

**DEVELOPMENT OF LONDON CITY AIRPORT TO ACCOMMODATE 9 MILLION PASSENGERS
PER ANNUM**

Planning Application Reference: 22/03045/VAR

Local Planning Authority Appeal Reference: 23/00059/REF

Planning Inspectorate Reference: APP/G5750/W/23/3326646

Date of Inquiry: 5 – 15 December 2023

PROOF OF EVIDENCE OF MR JAKE FARMER AssocRTPI

PLANNING AND CLIMATE CHANGE

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1. Introduction

Personal details

- 1.1 My name is Jake Farmer. I hold a bachelor's degree in Geography and am an Associate Member of the RTPI. I started my career at a Planning and Architecture practice based in Ewell, Surrey, and subsequently moved to another practice based in Walton-on-Thames, where I managed and advised on a number of developments of varying scales and degrees of complexity.
- 1.2 I am currently an Associate Planner at DLP Planning Ltd following a promotion in July 2023. DLP Planning is a part of the DLP Consulting Group, a multi-disciplinary consultancy with offices in eight locations across England and Wales including a sub-office in Milton Keynes. Throughout my career I have provided planning consultancy services for large scale residential development, renewable energy projects, development management services for Local Planning Authorities and the development of strategic sites.
- 1.3 I have significant experience of both the submission and negotiation of planning applications, the promotion of development through the development plan making process, and the conduct of appeals.
- 1.4 I understand my duty to the Inquiry and have complied, and will continue to comply, with that duty. I confirm that this evidence identifies all facts which I regard as being relevant to the opinion that I have expressed, and that the Inquiry's attention has been drawn to any matter which would affect the validity of that opinion. Neither I, nor DLP Planning Ltd. by whom I am employed, are instructed on the basis of a success fee.
- 1.5 The submissions which I have prepared and provide for this appeal are true and have been prepared, and are given, in accordance with the guidance of my professional institution, the RTPI, and I confirm that the opinions expressed are my true and professional opinions irrespective of by whom I am instructed.



Jake Farmer
Associate Planner

Scope of evidence

- 1.6 This proof of evidence covers the specific London policy context that requires additional consideration to be given to the climate change impacts of the proposed development, assesses it against development plan policy in relation to noise, identifies other material considerations (including national policy) relevant to the determination of the appeal, and undertakes a planning balance.

- 1.7 I am providing evidence on behalf of HACAN East. I am acting as an independent witness offering my services based on my academic and practical experience. The evidence which I have prepared and provide for this appeal in this proof of evidence is true to the best of my knowledge and belief. I confirm that the opinions expressed are my true and professional opinions based on the facts I regard as relevant in connection with the appeal.

2. Background

Planning history of the site

- 2.1 Outline planning permission was initially granted for London City Airport in May 1985. In July 1998 permission was granted to allow up to 73,000 Air Transport Movements (“ATMs”) per annum but with conditions limiting operating hours from 1 April 1999 to 06:30 to 12:30 on Saturday and 12:30 to 22:00 on Sunday (LRP219/J9510/017, Conditions 11(c) and 11(e), [CD7.3]).
- 2.2 In 2009 planning permission was granted to accommodate up to 120,000 ATMs (07/01520/VAR, [CD7.5]). The curfew remained intact.
- 2.3 On 26 July 2016 permission was granted on appeal for "Works to demolish existing buildings and structures and provide additional infrastructure and passenger facilities at London City Airport" (13/01228/FUL, [CD7.8]). Annual passenger numbers were capped for the first time at 6.5 million annually and the weekend curfew was retained.

Appeal proposal

- 2.4 The Section 73 application which forms the subject of the present appeal was submitted on 19 December 2022. The appeal proposal is described as follows:

“Section 73 application to vary Conditions 2 (Approved documents) 8 (Aircraft Maintenance) 12 (Aircraft Stand Location) 17 (Aircraft Take-off and Land Times) 23, 25, 26 (Daily limits) 35 (Temporary Facilities) 42 (Terminal Opening Hours) 43 (Passengers) and 50 (Ground Running) to allow up to 9 million passengers per annum (currently limited to 6.5 million) arrivals and departures on Saturdays until 18.30 with up to 12 arrivals for a further hour during British Summer Time (currently allowed until 12.30), modifications to daily, weekend and other limits on flights and minor design changes, including to the forecourt and airfield layout attached to planning permission 13/01228/FUL allowed on appeal APP/G5750/W/15/3035673 [...].” (“The Appeal Proposal”).

Reasons for Refusal

- 2.5 The London Borough of Newham (“LBN”) refused the application for two reasons:
 - (1) The proposal, by reason of the additional morning and Saturday flights, and reduction of the existing Saturday curfew would result in a new material noise impact which would result in significant harm to the residential amenity of nearby residential properties. This would be contrary to policies

D13 and T8 of The London Plan (2021) and policies SP2 and SP8 of the Newham Local Plan (2018).

- (2) A Deed of Variation is required in order for the s106 agreement of the parent permission to apply to this permission to secure and update the obligations necessary to make the application acceptable. In the absence of such an agreement the application would fail to secure benefits, financial contributions including mitigations related to employment, transport, air quality, sustainability and residential amenity.

Note to Applicant: This final reason for refusal could be overcome following the submission of an acceptable proposal and the completion of a S.106 legal agreement which address each of the above points.

3. The Development Plan

The Statutory Test and Decision-Making Context

- 3.1 Section 38(6) of the Planning and Compulsory Purchase Act 2004 (“**the 2004 Act**”), requires that development proposals are determined in accordance with the development plan unless material considerations indicate otherwise.
- 3.2 A further context for this is provided at paragraph 38 of the National Planning Policy Framework (2023) (“**the NPPF**”), which, in respect of decision-making, requires local planning authorities to approach decisions in a positive and creative manner and use the full range of planning tools available, and work proactively with applicants to secure developments that will improve the economic, social and environmental conditions of the area, in line with the objectives for sustainable development. Decision-makers at every level should seek to approve applications for sustainable development where possible.
- 3.3 The development plan for the purposes of the Appeal Proposal comprises:
 - 3.3.1 the London Plan (GLA, March 2021)
 - 3.3.2 the Newham Local Plan (2018)
 - 3.3.3 the Newham Local Plan Policies Map (2018)
 - 3.3.4 the Joint Waste Development Plan for the East London Waste Authority Boroughs (adopted 27th February 2012).
- 3.4 Material weight must also be given to the NPPF and relevant portions of the Planning Practice Guidance, notably the National Planning Practice Guidance (“**NPPG**”) on matters including Noise and Climate Change. These are dealt with in more detail in the portion of my proof which deals with material considerations below.
- 3.5 It is noted that the Draft Newham Local Plan (Regulation 18) was approved at Cabinet in December 2022 for consultation. In this instance, given that the Draft Local Plan has not proceeded to Regulation 19, in accordance with the provisions of the NPPF, and can therefore only be attributed minimal weight in the planning balance.

Newham Local Plan (2018), [CD3.4.1]

- 3.6 The following policies and are considered to be relevant to the assessment of the merits of this application.
- 3.7 Policy SP2: Healthy Neighbourhoods:

- 3.7.1 The Appellant did not consider this policy to be relevant to the Appeal Proposal but LBN's statement of case highlights that Part 1(A)(iii) of the policy emphasises: *"The need to improve employment levels and reduce poverty, whilst attending to the environmental impacts of economic development including community/public safety, noise, vibrations and odour and the legacy of contaminated land as per SP8 and SC1"*.
- 3.7.2 LBN's statement of case further highlights the fact that Policy SP2 emphasises need to balance economic and environmental considerations and provides important context for Policy SP8. I agree.
- 3.8 Policy SP8: Ensuring Neighbourly Development:
- 3.8.1 Policy SP8, Part 2(A)(xi) requires development to address the need to *"Avoid unacceptable exposure to light (including light spillage), odour, dust, noise, disturbance, vibration, radiation and other amenity or health impacting pollutants in accordance with policy SP2"*.
- 3.8.2 The key aspect of this policy is the avoidance of 'unacceptable exposure' to the listed pollutants. For the reasons outlined within this Proof of Evidence and throughout HACAN East and LBN's statement of case, I consider that there will be unacceptable exposure to noise resultant from the appeal proposal.

London Plan (2021), [CD3.3.1]

- 3.9 Policy D13: Agent of Change: This policy emphasises the importance of adequate mitigation measures being put in place to address new sources of noise or nuisance occasioned by new development, stating that *"Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed"*.
- 3.10 Policy D14: Noise: The policy seeks to avoid significant adverse noise impacts on health and quality of life. The policy also requires developments to mitigate and minimise the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses. The policy encourages design solutions to separate new noise sensitive development from major noise sources such as airports.
- 3.11 Policy T8: Aviation: This policy provides at T8(B) that: *"The environmental and health impacts of aviation must be fully acknowledged and aviation-related development proposals should include mitigation measures that fully meet their external and environmental costs, particularly in respect of noise, air quality and*

climate change. Any airport expansion scheme must be appropriately assessed and if required demonstrate that there is an overriding public interest or no suitable alternative solution with fewer environmental impacts”.

- 3.11.1 Paragraph 10.8.2 of the explanatory text for Policy T8 states that whilst London’s airports provide economic benefits via trade and tourism, *“the aviation industry must fully address its environmental and health impacts. Government and industry must also recognise local communities’ concerns about aviation noise and pollution, consult fully with those affected, and use new technologies to deliver tangible reductions in noise exposure and pollution.”*
- 3.11.2 Further, paragraph 10.8.4 states that: *“Any airport expansion proposals should only be taken forward on the basis that noise impacts are avoided, minimised and mitigated, and proposals should not seek to claim or utilise noise improvements resulting from technology improvements unrelated to expansion. Nor should expansion result in significant numbers of new people being exposed to new or additional noise harm.”*
- 3.11.3 Additionally, paragraph 10.8.8 provides that: *“The aviation impacts on climate change must be fully recognised and emissions from aviation activities must be compatible with national and international obligations to tackle climate change. The implications for other sectors and other airports must also be fully understood when expansion proposals are brought forward, and aviation greenhouse gas emissions must be aligned with the Mayor’s carbon reduction targets.”* (Emphasis added).

4. Material considerations

NATIONAL PLANNING AND AVIATION POLICY

National Planning Policy Framework

- 4.1 The NPPF contains a presumption in favour of sustainable development. The three dimensions to consider in determining the extent of sustainable development are Economic, Social and Environmental factors. In order to achieve sustainable development therefore, a balance between the three dimensions should be sought and that not one single dimension should carry more weight than the others.
- 4.2 No specific guidance is given touching on airports other than at footnote 46 to paragraph 110(e), which states that “Policies for large scale facilities should, where necessary, be developed through collaboration between strategic policy-making authorities and other relevant bodies”.
- 4.3 Regarding noise, the NPPF provides as follows:
- 4.3.1 At Paragraph 180 that *“Planning policies and decisions should contribute to and enhance the natural and local environment by [...] e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.”*
- 4.3.2 At Paragraph 191 that *“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: a) mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life [...]”*
- 4.4 Regarding climate change, the NPPF provides:
- 4.4.1 At Paragraph 7, that, at a *“very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs”*. This long-term and inter-generational understanding is especially important when considering climate impacts.

- 4.4.2 At Paragraph 157 that the planning system overall (which includes decision-taking) should “support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: **shape places in ways that contribute to radical reductions in greenhouse gas emissions**, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.” (emphasis added)
- 4.4.3 At Paragraph 158 that plans should “take a proactive approach to mitigating and adapting to climate change”. Footnote 56 makes clear this must be “in line with the objectives and provisions of the Climate Change Act 2008”. Policies “should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts”.

National Planning Practice Guidance: Noise (July 2019), [CD3.7.7]

- 4.5 In the first instance, paragraph 002 (reference ID: 30-001-20190722) states that noise impacts can override other planning considerations “where justified, although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern.”
- 4.6 The Noise NPPG also provides details on what factors influence noise impacts resultant from development. They include:
- “the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;
 - for a new noise making source, how the noise from it relates to the existing sound environment;
 - for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;
 - the spectral content of the noise (i.e. whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features), and;
 - the local arrangement of buildings, surfaces and green infrastructure, and the extent to which it reflects or absorbs noise.”

- 4.7 The NPPG also provides other specific factors such as the cumulative impacts of more than one source of noise. (Paragraph: 006 Reference ID: 30-006-20190722)
- 4.8 Paragraph 012 (reference ID: 30-012-20190722) states *“The agent of change principle may apply in areas near to airports, or which experience low altitude overflight, where there is the potential for aviation activities to have a significant adverse effect on new noise-sensitive development (such as residential, hospitals and schools). This could include development in the immediate vicinity of an airport, or the final approach and departure routes of an operational runway, and locations that experience regular low altitude overflight by general aviation aircraft, where this activity could subject residents or occupiers to significant noise, air quality issues and/or vibration impacts. The need for and type of mitigation will depend on a variety of factors including the nature of the aviation activity, location and normal environmental conditions in that context. Local planning authorities could consider the use of planning conditions or obligations to require the provision of appropriate mitigation measures in the new development.”*

Aviation Policy Framework (March 2013), [CD3.5.1]

- 4.9 The Aviation Policy Framework includes at Paragraph 3.12 the general principle that the Government’s overall objective on noise *“is to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise.”*
- 4.10 Paragraph 3.19 states that *“Average noise exposure contours are a well-established measure of annoyance and are important to show historic trends in total noise around airports. However, the Government recognises that people do not experience noise in an averaged manner and that the value of the LAeq indicator does not necessarily reflect all aspects of the perception of aircraft noise. For this reason, we recommend that average noise contours should not be the only measure used when airports seek to explain how locations under flight paths are affected by aircraft noise. Instead, the Government encourages airport operators to use alternative measures which better reflect how aircraft noise is experienced in different localities, developing these measures in consultation with their consultative committee and local communities. The objective should be to ensure a better understanding of noise impacts and to inform the development of targeted noise mitigation measures.”* (Emphasis added).
- 4.11 As regards the guidance to airport operators to develop measures in consultation with local communities, it should be noted that HACAN East’s case benefits from an extensive real-life citizen science study into the noise impacts of LCA aircraft outside of the assessed noise contour, reinforcing the rationale for LBN’s first reason for refusal.

Airports National Policy Statement (2018), [CD3.5.2]

- 4.12 Published in June 2018, the Airports NPS provides the primary basis for decision making on development consent applications for airport infrastructure in London and the Southeast. The Airports NPS sets out the framework for directing new and increased airport development in the region.
- 4.13 Paragraph 5.44 states that *“The impact of noise from airport expansion is a key concern for communities affected, and the Government takes this issue very seriously. High exposure to noise is an annoyance, can disturb sleep, and can also affect people’s health. Aircraft operations are by far the largest source of noise emissions from an airport, although noise will also be generated from ground operations and surface transport, and during the construction phase of a scheme.”*
- 4.14 Paragraph 5.55 states: *“The Government recognises that aircraft noise is a significant concern to communities affected and that, as a result of additional runway capacity, noise- related action will need to be taken. Such action should strike a fair balance between the negative impacts of noise and positive impacts of flights.”*

Making Best Use of Existing Runways Policy Statement (2018), [CD3.5.3]

- 4.15 The Making Best Use of Existing Runways Policy Statement (“**MBU**”) sets out that environmental impacts and proposed mitigations must be adequately addressed. The whole policy document is relevant (apart from the numbers in the various tables, which are now out of date). The final “Policy Statement” provides in bold at Paragraph 1.29 that:

“The government is supportive of airports beyond Heathrow making best use of their existing runways. However, we recognise that the development of airports can have negative as well as positive local impacts, including on noise levels. We therefore consider that any proposals should be judged by the relevant planning authority, taking careful account of all relevant considerations, particularly economic and environmental impacts and proposed mitigations. This policy statement does not prejudge the decision of those authorities who will be required to give proper consideration to such applications. It instead leaves it up to local, rather than national government, to consider each case on its merits.”

Aviation Noise Policy Statement (March 2023), [CD3.7.3]

- 4.16 The Department for Transport has stated that it intends to publish a Noise Policy Paper 'later this year [2023]'.¹ In advance of this, it has set out a two-paragraph revised aviation noise policy statement, prior to full consultation on the Noise Policy Paper.
- 4.17 The statement states that *"the impact of aviation noise must be mitigated as much as is practicable and realistic to do so, limiting, and where possible reducing, the total adverse impacts on health and quality of life from aviation noise."* (Emphasis added).
- 4.18 The statement notes that the Government maintains the position that *"limit, and where possible reduce" remains appropriate wording. An overall reduction in total adverse effects is desirable, but in the context of sustainable growth an increase in total adverse effects **may** be offset by an increase in economic and consumer benefits. In circumstances where there is an increase in total adverse effects, "limit" would mean to mitigate and minimise adverse effects, in line with the Noise Policy Statement for England."* (Emphasis added).
- 4.19 This emphasises the importance of seeking the solution that most effectively mitigates the impacts of aviation noise. It also indicates that economic and consumer benefits should not be assumed to offset adverse effects as a matter of course. The benefits and harms must be weighed on a case-by-case basis.

NATIONAL CLIMATE CHANGE CONTEXT

Climate Change Act (2008), [CD3.9.9]

- 4.20 Enacted in 2008, the Climate Change Act ("**CCA**") forms the basis of the UK's approach to tackling and responding to climate change. It sets out emission reduction targets that the UK must comply with as a matter of legality. The Act initially committed the UK to reducing its greenhouse gas ("**GHG**") emissions by 80% by 2050. The Climate Change Act 2008 (2050 Target Amendment) Order 2019 amended that target to a 100% reduction in GHG emissions from 1990 levels by 2050.
- 4.21 Under sections 4 and 9 of the CCA 2008, the Secretary of State must set regular carbon budgets for each succeeding five-year period, taking into account advice from the Climate Change Committee ("**CCC**"), and ensure that the net UK carbon

¹ Department for Transport, Overarching aviation noise policy statement, (March 2023), <https://www.gov.uk/government/publications/aviation-noise-policy-statement/overarching-aviation-noise-policy#:~:text=The%20impact%20of%20aviation%20noise,of%20life%20from%20aviation%20noise>.

account for each budgetary period does not exceed the carbon budget, thereby establishing a net zero trajectory.

Jet Zero Strategy: Delivering Net Zero Aviation by 2050 (July 2022) [CD3.5.7]

4.22 The Jet Zero Strategy sets out the long-term strategy for the aviation sector's approach to tackling climate change. The strategy sets out how the industry will be 'decarbonised' over the period up to 2050.

4.23 The Appellant states that the proposal's compliance with the Jet Zero Strategy means that, by definition, it has no unacceptable climate impacts (Appellant's statement of case, [CD10.1], paras 9.7 and 10.9). I disagree for the following reasons:

4.23.1 While undoubtedly a relevant material consideration, the Jet Zero Strategy is not a planning policy document. I am of the view that greater weight should be attributed to relevant national and local planning policies when considering the climate impacts of the proposed development. As set out in MBU and quoted above, each case must be considered on its merits and the environmental impacts of specific proposals must be adequately addressed.

4.23.2 In particular, as shall be set out in more detail below in the section on London climate change policy, the appeal proposal must be assessed within the context of the Mayor's target to make London a Net Zero carbon city by 2030, some twenty years sooner than the target date for decarbonising the aviation sector in the Jet Zero Strategy.

Climate Change Committee: 2023 Progress Report, [CD3.9.2]

4.24 Published in June 2023 with the latest update on 12 October 2023, the CCC's 2023 progress report to Parliament showed that the UK is significantly off track to meet Net Zero commitments across virtually all sectors of the economy.

4.25 The June 2023 Report deals in detail with the Jet Zero Strategy and reaffirms the advice about airport expansion, despite the Strategy [CD3.9.2, p. 267]. It recommends that "*Net airport expansion should only proceed if the carbon-intensity of aviation is outperforming the Government's pathway and can accommodate this additional demand. Current Government policy is not delivering an outcome consistent with this.*" [CD3.9.2, p. 276].

4.26 The October 2023 update focuses predominantly on the impact of the Prime Minister's announcements on 20 September 2023, which did not address aviation. However, it does include aviation and shipping in the table setting out the Change

in the level of risk of Government plans for the period 2028-2032, where the October 2023 assessment finds that a very large part of average annual emissions are still covered by policies with some or with significant risks, and that a sizeable part are covered by insufficient plans.

LONDON CLIMATE CHANGE POLICY

Mayor's Net Zero Target

4.27 As set out above, the explanatory text to London Plan Policy T8 at 10.8.8 provides that:

“The aviation impacts on climate change must be fully recognised and emissions from aviation activities must be compatible with national and international obligations to tackle climate change. The implications for other sectors and other airports must also be fully understood when expansion proposals are brought forward, and aviation greenhouse gas emissions must be aligned with the Mayor's carbon reduction targets.” (Emphasis added).

4.28 In January 2022, the Mayor adopted a target to make London a Net Zero Carbon City by 2030, as set out in the policy document ‘London Net Zero 2030: An Updated Pathway’ [CD3.9.6]. This document draws on a report commissioned by the Mayor and published on 18 January 2022 by Element Energy: ‘Pathways to Net Zero Carbon by 2030’ [CD3.9.7].

4.29 The ‘Analysis of a Net Zero 2030 Target for Greater London’ report by Element Energy Limited notes that in 4.1.2: Actions to decarbonise transport, *“aviation emissions have a large impact on the level of residual emissions from transport, representing 20% of the difference in emissions between No Constraints and High Electrification. As such, limiting growth of aviation as far as possible is a crucial action for achieving the Mayor's climate ambitions.”* [CD3.9.38, p.54].

4.30 The report also notes that one of the key measures in seeking to achieve the Mayor's climate ambitions would be *“Working with Boroughs and lobbying Government to limit further expansion of airports through reviewing its Airport National Planning Statement and to limit aviation travel demand growth”* [p.54].

5. Climate impact of appeal proposal

- 5.1 In this case, I am of the opinion that it is important to provide the wider climate change context to the proposed increase in the operational hours and passenger capacity of the airport. Given the Mayor's Net Zero London by 2030 target, bolstered by the most recent recommendations from the CCC, it is important for decision-makers to approach all proposals for aviation expansion within the capital with caution. This London policy context is different from other airport expansion inquiries and means that a different approach has to be taken to various considerations, including MBU. Even if MBU generally means that climate impacts of aviation expansion are dealt with at a national level, that approach cannot be taken for this proposal, because of the requirements of the relevant local planning policy.
- 5.2 There are also other material national policies. Paragraph 157 of the NPPF makes it clear that at the strategic level, the planning system should seek to support development that helps to shape places in ways that contribute to radical reductions in greenhouse gas emissions.
- 5.3 The strategic aim of reducing carbon emissions is also reflected in the National Aviation Policy Framework (2013) [CD3.5.1], with paragraph 2.4 setting out the 'Government's objective of ensuring that the aviation sector makes a significant and cost-effective contribution towards reducing global emissions,' as well as in the overarching strategic purpose of the Jet Zero Strategy [CD3.5.7].
- 5.4 Within the London context, as noted within the Material Considerations section above, the Mayor is *"working with Boroughs and lobbying Government to limit further expansion of airports through reviewing its Airport National Planning Statement and to limit aviation travel demand growth"*, thereby calling into question the political context and the relative economic benefits referred to by the Appellant.
- 5.4.1 Whilst not disputing that the appeal proposal will have economic benefits, the fact that the Mayor is proactively working to limit aviation travel and travel demand growth within the capital indicates that, as a matter of policy, the mitigation of climate impacts from aviation in London should be prioritised, even in the face of potential economic benefits from aviation expansion.
- 5.4.2 Therefore, I consider it necessary to question the cost (both to the environment and the economic cost of the climate and wider

environmental impact) that is to be paid to achieve the economic benefits that form the basis of the Appellant's case.

- 5.5 In policy terms, policy T8 (Aviation) part B of the London Plan (2021), requires *'environmental and health impacts of aviation to be fully acknowledged and aviation related development proposals should include mitigation measures that fully meet their external and environmental costs, particularly in respect of noise, air quality and climate change'*.
- 5.6 Whilst impacts of the appeal proposals in terms of noise are discussed in section 6 below, the policy also refers to 'environmental costs' relating to climate change. Similarly, part E of the policy notes that changes to airport operations and air traffic movements must take full account of their environmental impacts and the views of affected communities.
- 5.7 As stated throughout this document, the necessity for the environmental impacts of the proposed development to be sufficiently mitigated and minimised is well established in policy T8(B) of the London Plan (2021). Policy SP8(1a) of the Newham Local Plan also highlights the need for development to consider the environmental impacts on surrounding uses and properties.
- 5.8 There is a clear and established need, throughout national, regional and local planning policy, for development to consider the environmental impacts resultant from the development and how impacts can be mitigated and minimised. It is my view that the Appellant's consideration of these impacts is incomplete and its proposed mitigation insufficient, for the reasons set out below.

Emissions increase to 2031

- 5.9 The Appellant's Environmental Statement at Table 11-19 [CD1.18, Chapter 11, p. 38] acknowledges that the projected GHG emissions from the airport in the year 2031 in the development case ("**DC**") scenario will be 389,519 CO₂e tonnes, a net increase of 77,024 CO₂e tonnes over the do minimum ("**DM**") scenario.
- 5.10 As set out by LBN in its statement of case, the appeal proposal would also result in a significantly higher level of emissions than if additional demand were accommodated at other London airports (LBN Statement of Case, [CD10.2], para 5.18).
- 5.11 The appeal proposals represent an intensification of the use of the airport, through the increase in the number of flights and associated operations, along with the reduction of the respite period. This would result in a clear and acknowledged increase in the levels of carbon emissions from LCA up to 2031, with no proposals in place for the expansion of capacity at LCA to be accompanied by a reduction in

capacity elsewhere, in line with the Mayor's updated pathway to Net Zero by 2030. Without clear and proportionate mitigation measures, there will be a demonstrable departure from London Plan policy and accompanying guidance.

Uncertainty of climate impact from 2031

5.12 Nevertheless, the LCA suggests in its statement of case that the Inspector should assign positive weight to the Appeal Proposal's effect on climate change because it will purportedly facilitate a new generation of planes which will result in lower per-passenger emissions (Appellant's Statement of Case, [CD10.1], paras 9.6–9.7).

5.13 It is considered that this a flawed approach for two reasons:

5.13.1 First, it relies on uncertain technology. In its June 2023 progress report, the CCC described "reliance on nascent technology" such as sustainable aviation fuel as a high risk approach to decarbonisation up to the period of the Sixth Carbon Budget ([CD3.9.2], p. 267).

5.13.2 Second, there is a lack of compliance with the Mayor's 2030 Net Zero target in any event, even if the anticipated technology does come on stream after 2031, since the Appellant acknowledges that the appeal proposal will lead to increased emissions at that date relative to the 'do minimum' scenario.

5.14 The Appellant also suggests in their Statement of case ([CD10.1], paras 9.7 and 10.9) that the appeal proposal's compliance with the Jet Zero Strategy provides sufficient consideration in terms of the long-term climate impacts of the proposed development. I disagree with this for the reasons set out in section 4 above.

5.15 In terms of the appeal proposal's compliance with the relevant policies of the London Plan (2021) and the Newham Local Plan (2018) the proposed development is required to demonstrate that mitigation measures are implemented that fully meet their external and environmental costs.

5.16 It is my contention that the reliance on the long-term strategic aims set out in the Jet Zero Strategy cannot be deemed a sufficiently substantial measure in fully addressing the proposed development's external and environmental costs. In this respect, in order to satisfy the provisions of Policy T8 of the London Plan, I consider that more localised, specific evidence should be provided by the Appellant to demonstrate that the increase in the operating hours of LCA would not result in an unacceptable impact upon the air quality, noise impacts or climate change matters.

5.17 The Appellant has failed to fully assess the proposed development's external and environmental cost. Only HACAN East has provided evidence addressing all aspects of this cost, in accordance with best practice economic guidance for aviation interventions (see Dr Alex Chapman's evidence).

6. Noise impacts

6.1 In my view there is a demonstrable lack of compliance with Development Plan policies and national policies on noise. Specifically, with regard to the policies of the London Plan (2021) and the Newham Local Plan (2018) which were cited in Reason for Refusal 1 of planning application 22/03045/VAR.

6.1.1 The negative impact on residential amenity from noise is contrary to Newham Plan Policies SP2 and SP8.

6.1.2 The Appellant has failed to adequately demonstrate how impacts will be mitigated, contrary to London Plan Policy D13, or to provide credible proposals to meet its environmental impacts, contrary to London Plan Policy T8.

6.2 In particular, Policy SP8 (2a, xi) states that development is expected to *“Avoid unacceptable exposure to light (including light spillage), odour, dust, noise, disturbance, vibration, radiation and other amenity or health impacting pollutants in accordance with policy SP2”*.

6.3 When interpreting the policy, I draw attention to the need to avoid ‘unacceptable’ exposure to noise, as an amenity and health impacting pollutant. As mentioned in HACAN East’s Statement of Case and below, when recommending that planning permission be granted for application 22/03045/VAR, it is clear that the Inspector felt that the inclusion of a respite period was necessary for the noise impacts to be considered acceptable and for the application to therefore be considered compliant with SP8 (2a, xi).

6.4 The removal of 50% of the respite period would remove a significant proportion of the mitigation measures currently in place to facilitate the development approved at appeal under application reference: 13/01228/FUL.²

6.5 In this respect, I consider that in order to comply with the relevant Development Plan policies, a proportionate approach to mitigating the increase in the noise and vibration generated by the increase in operational activity must be taken. In my view, the current proposals do not constitute a proportionate approach.

² Regarding the potential health impacts of the loss of the Saturday afternoon respite period, see the Opinion Paper produced by Professor Charlotte Clark of the Population Health Research Institute, at St George’s, University of London, which is appended to this Proof of Evidence.

- 6.6 When assessing Policy D13 (Agent of Change) of the London Plan (2021), which states that *“new noise and nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts”*, the Appellant claims that the appeal proposals do not comprise new noise generating development.
- 6.7 However, I am of the opinion that, whilst London City Airport has been operational since 1987, the introduction of new flights and extended operating hours, proposed to be allocated within current respite period, would indeed create new noise generating impacts and would therefore be contrary to Policy D13, since I do not consider the proposed mitigation measures to be adequate.
- 6.8 It is also my view that the expansion of the operating hours of the airport would be contrary to guiding principles in the NPPF at paragraphs 180 and 191 and the Aviation Policy Framework at paragraph 3.12, in terms of the need for airport developers to “limit, and where possible reduce” noise impacts resulting from increased activity.
- 6.9 As regards MBU, it is noted that the policy statement does not mean that all applications to expand capacity of existing runways should be permitted or that applications should be given automatic positive weight. As required by the provisions of the NPPF and in accordance with MBU itself, all applications must be assessed on their merits in accordance with local circumstances and the effectiveness of proposed mitigations.
- 6.10 Here, the nature of LCA’s location and layout mean that the vast majority of flights follow the same flight path, accounting for changes in the direction of the runway with changes in wind direction. Within this context, the best mitigation in terms of noise impact is that which already exists, namely the 24-hour respite period at weekends.
- 6.11 No reasonable alternative mitigation has been put forward as part of the appeal proposals and, in that respect, there is a disproportionate relationship between impact and mitigation. The proposed mitigation measures are reliant on purported reduction in noise from new generation planes, about which there is considerable uncertainty (on this point see the proof of evidence of Dr Christian Nold). It is clear that environmental impacts have not been effectively mitigated. The unmitigated adverse noise impacts of the proposal mean that it does not comply with MBU. This weighs against the grant of planning permission.
- 6.12 For the reasons outlined above and in other documents that support HACAN East’s case I consider that the Appellant has failed to comply with relevant Development Plan policies and national planning policies on noise.

7. Planning balance

- 7.1 At its core, planning is about comparing the benefits of a proposed development with the harm it may cause. Very rarely are developments entirely without harm, or entirely without benefit, and consideration of the balancing exercise is an important element of the wider judgement of the appropriateness of development.
- 7.2 The starting point for considering the planning balance remains Section 38 (6) of the 2004 Act and the presumption in favour of development that accords with the development plan, read as a whole, unless material considerations indicate otherwise. The planning balance therefore requires consideration of the benefits of development set against the impacts and harm that may arise.
- 7.3 In this case, I submit that there is lack of compliance with development plan policies, namely Policies D13 and T8 of the London Plan (2021) and Policies SP2 and SP8 of the Newham Local Plan (2018). Therefore, I consider that the Appeal Proposal should not be permitted unless material considerations indicate otherwise.
- 7.4 In making their decision, LBN considered and afforded weight to the economic benefits of the proposal, as required by the Aviation Policy Framework and Airport National Policy Statement. However, they concluded that these were not enough to outweigh the identified harms to residential amenity from new noise impacts or the lack of compliance with the development plan.
- 7.5 I agree that identified harms to residential amenity from noise outweigh the benefits of the Appeal Proposal. I make three further points affecting planning balance:
- 7.5.1 There are compelling reasons to believe that the economic benefits of the appeal proposal may have been overstated for reasons set out in Proof of Evidence of Dr Alex Chapman. Therefore, this reduces the weight that can be attributed to them.
- 7.5.2 There are also reasons to believe that the noise impacts have been understated for reasons set out in Proofs of Evidence of Dr Christian Nold and John Stewart. This evidence is considered to increase the weight which should be given to this harm.
- 7.5.3 The climate change impacts of the appeal proposal create an additional failure to comply with London Plan Policy T8 and the accompanying Mayor's

2030 Net Zero target, and are a material harm in their own right, for the reasons set out in this proof. Significant weight should be attributed to them.

8. Summary and conclusion

- 8.1 The proposed increase in the operational hours of London City Airport to include arrivals and departures on Saturdays until 18:30 with up to 12 further arrivals during British Summer Time, halving the previously approved respite period included under the approved planning permission (13/01228/FUL, allowed under appeal ref: APP/G5750/W/15/3035673) represents an adverse increase in the noise generation resulting from the additional operational hours.
- 8.2 In policy terms, the key aspects to consider is whether the appeal proposals are in fact in conflict with Policies D13 and T8 of the London Plan (2021) and Policies SP2 and SP8 of the Newham Local Plan (2018) as was concluded by LBN in their OR.
- 8.3 The below summary provides an overview as to why I consider that the appeal proposals are indeed in conflict with the relevant planning policies cited by LBN in the first reason for refusal and why I consider that LCA's appeal ought to be dismissed.

Key points

- 8.4 In the first instance, it is acknowledged that planning decision makers can depart from development plan policies if there are material considerations as to why this is required.
- 8.5 I am of the opinion that in this instance, there are no material planning considerations that would justify a departure from the development plan policies and, as such, the development plan policies should be afforded their full weight in the assessment of the proposals.
- 8.6 On matters of noise:
- 8.6.1 As I have stated in section 6 of this document, the removal of 50% of the respite period would remove a significant proportion of the mitigation measures currently in place to facilitate the development approved at appeal under application reference: 13/01228/FUL.
- 8.6.2 In this respect, I consider that in order to comply with the development plan policies, a proportionate approach to mitigating the increase in the noise and vibration generated by the increase in operational activity must be taken.

- 8.6.3 As stated within the agreed Statement of Common Ground (SoCG) LBN does not consider the Appellant's separate assessment of weekend noise to be appropriate. I agree.
- 8.6.4 In this respect, I consider that the Appellant would have to submit comprehensive analysis of the impact of the noise levels generated from the increase in operational activity over the current respite period. Further, I consider that the Appellant would have to demonstrate how the additional noise impacts will be minimised and mitigated, especially given that the appeal proposal seeks to remove a significant proportion of the existing mitigation measures.
- 8.6.5 On a wider note, the lack of adequate mitigation contained within the appeal proposal mean that it does not comply with MBU. The Appellant's approach has wrongly assumed that the expansion of the capacity of the airport is MBU.
- 8.6.6 MBU does not mean that all applications to expand capacity of existing runways should be permitted or that applications should be given automatic positive weight. As required by the provisions of the NPPF, all applications must be assessed on their merits in accordance with local circumstances and the effectiveness of proposed mitigations.
- 8.7 On matters of climate change:
- 8.7.1 As stated within Section 5 of this document, the London policy context is different from other airport expansion inquiries, thanks to Mayor's Net Zero 2030 target and the London Plan policies and explanatory text supporting it.
- 8.7.2 The Appellant has relied upon the longer-term strategic impacts of future technologies in justifying the impact of the proposals upon climate change. As the Mayor's Net Zero target of 2030 would come before the acknowledged adverse emissions impact to 2031, the appeal proposals would be incompatible with the Net Zero by 2030 target.
- 8.7.3 The Appellant's case relies upon purported climate 'benefits' beyond 2031 are uncertain and reliant on speculative technologies, relying on the Jet Zero Strategy for 2050. The uncertainty surrounding technological development within the sector cannot be afforded as much weight in assessing the proposed mitigation strategies to address the increase in operational activity.

8.7.4 There is the potential for a reduced impact upon climate if additional demand could be met at other larger London airports where mitigation strategies may be able to be more accommodating to surrounding uses.

Appendix: Noise and Health Opinion by Prof. Charlotte Clark

Development of London City Airport to Accommodate 9 million passengers per annum

Noise and Health Opinion

3rd November 2023

Charlotte Clark,
Professor of Environmental Epidemiology,
Population Health Research Institute,
St George's, University of London

This report has been prepared by Professor Charlotte Clark, Population Health Research Institute, St George's, University of London, Cranmer Terrace, Tooting, London, SW17 0RE, United Kingdom.

Professor Clark is an expert in environmental epidemiology and psychology, gaining her BSc (Hons) in Psychology from the University of Surrey in 1997 and her PhD in Environmental Psychology from the University of Surrey in 2001. She is a Chartered Psychologist and Fellow of the British Psychological Society; and a Member of the Institute of Acoustics (UK). Her areas of expertise are in the effects of environmental noise on physical and mental health, wellbeing and learning; the design and analysis of epidemiological research studies; and evidence review and synthesis in the field of noise and health. Professor Clark is President of the International Commission for the Biological Effects of Noise (ICBEN) and has advised the World Health Organization, the UK Department for Environment, Food and Rural Affairs, the UK Department for Transport, ICAO, and the UK Independent Commission for Civil Aviation Noise. She currently sits on the Civil Aviation Authority's Environmental Sustainability Panel and leads the Department for Transport funded study of Aviation Night Noise Effects.

1. Environmental noise is accepted as a public health issue and has significant impacts on physical health, mental health, and wellbeing (European Environment Agency, 2020). In terms of aviation noise, the past two decades have seen an increase in evidence linking exposure to annoyance (Guski et al., 2017, Janssen et al., 2011), sleep disturbance (Basner, 2021, Basner and McGuire, 2018), cardiometabolic health (van Kempen et al., 2018) children’s learning (Clark et al., 2021b, Clark and Paunović, 2018a), and mental health (Clark et al., 2021b, Clark and Paunović, 2018b, Hegewald et al., 2020).
2. Environmental noise can influence health, as it can trigger biological responses in an individual, such as increasing stress hormone levels and influencing risk factors for poorer cardiometabolic health such as blood pressure, blood sugar and blood fats (Munzel et al., 2018, Munzel et al., 2017). If these biological responses are triggered over a long period (i.e., if exposure is chronic, over several years), they can lead to poorer mental health and diseases such as diabetes, heart attacks and strokes. These biological responses can also be triggered by annoyance and sleep disturbance associated with aircraft noise exposure (Basner and McGuire, 2018, Gong et al., 2022).
3. The Noise Policy Statement for England (Department for Environment, March 2010) sets out the following vision and aims:
 - **Noise Policy Vision** to “Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”
 - **Noise Policy Aims:** “Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
 - i. avoid significant adverse impacts on health and quality of life;
 - ii. mitigate and minimise adverse impacts on health and quality of life; and
 - iii. where possible, contribute to the improvement of health and quality of life.”
4. Annoyance is the most prevalent community response and health effect in a population exposed to aircraft noise. The term annoyance describes negative reactions to noise such as disturbance, irritation, dissatisfaction and nuisance (Guski, 1999). Amenity effects relate to annoyance as a health outcome. Exposure-response functions (ERFs) showing the ‘percentage highly annoyed’ (%HA), assessed following Technical Standard (ISO/TS15666:2021, 2021, ISO/TS15666:2003, 2003), plotted against noise exposure increasingly inform environmental and health impact assessments, guidance, and policy to protect public health.
5. Acoustic factors, such as the source of the noise and sound level (in decibels (dB)), account for only some of the annoyance response observed: other factors, referred to

as non-acoustic factors, such as the fear associated with the noise source, interference with activities, ability to cope, noise sensitivity, expectations, anger, perceived fairness, attitudes to the source – both positive or negative, and beliefs about whether noise could be reduced by those responsible influence annoyance responses (WHO, 2000), as well as individual factors such as age, social disadvantage, and employment status (Fenech et al., 2021, Civil Aviation Authority, 2021, Notley et al., 2014)). These factors can considerably shift annoyance responses (Civil Aviation Authority, 2021).

6. It is important to realise that in terms of uncertainty, there is little uncertainty that aviation noise effects health or that annoyance is a health effect. However, for some effects there is uncertainty in the magnitude of the effect in relation to exposure. For example, predicting or estimating annoyance at any given sound level has uncertainty, with wide-ranging estimates of annoyance being found for the same sound level across studies (Guski et al., 2017, Guski et al., 2018).
7. Uncertainty is associated with methodological differences in survey design (sampling, recruitment, population, range of exposure) but also in terms of how noise exposure is estimated; operational differences between airports (e.g. number of runways, night-flights, availability of respite) and non-acoustic factors (Clark et al., 2021a). Effects are likely to vary between contexts, with the World Health Organization (WHO, 2018) recommending the use of local data to estimate effects, where available.

“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. If, however, local data are not available, general exposure–response relationships can be applied, assuming that the local annoyance follows the generalized average annoyance.” (Section 5.5, page 109) (WHO, 2018).

8. Several international studies examining change in aircraft noise exposure, including newly overflown communities, airspace change, and runway alterations, have found that there is an excess annoyance response in relation to the change in noise exposure, both for increases and decreases in exposure (Brown and van Kamp, 2017, Brink et al., 2008, Fidell et al., 2002, Nguyen et al., 2018, Quehl et al., 2017). This means that when noise exposure increases that the annoyance response is slightly higher than would be predicted from steady-state ERFs for the actual noise exposure. Studies from Switzerland and the Netherlands suggest that these excess-responses are not short-term but can endure for at least a couple of years, if not longer (Breugelmans et al., 2007, Brink et al., 2008). These studies included communities experiencing relatively small increases in aircraft noise exposure e.g., 1-2 dB L_{den} to larger increases e.g., 5-7dB L_{den}). The proposed changes at LCA are likely to be associated with change effects, increasing annoyance in the local population.
9. It is very unusual for a scheme to rely solely on quieter aircraft as mitigation given the uncertainty in any reduction and the timeline for introduction. The WHO review of interventions for noise effects on health identified four types of interventions: reduction at source (e.g., regulation of emissions, curfews); path interventions (e.g., noise insulation); new/closed infrastructure (e.g., airspace design, urban planning), and other physical interventions (e.g., access to quiet, access to greenspace). The ICAO

Balanced Approach sets out how noise reduction should be managed, with restrictions only to be considered when other options have been exhausted (International Civil Aviation Organization, 2008). The application makes no mention of noise insulation, which is typically applied in infrastructure and airspace change projects to 'avoid' effects on health and quality of life and comply with the Noise Policy Statement for England.

10. The loss of respite from aircraft noise in the local communities on Saturday afternoons and early in the morning will impact on health. Analyses of SoNA 2014 (Survey of Noise Attitudes) for the Heathrow sample, who receive predictable respite due to operational modes and runway alternation, found that respite was associated with a reduced likelihood of being highly annoyed. Respondents who experienced at least 9 dB $L_{Aeq,8h}$ noise respite in the daytime were less likely to be highly annoyed. Residents who experienced less than 4 dB $L_{Aeq,8h}$ noise respite or 4-8.99 dB $L_{Aeq,8h}$ noise respite were not found to have any statistically significant effect on the likelihood of being highly annoyed. For residents experiencing no landing noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 52 dB $L_{Aeq,16h}$. For residents experiencing at least 9 dB $L_{Aeq,8h}$ noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 59.5 dB $L_{Aeq,8h}$, a shift of 7.5 dB $L_{Aeq,16h}$ for the same annoyance response. The current respite at LCA will be lowering levels of annoyance in the local populations, which will increase should the respite be removed. The current Saturday afternoon and early morning (06.30-07.00) respite will be contributing to reducing rates of annoyance within the local communities.

References

- BASNER, M. 2021. Effects of noise on sleep. *Reference Module in Neuroscience and Biobehavioral Psychology*. Elsevier.
- BASNER, M. & MCGUIRE, S. 2018. WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep. *International Journal of Environmental Research and Public Health*, 15, 519.
- BREUGELMANS, O., HOUTHUIJS, D., VAN KAMP, I., STELLATO, R., VAN WIECHEN, C. & DOORNBOS, G. 2007. Longitudinal effects of a sudden change in aircraft noise exposure on annoyance and sleep disturbance around Amsterdam Airport. *International Congress on Acoustics*. Madrid.
- BRINK, M., WIRTH, K. E., SCHIERZ, C., THOMANN, G. & BAUER, G. 2008. Annoyance responses to stable and changing aircraft noise exposure. *Journal of the Acoustical Society of America*, 124, 2930-2941.
- BROWN, A. L. & VAN KAMP, I. 2017. WHO Environmental Noise Guidelines for the European Region: A systematic review of transport noise interventions and their health effects. *International Journal of Environmental Research and Public Health*, 14, 873.
- CIVIL AVIATION AUTHORITY 2021. CAP1506: Survey of Noise Attitudes 2014. Second Edition ed. London; United Kingdom: Civil Aviation Authority.

- CLARK, C., GJESTLAND, T., LAVIA, L., NOTLEY, H., MICHAUD, D. & MORINAGA, M. 2021a. Assessing community noise annoyance: A review of two decades of the international technical specification ISO/TS 15666:2003. *J Acoust Soc Am*, 150, 3362.
- CLARK, C., HEAD, J., VAN KAMP, I., VAN KEMPEN, E., HAINES, M. & STANSFELD, S. 2021b. A meta-analysis of the association of aircraft noise at school on children's reading comprehension and psychological health for use in Health Impact Assessment. *Journal of Environmental Psychology*, 101646.
- CLARK, C. & PAUNOVIĆ, K. 2018a. WHO Environmental Noise Guidelines for the European Region: A systematic review on environmental noise and cognition. *International Journal of Environmental Research and Public Health*, 15, 285.
- CLARK, C. & PAUNOVIĆ, K. 2018b. WHO Environmental Noise Guidelines for the European Region: Systematic review of the evidence on the effects of environmental noise on quality of life, wellbeing and mental health. *International Journal of Environmental Research and Public Health*, 15, 2400.
- DEPARTMENT FOR ENVIRONMENT, F., AND RURAL AFFAIRS, March 2010. Noise Policy Statement for England. London: Department for Environment Food and Rural Affairs.
- EUROPEAN ENVIRONMENT AGENCY 2020. Environmental Noise in Europe 2020. Luxembourg: Publications of the European Union.
- FENECH, B., LAVIA, L., RODGERS, G. & NOTLEY, H. 2021. Development of a new ISO Technical Specification on non-acoustic factors to improve the interpretation of socio-acoustic surveys. *Paper presented at the 13th IC BEN Congress on Noise as a Public Health Problem*. 14-17 June, Stockholm.
- FIDELL, S., SILVATI, L. & HABOLY, E. 2002. Social survey of community response to a step change in aircraft noise exposure. *J Acoust Soc Am*, 111, 200-9.
- GONG, X., FENECH, B., BLACKMORE, C., CHEN, Y., RODGERS, G., GULLIVER, J. & HANSELL, A. L. 2022. Association between noise annoyance and mental health outcomes: A systematic review and meta-analysis. *International journal of environmental research and public health*, 19, 2696.
- GUSKI, R. 1999. Personal and social variables as co-determinants of noise annoyance. *Noise and Health*, 1, 45-56.
- GUSKI, R., SCHRECKENBERG, D. & SCHUEMER, R. 2017. WHO Environmental Noise Guidelines for the European Region: A systematic review on environmental noise and annoyance. *International Journal of Environmental Research and Public Health*, 14, 1539.
- GUSKI, R., SCHUEMER, R. & SCHRECKENBERG, D. 2018. Aircraft noise annoyance - Present exposure response relations. *Euronoise Crete*.
- HEGEWALD, J., SCHUBERT, M., FREIBERG, A., ROMERO STARKE, K., AUGUSTIN, F., RIEDEL-HELLER, S. G., ZEEB, H. & SEIDLER, A. 2020. Traffic Noise and Mental Health: A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*, 17.
- INTERNATIONAL CIVIL AVIATION ORGANIZATION 2008. ICAO 9829, Guidance on the balanced approach to aircraft noise management, 2nd Edition.
- ISO/TS15666:2003 2003. Acoustics - Assessment of noise annoyance by means of social and socio-acoustic surveys. Geneva; Switzerland: International Organization for Standardization.
- ISO/TS15666:2021 2021. Acoustics - Assessment of noise annoyance by means of social and socio-acoustic surveys. Geneva; Switzerland: International Organization for Standardization.

- JANSSEN, S. A., VOS, H., VAN KEMPEN, E. E., BREUGELMANS, O. R. & MIEDEMA, H. M. 2011. Trends in aircraft noise annoyance: the role of study and sample characteristics. *Journal of the Acoustical Society of America*, 129, 1953-62.
- MUNZEL, T., SORENSEN, M., GORI, T., SCHMIDT, F. P., RAO, X., BROOK, F. R., CHEN, L. C., BROOK, R. D. & RAJAGOPALAN, S. 2017. Environmental stressors and cardio-metabolic disease: part II-mechanistic insights. *Eur Heart J*, 38, 557-564.
- MUNZEL, T., SORENSEN, M., SCHMIDT, F., SCHMIDT, E., STEVEN, S., KROLLER-SCHON, S. & DAIBER, A. 2018. The Adverse Effects of Environmental Noise Exposure on Oxidative Stress and Cardiovascular Risk. *Antioxid Redox Signal*, 28, 873-908.
- NGUYEN, T. L., NGUYEN, T. L., MORINAGA, M., YOKOSHIMA, S., YANO, T., SATO, T. & YAMADA, I. 2018. Community response to a step change in the aircraft noise exposure around Hanoi Noi Bai International Airport. *J Acoust Soc Am*, 143, 2901.
- NOTLEY, H., GRIMWOOD, C., RAW, G., CLARK, C., ZEPIDOU, G., VAN DE KERCKHOVE, R. & MOON, N. 2014. National Noise Attitude Survey 2012 (NNAS2012): Summary Report. London: DEFRA.
- QUEHL, J., MULLER, U. & MENDOLIA, F. 2017. Short-term annoyance from nocturnal aircraft noise exposure: results of the NORAH and STRAIN sleep studies. *Int Arch Occup Environ Health*, 90, 765-778.
- VAN KEMPEN, E., CASAS, M., PERSHAGEN, G. & FORASTER, M. 2018. WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Cardiovascular and Metabolic Effects: A Summary. *Int J Environ Res Public Health*, 15.
- WHO 2018. The World Health Organization Guidelines for Environmental Noise Exposure for the European Region. Copenhagen: Denmark: World Health Organization Europe.