

In **Australia**, the South Australian Environment Protection Authority is currently reviewing its noise policy with the objective to better protect health from exposure to excessive commercial and industrial noise [43]. This includes the setting of permissible noise limits and measures for non-compliance and developing procedures to prevent future and emerging noise challenges. The Authority has also updated its guidelines for environmental noise from wind turbines, including the consideration of sound characteristics of aggregations of wind turbines such as low frequency noise, infrasound, tonality change, and amplitude modulation [44].

The New South Wales Environment Protection Authority has developed a draft construction noise guideline to ensure that in construction works all practical and economically reasonable mitigation measures to reduce sound pressure levels are applied to protect the public from adverse impacts [45].

The legislators of Victoria developed environment protection regulations, effective 1 February 2023, which regulate noise emissions from all kinds of sources, labelling issues, permissible sound pressure levels, audits, and offences and penalties for non-compliance [46].

The Waka Kotahi NZ Transport Agency of **New Zealand** published in 2021 a new version of its manual for monetizing benefits and costs of proposed investments in highway transport activities [47]. The manual developed a formula for estimating the benefits of reducing sound pressure levels emitted from highways at residential levels.

CONCLUSIONS

The current report provides an update and expansion of a previous review of environmental noise policies and actions in 2017-2021, presented at the 2021 conference of the International Commission on Biological Effects of Noise, and published in a 2022 issue of the South Florida Journal of Health. The current 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 and supranational bodies - World Health Organization, International Civil Aviation Organization, United Nations Environment Programme, the International Standardization Organization, the European Union/European Commission, the European Environment Agency, the European Aviation Safety Agency - and in selected countries in Europe, North America, Asia, and Oceania. There is a considerable amount of new relevant documents on these topics in international organizations and some countries from 2020 to 2022. More details of the individual activities can be extracted from the full report submitted to South Florida Journal of Health.

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