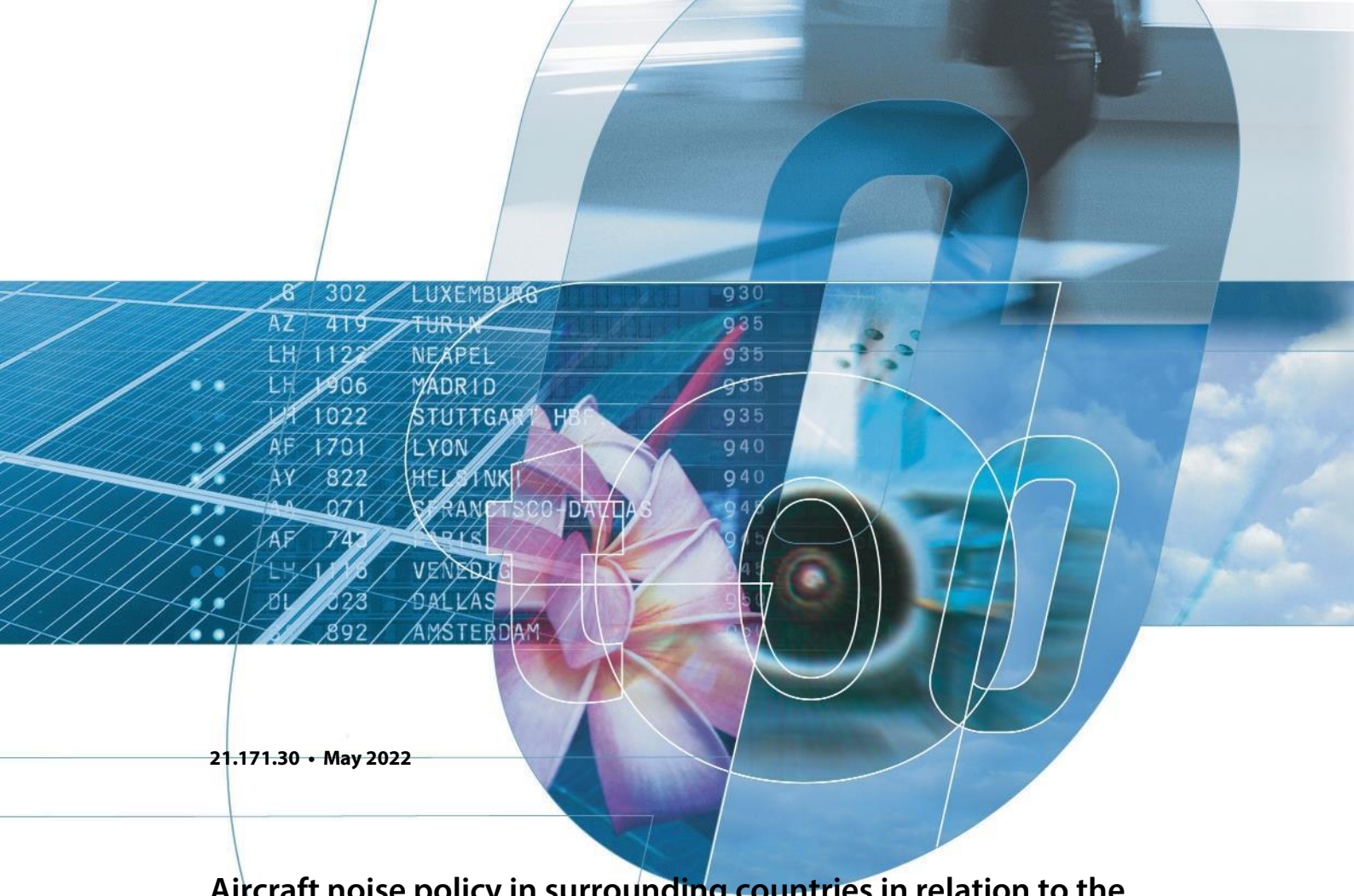

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Aircraft noise policy in surrounding countries in relation to the WHO advice on aircraft noise

Aviation Consultants

to70

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Prepared for

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Samenvatting

In de 'Environmental Noise Guidelines for the European Region' (ENG, oktober 2018) doet de Wereldgezondheidsorganisatie (WHO) de sterke aanbeveling om voor vliegtuiggeluid de geluidbelasting ter plaatse van woningen te reduceren tot onder 45 dB L_{den} en 40 dB L_{night}. Het Nederlandse ministerie van Infrastructuur en Waterstaat heeft behoefte aan meer inzicht in hoe deze richtlijnen in verschillende omringende landen zich verhouden tot de geluidregelgeving in dat land en of er ontwikkelingen in die landen zijn naar aanleiding van deze richtlijnen. Middels interviews met betrokkenen vanuit zowel overheden als luchthavens in het Verenigd Koninkrijk, Frankrijk, Duitsland, België en Denemarken en via een bureaustudie, ook wat betreft de wetenschappelijke discussie die er is over deze richtlijnen, zijn inzichten ontstaan op de volgende vier onderzoeksvragen.

Hoe ziet de geluidregelgeving voor luchtvaart er uit in een aantal omringende Europese landen?
Alle onderzochte Europese landen kennen regelgeving voor vliegtuiggeluid waarbij gebruik wordt gemaakt van bepaalde maximale waarden (die in principe niet overschreden mogen worden) en soms ook streefwaarden (waarboven maatregelen overwogen moeten worden). Tussen de landen zijn verschillen in normering (de hoogte van die waarden) en in gehanteerde indicatoren: naast of aanvullend op de door de WHO gebruikte jaargemiddelden (L_{den} en L_{night}) worden ook andere indicatoren gebruikt zoals L_{max}, NAx en het aantal vluchten.

Hoe verhouden de WHO-richtlijnen zich tot deze regelgeving?
De streefwaarden en de maximale waarden die deze landen hanteren liggen hoger dan de door de WHO geadviseerde waarde van 45 dB L_{den}. De laagste waarde waarboven maatregelen worden overwogen ('streefwaarde') is 50 dB in Frankrijk, 51 dB in het Verenigd Koninkrijk, en voor de andere landen nog hoger. Maximale waarden die niet overschreden mogen worden liggen rond 65 tot 70 dB L_{den}.

Welke ontwikkelingen zijn er in die landen op het gebied van normstelling aan luchtvaart en omgaan met ruimtelijke ontwikkelingen naar aanleiding van de WHO-richtlijnen?
Geen van de onderzochte landen heeft plannen om de geluidregelgeving aan te passen vanwege de WHO-adviezen door bijvoorbeeld (dichter) aan te sluiten bij de advieswaarden. Er zijn in meerdere landen wel plannen voor wijziging van de regelgeving voor vliegtuiggeluid. De achtergrond daarvan zijn verbeteringen in het stelsel of in de rekenmethode (UK, DK, NL), of een vastgestelde planmatige actualisatie van regelgeving (D, FR), niet de WHO-adviezen.

Belangrijke argumenten om niet aan te sluiten bij de WHO-aanbevelingen zijn:

- de discussies over de kwaliteit van achterliggende dosis-effectstudies die geleid hebben tot deze advieswaarden,
- het beschikbaar hebben van een (eigen) nationale blootstelling-responsrelatie (BR-relatie, ook wel 'dosis-effectrelatie' of 'hindercurve') en daaraan gerelateerde normering,
- praktische bezwaren omtrent het onvoldoende betrouwbaar kunnen berekenen van de geluidbelasting voor lage niveaus en op grote afstand van de luchthaven, en
- het niet bestaan van een wettelijke verplichting om WHO-adviezen door te voeren in nationale regelgeving.

Hoe wordt er door betrokkenen vanuit de wetenschap en de praktijk gekeken naar en gereageerd op de achterliggende methodiek van de WHO om tot deze richtlijnen te komen?
De wetenschappelijke discussie richt zich met name op de kwaliteit (de hardheid) van de achterliggende BR-relatie. De door WHO gebruikte BR-relatie ligt voor de meeste lidstaten hoger dan de BR-relatie die op nationaal onderzoek is gebaseerd, wat leidt tot lagere advieswaarden. De achterliggende studies waar de nieuwe BR-relatie op gebaseerd is, laten veel variatie zien, die waarschijnlijk een gevolg is van vooral niet-akoestische factoren.

Belangrijke aanpassingen bij luchthavens kunnen bijvoorbeeld ook leiden tot hogere ervaren hinder. Ook is er discussie over de selectie van datasets: zowel onderzoeken die (mogelijk) ten onrechte meegenomen zijn en het ontbreken van recentere studies. De vraag is of achterliggend onderzoek dat gekwalificeerd is als van 'gemiddelde' kwaliteit, mogen leiden tot 'sterke' aanbevelingen. Verder is er discussie over de (beperkte) aandacht die er is geweest voor kosten/baten overwegingen, de WHO-aanbevelingen zouden vooral gezien moeten worden vanuit gezondheidsperspectief, en dan nog alleen vanwege geluid.

Vanuit het onderzoek is duidelijk geworden dat de betrokken deskundigen waardering hebben voor het werk van de WHO en het transparante proces hoe ze tot deze resultaten is gekomen. De aanbevolen waarden kunnen zinvol zijn als richtwaarden voor de lange termijn. Voor de korte termijn zien ze risico's omdat deze lage advieswaarden kunnen leiden tot onrealistisch hoge verwachtingen bij burgers, terwijl er voor de overheden en de luchthavens weinig perspectief is om er aan te kunnen voldoen.

Summary

In the 'Environmental Noise Guidelines for the European Region' (ENG, October 2018) the World Health Organization (WHO) strongly recommends that the noise levels at people's homes produced by aircraft should be reduced to below 45 dB L_{den} en 40 dB L_{night}. The Dutch Ministry of Infrastructure and Water Management would like to gain more information about the WHO guidelines and if developments are taking place to change aircraft noise legislation and policy in (surrounding) countries. Based on interviews with stakeholders from both governments and airports in the United Kingdom, France, Germany, Belgium and Denmark and on a desk study, also with regard to the ongoing scientific discussion about these guidelines, insight was gained on the following four research questions.

What is the aircraft noise legislation and policy in surrounding European countries?
Each of the countries investigated have regulations for aircraft noise that make use of certain maximum values (which in principle may not be exceeded) and sometimes also target values (above which measures must be considered). There are differences between countries in the noise limits (the level of these values) and in the indicators used: besides, or in addition to the annual averages used by the WHO (L_{den} and L_{night}), other indicators are also used,such as L_{max}, NAx and the number of flights.

How do the WHO guidelines relate to these legislation and policy?
The limit and target values used by these countries are higher than the WHO-recommended values of 45 dB L_{den}. The lowest level above which measures are considered ('target value') is 50 dB in France, 51 dB in the United Kingdom, and even higher for the other countries. Maximum never-to-exceed values are around 65 to 70 dB L_{den}.

What developments in changing aircraft noise legislation and policy are taking place in these countries in response to the WHO guidelines?
None of the countries studied has plans to adjust the noise regulations because of the WHO recommendations, for example, by reducing the limits (closer) towards the recommended levels. There are plans in several countries to change the regulations for aircraft noise. The background to this is for example better legislative structure or improvements to the noise assessment calculation methods (UK, DK, NL), or a process of regular legislative reviews and updates (D, FR), and not the WHO guidelines.

Important arguments for not implementing the WHO recommendations are:

- the discussions on the quality of underlying exposure-response studies that led to these recommended values,
- having available a (own) national exposure-response function (ERF, also 'dose-response relation') and related standards,
- practical objections regarding the reliability of noise calculation for low noise levels and at a larger distance from the airport, and
- the fact that there is no legal obligation to implement WHO recommendations in national regulations.

What is the latest insight in the scientific debate by scientist and practitioners to the methodology used by the WHO to come up with the guidelines regarding aircraft noise?
The scientific discussion focuses in particular on the quality (the solidity) of the underlying ERFs. The ERF used by WHO is higher for most countries than the ERF based on national research, which leads to lower thresholds. The underlying studies on which the new ERF is based show a lot of variation, which is probably a result of mainly non-acoustic factors. For example, important changes to airports can also lead to higher annoyance ratings. There is also discussion about the selection of datasets: both studies that were (possibly) wrongly included, and the fact that more recent studies could not yet be included. A question is whether underlying research that is qualified as of 'moderate' quality should lead to 'strong' recommendations.

Furthermore, there is discussion about the (limited) attention that has been paid to cost/benefit considerations, the WHO recommendations should mainly be seen from a health impact perspective, and then only due to noise.

It has become clear from that the experts interviewed value the work done by the WHO, the scientific process that was followed and the transparent way in which they have presented their results. The recommended levels are regarded by some as a helpful target to aim for in the long term. In the short term they see risks, because these

low recommended values may raise unrealistic expectations with the general public and citizen's associations, while there is little perspective for governments and airports to actually being able to meet these.

1. Introduction

The World Health Organization (WHO) Regional Office for Europe published their Environmental Noise Guidelines for the European Region in 2018 [1]. In the Netherlands, the Dutch Ministry of Infrastructure and Water Management is currently in the process to determine if and how these guidelines are transposed to national policy and legislation. The Dutch Ministry of Infrastructure and Water Management would like to gain more information about the WHO guidelines and if developments are taking place in changing aircraft noise legislation and policy in (surrounding) countries. This report contains the results of a study about aircraft noise policy in countries surrounding the Netherlands, in relation to the WHO guidelines on aircraft noise. This study has been performed by To70 and M+P commissioned by the Dutch Ministry of Infrastructure and Water Management.

1.1 Research objective and questions

The Dutch Ministry of Infrastructure and Water Management would like to have a better understanding how the WHO guidelines (regarding aircraft noise) in various surrounding countries relate to the noise regulations in that country and whether (and if yes, which) developments are taking place in those countries to use the WHO guidelines to strengthen national legislation or policy. In order to meet the research objective, a study answering four research questions has been performed:

1. What is the aircraft noise legislation and policy in (surrounding) European countries?
2. How do the WHO guidelines relate to these legislation and policy?
3. What developments in changing aircraft noise legislation and policy are taking place in (surrounding) European countries in response to the WHO guidelines?
4. What is the latest insight in the scientific debate by scientist and practitioners to the methodology used by the WHO to come up with the guidelines regarding aircraft noise?

1.2 Methodology and scope

The study has been performed using the following methodology:

1. Collect the latest noise legislation and policy from the different countries, using public information and request for information within our network. This noise legislation and policy is summarised and the results have been verified by the experts from the country concerned with whom we are in contact for the fourth part of the study (interviews with experts from surrounding countries).
2. Based on this analysis, we have interpreted how these noise legislation and policy relate to the WHO guidelines.
3. We provide a description of the (discussion about the) underlying methodology of the WHO on the basis of our own expertise, the information available in various (international) papers and presentations, and the information that we have collected and provided from the discussions. We have summarised the technical-content discussions in a legible way, with conclusions regarding both the reliability and the feasibility of the WHO guidelines.
4. Within our network, we have identified experts (both from the government and the airport) per country with whom we have discussed the implementation of the WHO guidelines in their country. During this interview we gained a better understanding of the current attitude of each country towards the WHO guidelines. Are there any plans to implement the guidelines? If yes, which one? Etc. A record of each interview has been made, which (with regard to their own country) has been verified before this report was published. These records are given in Chapter 4.
5. A conclusion has been drafted to summarize the outcome of the study and answer the research questions.

The selection of the surrounding countries to include in the study has been done based on the level of representativeness for the Dutch situation (such as social-economic resemblance and size and function of the airports) from those countries which are close to the Netherlands.

1.3 Reader's guide

This report consists of 5 chapters. Chapter 2 contains the latest insight in the scientific debate about the WHO guidelines. The current legislation and policy regarding aircraft noise for each of the countries is presented in chapter 3. Chapter 4 contains the interview results (broken down per country). The conclusions derived from the scientific debate, current legislation and interviews are presented in chapter 5.

2. Debate on WHO guidelines

The WHO Regional Office for Europe published their Environmental Noise Guidelines for the European Region in 2018. For aircraft noise, the WHO recommends reducing noise levels below 45 dB L_{den} and 40 dB L_{night} to avoid significant health impacts, and to implement suitable reduction measures with a preference towards infrastructural changes. Since 2018, several publications have been made that critically evaluate the WHO's findings, both from the noise community and from the aircraft sector. To some extent, researchers involved in the Guidelines development have answered to this critique.

In a separate Annex to this report, the debate following the WHO's Environmental Noise Guidelines report, the separately published systematic reviews and the WHO's final recommendations is described and summarised. The information is a summary of several public sources, being:

1. some points of discussion brought forward by the WHO researchers themselves in their own report and publications;
2. a series of journal articles, reply's and comments initiated by Truls Gjestland in the International Journal of Environmental Research and Public Heath;
3. a second strain of discussion publications initiated by Gjestland in the Journal of the Acoustic Society of America;
4. a report published by the European region of the Aircrafts Council International.

Also included in the review are two Dutch reports by RIVM. These reports do not critically review the WHO findings, but focus on policy recommendations how the WHO Guidelines could be used in strengthening national policies about health improvement.

Disclaimer

For this report, the authors have not performed a wide literature survey to find more sources of comments supporting or challenging the WHO research and guidelines. The sources mentioned were known to the authors and it was anticipated that several of the contacts that are interviewed for this project were also aware of these publications. None of the critique below is from the authors themselves. It is as much as possible an objective summary of what was stated by various other experts in the sources mentioned above. The authors of this report have then drawn their conclusions on what relevant points remain in the end.

The focus of this research is on the research methodology of the WHO. The sources did not contain discussion on the quality of the exposure-response function per airport, although it is discussed if the methods used for each individual airport give comparable results. Delving deeper into the quality of the individual airport studies is out of scope for this research. Also not included is any discussion regarding the other noise sources in the WHO guidelines (i.e. road, rail noise, wind turbines or leisure noise).

2.1 WHO Environmental Noise Guidelines

In October 2018, the World Health Organization Regional Office for Europe published their Environmental Noise Guidelines for the European Region [1] ('ENG'), following their 1999 community noise guidelines [2] and 2009 night noise guidelines for Europe [3]. Although the guidelines focus on the European Region, the evidence base included also research from Asia, Australia and the USA.

The ENG provide separate recommendations for road, rail, aircraft, wind turbine and leisure noise. For each of these sources, a systematic review of existing evidence on noise and health was performed by the WHO researchers. Each review focuses on a particular health outcome (e.g. annoyance, sleep disturbance, cardiovascular disease) to find reliable indications of adverse health effects related to each noise source as well as the magnitude of such effects. If possible, an exposure-response function (ERF) that describes the prevalence or incidence of that health endpoint as a function of the long-term average noise level (L_{den}, L_{night}) is established. The WHO reviewers graded the quality of the evidence from **high** to **very low**.

A separate team of experts, the Guideline Development Group (GDG), has pre-set absolute or relative risk levels for each health outcome (e.g. ≤10% highly annoyed people). Based on the systematic review results and quality assessment, the GDG has then formulated recommendations, including maximum L_{den} and L_{night} levels. Each recommendation is then rated **strong**, indicating it can be adopted in most situations, or **conditional**, indicating it may not apply to all circumstances and adoption should be considered in a policy-making process with stakeholders.

Recommendations for aircraft noise

For aircraft noise, the WHO recommendations are formulated as follows:

> For average noise exposure, the GDG strongly recommends reducing noise levels produced by aircraft below **45 dB L_{den}**, as aircraft noise above this level is associated with adverse health effects.
>
> For night noise exposure, the GDG strongly recommends reducing noise levels produced by aircraft during night time below **40 dB L_{night}**, as aircraft noise above this level is associated with adverse effects on sleep.
>
> To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from aircraft in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions the GDG recommends implementing suitable changes in infrastructure.

The WHO report that contains these recommendations gives further explanation and guidance. It is stated, for instance, that "data and exposure–response curves derived in a local context should be applied whenever possible to assess the specific relationship between noise and annoyance in a given situation". It is acknowledged that the response is different from airport to airport due to a different fleet mix, night closure, frequency etc. The WHO nevertheless recommends the specific noise levels mentioned above. It is not stated that local exposure-response functions should be used to redetermine local noise limits.

The report does not recommend explicit methods to determine the exposure. The systematic reviewers mention that in their quality selection of studies to include, they assessed if the method to determine the L_{den} or L_{night} was reported and reliable or standardised. It is expected that not all studies have used the same method (i.e. Doc29) and that results using different methods have been mixed.

Annoyance

The systematic review on environmental noise and annoyance [4] revealed that for aircraft noise there is evidence that the occurrence of high annoyance (HA) increases with an increase of the L_{den}. Also, they establish an ERF from various available studies, see Figure 1. The evidence for this ERF was graded as moderate quality. The quality of each individual study is regarded high, but as there is a wide scatter between the data of the various studies, as is clear from the figure, the overall evidence quality is downgraded to moderate.

Based on the ERF resulting from the full dataset (the black line in Figure 1) and the pre-set benchmark level of maximum 10% HA, the GDG comes to the recommendation to reduce L_{den} levels for aircraft noise below 45 dB. The GDG rates this as a strong recommendation. Other health impacts related to the L_{den} were also identified, such as ischaemic heart disease or cognitive impairment of school children, but with lower quality evidence and/or starting at higher levels.

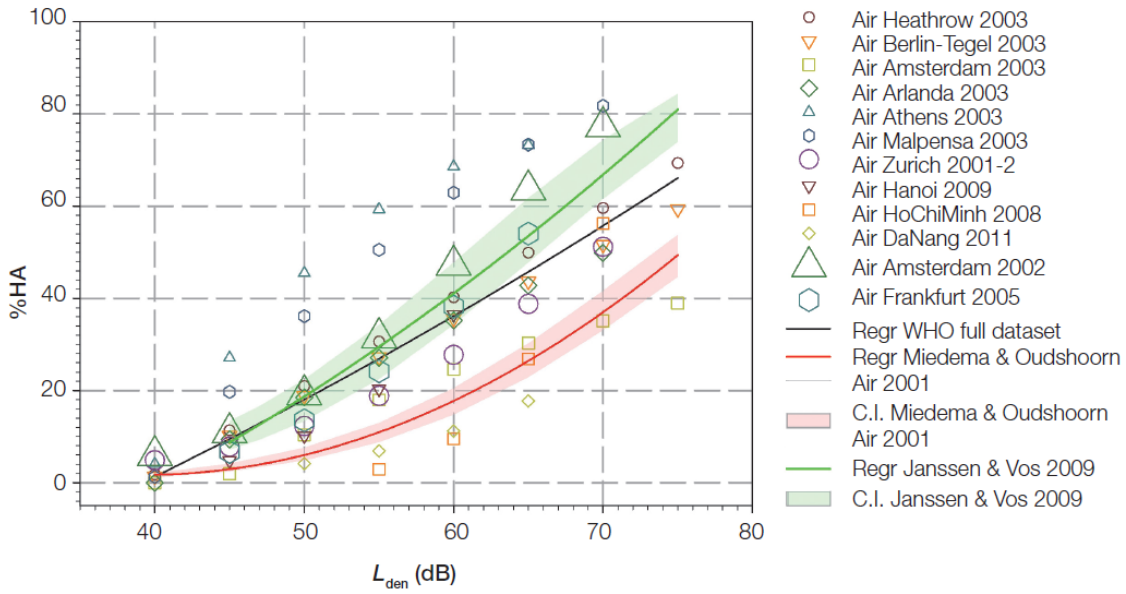

Figure 1: Exposure-response function for aircraft noise: % highly annoyed population vs. L_{den}; black line shows the ERF from the 2018 WHO guidelines, red line shows the earlier EU standard curve (Miedema & Oudshoorn), green line shows an ERF by Janssen & Vos in 2009 (figure from [1])

Sleep disturbance

A systematic review was performed for environmental noise and sleep disturbance [5]. The WHO findings have been based on studies using 'self-reporting': surveys with questions about conscious problems with falling asleep, awakening, or being able to sleep continuously. The reviewers conclude that there is evidence of an increased chance of sleep disturbance, combined from all sleep questions, with increasing L_{night} values. Also, the percentage of highly sleep disturbed (HSD) population was established as a function of the L_{night} in 5 dB classes. A second order polynomial was fitted through these data points, see Figure 2. This is not exactly the same as an exposure-response function, like for annoyance, but it is similar. The evidence was rated moderate quality. It should be noted that these L_{night} levels are outdoor noise levels at the most exposed building façade, not necessarily the bedroom façade.

Based on the polynomial function (black line in Figure 2), the GDG recommends that Lnight is reduced below 40 dB. At this level, there is still 11% of HSD, which is considerably higher than the pre-set benchmark of maximum 3%. However, calculated noise levels below 40 dB Lnight were considered to be too inaccurate for any recommendation.

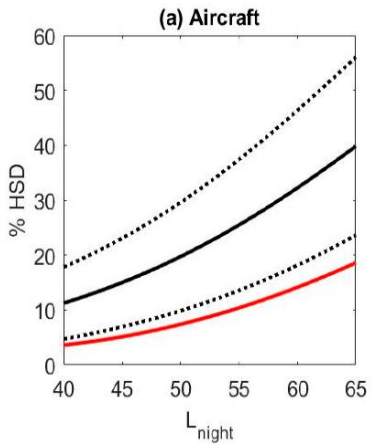

Figure 2: Percentage of highly sleep disturbed based on self-reporting, for aircraft noise vs. the Lnight in dB. Black dashed lines show the 95% confidence intervals; red line shows the ERF by Miedema and Vos in 2007 (figure from [5])

2.2 Summary of discussion

From the published discussions, several points of discussion emerge that WHO researchers agree on or where the critique is not or insufficiently disproven. Unresolved discussion points can be summarised as follows:

- the exposure-response function (ERF) found by the WHO for aircraft noise annoyance, based on evidence from 2000 – 2014, is higher than the earlier ERF commonly used in Europe since 2001. Researchers disagree as to what extent this is due to a real increase in annoyance at a given noise level or due to differences in evidence selection and analysis methods;
- the WHO evidence base for aircraft noise show considerable heterogeneity, possibly caused by severe differences in non-acoustic factors between the various studies. As the WHO report itself states, it may not be possible to determine the exact annoyance for each exposure level in a generalised situation, and evidence derived in a local context should be applied whenever possible. Also, WHO's decision to formulate 'strong' recommendations based on 'moderate' quality evidence is questioned, also by the aircraft sector;
- one important non-acoustic factor is airport changes: annoyance by aircraft noise exposure is higher at airports that have recently undergone changes (e.g. expansions, abruptly increased traffic). As the WHO evidence base contains several such 'high rate change airports', the ERF may be somewhat biased towards higher annoyance, and consequently a lower recommended L_{den} threshold;
- there is agreement that the ERF depends strongly on the selection of survey studies underpinning it. Critics challenge WHO's selection: some studies should not have been included, for various reasons of incomparability, while others should have been. Researchers seem to agree that it would be valuable to revisit this selection and to include a number of new studies that has become available in recent years;
- specifically for Dutch airports, ERFs found by RIVM from national data actually show annoyance and sleep disturbance similar to the new WHO ERF at low noise levels and higher annoyance at high noise levels. Significant differences are found between various regional Dutch airports, attributed also to non-acoustic factors;
- considerations of costs and benefits, as the WHO claims were included, have not been based on thorough research or objective evidence. The WHO recommendations may be regarded as being formulated primarily from a health perspective, and balancing these against economic and other societal interests is up to the policy makers.

3. Current aircraft noise legislation

Five countries of interest have been selected to perform interviews with key individuals who are dealing with the WHO guidelines for aircraft noise. These countries are France, UK, Germany, Belgium and Denmark. A desk study was performed to identify the current aircraft noise legislation within each country.

3.1 United Kingdom

In the UK the Aviation Policy Framework of 2013[1] is the guiding document relating to aircraft Noise. It stipulates that the Department for Transport (DfT) is directly responsible for noise control at the three designated airports of Heathrow, Gatwick and Stansted. Otherwise the policy is that noise is best handled by the airport itself with local authorities and the surrounding population. Any spatial planning restrictions or noise compensations schemes for all other UK airports besides Heathrow, Gatwick and Stansted are therefore managed on a local level.

The Aviation policy framework require the government to produce annual noise exposure maps for the designated airports using from 54 to 72 dB LA_{eq}, 16 hour contour. The 54 dB LA_{eq}, 16 hour daytime contour is considered the limit for significant community annoyance[2]. This limit was previously set on 57 dB LA_{eq}, but was changed to 54 dB in 2016. For the night time, the 48 to 72 dB LA_{eq}, 8 hour contour is being used. These contours are meant for monitoring purposes and to give a historic perspective on aircraft noise.

Heathrow airport reports multiple other metrics in their annual reports, including annual L_{day}, $L_{evening}$, L_{night}, L_{den}, $LA_{eq,6.5h\ night}$, N65 and N70 annual 16-hour day and N60 annual 8-hour night noise contours. The UK CAA also proposed to report overflight metrics for two scenarios: noise changes between 2006 and 2019 and noise changes between 2018 and 2019.

In October 2017, the UK government published their Consultation Response on the UK Airspace Policy. This Airspace Consultation Response states (among other things related to the metrics above) that the Government intends to make changes to the noise compensation policies. The UK Government will expect from airport operators to (among others):

- offer households exposed to levels of noise of 69 dB LA_{eq} 16 hour or more, assistance with the costs of moving;
- offer full insulation to be paid by the airport for homes within the 69 dB LA_{eq} 16 hour contour, where the home owners do not want to move (this is an additional requirement proposed in the 2017 draft Airspace Policy);
- offer acoustic insulation to noise-sensitive buildings, such as schools and hospitals, exposed to levels of noise of 63 dB LA_{eq} 16 hour or more;

The UK government also instructs local authorities and airports to use the Lowest Observable Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL) metrics when analysing changes in the noise situation. This is part of the Transport Analysis Guidance (TAG) methodology to calculate adverse effects of changes in operations.

While the National Planning Policy Framework (NPPF) requires the noise to be considered for new developments, there are no limits on aircraft noise levels. New developments in noise sensitive areas (69 or 63 dB LA_{eq} 16 hour) are therefore not explicitly prohibited.

3.2 Germany

The German Act for Aircraft Noise Protection[3] from 2007 mandates commercial and military airports to have noise protections zones. Two daytime zones and one night-time zone (if applicable). The contours are made based on LA_{eq} and Number Above Threshold (NAT) using $L_{A,max}$. The contours are made based on the average 6 months

[1] https://www.caa.co.uk/Consumers/Environment/Noise/Noise/

[2] Please note: The LAeq,16h noise metric is calculated and used differently than the Lden value. More information about converting noise metrics is available in the following study: https://www.sciencedirect.com/science/article/abs/pii/S1438463917304819?via%3Dihub

[3] https://www.bmuv.de/fileadmin/bmu-import/files/english/pdf/application/pdf/flulaermg_en.pdf

future forecast of flights movements. The night-time protection zone is created by the union of the LA_{eq} night contour with the number above threshold (NAT) with the $L_{A,max}$ values stated in the table below.

Zone	Existing civilian airfield	New/expanding civilian airfield
Daytime protection zone 1 (06:00 – 22:00)	65 dB(A) LA_{eq} Day	60 dB(A) LA_{eq} Day
Daytime protection zone 2 (06:00 – 22:00)	60 dB(A) LA_{eq} Day	55 dB(A) LA_{eq} Day
Night-time protection zone (22:00 – 06:00)	55 dB(A) LA_{eq} Night and 6 x 72 dB(A) LA_{MAX} Night	50 dB(A) LA_{eq} Night and 6 x 68 dB(A) LA_{MAX} Night

An example of a map showing the protection zones of Frankfurt Airport are displayed in figure 1.

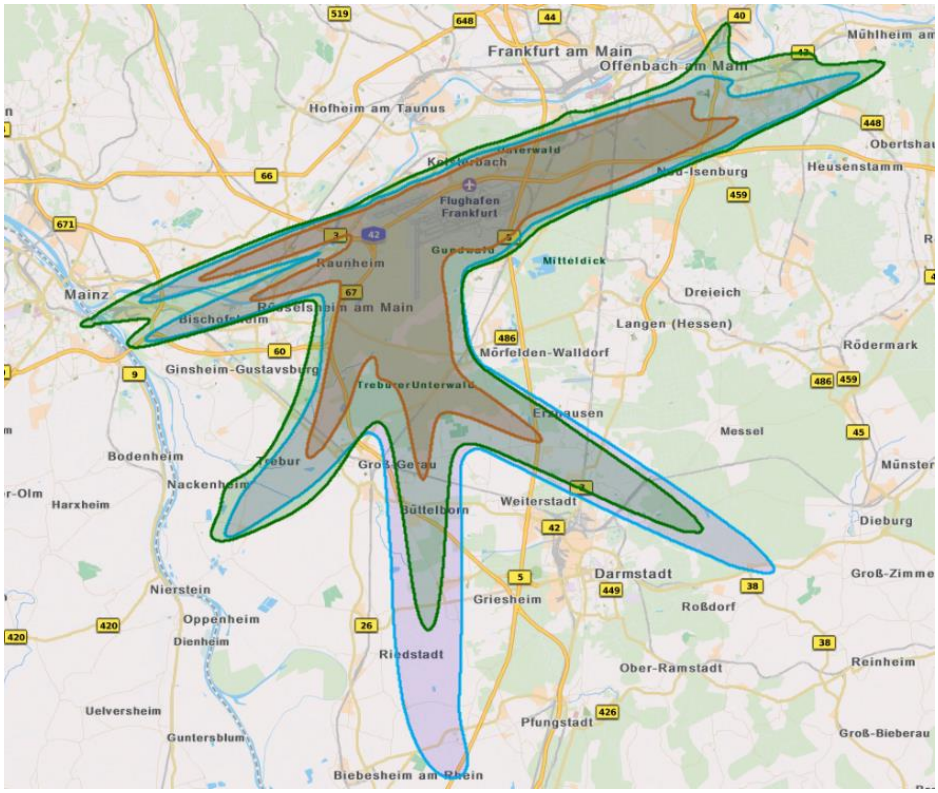

Figure 3: Protection zones at Frankfurt Airport[4]

The law stipulates how each the restrictions and rules which apply for each protections zone. For example, no hospitals or elderly care homes can be built in any of the protection zones. While the daytime protection zone 1 and night time protection zones prohibit any construction of new dwellings. For existing dwellings in the same zones, the cost of soundproofing will be covered. Houses in the night-time protection zone will get compensation for installation of a ventilation system for rooms primarily used for sleeping. There are also different compensations schemed for sounds insulation depending on the protection zone a dwelling resides in.

[4] https://framap.fraport.de/framap/main/r/isfl/go

3.3 Denmark

In Denmark, the Environmental Protection Agency (EPA) guide no. 5/1994: "Noise from aerodromes"[5] contains the legislation around aircraft noise. This guide is applicable for all airfields, airports and airbases, with the exception of Copenhagen Airport. Copenhagen Airport has been working on noise management from the 1970's, specifically focusing on land-use planning. Therefore, there are little to none residential areas situated within the 55 dB(A) L_{den} contour. The current noise exposure levels are well within the noise limits established in the 1970's.

The EPA guide is used both for environmental permits and for land-use planning. For land-use planning, the EPA designate a noise zone around an airport, where the noise level exceeds the recommended noise limit. The table below contains an overview of recommended noise limits for airports and airfields in Denmark. The EPA makes a distinction between limits for airfields (often small and non-commercial) and airports and airbases.

Restriction	Airfield	Airport, Airbase
Residential areas and noise-sensitive buildings for public purposes (schools, hospitals, nursing homes, etc.)	45 dB L_{den}	55 dB L_{den}
Scatter settlements in rural areas	50 dB L_{den}	60 dB L_{den}
Hotels, offices, etc.	60 dB L_{den}	60 dB L_{den}
Recreational areas with accommodation (Summer houses, camping sites, etc.)	45 dB L_{den}	50 dB L_{den}
Other recreational areas without accommodation	50 dB L_{den}	55 dB L_{den}

3.4 France

In France, the *L'Autorité de contrôle des nuisances aéroportuaires (ACNUSA)* is an independent administrative authority (created by Law No. 99-588 of July 12, 1999) responsible for controlling all the measures to reduce nuisance of aviation. ACNUSA can issue recommendations on any question relating to environmental nuisances on and around airports and has a duty to inform stakeholders (particularly local residents) about aircraft noise. In addition to its powers over all civil airports, it has specific powers over 12 main platforms and 4 aerodromes and the power to sanction airlines.

Beside the ACNUSA there are also other plans and regulations in place in place for noise management purposes:

- Plan d'exposition au bruit (PEB)
- Plan de Gene Sonore (PGS)
- Carte stratégique de bruit, implementing directives 2002/49/CE and 2015/996 and 2020/367
- Courbe d'environnement sonore (CES)

Figure 4: ACNUSA activities

The Plan d'exposition au bruit (PEB) contains spatial planning restrictions (Zone A, B, C and D) for three types of airports. The zones are derived from medium and long term development (15-20 years) scenario's and each zone has specific L_{den} values. The zones are established by the 'prefecture' (region) and DGAC including a local consultation and ACNUSA for the bigger airports (more than 20.000 movements).

[5] https://eng.mst.dk/air-noise-waste/noise/recommended-noise-limits/noise-zones/airport-and-airfield-noise-zone/

	Zone A	Zone B[9]	Zone C	Zone D[9]
Cas général	$L_{den} \geq 70$	$70 > L_{den} \geq (62 \text{ à } 65)$	$(62 \text{ à } 65) > L_{den} \geq (55 \text{ à } 57)$	$(55 \text{ à } 57) > L_{den} \geq 50$
Aérodromes visés à l'article R.112-2 du code de l'urbanisme	$L_{den} \geq 70$	$70 > L_{den} \geq (62 \text{ à } 65)$	$(62 \text{ à } 65) > L_{den} \geq (52 \text{ à } 57)$	$(52 \text{ à } 57) > L_{den} \geq 50$
Aérodromes militaires listés par arrêté[10]	$L_{den} \geq 70$	$70 > L_{den} \geq (62 \text{ à } 68)$	$(62 \text{ à } 68) > L_{den} \geq (55 \text{ à } 64)$	$(55 \text{ à } 64) > L_{den} \geq 50$

The Plan de Gene Sonore (PGS) contains three zones for isolation measures at the bigger airports. The isolation zones are similar to zone A and B from the PEB.

To align with the European directives 2002/49/CE and 2015/996 and 2020/367, a noise action plan containing charts (Carte stratégique de bruit) is made for airports with more than 50,000 movements a year. This noise chart is based on the previous year or forecast based on the current situation if the year is not representative.

The evolution of noise at airports is also monitored in the Courbe d'environnement sonore (CES). It uses similar information as the Carte stratégique de bruit (55 dB(A) L_{den}) and provides information to those interested in the evolution of aircraft noise

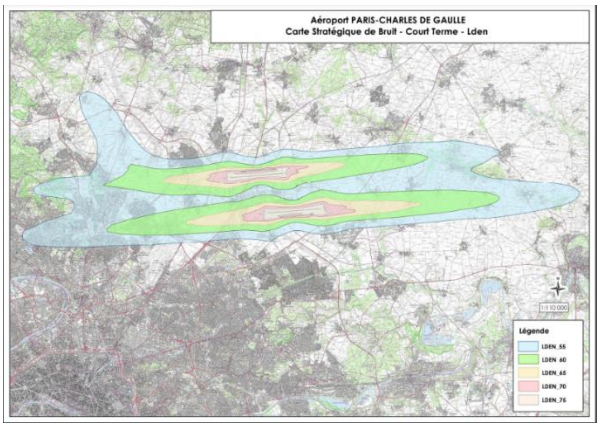

Figure 5: Carte stratégique de bruit for Paris CDG

3.5 Belgium

Belgium has multiple governing bodies, since the country is divided into three regions: Flanders, Wallonia and Brussels. The Flanders Environment Agency (VLAREM) is responsible for the development and monitoring of aircraft noise policy and legislation for Belgium's biggest airport, namely Brussels Airport.

Within the VLAREM noise policy, a destination is made in types of airports. Class 1 airports (airports with a runway bigger then 800 meters) are required to calculate and report the following noise exposure contours:

- 55, 60, 65, 70 en 75 dB(A) L_{den} (including number of severely annoyed people);
- 55, 60, 65, 70 en 75 dB(A) L_{day} (time period from 07:00 till 19:00);
- 50, 55, 60, 65, 70 en 75 dB(A) $L_{evening}$ (time period from 19:00 till 23:00);
- 45, 50, 55, 60, 65 en 70 dB(A) L_{night} (time period from 23:00 till 07:00).

This information (or a part of this information) is also required for the noise action plans (European directives 2002/49/CE and 2015/996 and 2020/367) that Brussels Airport must submit to the European Commission. Brussels Airport also needs to calculate and report additional N60 and N70 (number above frequency contours) noise exposure contours as part of their environmental permit.

The noise policy and legislation of the Walloon government is more aligned with the French government. For example, Liege Airport uses the same noise zone definitions as used by the French government.

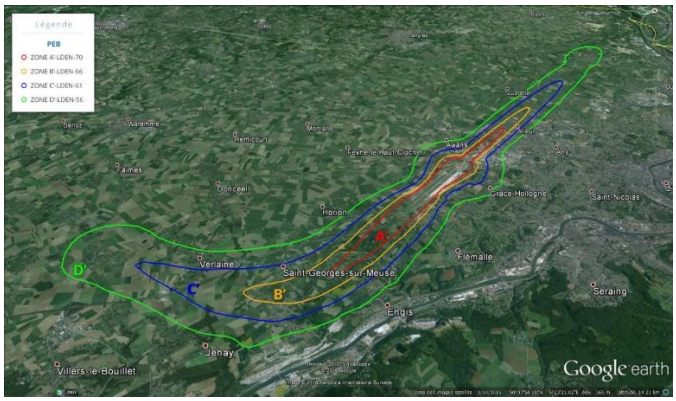

Figure 6: Liege Airport noise zones[6]

4. Interview results

A representative from the government and airport from each country have been selected through our network. Interviews were conducted to acquire a reflection of the current view on the WHO guidelines for each country. This chapter contains the records of these interviews, divided per country and per viewpoint (governmental representative and airport representative).

4.1 United Kingdom

For the UK, interviews have been performed with an expert from the Department of Transport (representing the UK government) and an expert from London Heathrow airport (representing the aviation industry).

UK Government

The foundation of current UK aircraft noise legislation dates back to the Civil Aviation Act of 1982. Currently the 2013 Aviation Policy Framework is the main guiding document, but policy is somewhat dispersed across different documents. A process is currently ongoing to bundle policy and guidance into a single piece; this is expected to finish in 1 – 2 years. A great variety of noise metrics are used for different purposes: daytime and night-time periods, overflight metrics, $L_{Aeq,16h}$ and L_{den}, number of flights above a certain level (NAx). Government, airports and stakeholders are also discussing the development and introduction of 'noise envelopes'[7].

To assess impacts and support cost/benefit-based decisions on developments and noise measures, UK uses the TAG system (Transport Analysis Guidance), which includes monetisation values to quantify noise effects. The noise level considered to be the onset of significant adverse health effects is 54 dB $L_{A,eq,16h}$ (lowered from 57 dB in 2017). The LOAEL (Lowest Observed Adverse Effect Level) was set at 51 dB $L_{A,eq,16h}$ in 2017 and is the level at which noise must be assess for airspace changes. Also, the monetary values attached to each dB-level are being reviewed. This process is led by DEFRA's Costs and Benefits Noise Subject Group, IGCB(N). The WHO Guidelines are seen as one source of input for this process. UK also have their own, national Survey of Noise Attitudes (SoNA), which was done in 2014 – 2017. It is preferred, as also stated in the WHO Guidelines, to use local exposure-response functions rather than the generic EU-curves. As the WHO's exposure-response function is based on international studies, UK government arguments that it cannot be automatically adopted for UK airports. The WHO Guidelines publication did help to trigger the government to commission a new update to the SoNA study, which it is expected will be conducted by 2023.

One particular problem with the WHO recommended 45 dB L_{den}, as put forward by the Civil Aviation Authority, is the expected modelling uncertainty at such low levels and, particularly for Heathrow, such great distances from the airport. This is a fundamental and important issue, as huge numbers of buildings and costs are involved in such a great area.

[6] https://www.liegeairport.com/flexport/en/map-of-noise-zones/

[7] 'Noise envelopes' define airport-specific noise boundaries in terms of number of movements, noise exposure levels, noise impacts, possibly in combination.

Heathrow airport

From Heathrow airport, it is stressed that there is a need for a specific and measurable long-term noise objective which is relevant to the local situation. This could for example take account of growth in operations and/or population, and include indicators based on desired outcomes (e.g. health, social, economic). This is more likely to resonate with stakeholders if it includes outcomes valued by the different interest groups. Current legislation focuses on dB-values and associated population exposures, rather than on limiting or reducing health outcomes (e.g. sleep disturbance). The WHO Guidelines work has mainly focused on dose-response functions for noise, without much consideration of other factors influencing the noise impacts ('non-acoustic factors'). And the dose-response curves change every couple of years based on a new local or international study: in the UK for example ANIS (1980's), ANASE (1990's), WHO 1999, SoNA 2014-2017, WHO 2018 and potentially a new SoNA study have created a focus and debate on *the exact* quantification of the problem, rather than understanding and exploring effective management interventions. It is considered difficult to run an effective noise management program at the airport with no stable long-term goals against which to judge and assess progress. A good process would be to:

- define the metrics to be used, and how you are going to measure them;
- set a meaningful long-term objective (e.g. >10 years);
- apply the ICAO Balanced Approach in order to determine the best (most cost effective) way to reach the objective;
- monitor and improve the progress e.g. every 5 years.

There is continuous dialogue between the airport, the government and the airport communities. The 2018 WHO Guidelines were published in the middle of discussions on the Heathrow expansion. The publication added little to the ongoing conversations, because they simply added another dose response curve to the debate. They were launched without much context, which created unrealistic expectation amongst community aircraft noise action groups. The Guidelines, for instance, give no attention to the fact that more stringent aircraft noise regulations could lead to increased road/rail traffic and noise. Action groups also tend focus on one unfavourable mode. Why, for example, is a night ban common for air traffic but not for rail or road? Context and guidance from WHO to this aspect would have been helpful. There was also frustration amongst industry groups due to the limited stakeholder consultation and understanding of, or research into, effective interventions. The Guidelines offer little practical assistance to policy makers since they do not consider the feasibility of achieving the levels suggested within a sustainable transport network. Nor do they consider other WHO studies on e.g. climate change or unemployment, which may be contradictory.

Several issues were found with the noise Guidelines themselves and the underlying evidence. The effects of non-acoustic factors, for instance, are important and were not expressed in the recommendations. This is a knowledge gap. The evidence base for interventions was limited, and there has been no good and longitudinal evaluation of the effect of interventions. For example: has noise insulation for schools shown to be an effective way to reduce reading ability delays? The airport wants to know which solutions are effective, given the desired output and objective. The WHO gives no practical guidance or prioritisation. A focus on low noise levels such as 45 dB L_{den} may lead to unwanted effects near the airport for example. As the largest number of people live further away from the airport, reducing the lowest noise levels would statistically be smart, but this could go at the expense of the direct airport neighbours being exposed to the highest levels.

Developing the concept of 'noise envelopes' is considered a good example of how to collaborate with all stakeholders, and how the noise and health impacts could best be reduced whilst ensuring the sustainable development of the aviation transport network. Heathrow has advised on some specific points of research such as non-acoustic factors, cost/benefit analysis, the effects of interventions and communication. It is hoped that these will start to be addressed in the near future as research programs are developed..

4.2 Germany

For Germany, interviews have been performed with an expert from the German Environment Agency (UBA) and an expert from Frankfurt Airport (representing the aviation industry).

German Environmental Agency (UBA)

The current German aviation noise policy uses various instruments and measures which are mainly based on German Civil Aviation Law (Luftverkehrsgesetz) and the Act on Protection against Aircraft Noise (Gesetz zum Schutz gegen Fluglärm). For instance, the Civil Aviation Law obliges the operators of civil airports which are

served by airline traffic to set up and continuously operate installations for the measurement of air traffic noise near the airport. The Act of Protection against Aircraft Noise requires the establishment of noise protection areas at commercial airports as well as military airfields with the operation of jet or heavy transport aircraft. A noise protection area consists of two Daytime and one Night-time Protection Zones. In Daytime Protection Zone 1, structural noise protection measures on existing residential buildings will be reimbursed at the airport operator's expense. In the Night-time Protection Zone, the airport operator also bears the expenses for the installation of ventilation systems in bedrooms. The noise protection zones are regularly reviewed and updated every 10 years. The German Government has submitted a report on this act to the German Parliament (Deutscher Bundestag) in 2019. The report evaluates the noise protection areas, taking into account the state of noise impact research and aviation technology.

In Germany numerous studies on aircraft noise have been conducted around local airports. The Noise-Related Annoyance, Cognition, and Health (NORAH) study published in 2015 that investigated numerous airports at the same time, forms a relevant extension of the scientific foundation on aircraft noise, for example. Additionally, the WHO Environmental Noise Guidelines for the European Region published in 2018 are an essential element of scientific research to improve the noise situation in Germany. The German Environment Agency values the transparent scientific approach followed by the WHO while developing the latest guideline set. This eases the comparison of their results with other or future evidence. More specifically it regards the WHO recommendations on aircraft noise as a relevant indication that current values defined in the German Act on protection against aircraft noise need to be lowered considerably. Additionally, it was pointed out that WHO advises to use local exposure-response data if available, which might yet be more sensitive than the generalized exposure-response-functions used in the guidelines. It was also emphasized that the distinction between new/expanding and existing airports can be relevant when you look at the exposure-response-functions of noise annoyance and aircraft noise.

It was also mentioned that some elements of the WHO guidelines for environmental noise for the European Region are also evaluated critically. For example, that the WHO guidelines only consider continuous average sound pressure levels (L_{den} and L_{night}) and not single event noise indicators like Lmax. Focussing on average based metrics such as L_{den}, LA_{eq} are very useful for noise action plans, but insights into noise effects based on single event metrics are regarded as equally relevant, especially in relation to the adverse health effects of night time aircraft noise. For the establishment of noise protection zones at airports, Germany is currently combining sound pressure-based single event metrics with continuous average sound pressure level metrics. The German Environment Agency welcomes this approach and uses the WHO guidelines to further develop its mid and long-term goals on the protection against aircraft noise.

Frankfurt Airport

Frankfurt Airport has a similar view as the German government on the use of WHO guidelines within the German context or legislation:

- Frankfurt Airport mentioned that the use of the 45 dB(A) L_{den} as an upper limit for a noise protection zone is not feasible, given the very large area within these contours;
- The current German legislation on aircraft noise have been proven sound (up to the highest court);
- The noise protection zones (and noise mitigation in general) are derived from scientific research related to adverse health effects.

Frankfurt Airport further mentions that the WHO guidelines have no legal status in German law. Frankfurt Airport also addresses some of the 'practical' issues they face if they consider to implement the outcomes of the statistical approach WHO used in their study. One thing that was mentioned was the focus on which part of the surrounding population you need to protect when shifting the focus to a larger area, such as the 45 dB(A) L_{den}. As an example, Frankfurt Airport mentioned that they can easily reduce the number of people with lower dB values (such as the 45dB(A) L_{den}), but as a result might increase the number of highly annoyed people with higher dB values closer to the airport.

Frankfurt Airport also addressed the periodic updates of the noise protection zones. Frankfurt Airport want to stress that this process is highly reliant on the calculation and monitoring implications, when changing the limits of the noise protection zones. Before considering to lower the noise limits, the regulations prescribing the calculation methods first need to be updated

Frankfurt Airport also want to emphasise their continuous efforts to reduce noise and emissions within the noise protection zones. They stress that safety is their main priority, followed by optimizing the capacity and efficiency and minimizing the adverse effects for the surrounding of the airport. Frankfurt Airport mentioned that changes in the federal government (increased position of green parties) may increase the focus on minimizing the adverse effects even further in coming legislations or during periodic updates.

4.3 Denmark

For Denmark, interviews have been performed with an expert from the Danish Environmental Agency (representing the Danish government) and an expert from Copenhagen airport (representing the aviation industry). The Danish experts prepared the interview together and therefore the results of both interviews are presented together.

Danish Government and Copenhagen Airport

In Denmark, the current noise limits and noise mitigation measures has a long history. All airports must oblige to the Danish EPA regulations and noise limits. Besides the Lden-based contours, the Danish EPA also uses single event metrics for operations during night. Overall, the Danish EPA concludes that aircraft noise is not considered as a large problem given the little amount of people/houses within the different noise contours. This does not mean that people living close to airports are not annoyed, but (for instance) road traffic noise is considered to be a much bigger issue.

The land-use planning for Copenhagen Airport go back as far as the late 1970's and are still in place as of today. Strict compliance to the land-use plan and the favourable location of Copenhagen Airport (next to the sea) are two of the reasons as to why only a small amount of people are located within the 55 dB(A) L_{den} contour.

The 55 dB(A) L_{den} contour is the lowest value to report in the mandatory noise action plan for the European Commission. Copenhagen Airport stresses that they continuously put effort in mitigating noise whenever this is possible and provide transparent information to those interested.

Regarding the WHO guidelines, a simple impact assessment was done: an extension of the noise limits up to 45dB L_{den} showed that only a small number of people are located within this contour. This is due to the extensive land-use planning they have in place for decades and the size of most Danish airports (small airports with limited traffic numbers).

This is one of the reasons the Denmark has decided to reject the WHO guidelines for aircraft noise. Another reason is that they have no confidence in the outcomes of the WHO report for aircraft noise, based on criticism of Truls Gjestland (see section 2.2 for more information). The Danish EPA therefore advised the Danish government to reject the WHO guidelines related to aircraft noise for use in Denmark. No further action is being undertaken to change or update the current aircraft noise policy.

4.4 France

For France, an interview has been performed with experts from the French Civil Aviation Authority DGAC (representing the French government). It has not been possible to interview the expert from Paris Charles de Gaulle Airport within the timeframe of the project.

French government

The French civil aviation authority (*Direction générale de l'aviation civile*, DGAC) is the central agency responsible for management and monitoring of regulations as well as air traffic navigation, within the Ministry of Ecology (see Figure 7). Additionally, there is an independent authority outside of the Ministry monitoring the noise and air pollutant emissions from French airports (*Autorité de contrôle des nuisances aéroportuaires*, ACNUSA). ACNUSA provides recommendations and opinions on the DGAC activities, to which DGAC is obliged to respond. ACNUSA also has the mandate to sanction airlines not complying with the regulations. Furthermore, there are local state representatives (préfectures) who lead a continuous process of consultation with residents and other local stakeholders. They are supported by the DGAC.

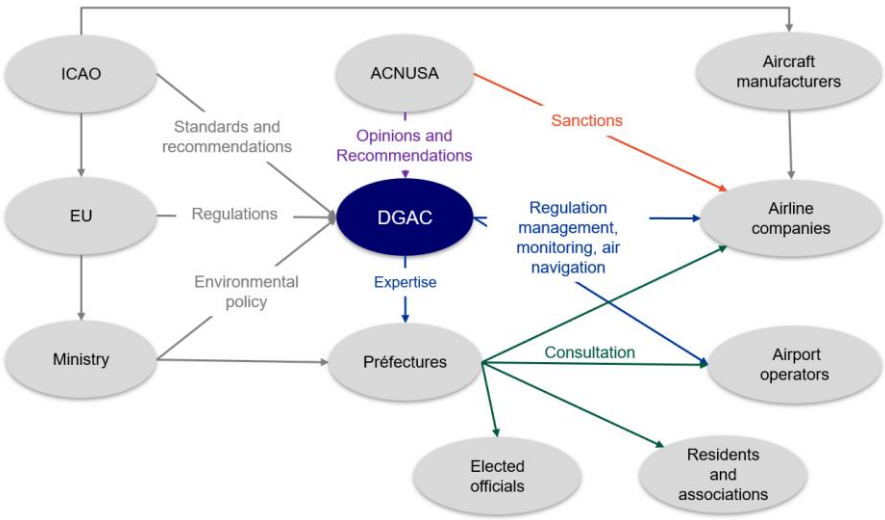

Figure 7: Overview of aviation stakeholders in France

The French government is not currently considering to adapt their noise regulations following the WHO Environmental Noise Guidelines, and has no plans to implement the recommended values of 45 dB L_{den} / 40 dB L_{night}. ACNUSA is generally in favour of further noise reductions when possible, and they regularly advise to consider regulatory changes or noise measures. They have however not made any recommendations to consider implementation of the WHO recommendations, or at least not yet.

There are two main arguments not to implement the WHO guidelines in regulations. First, the evidence quality is regarded insufficient, as it was graded to be only 'moderate' by the WHO experts, and also in the light of the debate by Gjestland et al. Second, the recommended levels are considered to be unfeasible: these could only be met by taking very strong measures such as a severe reduction of traffic, which is only a last resort, following the French implementation of the Balanced Approach. Also, for Paris, a large part of the population is already exposed to noise above 45 dB L_{den}, with air traffic not being the dominant noise source. It was estimated that the 45 dB L_{den} contour for aviation would be 9 times larger than the 50 dB L_{den} contour currently used for urban planning restrictions. For the soundproofing program, the expansion of the contours would lead to 3 to 5 times more dwellings to be included in the soundproofing program, which is unrealistic. Such contours are also larger than the area for which flight paths are available, so there would be insufficient data to calculate and manage these.

Immediately after the WHO publication, there were some strong statements from residents' associations in media and in the consultations, and some legal challenges. But the WHO recommendations have no legal status, other than the mandatory use of the new ERFs for the END noise action plans, as prescribed in the 2020/367 Directive. The process of END action plans is considered a good process for French airports, and their action plans have several indicators to monitor the progress of the actions. The WHO guidelines add little or no value to that.

Around three major airports (Paris-Charles de Gaulle, Lyon-Saint-Exupéry and Toulouse-Blagnac), several studies have been made to understand the health impacts of aircraft noise on the population near the airports, under the scientific programme DEBATS (http://debats-avions.ifsttar.fr/). The programme includes ecological, individual longitudinal and clinical studies, and has been running from 2012 until recently. A pool of local residents has been visited by researchers in 2013, 2015 and 2017/2019. The study includes surveys on annoyance and anxiety/depression disorder, a sleep study and blood pressure measurements. The DEBATS results showed a higher percentage of people highly annoyed by aircraft noise than predicted by older EU reference exposure-response function (Miedema), but lower than predicted by the new WHO 2018 ERF. For example, at 60dB(A), the Miedema curve predicts 17% HA, whereas the curve based on the DEBATS results predicts between 22 and 27%, and the 2018 WHO curve predicts 36%. The results have not led to a proposal to lower the noise level thresholds in the legislation.

Specifically for Paris-Charles de Gaulle, there is a noise indicator based on measurements (IGMP), used for discussion with stakeholders, showing that the noise has been decreasing steadily over the last 10 years.

4.5 Belgium

A request for an interview was send out to experts from the Belgium government and an expert from Brussels Airport. They responded that it was to premature to conduct an interview, since they are still debating if and how they want to implement the WHO guidelines in national legislation and policy. They therefore rejected our request to conduct an interview and hence no broader perspective from Belgium can be enclosed in this report.

5. Conclusions

The WHO Environmental Noise Guidelines (ENG) published in October 2018 formulate recommendations with respect to the reduction of annoyance, sleep disturbance and other health effects from aircraft noise. As shown in this report, the ENG since their publication have been noticed, studied and discussed, in scientific debate on an European scale as well as on a policy level in each of the five countries involved in this study (BE, DE, DK, FR and UK).

Each of these countries, often since long, has some level of aircraft noise regulation. The details of these regulations were discussed in interviews with experts from both government and airport sides. All regulations include maximum limit values, not to be exceeded, and/or target values, as a minimum above which urban planning or soundproofing measures start. The limit and target values defined in regulations are all higher than the 2018 WHO recommended values of 45 dB L_{den} and 40 dB L_{night}, which confirms what was reported earlier by the EPA Network [6], at least for these countries. The lowest L_{den} level above which any assessment of noise impacts starts is 50 dB (FR), 51 dB (UK) or higher. Above such minimum thresholds, soundproofing schemes or urban planning measures come into play. Noise measures affecting aircraft operations (traffic restrictions, night bans, rerouting) are typically considered only at higher noise levels, and any maximum never-to-exceed L_{den} levels are around 65 to 70 dB(A). Besides L_{den} and/or L_{night}, countries (DE, FR, UK) often have additional noise indicators (e.g. L_{max}, NAx) or other metrics (e.g. number of overflights) in place. These may very well have a limiting effect on aircraft noise and health effects, instead of or in addition to the L_{den} / L_{night} limits.

In some countries (UK, DK), like in the Netherlands, the current aircraft noise legislation is currently being reviewed and will possibly be updated. Such reviews are not triggered by the ENG publication, but rather because other improvements are needed, e.g. better legislation structure or improvements to the noise assessment calculation methods. Other countries (DE, FR) have defined a process of regular legislative reviews and updates. Experts indicate that the ENG and the exposure-response functions in it will be used as a source of evidence for noise impacts in such updates, and for comparison with national studies. But the ENG recommendations are not a driving force to change existing legislation and guidance, at least not for aircraft noise.

The situation in Copenhagen is somewhat different from the other airports (Paris CDG, Heathrow, Frankfurt), as the number of people affected is much smaller. The consequences of implementing the WHO recommendations for the airport would be much smaller than for the other airports, but also the benefits would be much smaller. Aircraft noise is simply not so big of an issue here. This is partly due to the position of the airport with most flight paths over sea. Partly this is due to strict land use planning in the past in the land areas close to the airport, and sticking to that policy by consecutive governments.

None of the countries indicate that the WHO recommended L_{den} or L_{night} values will be implemented as new minimum threshold values, and certainly not as maximum limits. Government and airport representatives generally seem to be in good agreement on this from both sides, even though public pressure, e.g. from citizen's associations, has certainly resulted from the ENG publication. The main arguments for these countries not to implement the WHO recommendations are one or more of the following:

- The quality of the evidence presented by WHO for aircraft noise is regarded of insufficient quality. Experts mention WHO's own 'moderate quality' grading. Several mention also, without elicitation, the scientific critique put forward by Gjestland, and the fact that several newer studies have not yet been included.
- When national or local studies with exposure-response functions (ERFs) are available (DE, FR, UK), such evidence prevails over the WHO guidelines that represent an international average. Experts point out that this is recommended in the ENG. National ERFs mentioned in the interviews show lower annoyance ratings than the WHO 2018 curve (at the same L_{den}), although they may be higher than the Miedema curves regarded as the previous EU reference curves. Using the national ERFs, the WHO benchmark of 10% highly annoyed people will lead to higher L_{den} thresholds than the 45 dB recommended by WHO.
- The 45 dB L_{den} / 40 dB L_{night} levels are considered unrealistic and unfeasible. The size of the area involved with such low levels is huge (radius 30 km or more for Paris-CDG, Frankfurt and Heathrow), as is the number of people within these contours. This raises several issues:
    - The area exposed to these levels is several times larger than the area involved in current regulations, e.g. for soundproofing measures, which would involve enormous extra costs.
    - Actually bringing down the noise levels to meet these recommendations would require very severe restrictions on traffic, basically leading to a full shutdown of the airport.

    - Noise assessment models (e.g. Doc29) are considered to be insufficiently accurate at such low noise levels. Input data for such large areas may not be available. And other noise sources are expected to be dominant over the aircraft noise.
- Member States and the UK have no legal obligations, in EU or national legislation, to implement the WHO recommendations, other than using the new ERFs in Directive 2020/367 for their noise action plans. There have not been any court cases where it was decided that authorities have to consider the WHO guidelines for aircraft noise.

Overall, the experts interviewed value the work done by the WHO, the scientific process that was followed and the transparent way in which they have presented their results. The recommended levels are regarded by some as a helpful target to aim for in the long term. The report will be used by most governments as valuable scientific research to take into account when updating aircraft noise legislation. The airports indicate that they are putting significant efforts in reducing their noise impact, and to establish and keep good relations and cooperation with their neighbours. The lack of a good cost/benefit study and the limited amount of context and guidance around the recommendations are seen as shortcomings. It is considered a risk that it may raise unrealistic expectations with the general public and citizen's associations, while there is little perspective for governments and airports to actually being able to meet these.

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