



## Progress on environmental noise policies from 2008-2013 in Asia and the world

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### ABSTRACT

This paper provides a review of international progress on environmental noise mitigation policies and strategies, best practices and guidelines for environmental noise management. A considerable amount of relevant documents in many countries on these topics were published in the last five years. Much of this progress was made in the European Union and the World Health Organization, although other areas of the world demonstrated a continuing commitment to improvement on these issues, especially in the United States, Japan and Vietnam. These topics are particularly important because they embody the transfer into policies and legislation of expert work on the effects of noise exposure. In addition they address the vital area of the benefits of noise abatement. The latter focus area includes topics such as economic costs of environmental noise abatement and the benefits of adequate and affordable environmental noise mitigation policies in terms of avoided health and other costs, which is crucial for governments to implement strategies and policies for environmental noise management.

Keywords: Environmental noise management, international bodies, developed & developing countries, best practice, valuation I-INCE Classification of Subjects Number(s): 89, 82

### 1. INTRODUCTION

Environmental noise relates to ambient sound pressure levels caused by all types of sources except sources at the workplace. Sources include transport, construction work, industrial facilities, neighbourhood, and recreational activities. Noise from these sources makes it hard to maintain a peaceful attractive urban or non-urban environment. The impacts of environmental noise include cardiovascular effects, sleep disturbance, cognitive impairment, annoyance and effects on residential behaviour, tinnitus and hearing impairment. Environmental noise is a challenge still underestimated in most developing countries where much higher sound pressure levels prevail than in developed countries. The external costs of noise may be enormous. E.g. in the EU they were estimated to amount in 2008 to between 0.3 and 0.4 per cent of its gross domestic product of Euro 12.5 trillion (1); in Japan estimates amount to 1.2-1.7 per cent (2) and 0.2 per cent of the GDP (3), but in developing countries of Asia much higher percentages may be found due to the higher exposure levels (4).

In order to protect human health and well-being environmental noise management is needed to maintain low noise exposure. The basis of environmental noise management is a government policy framework and adequate legislation. A legal framework is needed to provide a context for noise

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management. This includes criteria and standards for environmental noise exposure levels, noise assessment procedures and control measures as part of environmental health programmes (5).

The present paper presents the progress international organization and national governments and agencies achieved during the last five years. It is an expansion and update of recent reports by the authors (6, 7).

## 2. INTERNATIONAL BODIES

### 2.1 World Health Organization

The World Health Organization (WHO) provides scientific advice to the noise policy-making process in terms of guidelines and recommendations, which are not enforceable. In supplementing the WHO Guidelines for Community Noise (5), WHO-EURO in 2009 published the “Night Noise Guidelines for Europe (NNG)” (8). The NNG specifically examine the issue of sleep disturbance and other effects of night-time aircraft overflights and providing guidelines for night-time noise, including recommendations for noise metrics and noise exposure criteria.

Expert working groups convened by the WHO Regional Office for Europe prepared a more recent WHO report (9) on the burden of disease from environmental noise. This report aims to provide technical support to policy-makers and their advisers in the quantitative risk assessment of environmental noise. Basis of the report is evidence and data available in Europe on various health effects. The report synthesizes the evidence on the exposure-response relationships between environmental noise and annoyance, cardiovascular disease, cognitive impairment, sleep disturbance, and tinnitus. In addition to exposure-response relationships the report applies exposure distribution, background prevalence of disease and disability weights of the health outcome, to calculate the burden of disease in terms of disability-adjusted life-years.

### 2.2 International Institute of Noise Control Engineering

In 2011 the International Institute of Noise Control Engineering (I-INCE) published a report of its Technical Study Group 6 on environmental noise impact assessment and mitigation (10). The objective of the report is to provide practical advice on noise management strategies for stakeholders involved with environmental noise management. This noise policy-related report presents guidance on performing an environmental noise impact analysis. It outlines and recommends a general process to balance the positive effects of controlling exposure to environmental noise against the costs and technical feasibility of achieving effective noise control. The guidelines and principles outlined in the report for a generic environmental noise impact analysis process are recommended to harmonize internationally different national approaches.

In 2009 I-INCE published a review of the information on national-level approaches to control of environmental noise (11). The report revealed that apart from a partial harmonisation in the EU national approaches to control of community noise are vastly different. Differences included:

- Category of legislative documents;
- Nature of each document (emission or imission\*);
- Requirements for existing situations (retrofit), new installations, or both ;
- Measure of exposure to noise for each noise source and its measurement method;
- Noise assessment method;
- Assessment of time intervals.

The time-averaged, A-frequency weighted sound level is the most common descriptor of noise imission\*. The control of noise at the source through limits on noise emission is considered to be the most economic and technically feasible approach to controlling noise in urban areas.

In November 2012 I-INCE published a report of its Technical Study Group 1 on outdoor recreational noise (12). “The aim of this report is to increase awareness of the effects of recreational noise and to suggest strategies that may be used to ameliorate the situation prevalent in many countries today” (12, page 2). An additional aim was to provide practical advice on noise mitigation from major motor sport activities and street racing which are an issue in some but not all countries. The report recommends the adoption of the World Health Organization guidelines for community noise for residential and noise sensitive areas.

### 2.3 European Environment Agency

The European Environment Agency (EEA) has established the EEA Expert Panel on Noise (EPoN) to

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\* We use the writing ‘imission’ instead of ‘imission’ in order to align writing and pronunciation.

support the European Commission in the implementation and development of an effective noise policy for Europe. In October 2010 the EEA published the outcome of work by the EPoN as a good practice guide on noise (13). EPoN aims to build upon tasks delivered by previous working groups, particularly regarding Directive 2002/49/EC on Environmental Noise (END), which relates to the assessment and management of environmental noise. The main purpose of the good practice guide is to present current knowledge about the health effects of noise. The emphasis is to provide stakeholders with practical and validated tools to calculate health impacts of noise in strategic noise studies such as the action plans required by the END or any environmental impact statements. The good practice guide is intended to assist policymakers, competent authorities and other interested stakeholders in understanding and fulfilling the requirements of the END.

The EEA has updated and improved its Noise Observation and Information Service for Europe (NOISE) database (14). It now contains noise exposure data for agglomerations, major airports, major railways, and major roads in EEA member countries from 2007 to December 2012. The data can be viewed in a user-friendly interactive map tool or can be downloaded in a variety of formats. For the first time, the map viewer also displays local noise contour maps for selected areas. Compiling information from 19 of the 32 EEA member countries, the NOISE database represents a major step towards a comprehensive pan-European service. Users of the NOISE database can view the extent of data reported in accordance with the END on a colour-coded map.

In 2012 the EEA published a handbook (15) on the delivery of data in accordance with the END. The handbook includes updates to ensure compatibility with the Reportnet system for data delivery (16). Annexes provide specific guidance for major roads, railways, airports and agglomerations; strategic noise maps, action plans and data collection; noise limit values and noise control programmes.

In 2013 the EEA has launched the most comprehensive map of noise exposure in Europe (17). It shows the extent to which European citizens are exposed to noise. Estimations indicate that half of the population in urban agglomerations with more than 250,000 inhabitants are exposed to levels above  $L_{den} = 55$  dBA. Over 41 million Europeans endure excessive noise from road traffic alone in the largest cities.

## 2.4 European Network on Noise and Health

As described on their web site (18), “The ENNAH (European Network on Noise and Health) network was funded by the European Union’s 7<sup>th</sup> Framework Programme ... to establish a research network of experts on noise and health in Europe. The network brought together 33 European research centres to establish future research directions and policy needs for noise and health in Europe. The Network focussed on the study of environmental noise sources, in particular transport noise, as well as emergent sources of noise such as noise from wind farms and low frequency noise. The network has facilitated high level science communication and encouraged productive interdisciplinary discussion and exchange.” In 2013 the Final Report of the ENNAH Network was published (19). The Network aimed to support research-based policy making. It examined a range of issues including how to:

- make current noise maps more useful for public health research;
- develop innovative exposure measurement techniques in future noise and health studies;
- jointly study air pollution and noise;
- establish research partnerships among young and older noise and health researchers;
- improve estimates of the burden of disease from exposure to environmental noise; and
- develop skills in health impact assessment for transport-related noise exposure.

ENNAH has outlined recommendations for research to strengthen the evidence base on:

- exposure-response relationships for hypertension and coronary heart disease related to environmental noise by using robust study designs
- the associations between environmental noise and children’s cognitive abilities;
- establishing whether interventions to reduce environmental noise do reduce its impacts on health; and
- assessing where new investment in noise research should be placed.

## 2.5 European Union

The European Commission (EC) strives to improve noise policies across the European Union (EU) with most of these efforts addressing issues related to the END (20). Considerable scientific and government support helps the EC to achieve its objectives. The main website of the EU policy on environmental noise provides the range of EC Directorate General Environment activities related to noise policies (21).

The European Commission contracted the Dutch consultancies Milieu Ltd., Risk and Policy Analysis Ltd. and TNO to review the implementation of the END. The review project entailed three tasks and ran from December 2008 until May 2010. These tasks are summarised in the project’s objectives:

1. To review the implementation of the key provisions of the Directive by the 27 Member States and develop proposals for the amendment of the Directive, if considered appropriate;
2. To provide a comprehensive review of measures employed to manage environmental noise from key sources in the Member States; and

3. To develop an Action Plan outlining further implementation strategies and Community action on environmental noise, if considered appropriate.

Three reports (22, 23, 24) have been produced on these tasks and can be accessed on the website of the European Commission (21).

Preliminary estimates of the burden of disease due to noise exposure indicate that at least 1.685 million disability adjusted life years are lost annually in the EU, mostly due to traffic noise, and this amounts to around 0.35 per cent of Gross Domestic Product (9). In 2011, the EC published a report on the implementation of EU's environmental noise policy and organised an on-line consultation on the report in 2012 (25, 26). The consultation gathered stakeholders' views on the information provided in the report and the effectiveness, strength and weaknesses of EU environmental noise policies.

## 2.6 International Civil Aviation Organization

In the fall of 2007, the Committee on Aviation and Environmental Protection (CAEP) of the International Civil Aviation Organization (ICAO) held a workshop in Montreal, Canada, titled "Assessing Current Scientific Knowledge, Uncertainties and Gaps in Quantifying Climate Change, Noise and Air Quality Aviation Impacts". As described in the final report from the noise panel at this Workshop (27), "The CAEP process of assessing aircraft noise impacts is primarily based on the number of people exposed to significant noise as measured by day-night sound level, or DNL, which is not an assessment of impacts per se. This approach of quantifying people exposed should be modified to focus more specifically on the health effects or outcomes of aircraft noise exposure." Furthermore the report states: "There are currently well-documented exposure-response relationships for a number of health effects, which can be applied presently by CAEP to the overall aircraft noise assessment process, except for sleep structure and coronary heart diseases. However, because air traffic has evolved from fewer operations with loud aircraft to more frequent operations with quieter aircraft, an update to exposure-response curves may be needed to better reflect current and projected air traffic operations." The Workshop in Montreal also noted that the applicability of and ability to generalize existing noise effects research data and related exposure-response relationships and thresholds to all countries is questionable and must be addressed. Considerable additional information may be obtained from this important report with respect to air quality and climate.

In continuation of their work, the CAEP experts agreed on a new noise standard seven EPNdB\* (Effective Perceived Noise level) below ICAO's current Annex 16, Volume 1 Chapter 4 noise limit for new-design and for in-use lighter aircraft (28). CAEP experts also agreed to a lower noise limit for subsonic jet airplanes with take-off mass below 8.618 tonnes. They also decided on a new noise standard for Tilt-Rotor aircraft to be the same as that existing for helicopters. In addition, CAEP developed medium- and long-term goals to reduce noise from turboprop, turbofan and new-design aircraft (28).

## 3. ACTIVITIES IN COUNTRIES

### 3.1 United Kingdom

The United Kingdom, in particular the Interdepartmental Group of Costs and Benefits, Noise Subject Group (IGCB(N)), continued to make significant contributions to the noise effects research and noise policy-making activities in the last five years. In August 2008 the IGCB(N) published the first report on the economic valuation of noise pollution (29). Initial estimates suggested that annoyance costs lyannual amount to £ 3 – 5 billion, costs of adverse health impacts were approximately £ 2 - £3 billion and productivity losses another £2 billion annually, totalling £7 - £ 10 billion per year. Two years later an Ad Hoc Expert Group was established and discussed the available evidence relating to the effects of environmental noise on health. The report of the Group asserted that many people in the UK "are affected, some seriously, by exposure to environmental noise" (30). The report recommends the establishment of a research programme in the UK on the effects of environmental noise on health. It also emphasizes the need for noise and health issues to be taken into account in noise policies.

In the same year a key publication relating to Noise and Health, with implications for economic valuation, and for noise policy in general appeared on the website of the Department for Environment, Food, and Rural Affairs (DEFRA; 31). This publication was a project to undertake a review of research into the links between noise and health. The four key aims of this project were to identify:

- The most likely adverse health impacts from noise and review the current state of evidence for each of the impacts;
- Emerging adverse health impacts that should be kept under review for future consideration in evaluation;
- Structural challenges to developing robust exposure-response functions; and

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\* The EPNdB is a measure of human annoyance due to aircraft noise, taking into account the perceived noise level and duration. It is  $EPNdB = dB(A) + 13$

- Recommendations for robust exposure-response functions, which could be applied for policy action in the UK.

The report has been split into two reports – a background and summary report and a technical report with full details. Since these reports represent the view of the authors, the IGCB(N) has published a report titled “Noise & Health – Valuing the Human Health Impacts of Environmental Noise Exposure” (32). The purpose of this paper is “to establish evaluation methodologies to reflect the available evidence quantitatively, and where possible, to inform policy decisions through appraisal”.

In March 2010 the DEFRA published the Noise Policy Statement for England (33). This document sets out the long-term vision of government environmental noise policy to promote good health and quality of life through the management of environmental noise. The policy represents an important step forward, by helping ensure that environmental noise issues are considered at the right time during the development of policy and decision making. It highlights the underlying principles on environmental noise management already existing in legislation and guidance.

The purpose of Noise Action Plans (34) is to assist in the management of environmental noise and its effects, including noise reduction if necessary, in the context of government policy on sustainable development. To date, the Secretary of State for Environment, Food and Rural Affairs has formally adopted Noise Action Plans for 23 agglomerations (large urban areas), major roads, and major railways in England as of 15 March 2010. The Action Plans represent a strategic approach to and set out a direction for managing environmental noise. They do not propose any specific noise mitigation measures at this stage. It is intended any such measures will be identified and agreed at a local level. Responsibility for implementing the plans will fall on those authorities, which are responsible for generating the noise (road, rail and air infrastructure), including industrial noise in urban agglomerations.

In 2011 DEFRA published a report titled “The Economic Value of Quiet Areas” (35) as requested by the END and the Natural Environment White Paper (36). Using a willingness-to-pay approach the total use value for visits to quiet areas for England as a whole is estimated to lie somewhere between £19.02 million and £1.4 billion per year.

Since the publication of the Natural Environment White Paper in 2011, DEFRA has published periodic Natural Environment White Paper Implementation Update Newsletters (37). The newsletters highlight significant progress since the last update.

In 2011 DEFRA asked the Transport Research Laboratory to prepare a report on the effects of environmental noise on productivity (38). The report was not able to quantify the economic impacts of environmental noise on productivity.

In the same year DEFRA also published a report on the monetary quantification of selected environmental noise-related health impacts (39). The Quality Adjusted Life Years lost to acute myocardial infarction, stroke and dementia due to road noise exposure in agglomerations inhabited by 43% of the population, were valued at £1.1 billion annually; those due to railway noise levels amounted to £43 million annually.

In 2012 DEFRA commissioned a project, which examined the effectiveness of a number of noise policy measures introduced since 1960 in reducing the impact of noise problems that they were intended to address (40). This was to inform the delivery of the Noise Policy Statement for England (NPSE) which applies to three categories of noise – environmental noise (e.g., from transport), neighbour noise (e.g., from habitants of houses and flats), and neighbourhood noise (e.g., from premises used for industrial or leisure purposes) (41). Measures examined were: aircraft and road vehicle noise emission limits; building regulations relating to sound insulation; noise nuisance and control legislation; and controls on construction noise. The study found the following results (41):

- Aircraft noise within the 57dBA Leq 16 hour contour had reduced by 87% (Heathrow) and 78% (Gatwick) from 1972 to 2009 despite growth in aircraft movements. The reductions were smaller than expected for other airports where data were only available for later years.
- Road traffic noise was found to have fallen by 2 dBA on motorways and 5dBA for A roads and minor roads between 1971 and 2010 despite high traffic growth especially on motorways.
- Compliance with building regulations has increased; although statutory noise nuisances have increased over time it is likely that the legislation has enabled intervention and resolution, which would not otherwise have occurred.

Based on information from noise mapping, DEFRA developed and published in 2013 and 2014 a number of noise action plan publications including:

- Noise Action Plan: Agglomerations (42, 43);
- Noise Action Plan: Roads (Including Major Roads) Environmental Noise (England) Regulations 2006 (as amended) 2014 (44);
- Noise action plan for railways (including major railways) (45);
- Implementation of round 1 action plans: progress report (46);
- Guidance for airport operators to produce noise action plans (47);
- Consultation: draft noise action plans (48).

### 3.2 United States of America

Federal agencies, such as the Federal Aviation Administration, Department of Housing and Urban Development and the Department of Transportation continue to have active programmes on environmental noise research and mitigation. In spite of this, there have been very little major improvements or modifications of U.S. noise policies in recent years. However, a new national programme titled “Towards a Quieter America” has recently been initiated to achieve a perspective shift, organize and mobilize stakeholders (government, academia, healthcare, engineers, educational institutions, industry), and achieve evidence-based, incremental improvement in environmental noise policies (49, 50). A seven-phase approach includes the identification and education of the various stakeholders (Congress members; federal agencies; state and local agencies; private sector, including NGOs, professional societies, research institutions, and industry groups; the media; and the public. Another objective of the programme is to organize and support teaching, research and development related to environmental noise, its effects on public health, and to technologies for monitoring and management. The final objective is to assist in ensuring the achievement of changes in environmental noise policy. This programme will include an ongoing series of workshops, roundtable discussions and briefings of stakeholders in Washington, DC.

The primary basis for the broad national campaign was the 2010 publication of “Technology for a Quieter America” by the National Academy of Engineering (51). This report identified and characterized the most common sources of environmental noise, and discussed efforts that have been made to reduce noise emissions and mitigate the noise exposure of people in various environments. The report also reviewed the standards and regulations that govern noise levels and presented information on the cost-benefit trade-offs between efforts to mitigate noise and the improvements they achieve. Information sources available to the public on noise challenges and their mitigation, and the need to educate professionals are also considered.

The International Council of Academies of Engineering and Technological Sciences (CAETS) through the CAETS Noise Control Technology Committee held a workshop entitled “The design of low-noise vehicles for air, road, and rail transportation” in 2008, including nine international academies, and a forum entitled “Second CAETS forum on worldwide noise sources”, in 2009. Findings include (52):

- Vehicle noise emissions are a global issue and are the predominant sources of environmental noise.
- Aircraft technology is fully globalized while road vehicle technology is partially globalized.
- Advanced rail vehicle and track technology is well developed in Europe and Asia.
- Environmental noise generated by industrial equipment and consumer products are also part of the global noise issue.

In 2012, the US Department of Transport (US DoT) published the *High-Speed Ground Transportation Noise and Vibration Impact Assessment* (53). This document provides guidance and procedures for the assessment of potential noise and vibration impacts and mitigation measures resulting from proposed high-speed ground transportation (HSGT) projects with train speeds of 90–250 mph.

In 2013 the US National Academies Press published a document on the protection of National Parks’ soundscapes, based on a meeting held in 2012 (54), which focused on the scope for reducing operational noise within parks. Cost effective options identified included: monitoring noise levels; raising staff awareness; better maintenance and purchasing practice. The results of the workshop were more qualitative than quantitative.

### 3.3 Japan

Activities in Japan over the past five years include the revision of the “Environmental Impact Assessment Law”, designed to prevent serious influence on environment by large-scale developments. To strengthen the Environmental Impact Assessment Law, which was enacted in 1997, a minor amendment was made in April 2011, in which the concept of “strategic environmental assessment” has been included. In the end of 2007, the Ministry of the Environment revised the Guideline of Environmental Quality Standard (EQS) for Aircraft Noise to use  $L_{den}$  instead of WECPNL (11). Revision of a manual for measurement and evaluation of aircraft noise followed it in 2009 (55). The guideline was enforced from 2013, April. Japan is also currently working on improved noise policies for the following topics:

- Noise from the high-speed railway (Shinkansen), reducing the “tunnel boom” through a long nose design, aerodynamic sounds by absorbing materials, and vibrations through a full active suspension and body tilting system (56);
- Revision of the Aircraft Noise Prevention Law (55);
- Research on sleep disturbance due to noise exposure (57);
- National policy for wind turbine noise (58);
- Methods for evaluating the effects of military aircraft noise and artillery noise on educational facilities and hospitals (59);

### 3.4 Vietnam

The problem of transport noise in its cities has been only relatively recently recognised in Vietnam (60). Environmental noise management developed only after 2000. Activities in Vietnam during 2008-2013 include the 'National Technical Regulations of Noise' of 2010, which regulate the permitted sound pressure levels in special zones (health facilities, libraries, kindergartens, schools, churches, temples, pagodas) and common areas (residential areas, hotels, motels, administrative agencies) (61). In special zones the permitted sound pressure levels are 55 dBA during daytime (6 am to 9 pm) and 45 dBA during night time (9 pm to 6 am). In common areas the permitted sound pressure levels are 15 dBA higher during daytime and 10 dBA during night time. Sound pressure levels are monitored by applying ISO 7878-1:2008 and ISO 7878-2:2010.

In the same year the 'National Technical Regulations on Vibration' were also promulgated (62). This decree regulates the permitted levels of vibration-generated acceleration due to construction activities. In special zones the acceleration should not exceed 75 dB during day time (6 am to 6 pm) and comply with background levels during evening and night time (6 pm to 6 am). The same level applies for common areas during daytime, defined as 6 am to 9 pm, and night time (9 pm to 6 am). The maximum levels of acceleration due to vibration from non-construction sources are limited to 60 dB in special zones and 70 dB in common areas during daytime (6 am to 9 pm) and to 55 dB in special zones and 60 dB in common areas during night time (9 pm to 6 am). The relation between the vibration  $v$  in [dB] and the acceleration  $a$  in [ $\text{m/s}^2$ ] is provided by  $v = 9.0347 \cdot \ln(a) + 101.4$ .

The Decree 29/2011/ND-CP of 18 April 2011 regulates in chapter II for a number of projects the subject and form of, time for, and contents of the strategic environmental assessment (SEA) reports, the requirements and procedure for the appraisal of the SEA reports, and the responsibilities of the project owners after the appraisal (63). Similarly for projects subject to an environmental impact assessment (EIA), the contents and requirements of the EIA, the consultation process and publicity of information are regulated in chapter III of this decree. In Appendix I to the decree the strategic projects and master plans subject to detailed SEA are listed; Appendix II lists 146 projects subject to EIA. For projects with nature, size and capacity outside the latter list or below the level set in the list the contents of, time for, the registration process for a written environmental protection commitment and the project owner responsibilities are formulated in chapter IV of the decree. A final chapter V regulates the provisions for implementation.

## 4. CONCLUSIONS

Substantial progress has been made during 2009-2013 in the understanding of the health impacts of environmental noise exposure, exposure-response relationships and control measures in developed countries. International organizations have compiled the evidence and given advice on how to mitigate the impact of environmental noise. The WHO Regional Office for Europe has complemented its Guidelines for Community Noise with the Night Noise Guidelines and estimated the European burden of disease due to environmental noise exposure. I-INCE has provided practical advice on noise management strategies for stakeholders involved with environmental noise management, published a review of the information on national-level approaches to control of environmental noise, and addressed the challenge of exposure to recreational noise. The EEA published a handbook on the delivery of data in accordance with the END, a good practice guide on noise, and has updated and improved its NOISE database. The ENNAH established a research network of experts on noise and health in Europe, which has facilitated high-level science communication and encouraged productive interdisciplinary discussion and exchange. The EC published a report on the implementation of EU's environmental noise policy and gathered stakeholders' views on the information provided in the report and the effectiveness, strength and weaknesses of EU environmental noise policies. An expert workshop organized by the Committee on Aviation and Environmental Protection of the ICAO recognized the existence of well-documented exposure-response relationships for a number of health effects, which can be applied to aircraft noise assessment although it also noted that the applicability of and ability to generalize existing information on noise effects research and related exposure-response relationships and thresholds to all countries is questionable.

With respect to activities in countries the Department for Environment, Food, and Rural Affairs of the UK has made substantial contributions to the noise effects research and noise policy-making activities. These include several reports on the economic valuation of environmental noise exposure, the "Noise Policy Statement for England", the Natural Environment White Paper and its updates, an assessment of the effectiveness of a number of noise policy measures intended to reduce the impact of environmental noise problems, and noise action plans. The USA, after a long period of not addressing environmental noise challenges at all developed a national programme titled "Towards a Quieter America" to achieve a perspective shift, organize and mobilize stakeholders, and achieve evidence-based, incremental

improvement in environmental noise policies. Japan strengthened its Environmental Impact Assessment Law and revised the Guideline of Environmental Quality Standard (EQS) for Aircraft Noise. Japan intends to improve its noise policies on several topics including railway noise and wind turbine noise. Activities in Asian countries are scarce the most notable being those initiated in Vietnam. These include national technical regulations of noise and on vibration', and the decree on the SEA, EIA, and the environmental protection commitment.

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