

1. I have been living in Bow since **December 2011** and when I moved in the area the airport was already here (smaller, less, dispersed flight paths). One was able to hear the odd plane (much smaller and quieter aircrafts) flying more dispersed and therefore generating much less noise overall. Fast forward to 2016 when LCY concentrated their flightpaths without any consultation (and I hope we can all agree that flight paths are the elephant in the room and why so many residents are objecting the expansion). According to the report **PBN implementation benchmarking reviewed**, accepted and published by Heathrow in April 2022 where London city airport was one of the PBN case studies **LCY generated extensive criticism for a relatively low level of engagement around the flight path changes to introduce PBN . There were no public meetings, advertised community events, or engagement with local authorities, also no written communications were targeted at the affected areas.** According to the same report, the increase in aircraft noise complaints post 2016 was 4 fold. Also in 2016 permission was granted to extend the runway to cater for bigger (and noisier) aircrafts. Triple whammy (more movements, bigger planes, concentrated paths) also Heathrow flight paths on top so LCY planes have to remain at lower altitudes across vast area of London perfect storm. Michael (my neighbour who has been living in the area since the 1960s said to me that when the airport opened in the 80s the public was told there will be vertical planes in the future in order to be less disrupting for the local residents.
2. I've attended one of LCY's **Noise Action Plan (2024~2028)** meeting which was not only a tick boxing exercise but one of the LCY representative there agreed that the airport did not anticipate the extent of the outrage following the PBNs and larger aircrafts introduction in 2016 and the resulting "**noise ghettos**". We are now towards the end of 2023 ~ almost **8 years** have passed and LCY hasn't addressed the issue. No empathy, no compassion just maximising profits. I am aware we live in a capitalistic society but what is the social cost of LCYs expansion? How much is just too much.
3. **Early morning flights** ~ the quietest time of the day and therefore LCY planes have massively disproportionate impact that disturbs people's circadian rhythms (including mine which is my biggest issue here). As presenting video/audio evidence was quite complicated during the public enquiry I was unable to do so and I am not certain even LCY can appreciate the unbearable noise their planes are generating. What about shift workers and caregivers. People whose sleep schedule is not under their control (doctors, caregivers, etc friends) ~ people have to save lives while we are debating LCYs expansion plans. I have multiple videos which

I am more than happy to share.

4. **Weekend flights** ~ the only respite from the unacceptable noise levels (even this is far from consistent respite not adequate only 24h a week) with no alternating PBNs the same communities are being overflown over and over and over again. I would just like to stress that the airport is called **London City Airport** not Newham Airport or East London Airport ~ its main target is **business travel to cater for the City** which shouldn't be allowed on the weekends. East London is now very well connected with Heathrow Via Elizabeth line, Stanstead via busses and Southend Airports via train so there is no real need for expansion from that perspective as we are all aware business travel should be going down especially post Covid when many companies realised there is no need to travel thousands of miles for one meeting which could be a video call and therefore reduce their carbon footprint. According to **Forbes business travel will never be back to pre pandemic levels.**
5. **Physical and Mental health** ~ I hope this will be discussed at expert level during the public enquiry but there is so much evidence of the negative health impacts from noise pollution. According to Lady King chair of the Science and Technology Committee of the House of Lords ... **Not only can they (noise and light pollution) cause annoyance, impacting quality of life, but through the disruption of sleep and circadian rhythms (think early morning flights especially) both noise and light pollution can contribute to heart disease and premature death.** East London is finally rejuvenating after decades of poverty and more and more people are moving to the area which is becoming densely populated (look at all the high rises being built around) which means LCYs impact is orders of magnitudes higher nowadays than when the airport was built. The lovely area of the Bow Cemetery park where people run and walk especially at lunchtime is just under the departures flight path. Nature is profound for increasing one's mental health and improving cognition and preventing burnout, yet with the airplane noise it is becoming obsolete. In addition I live in a small gated development and we pride ourselves with our lovely gardens overseen by my 93 years old neighbour Veronica - we can't really enjoy those anymore due to the constant noise from the LCY planes.
6. **Financial impact of soundproofing one's home ~ not widely discussed.** In order to try and mitigate the insane noise disruption (especially during early mornings) I had to hire an acoustician (had no idea those existed before I did my research) and as a result had to get double acoustic laminated glass windows. With better specked ones in my 2 bedrooms and less than optimal in the kitchen and living room the bill came to 17,784.89 after months of research and bargaining for

discounts. Then there are additional costs for acoustic mineral wool for the loft, etc... with the sky high energy bills, raise in unemployment and the cost of living crises I wouldn't have spent the money as my existing double glazing is relatively recent purchase but when it came to MY mental and physical health it had to be done - especially the unparalleled disturbance of the early morning flights. Most days I DO wake up from the sudden loud noises during the early morning hours and every day there are easterly winds is cherished (sadly only 30% annual average). I am fortunate to have a job while lots of my neighbours are elderly and/or vulnerable people who can't even attend today due to ill health to express their views and definitely cannot spend thousands of pounds soundproofing their home.

7. I am a statistician by trade and just wanted to add as well that **average decibels are not really useful** especially for high severity noises like airplane noise and the fact the decibel scale is logarithmic rather than linear is crucial here. Levels of noise reach 70~75 decibels outdoors where I live which is extremely loud.
8. **Overall public response** ~ more than 95% of respondents objected the expansion during Newham's consultation, all affected London boroughs objected, multiple councillors and MPs objected. We have the privilege to live in one of the oldest and best functioning democracies in the world. The public clearly objects LCY expansion and I honestly cannot comprehend why we are even here today.

Thank you for your time and the opportunity to speak.

D/020/016/015

A note on the date of publication of this report:

This study, on behalf of the HCNF, commenced in October 2019. A number of workshops, focused on developing this report, were held with various representatives of the HCNF between October 2019 and March 2020. The study was originally due to report at the HCNF in March 2020, however this meeting was cancelled due to the Covid-19 Pandemic.

The Covid-19 Pandemic has caused significant disruption to aviation on a global basis, including at Heathrow. As a consequence of its impact Heathrow has undergone significant changes in operations, personnel and managerial structure. The combined impact of the pandemic and these changes caused a delay in the publication of this report.

This report was reviewed, accepted and published by Heathrow in April 2022

PBN Implementation Benchmarking

March 2020

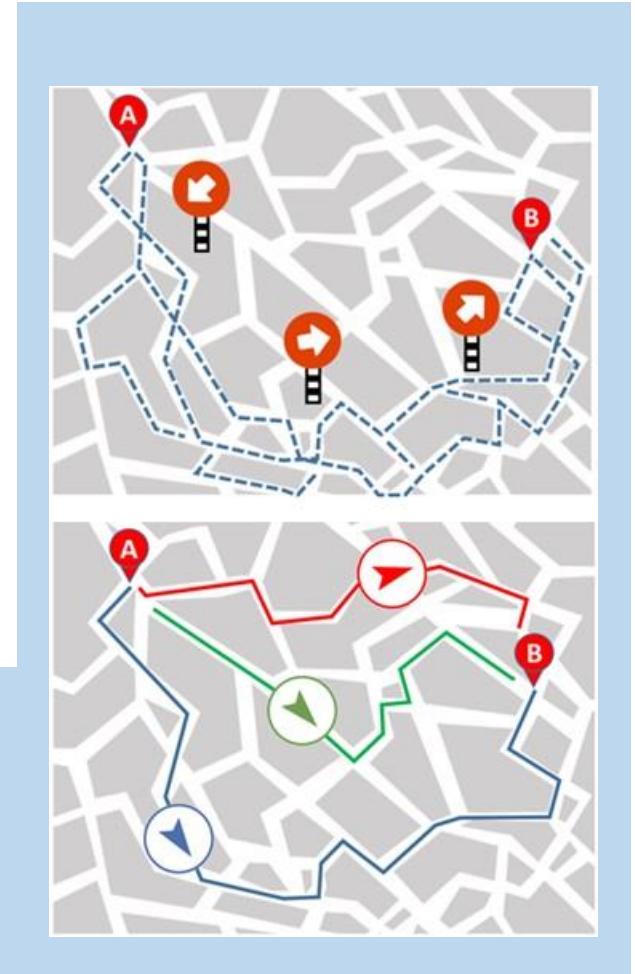
Mike Fairbanks

Alex Goman

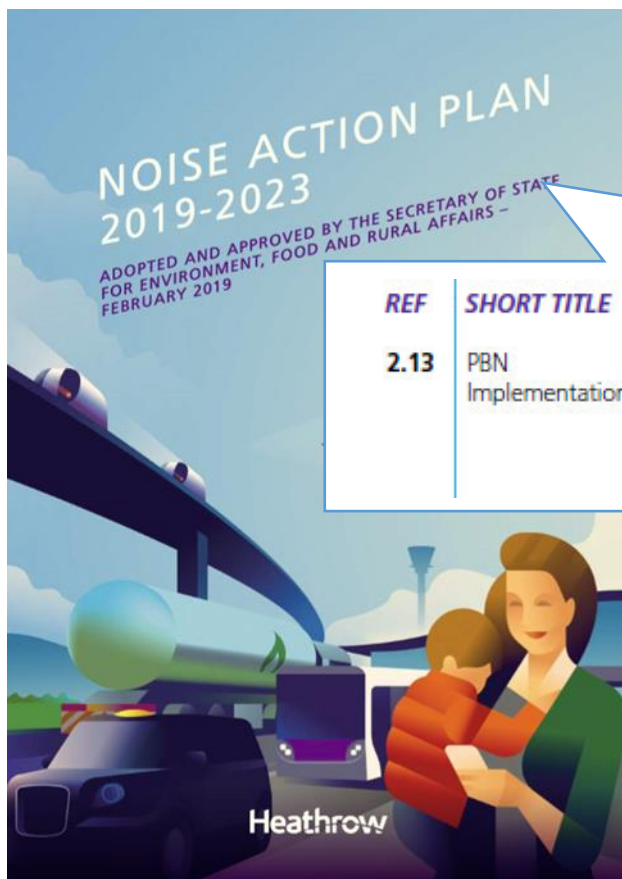
PBN is being introduced around the world, with varying approaches to design, engagement and implementation

- Around the world investments are being made in infrastructure to enhance the safety and efficiency of air navigation. A key technology supporting these programmes is Performance Based Navigation (PBN).
- PBN encompasses a shift from current ground-based navigation aids emitting signals to aircraft receivers, to systems in the aircraft that receive satellite signals.
- These signals determine the aircraft's position by meeting specific accuracy and integrity requirements
- While PBN can increase airspace efficiency by providing more direct paths, (thereby reducing aircraft fuel burn and emissions), it tends to result in aircraft flying more precisely-defined flight paths. This can exacerbate noise impacts and annoyance for communities overflown.

To understand the effects of PBN we can draw an analogy with conventional satellite navigation, as is used in many modern vehicles. Traditional navigation through a town, from point A to point B would rely on conventional signposts; this results in a distribution of traffic across multiple routes. Introducing satellite navigation using predefined routes directs all traffic along those specific routes.



This benchmarking study was commissioned by Heathrow as part of its Noise Action Plan



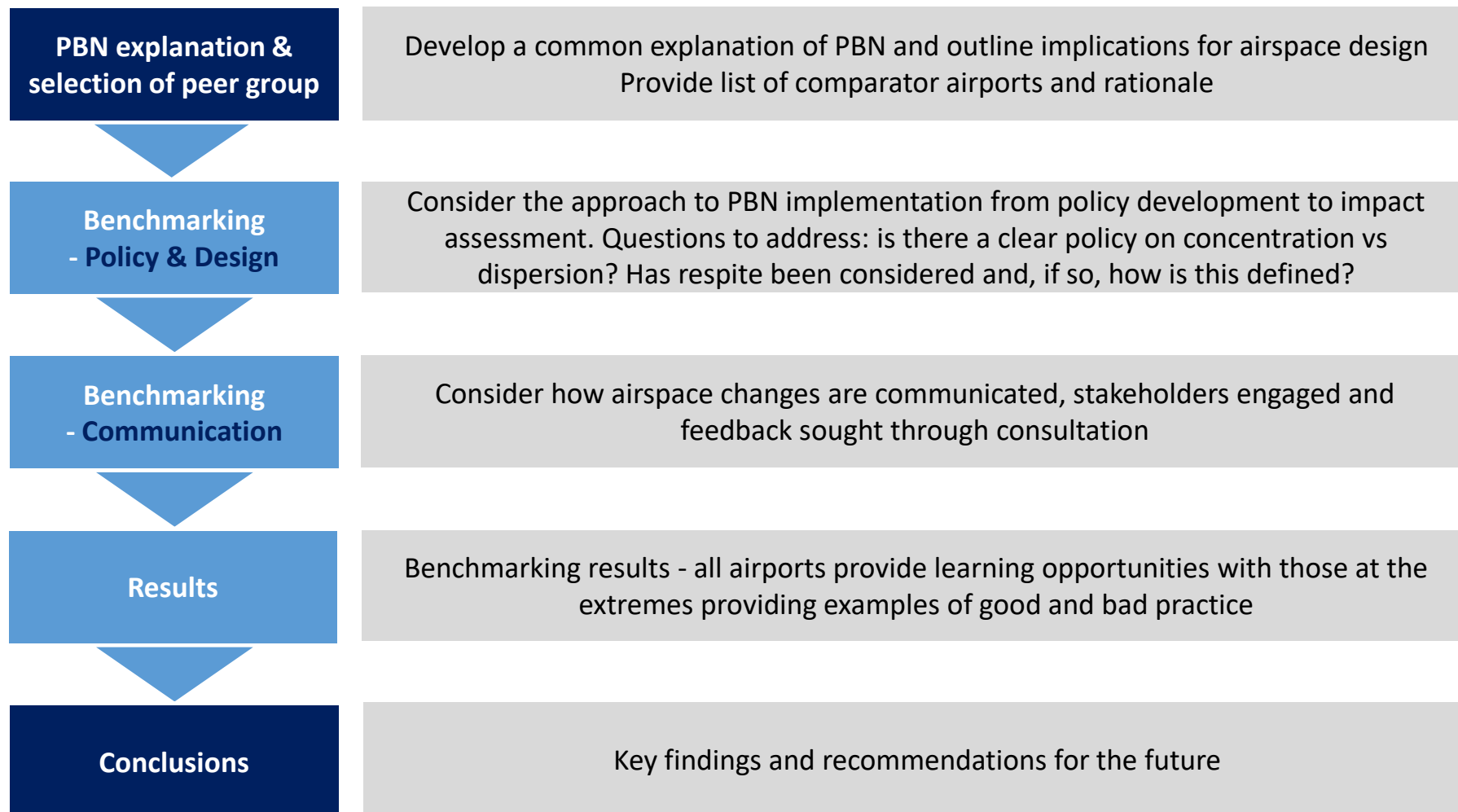
Quieter Procedures

We will work with all our stakeholders to explore and employ best practice, lower noise operating procedures to reduce the impact of aircraft on residents

REF	SHORT TITLE	ACTIONS	DATE	PERFORMANCE INDICATOR	TARGET	IMPACT	COMMUNITIES AFFECTED
2.13	PBN Implementation	With the HCNF we will develop a scope for a study on the benchmarking of Performance Based Navigation (PBN) implementation including international experiences and publish a report by 2019.	2019	Scope developed	Report published	Arrivals Departures	Communities within and beyond 55dB L _{den}

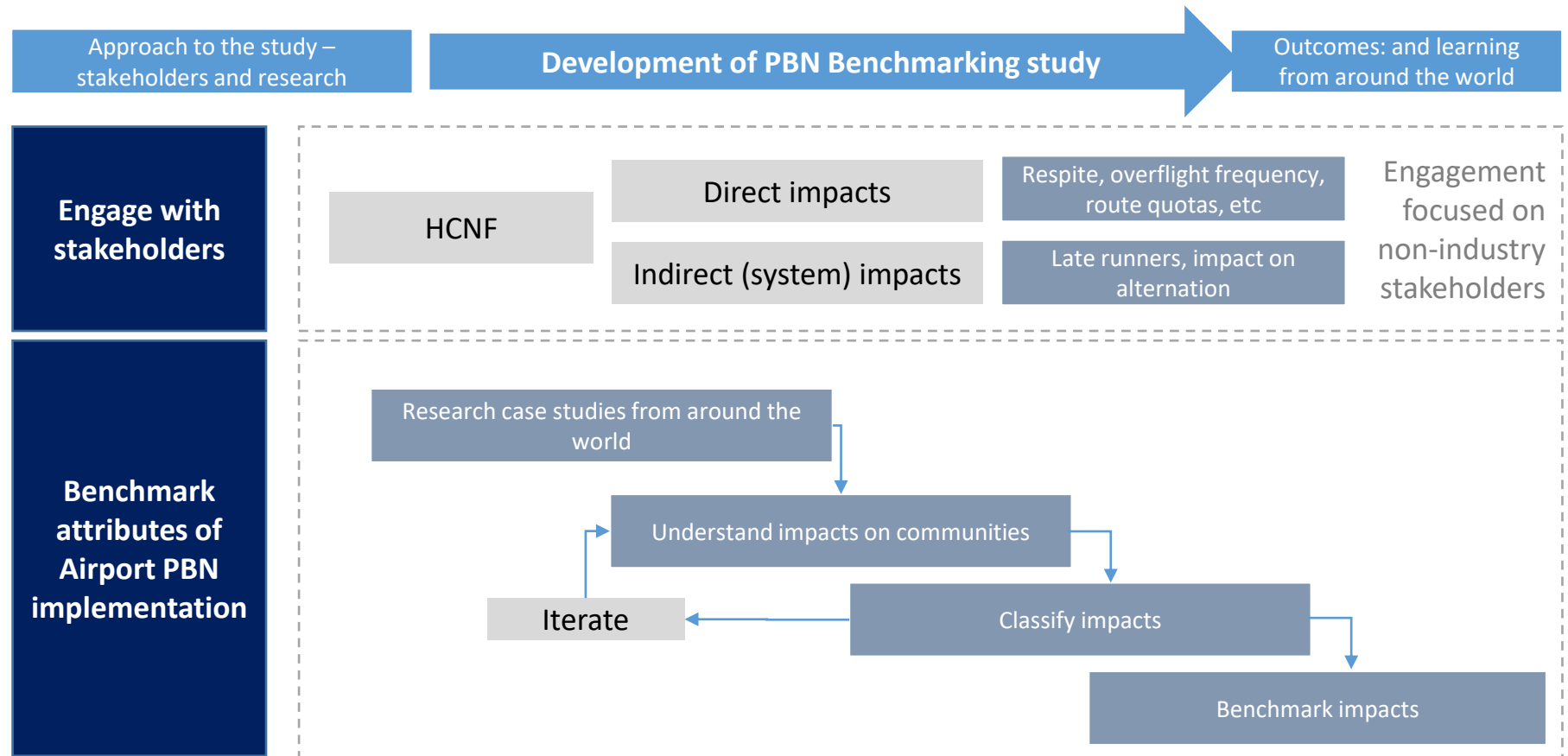
- Develop a common understanding of PBN
- Understand the perceptions of the stakeholder communities to PBN
- Identify good and bad practice in
 - PBN design
 - stakeholder engagement and
 - implementation
- Perform benchmarking analysis and case studies to:
 - draw conclusions
 - make recommendations

The approach to this study was informed and shaped by engagement with members of the HCNF*



* Heathrow Community Noise Forum

The study drew information from Heathrow's community stakeholders and desk-based research on other airports



HCNF provided feedback on Heathrow's engagement on airspace to date, and suggested comparator airports

- Four stakeholder workshops were held with members of the HCNF during the course of this study, each attended by 2-6 members of the HCNF. An email address was set up to support this
- Each workshop discussed PBN and the proposed framework for this study, and gathered feedback on the proposed assessment categories
- The key areas of concern from communities focused on the potential impact of flightpath concentration
- An update workshop was held with members of the HCNF in February 2020 where details of the assessment criteria were shared, although the benchmarking itself was conducted independently by Taylor Airey
- In response to the points raised in these workshops, London City was included as a case study. Note this case study was added after the benchmarking exercise had been completed

Comparator airports have implemented PBN and have information publicly available

- We have included comparator airports that:
 - Are implementing PBN
 - Have attracted a high level of protest or are relatively open/transparent with public data available
 - Provide learning opportunities for Heathrow and are comparable in size
- We analysed airspace changes at a city level since the airspace changes generally covered multiple airports (e.g. all New York airports)

- **UK:** Heathrow
- **North America:**
 - **East:** New York, Washington DC, Boston
 - **West:** Los Angeles, San Francisco, Seattle
 - **Central:** Phoenix (PBN rescinded), Chicago, Denver, Charlotte
 - **Canada:** Vancouver, Toronto, Calgary
- **Europe:** Amsterdam, Vienna

Available
information

Significant
publicity

Useful Heathrow
comparators

- **Europe:** Frankfurt
- **Asia-pacific:** Sydney, Brisbane, Auckland
- As a result of community workshops London city was included as a case study

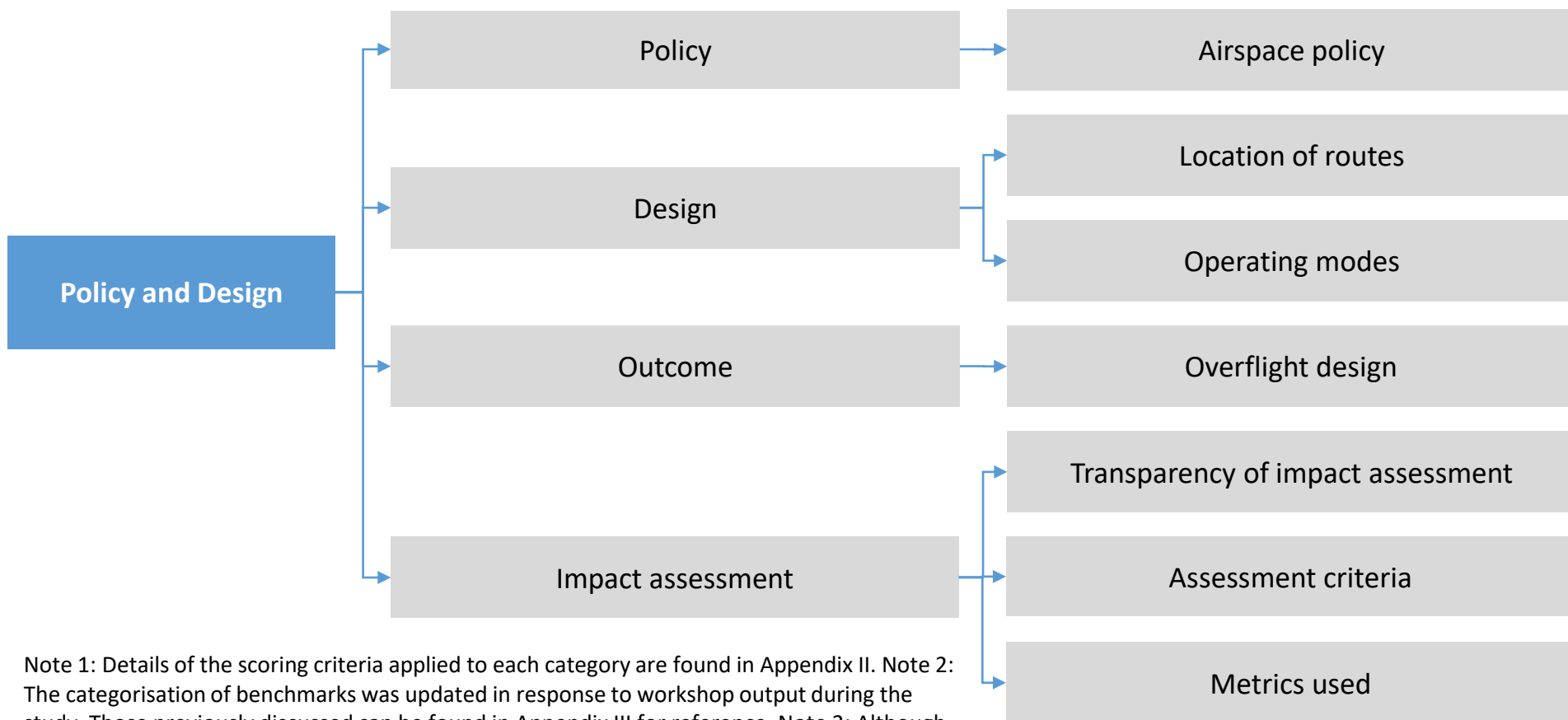
Recommended
from community
workshops

Benchmarking focussed on policy, design and communications

- An initial set of benchmarking categories was developed and shared with HCNF members via four community workshops
- The proposed benchmarking framework was revised following community feedback, to focus on areas most relevant to the Heathrow experience

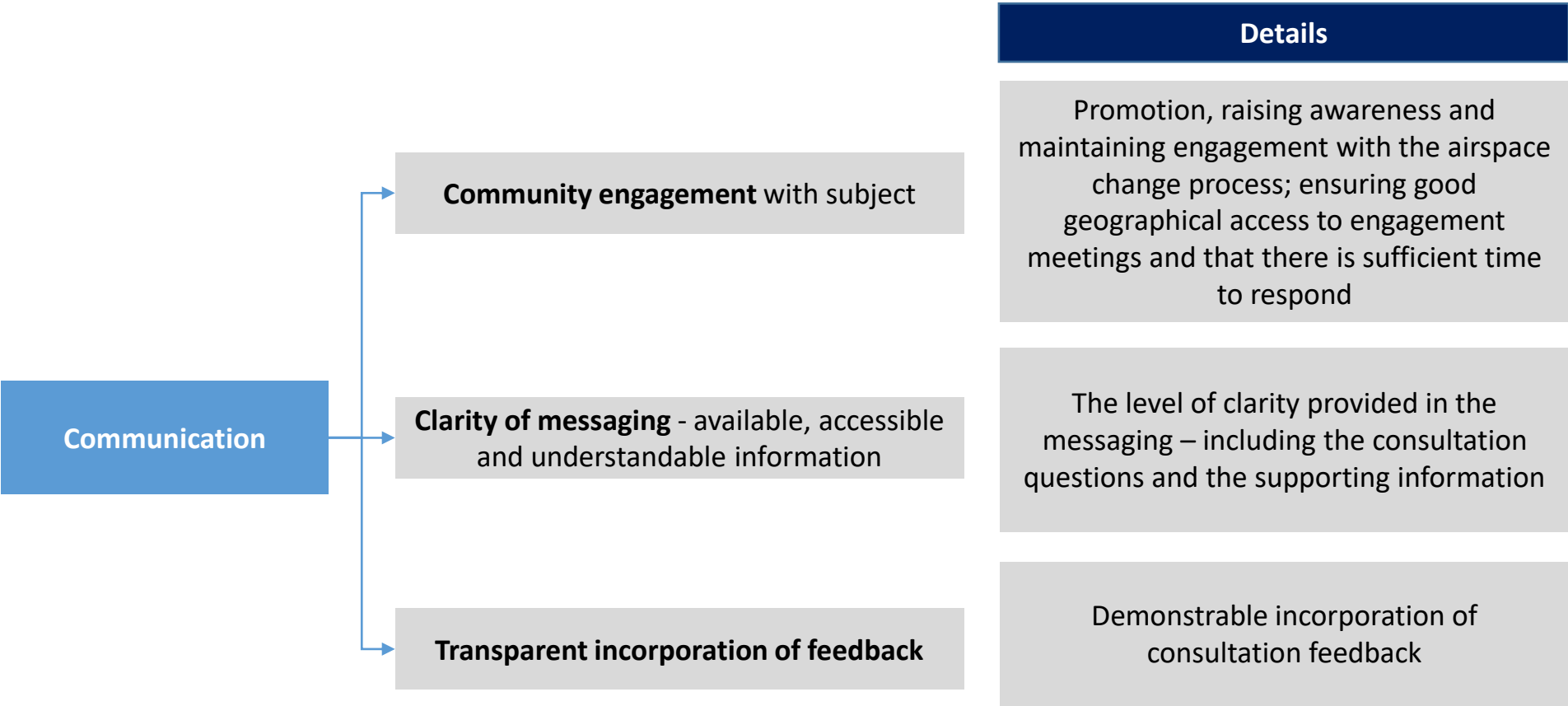
Heathrow was included in the benchmarking, despite not having implemented any PBN routes at the time of the study: the scores applied to Heathrow are therefore based on early indications of Heathrow's approach to design and engagement on the airspace change proposals underway in 2019-20 (Compton, IPA and Expansion)

We assessed the presence of suitable PBN policy and how that policy is then reflected in the airspace design



Note 1: Details of the scoring criteria applied to each category are found in Appendix II. Note 2: The categorisation of benchmarks was updated in response to workshop output during the study. Those previously discussed can be found in Appendix III for reference. Note 3: Although the categories have changed the same issues are covered by this new framework, as detailed in Appendix II.

We assessed the adequacy of engagement with local communities and how feedback is reflected in the design



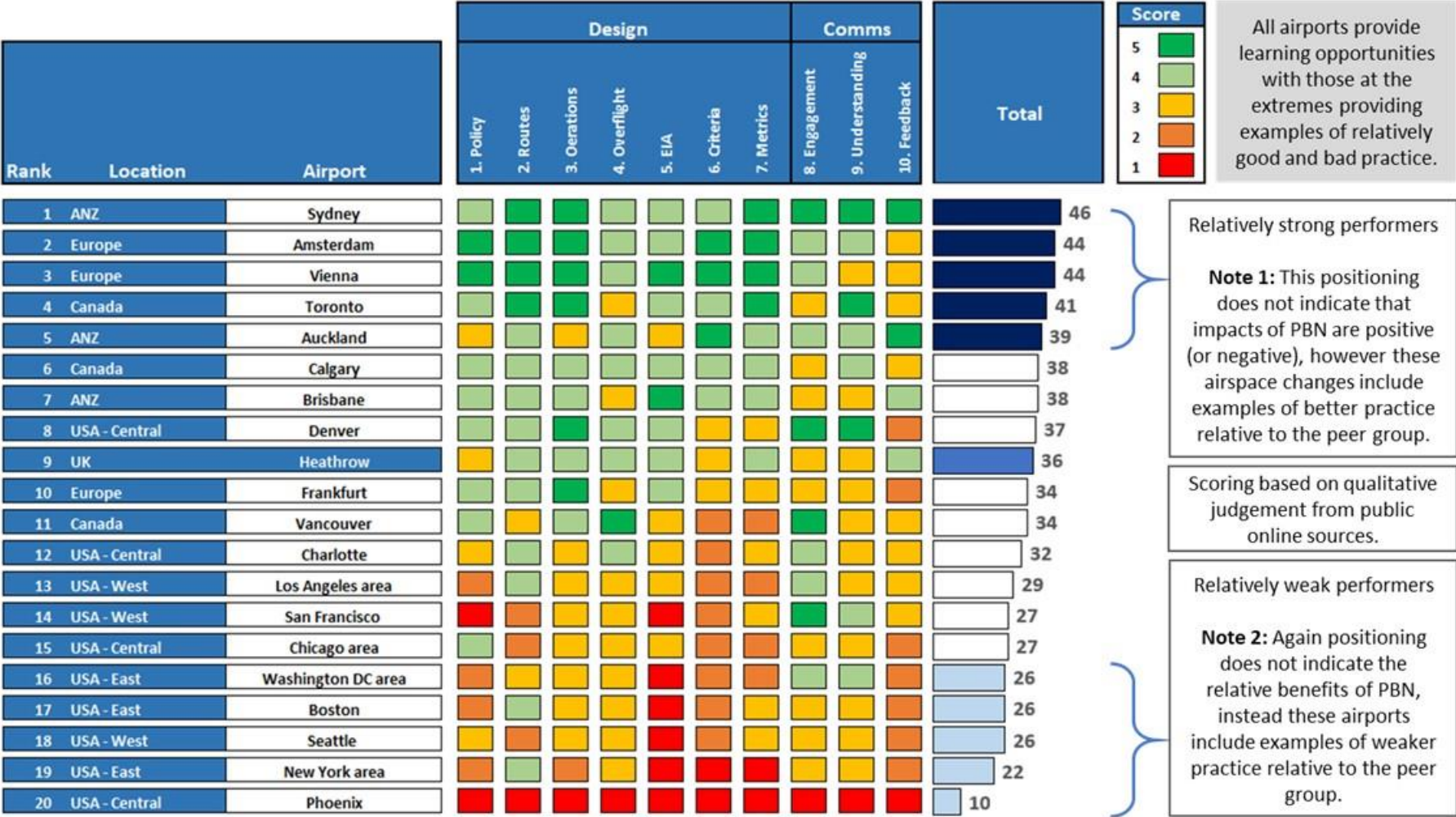
Note : Important lessons can be learnt from a recent FAA review of US PBN implementation, outlined in Appendix V. An example of good communications around airspace changes include emerging use of innovative technologies and the community workshops around the Compton Airspace change; PBN Mitigation presented in CAA CAP1378 also provides a useful starting point.

Twenty airports, including Heathrow, were assessed across ten categories

Assessment Criteria		
1	Airspace policy	What national and local policy was in force during the development of the airspace changes?
2	Location of routes	What consideration was given to minimising noise (and emissions) when designing location of routes?
3	Operating modes	What consideration was given to minimising noise (and emissions) when designing operation of routes?
4	Overflight design	How effective is the airspace design at offering respite for overflowed communities? (i.e. the outcome from categories 2 and 3, based on real-world impacts or modelled outcomes)
5	Transparency of impacts	How open and transparent was the airport about the likely environmental impacts of the proposed design?
6	Assessment criteria	How detailed and appropriate was the assessment of impacts?
7	Metrics	How suitable were the metrics used in the assessment?
8	Community Engagement	How effective was the promotion and awareness raising of the airspace change?
9	Understanding	How accessible and understandable was the community engagement material?
10	Use of feedback	Was community feedback demonstrably included in the subsequent airspace design?

Lessons can be learned from the best and worst performers

Appendix II provides details of the scoring criteria for each category



Heathrow's scores placed them middle of the table, based on policy, design and communication on ACPs to date

Assessment Criteria		Score	Rationale
1	Airspace policy	3	While there is a detailed policy framework and guidelines in place describing how to consult with those affected by the airspace changes (i.e CAP1616) no definitive position on policy objectives is offered by CAA or Government (e.g concentration of noise over existing routes vs maximum dispersal etc.)
2	Location of routes	4	Heathrow has considered multiple approaches to delivering respite, including multiple PBN routes and airspace alternation. However noise and overflight objectives are not closely defined in UK Government policy.
3	Operating modes	4	Heathrow indicated consideration of using flight path alternation (where dispersed PBN flight paths are used for set periods on a predictable basis) under design principle 6c. "Maximising sharing through predictable respite"
4	Overflight design	4	Heathrow's design principle 6d included avoiding overflying communities with multiple routes, including consideration of routes to/from other airports. Heathrow's design envelopes suggest investigation of 'switching off' sections of airspace to provide respite.
5	Transparency of impacts	4	As part of the CAP1616 process and the Airports National Policy Statement (ANPS), Heathrow is required to use a robust methodology that considers spatial planning, airspace management and environmental management.

Heathrow's scores placed them middle of the table, based on policy, design and communication on ACPs to date

Assessment Criteria		Score	Rationale
6	Assessment criteria	3	Heathrow had not, at the time of assessment, published graphics or resources in addition to noise contours to illustrate overflight intensity and typical height over the ground (e.g. Google earth files)
7	Metrics	4	In relation to noise, the Airports NPS (National Policy Statement) requires Heathrow expansion plans to avoid adverse (negative) effects on health and quality of life and to minimise the negative effects from aircraft operating at Heathrow: Heathrow will need to evaluate using a broad range of metrics
8	Community Engagement	3	Heathrow had not, at the time of assessment, designed targeted campaigns in the areas to be affected by the changes, since no route locations had yet been developed
9	Understanding	3	Heathrow had not, at the time of assessment, provided a clear and understandable explanation of airspace changes via an easy to navigate website. Instead the Heathrow website mainly provided a repository of .pdf files of varying degrees of detail that were difficult to cross-reference
10	Use of feedback	4	Involvement of community in the design of airspace routes for the proposed new Compton departure route was evidenced during community engagement sessions

Key findings: Policy and design

In relation to the overarching policy & design of PBN-related airspace change:

- The **overarching policy objectives** of PBN must be clearly articulated. There is a lack of an evidence-based policy framework in the UK, particularly in relation to the health impacts of repeated overflight
- **Routes should be located to minimise noise impact**, as per policy objectives, with impacts assessed in line with international standards and supported by a reliable and verifiable evidence base
- **Operating modes** used on these routes should examine how:
 - Noise can be dispersed;
 - Respite can be provided for affected communities;
 - A swathe of routes might be recreated using ‘managed dispersion’, if possible, to help mitigate noise impact
- The **overflight impact** on all stakeholders should be calculated, assessed and communicated transparently using useful, agreed & validated metrics; this should include the use of a framework for assessing health impacts related to noise and flight path change
- **‘Do nothing’ should be considered** as a viable outcome of a transparent and open assessment process if it is determined that PBN implementation is detrimental overall (e.g. through WebTag analysis)
- The **analysis must be robust and traceable** and include sensitivity tests to all assumptions (which must be clear and explained). Airports should be able to demonstrate that feedback provided has been listened to and taken into account
- **Engagement must be timed appropriately** to allow for meaningful dialogue. The CAA’s airspace change process can itself present challenges to building trust with communities. CAP1616 provides a process suitable for a relatively straightforward airspace change but it does not necessarily reflect the complexities inherent for a large airport such as Heathrow. For example it was noted that the CAP1616 process prevents airports from developing flight path options as early as some stakeholders would like.

Key findings: Communication and consultation

In relation to communication and consultation of PBN airspace changes:

- The **amount and quality of community engagement must be appropriate** to meet the needs of all affected stakeholders
- Readily **available, accessible and understandable information** must be provided
- A **sufficiency of time** must be allowed to ensure the consultation is accessible; this should be **supported by engaging websites and novel communication techniques** to encourage engagement and understanding
- The consultation must adhere to the '**Gunning**' principles, with proposals at formative stage, with sufficient information provided to give 'intelligent consideration', adequate time for consideration and response and 'conscientious consideration' is given to the consultation responses before a decision is made
- Communications during airspace consultations need to be **open, honest, transparent and consistent**, pursuing best practice in community engagement. It was recognised this will help to **build trust** with stakeholders. Examples of good airspace change communication materials are provided by airports in Australia and New Zealand.
- Airspace consultation websites should be reviewed for ease of access. This could be supported by a digital content strategy focused on providing **intuitive navigation** to its users (in addition to acting as a repository of .pdf documents providing a mixture of high-level summaries and detailed technical content).
- It was noted that the broad scope and size of the design envelopes consulted on by Heathrow in January 2019 restricted meaningful discussions about specific routes, designs or operating concepts as insufficient detail was available.
- There is a risk of 'over consultation' / 'over-engagement' at Heathrow; multiple airspace change projects running in parallel and additional, non-statutory, consultations taking place can result in confusion.

This study has identified recommendations for airports introducing PBN, and for UK Government

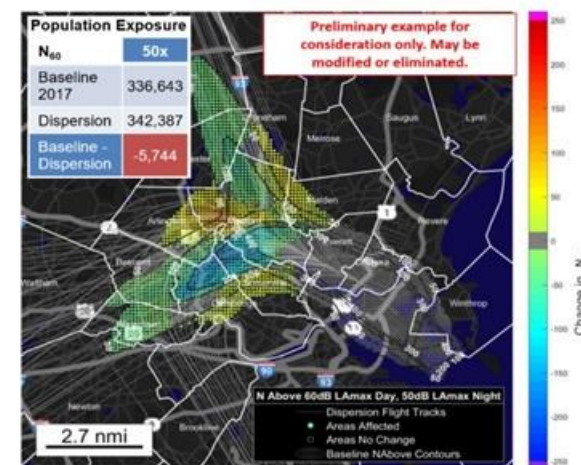
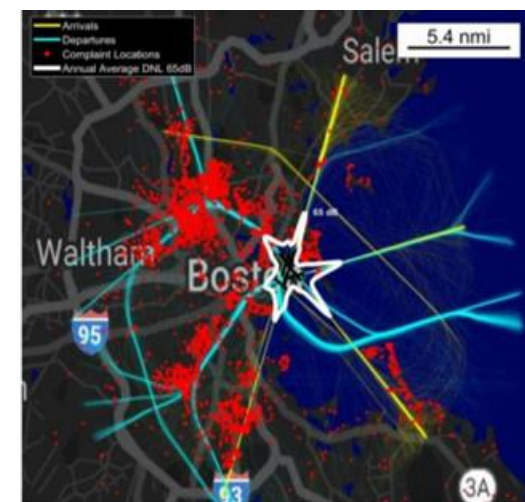
Policy	<p>1 Recommendation for UK Government: UK government policy offers no definitive statement on the preference for flight path dispersion/concentration and the resultant health impacts. Currently the guidance is vague & non-committal (eg around concentration vs. dispersion; the definition of respite, etc.) Policy detail would allow all stakeholders to optimise proposals against clear objectives.</p> <p>2 Recommendation for UK Government/UK CAA: There is insufficient joint sponsorship, accountability, authority and responsibility for the airspace changes affecting the London area. The UK airspace change process has resulted in a highly fragmented and complicated situation with multiple sponsors, governance bodies and coordination groups; this makes it difficult for sponsors and confusing/burdensome for stakeholders. More robust governance is needed. FMS limitations to multiple PBN routes should be challenged in appropriate governance groups (eg ACOG).</p>
Design / Assessment	<p>3 Recommendation for UK Government & airspace change sponsors: The standard metrics used to assess noise (and to a lesser extent local air quality) impact are under strong challenge, as is their transparency and relevancy. More meaningful metrics are needed, responsive to the needs of the affected community.</p>
Engagement	<p>4 Recommendation for airspace change sponsors: Engagement is a continuous process and relies on honesty, transparency and empathy. The earlier in the process that flight paths are identified and the affected communities are engaged in a genuine consultation, the greater is the opportunity to take feedback into account and modify the design. This relies on targeted communications to affected communities and a willingness to be open with all stakeholders.</p>

Supporting Material

- [Appendix I](#). Explaining PBN & its impacts
- [Appendix II](#). Benchmarking assessment criteria
- [Appendix III](#). Initial assessment categories
- [Appendix IV](#). Case studies
 - [Case study 1](#). London City
 - [Case study 2](#). Auckland
 - [Case study 3](#). Sydney
 - [Case study 4](#). Vienna
- [Appendix V](#). US PBN Summary
- [Appendix VI](#). Examples of good practice in airspace change communications

There are a number of areas where future work could inform effective PBN implementation

- Further work should be conducted by public and private organisations, in collaboration with Government & public health bodies where necessary, examining the health impacts of concentrated/dispersed flight paths
- Public and private bodies must work together for the collaborative development of meaningful metrics to help communities understand the impacts of flight path change, with particular reference to the appropriateness of noise contours and 'average' impacts
- More detailed forecasting of future flight path impacts is required, using local population & flight data to help quantify the impact to communities (e.g. as illustrated on this slide – showing the *change* in noise impact)
- Best practice guidelines around PBN engagement strategy should be developed, identifying:
 - **How websites and meetings can be engaging and accessible** for a wide audience and tailored to specific needs, learning lessons from implementations in the US, Europe and elsewhere
 - **Who should be targeted for engagement**, at what point and how (traditional mailshots, community based events, websites, etc.). Heathrow should consider what opportunities exist to ensure consultations are targeted to those likely to be impacted
 - **How airspace change sponsors can develop and use novel technologies to best communicate change**
- The responsibility for these areas of future work should be coordinated across the stakeholders involved in this work (Airports, ANSPs, Government, Regulator and Communities)



Pictures sourced from: 13th USA/Europe Air Traffic Management Research and Development Seminar (ATM 2019), [Advanced Operational Procedure Design, Concepts for Noise Abatement, Hansman et al.](#) Massachusetts Institute of Technology Cambridge, MA, USA; [RTCA Blueprint Community Outreach Task Group](#), Approved by the NextGen Advisory Committee June 2016

Appendix I – Explaining PBN

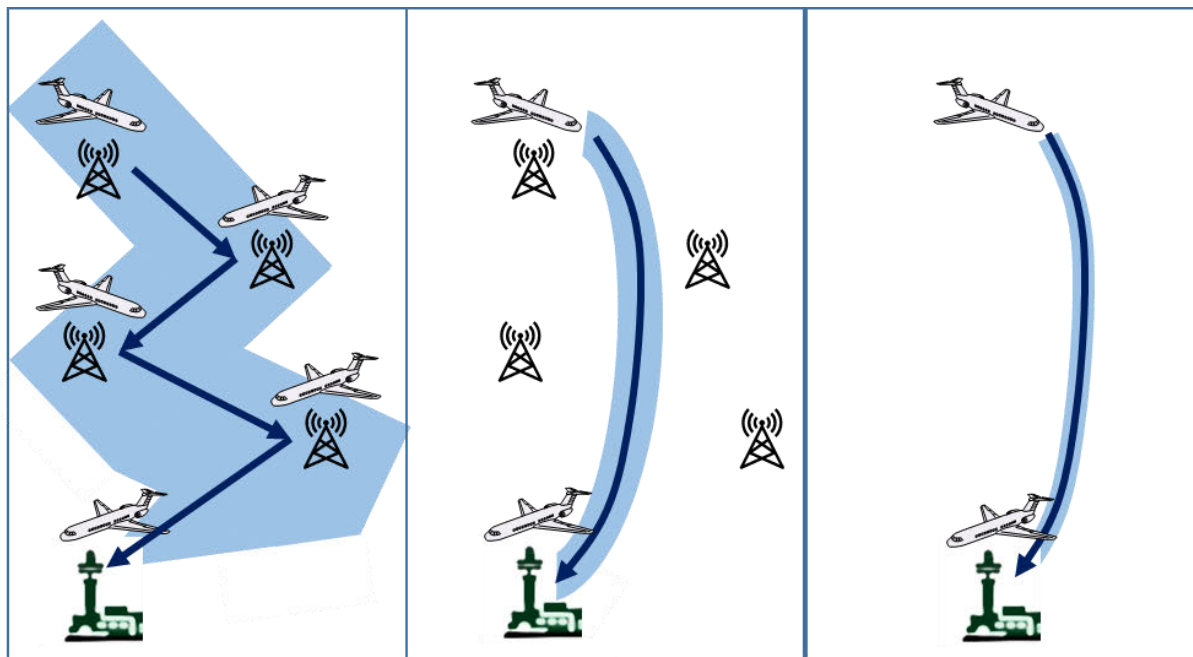
What is PBN?

Background	Around the world large investments are being made in infrastructure and systems to make sure growing volumes of air traffic are managed safely and efficiently. A key technology tool supporting these programmes is Performance Based Navigation (PBN).	
Technology	PBN encompasses a shift from current ground-based navigation aids emitting signals to aircraft receivers, to systems in the aircraft that receive satellite signals (such as the United States' Global Positioning System [GPS] - the European Union, Russia and China also have such systems) These signals determine the aircraft's position by meeting specific accuracy and integrity requirements.	
How it works	There are two elements to PBN: Area Navigation (RNAV) – this allows pilots to use a combination of satellite signals and other systems on-board aircraft to fly any desired flight path by reducing the limitations imposed by ground-based navigation systems.	Required Navigation Performance (RNP) – this is a more advanced form of RNAV as it adds monitoring capabilities to the cockpit to alert the pilot when the aircraft cannot meet specified navigation performance requirements. Key features of RNP are the ability to fly precise, curved approaches and provide predictable flight paths

Note that a full and detailed technical understanding of PBN is provided in ICAO Doc 9613 AN/937

What is PBN?

While PBN can increase airspace efficiency by providing more direct paths, (thereby reducing aircraft fuel burn and emissions), it also results in aircraft concentrating along their particular route.



The key difference between **RNP** and **RNAV** is that RNP requires on-board performance monitoring and alerting. This increases confidence in the accuracy of navigation and can enable closer spacing between routes.

With **Traditional Navigation**, aircraft have been required to fly routes between and over ground-based navigational aids. The performance of these aids is low so flight paths are dispersed and routes must be widely spaced

Area Navigation (RNAV) – Area navigation allows an aircraft to choose any course within a network of ground-based navigation beacons rather than navigating directly to and from the beacons. Flight paths are more direct than in traditional navigation and because navigation accuracy is increased, flights follow routes more precisely

Required Navigation Performance (RNP) – RNP is a type of PBN where the aircraft monitors its navigation performance

→ Aircraft track

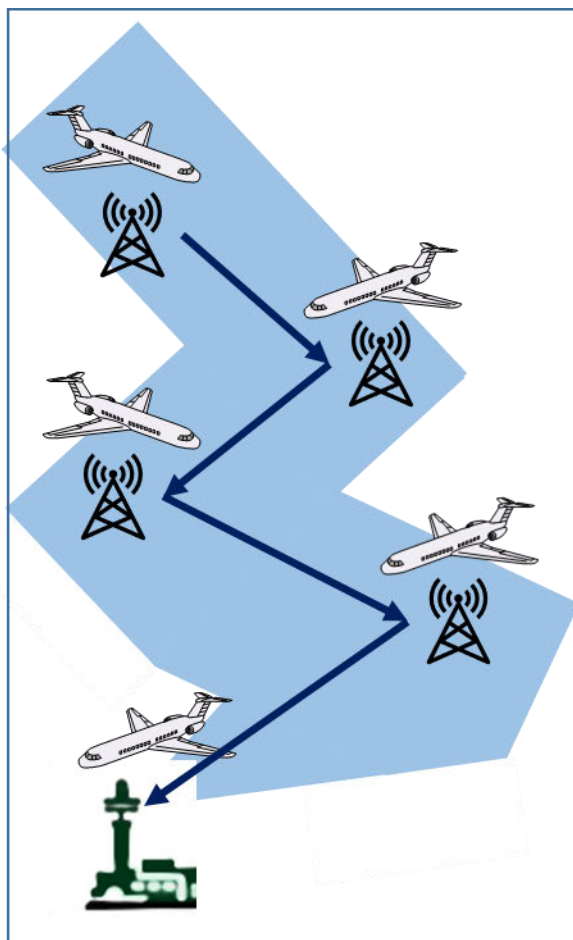
Swathe containing all tracks on the route



Ground-based navigation aid

Source: Taylor Airey analysis, Explanation of PBN: transport.govt.nz/air/; FAA Metroplex Programme Report [oid.dot.gov](https://www.faa.gov/air_traffic/operations/resources/metroplex/); UK CAA <https://www.caa.co.uk/Performance-based-navigation/>

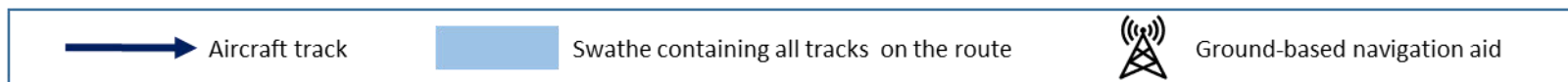
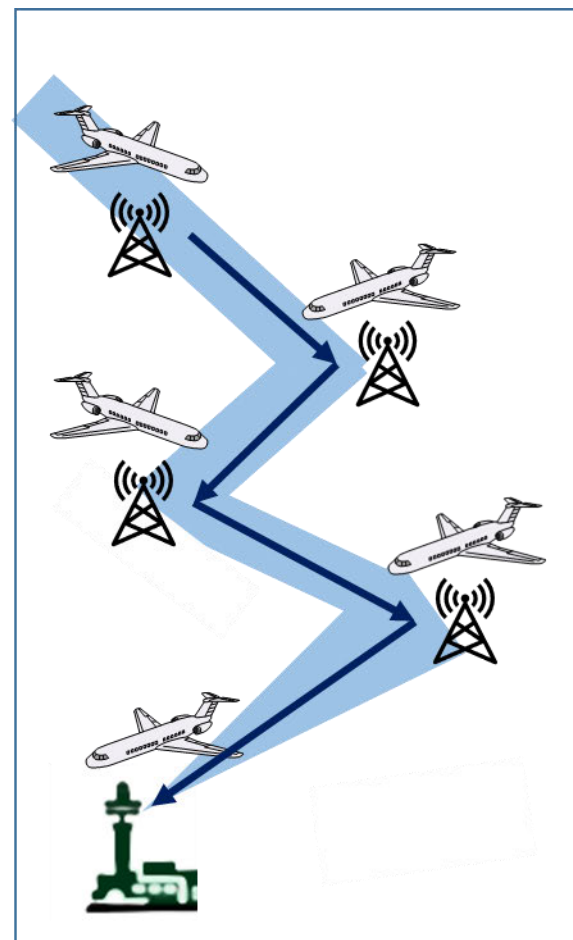
Even without PBN



Increased navigation accuracy

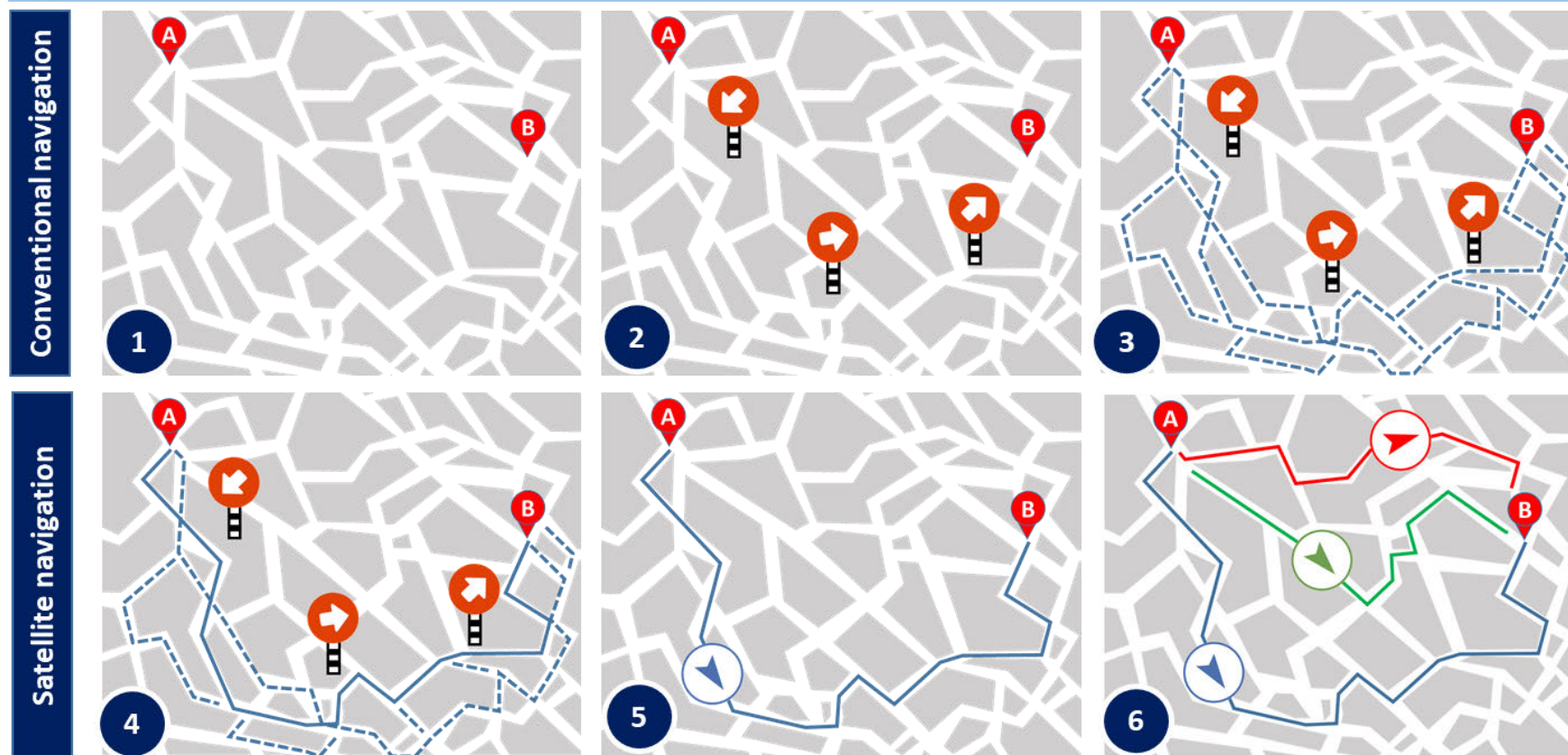


Concentrates flight paths



PBN – an analogy to navigating through a town

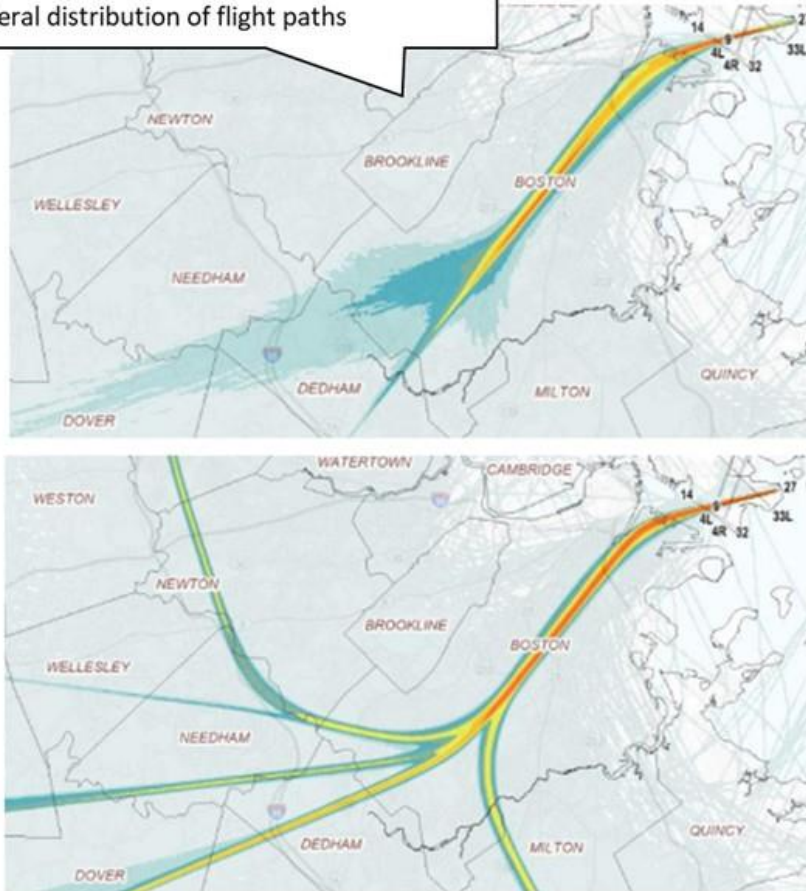
To understand the effects of PBN we can draw an analogy with conventional ground-based satellite navigation, as is used in many modern vehicles. Traditional navigation through a town, from point A to point B (1), would rely on a set of conventional signposts (2); this results in a distribution of traffic across multiple routes (3). Introducing satellite navigation using a predefined route (4) concentrates all traffic along the route (solid line) (5). This traffic can be dispersed by distributing traffic across multiple pre-defined routes (6). It should be noted that this is only a working analogy; in reality only a relatively small number of routes (4-5) can be pre-programmed into the aircraft's Flight Management System (FMS) for each airport approach route.



Note that a full and detailed technical understanding of PBN can be found in of PBN is provided in ICAO Doc 9613 AN/937

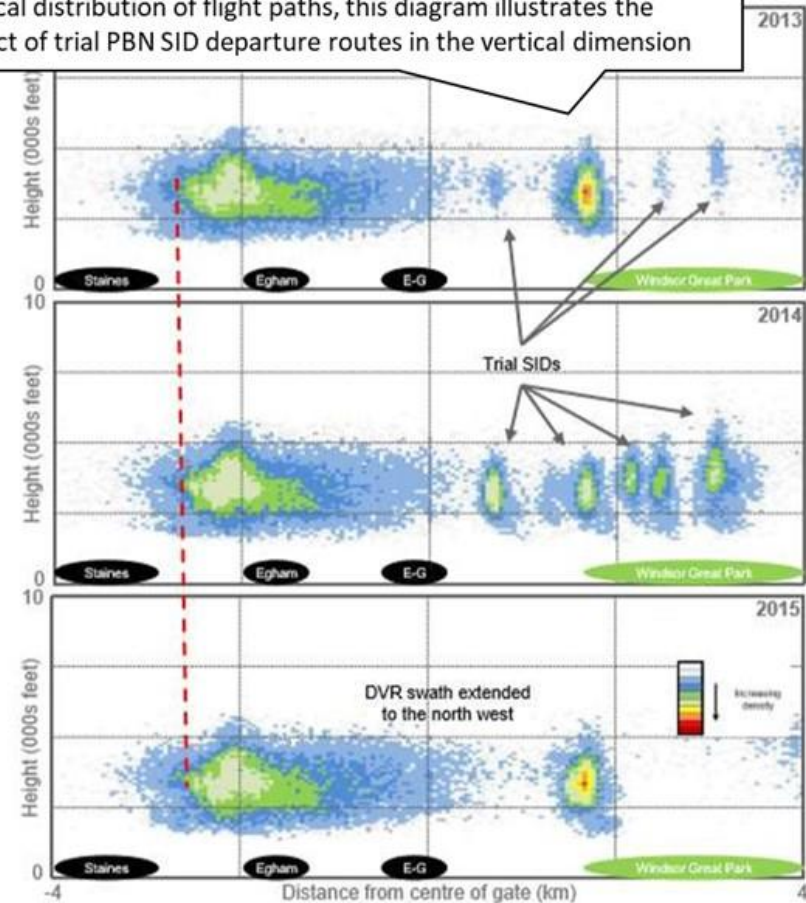
Studies have shown clear evidence of concentration due to PBN

Lateral distribution of flight paths



Boston Logan

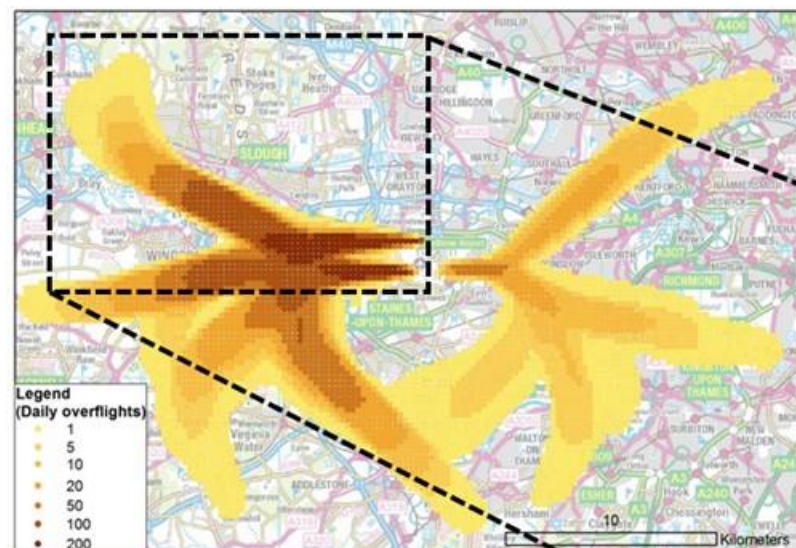
Vertical distribution of flight paths, this diagram illustrates the impact of trial PBN SID departure routes in the vertical dimension



London Heathrow

Source: Track density plots on left hand: MIT Centre International Centre for Air Transportation, Block 1 Procedures Recommendations for Boston Logan Airport community Noise Reduction, J Hansman, December 2017; Right side: 3 Villages study flight Path Analysis Report, PA Consulting for Heathrow, January 2016

Higher levels of overflight density should be used to target consultations at those most impacted



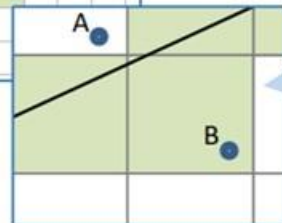
When a potential PBN route is identified a Communications strategy targeting the affected communities / areas along the line of the proposed PBN route should be put into action in accordance with CAA guidance setting out the 'cone of impact' from overflight



The information on this slide is designed to draw attention to existing CAA guidance and that this represents best practice in relation to other airports surveyed.



It should be noted that Heathrow's Airspace Change Programme had, at the time of assessment, not progressed to the stage of drawing lines on maps. Diagrams shown here are for illustration only.



Shading of grid squares identifies areas impacted by a given route. Note that coarser grids (larger squares) result in more reported overflights than fine grids (small squares) & that it is important to ensure adequate consideration is given to those areas that may not be directly overflown but still impacted by overflight (see point A [in a square 'not overflown'] vs. point B [in a square that is overflown], despite point A being closer to route).

Source: CAA's definition of overflight, CAP1498. CAP1498 Provides a definition of overflight using a 'cone' 48.5° from the position of the aircraft concerned. This produces a resulting overflight intensity plot for Heathrow's current flight paths (up to 4000ft). Example shows a 'typical' day of easterly operations at Heathrow.

Impact of concentration

Context

Feedback from community groups highlighted the importance of quantifying the impact of concentration terms of **total population overflown** and the **frequency of overflight**. Some stakeholders requested the study assess how concentrated flight paths impact specific locations compared with more distributed routes.

Proposed method

While a comprehensive environmental impact assessment is beyond the scope of this study it is possible to develop illustrative examples of how concentrated flight paths might alter the total population overflown and the frequency of overflight they are exposed to.



Recommendation

This analysis methodology could be extended into a more comprehensive comparative assessment of PBN impact using data sets local to comparator airports, using the following data:

- the population distribution (including density and geographic spread) surrounding an airport, including all those areas affected by either arrivals or departures up to 7000ft
- historic flight records (to identify the location and size of the traditional arrival and departure 'swathes')
- information detailing the positioning of the flight routes (either currently flown or planned)

The data will need to be of appropriate granularity to facilitate a meaningful analysis, however the availability of this data may vary from case to case. If desired the study could also include an assessment of PBN impact on particular noise sensitive locations (schools, hospitals, areas of outstanding natural beauty, outdoor amenities, etc.) and across multiple airports' flight routes (recognising some locations are overflown by multiple flight paths to multiple airports. We would recommend that further work is performed in this area to generate useful 'rules of thumb' that would assist in preliminary planning and impact assessment. This may need to be conducted at a strategic UK level (eg ACOG).

Source: Input received from attendees at the Study workshop, Taylor Airey & Community representatives, Heathrow, February 2020

Appendix II – Assessment criteria and scoring

Please note:

1. Benchmarking scores are based on the publicly available information about all the benchmarked airports, including publicly available plans published on airport websites. This includes the published information Heathrow's future airspace & its approach to airspace change.
2. The assessment of Heathrow was made on the basis of publicly available information relating to Heathrow's consultations to date (www.heathrow.com and www.heathrowconsultation.com). This assessment was made between September 2019 and March 2020.
3. The assessment of Heathrow's PBN implementation was performed on the basis of the published plans at the time of the study (including the published flight envelopes, the consultations that had taken place and the CAP1616 Airspace Change Process), and what these consisted of (i.e. design envelopes, rather than lines on maps).
4. Note that no PBN flight paths had been implemented at Heathrow as a result of the CAP1616 Airspace Change Programme at the time of writing of the report and that the airspace change process had only reached the 'design envelopes' stage.

1. Benchmark: Airspace policy

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- What national and local policy was in force during the development of the airspace changes?

1	2	3	4	5
<p>Complete absence of high-level policy framework or local guidance relating airspace modifications to population overflight, noise or spatial planning.</p>	<p>Some relevant policy in place, but typically formulated either ad-hoc, retrospectively or by applying general planning considerations from non-aviation transport modes (eg Road, Rail).</p> <p>Any policy in place must provide commentary on design objectives (eg avoiding population overflown, dispersing vs concentrating noise, etc) and level of consultation required on them.</p>	<p>Detailed policy framework and guidelines in place describing specifically how to consult with those affected by the airspace changes, especially where there are significant noise impacts or changes to procedures affecting new populations.</p> <p>Airspace design objectives are discussed in a national policy but no definitive position is offered by regulator or government (eg concentration of noise over existing routes vs maximum dispersal; minimise total number affected vs total newly affected; minimising overall level of change; minimise impact on noise sensitive locations, etc.).</p>	<p>The national airspace noise policy objectives are articulated clearly using a set of tightly defined and objective measures (eg number of newly overflown people, total noise exposure, degree of lateral dispersion, etc.).</p> <p>These design objectives are explicit in how they will safeguard the population impacted by the changes (eg by specifying an objective either to disperse noise or to concentrate it).</p> <p>The noise impacts are assessed in line with overarching frameworks on Public Health.</p>	<p>Airspace policy is integrated into broader noise management policies and means of consulting affected parties.</p> <p>Such holistic policy formulated in consultation with the affected population, enshrined in legal processes and integrated with government strategy at national and local levels (including any objectives for eg airport expansion; noise level, local air quality, wellbeing, health, economic, etc. analysing trade-offs using a ‘common currency’).</p> <p>Local Air Quality concerns are in line with ICAO standards (i.e. up to 3000ft)</p>

2. Benchmark: Location of routes

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- What consideration was given to minimising noise (and emissions) when designing location of routes?

1	2	3	4	5
<p>Little or no evidence to suggest that airspace routes are planned to minimise population overflight or noise exposure.</p>	<p>Multiple options are designed for one PBN route, all of which are feasible and operable. A clear rationale is provided for the preferred option, (if one is provided), justifying how this will minimise noise impacts compared to other possible options. Rationale uses commonly accepted environmental impact assessment modelling techniques and suitable overflight metrics as appropriate.</p>	<p>Evidence of multiple options for multiple routes determining noise impact, population overflown, etc.</p> <p>This is distinct from route option selection as described in level 2 where some consideration is also given to minimising aircraft emissions in addition to noise.</p>	<p>Transparent evidence of route optimisation using multiple routes, using performance metrics optimised over a number of key dimensions (eg overall noise exposure, population overflown, etc.).</p> <p>Multiple PBN routes can be used to create ‘managed dispersion’ of noise, within the limitations of the FMS. It is important to recognise that PBN cannot support an infinite number of route options.</p>	<p>Noise and overflight objectives are closely defined using a series of metrics enshrined in policy.</p> <p>Route options are optimised across a set of weighted variables designed to meet the policy objectives (eg noise level, local air quality, wellbeing, health, etc. analysing trade-offs using a ‘common currency’).</p> <p>This ‘common currency’ will have been developed through public consultation and aligned with associated policy areas (eg spatial planning). Thereby the location of all PBN route options are optimised with respect to a given set of criteria; aligned to top level policy objectives (see note)</p>

Note: It is not possible to produce a ‘one size fits all’ formula to determine route locations; instead the focus should be on alignment of the process with relevant national policy and close public consultation in developing specific options for route locations, and usage (dispersion, concentration, alternation, etc.), using fair, open and targeted communications / consultations.

3. Benchmark: Operating modes

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- What consideration was given to minimising noise (and emissions) when designing operation of routes?

1	2	3	4	5
No noise sensitive operating modes in place	<p>Runway alternation employed to help achieve respite.</p> <p>Alternating runways are used for allotted periods of time on a predictable basis, depending on operating mode (where feasible).</p> <p>Some restrictions in place on night-time operations.</p>	<p>Dispersed multiple PBN paths are used to laterally spread flights paths around a given airway route. This provides additional noise relief in addition to runway alternation (where this is in operation). All PBN flight paths are used and there are no specific limits or quotas in place on them.</p> <p>The means of dispersing flights can include, for example, the use of different 'coding houses' to laterally spread flights around a given PBN route.</p>	<p>Use of flight path alternation: where dispersed PBN flight paths are used for set periods on a predictable basis for a given operating mode to provide predictable periods of noise respite.</p> <p>The meaning of respite itself is well defined</p> <p>Airspace alternation - 'switching off' large blocks of airspace used by PBN routes for given periods of time on a predictable basis - will use flight path alternation, coordinated at a TMA level.</p>	<p>Use of route quotas/controls: Noise or overflight load limited by restrictions along a given route, typically using a system of route quotas set over a given period of time.</p> <p>Hours of operation along certain PBN routes may be restricted to take account of both noise sensitive locations and hours of noise sensitivity (eg schools, hospitals, residential areas, parks, etc).</p> <p>Specific night-time restrictions are placed on a route cognisant of noise sensitive locations.</p>

4. Benchmark: Overflight design

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- How effective is the airspace design at offering respite for overflown communities? (i.e. the outcome from categories 2 and 3, based on real-world impacts or modelled outcomes)

1	2	3	4	5
Little or no evidence to suggest that airspace routes and their operation are planned to minimise population overflight or noise exposure.	PBN route network is defined with adequate resilience to provide the designed capacity , avoiding 'bottlenecks' in air traffic flow and night flights caused by a lack of airspace capacity during the day.	Airspace network is designed to minimise noise nuisance by avoiding noise sensitive locations at certain times of day and/or provide respite through airspace/runway alternation.	<p>Airspace is designed at the Terminal Manoeuvring Area (TMA) level to enable all airports affected by the airspace change to coordinate their designs, understand how the entire volume of airspace will operate and communicate changes to stakeholders effectively</p> <p>This 'joined up' approach allows determination of where different volumes of airspace can be 'switched off' to provide respite (see note 1).</p> <p>Impact of noise on tranquillity</p>	<p>Investigations are conducted to understand the feasibility of using PBN to generate maximum lateral dispersal using 'managed dispersion' where this is desirable. Such a system would require a significant number of PBN routes to be defined and a means of safely allocating the air traffic across these routes to disperse overflight. Such a concept of operations has not yet been developed and its feasibility is yet to be researched in detail for congested airspace regions.</p>

Note this metric is an outcome from applying the operating restrictions to the route locations for the option under consideration. The benchmarking score is based either on actual real-world impacts or modelled outcomes where airspace changes are still in the design phase.

5. Benchmark: Transparent impact assessment

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- How open and transparent was the airport about the likely environmental impacts of the proposed design?

1	2	3	4	5
Impact assessment is either completed too late to allow the community adequate opportunity to properly scrutinise the findings, or uses a flawed methodology of insufficient detail when compared to similar studies elsewhere.	EA (Environmental Assessment) methodology is in line with international standards & norms, however the modelled impacts (or the business management) fails to adequately anticipate an increase in impacts and where these are set to originate from.	<p>Impact assessment demonstrates a good level of transparency back to models and input data.</p> <p>Community enquiries are actively managed and discussed through proactive community engagement.</p> <p>Proactive community engagement provides guidance around impact assessment methodologies.</p>	<p>EA methodology is transparent, understandable and directly relatable to government policy in spatial planning, airspace management and environmental management.</p> <p>Anticipated impacts are linked to overall policy statement and options are assessed.</p>	<p>Airspace change authorities publishes full findings of impact assessment and facilitates further analysis by interested parties through data sharing & production of useful resources (eg Google earth .kml files).</p> <p>Clear and understandable logic sequence is established between the defined 'cost function' and the chosen route options.</p>

6. Benchmark: Assessment criteria

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- How suitable were the metrics used in the assessment?

1	2	3	4	5
<p>Only high-level assessment criteria are produced, typically in the form of fuel savings or a reduction in carbon emissions. Little evidence of a assessment criteria being evaluated.</p>	<p>A comprehensive set of overflight assessment criteria & maps are produced and include measures relating to the population impacted by noise from the airspace changes. This includes the production of relevant noise contours (eg L_{DEN}, L_{Aeq}, etc.).</p>	<p>Material produced well in advance of the minimum airspace consultation period.</p> <p>Assessment Criteria are aligned to relevant national and local policy (where available, eg WebTag); such as noise, spatial planning, etc. These assessment criteria are generally accepted by both the local community and industry as providing necessary and useful indication of the impacts being considered.</p>	<p>In addition to noise contours other graphics or resources (such as Google earth files) are produced to illustrate overflight intensity and typical height over the ground.</p>	<p>Multiple assessment criteria are used to explain the impact of the design on the affected area beyond that required by existing policy guidance.</p> <p>Overflight maps are illustrated to include the areas affected by direct overflight and those in the immediate vicinity (affected by noise).</p>

7. Benchmark: Metrics

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- Will the proposed PBN route offer benefits to the affected community compared to a 'do nothing' comparable baseline scenario?

1	2	3	4	5
<p>Only high-level metrics are produced, typically in the form of fuel savings or a reduction in carbon emissions. Little evidence of a comprehensive environmental impact assessment being conducted.</p>	<p>A comprehensive set of overflight metrics & maps are produced and include measures relating to the population impacted by noise from the airspace changes. This includes the production total population impacted by noise and the number of newly affected people.</p>	<p>Material produced well in advance of the minimum airspace consultation period.</p> <p>Overflight metrics are produced showing the difference between a meaningful baseline and proposed scenarios (either using a heat map, coloured dots or similar).</p>	<p>Metrics used demonstrate that multiple routes have been analysed and the chosen design has been optimised primarily minimise noise impacts, in line with Government policy.</p>	<p>Metrics used to explain impacts are developed in collaboration with the community, so a meaningful understanding is developed.</p> <p>Metrics and graphics are used to communicate the amount of respite that may be experienced, where this is located, and for what times of day this would be in place.</p>

8. Benchmark: Community engagement

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- How effective was the promotion and awareness raising of the airspace change?

1	2	3	4	5
<p>Airspace change sponsor does not recognise community engagement as being integral to the PBN implementation process and minimal resources are provided for engagement.</p> <p>No public engagement events or forums are in place and this results in changes being made without any community engagement.</p>	<p>Information on PBN implementation is available, however it is either overly technical (so as to be generally inaccessible to the lay audience) or lacking sufficient detail (making it too vague to allow meaningful comment by a more technical audience) in relation to the consultation questions being posed.</p> <p>Minimal public engagement forums or workshops are put in place.</p>	<p>Engagement in the subject is actively promoted and advertised through multiple channels, including leaflet drops, accessible offline information (including hard copies of all public documents available in community centres), advertisements in the affected built environment, local & regional press.</p> <p>Creation of working groups, and community engagement forums and design workshops with interested groups.</p> <p>Engagement viewed as an opportunity to build trust in the consultation / airspace change process.</p>	<p>Significant community outreach activities are planned, including targeted campaigns in the areas to be newly or severely affected by the changes (ie. along a tight swathe around planned routes and in areas not previously affected by significant overflights).</p> <p>All relevant public engagement materials, events and forums are publicised well in advance and are designed to be readily accessible so as to be useable by people with disabilities.</p>	<p>Targeted presence established in the areas to be severely impacted. The airspace change sponsor seeks to effectively engage the community and provide all relevant information early on; this could include, for example, establishing a temporary office in the local environment likely to be to be impacted by the airspace change, to explain the changes to the community.</p>

9. Benchmark: Understanding

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- How accessible and understandable was the community engagement material?

1	2	3	4	5
<p>Minimal information is available about either current operations or changes to them; lack of resources and knowledgeable experts to explain airspace operations to local communities.</p>	<p>Open, transparent and understandable communications informing the affected community about current operations (including regular performance reporting, accessibility of online tools such as Webtrack, etc.).</p> <p>Communication about airspace changes through both online and offline sources (eg printed materials made available in community centres). These are produced in line with legal requirements.</p> <p>Consultation documents are supported by suitable maps, diagrams, videos and supporting technical annexes</p>	<p>Route location options are published early on, and well in advance of any statutory consultation period, to allow enough time to convey a meaningful understanding to those who may be impacted through targeted engagement. Such openness minimises any lack of community awareness.</p> <p>Impacts on the community are conveyed in such a way as to be readily understandable using both traditional face to face discussions and, where appropriate, novel & innovative technologies (eg sound booths, simulators, tabletop graphics, etc.).</p>	<p>Clear and understandable explanation of airspace changes is provided via an easy to navigate website. 'Headline' documents readily explain both the changes and the overall change process to the lay audience, together with the uncertainties and complexities involved.</p> <p>Information about upcoming operational changes (trials, introduction to service periods, etc.) are widely disseminated to the local communities. This includes overflight maps indicating those areas affected by direct overflight and those in the immediate vicinity.</p>	<p>Bespoke & responsive flight and noise analysis provides the affected community with data sets on reasonable request.</p>

10. Benchmark: Use of feedback

Scoring applied using published information in the public domain (airport, government and community based websites), and validated through stakeholder workshops and feedback

- Was community feedback demonstrably included in the subsequent airspace design?

1	2	3	4	5
<p>Either no feedback is sought (no consultation takes place), or there is no evidence that feedback from the consultation is considered.</p>	<p>Consultation does take place, however the details of those areas potentially impacted by higher flight volumes receive insufficient or poorly timed communications about the airspace changes and location of new routes. This results in a lack of meaningful feedback, either in overall volume or in the quality of the responses.</p> <p>There is a demonstrable lack of any consultation feedback being considered in the subsequently implemented design.</p>	<p>Full public consultation adheres to the 'Gunning' / Sedley principles :</p> <ul style="list-style-type: none"> - consultation at a time when proposals at a formative stage; - that the proposer must give sufficient reasons to permit of intelligent consideration; - that adequate time is given for consideration and response; and; - that the product of consultation is taken into account when finalising the decision. <p>PBN route details are published early on allowing time for communities to prepare prior to consultation. Consultation questions are framed to be accessible and allow meaningful feedback from the local community.</p>	<p>Involvement of community in the design, (eg using interactive 'workshop' sessions, demonstrating how the design team arrived at the route options proposed and any restrictions they are working with such as a minimum altitude, etc.). Airspace change sponsor develops a meaningful understanding of community feedback and any emerging consensus.</p> <p>The definition of 'consensus' needs to be agreed and, where possible, articulated as a set of metrics. The consultation (and the consensus itself) must be balanced. Consultations should be used to inform communities of the positive benefits and negative drawbacks of changes and provide sufficient information</p>	<p>The new airspace design is subject to a review after the first year of implementation.</p> <p>There is a clear process in place for rescinding airspace change if success criteria, defined prior to the change by the sponsor, are not met.</p>

Results: Policy and Design

Scoring applied using
published information in
the public domain

Metric		Metric 1 Airspace policy					Metric 2 Location of routes					Metric 3 Operating restrictions				
Location	Airport	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	UK Heathrow			●						●					●	
2	NZ Auckland			●						●				●		
3	Europe Amsterdam					●					●				●	
4	Europe Vienna					●					●				●	
5	Europe Frankfurt				●					●					●	
6	USA - East New York area		●							●			●			
7	USA - East Washington DC area		●						●					●		
8	USA - East Boston		●							●				●		
9	USA - West Los Angeles area		●							●				●		
10	USA - West San Francisco	●						●						●		
11	USA - West Seattle			●				●						●		
12	USA - Central Phoenix	●					●							●		
13	USA - Central Chicago area				●			●						●		
14	USA - Central Denver				●					●					●	
15	USA - Central Charlotte			●						●				●		
16	Canada Vancouver				●				●					●		
17	Canada Toronto				●					●	●				●	
18	Canada Calgary				●					●				●		
19	Australia Sydney				●					●	●				●	
20	Australia Brisbane				●					●				●		
Average (decimal)		3.2					3.65					3.65				
Score colour code (1-5)		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Results: Design and Assessment

Scoring applied using published information in the public domain

Metric		Metric 4 Overflight design					Metric 5 Transparent impact assessment					Metric 6 Assessment criteria					Metric 7 Metrics				
Location	Airport	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	UK Heathrow																				
2	NZ Auckland																				
3	Europe Amsterdam																				
4	Europe Vienna																				
5	Europe Frankfurt																				
6	USA - East New York area																				
7	USA - East Washington DC area																				
8	USA - East Boston																				
9	USA - West Los Angeles area																				
10	USA - West San Francisco																				
11	USA - West Seattle																				
12	USA - Central Phoenix																				
13	USA - Central Chicago area																				
14	USA - Central Denver																				
15	USA - Central Charlotte																				
16	Canada Vancouver																				
17	Canada Toronto																				
18	Canada Calgary																				
19	Australia Sydney																				
20	Australia Brisbane																				
Average (decimal)		3.4					2.95					2.9					3.2				
Score colour code (1-5)																					

Results: Communication and Engagement

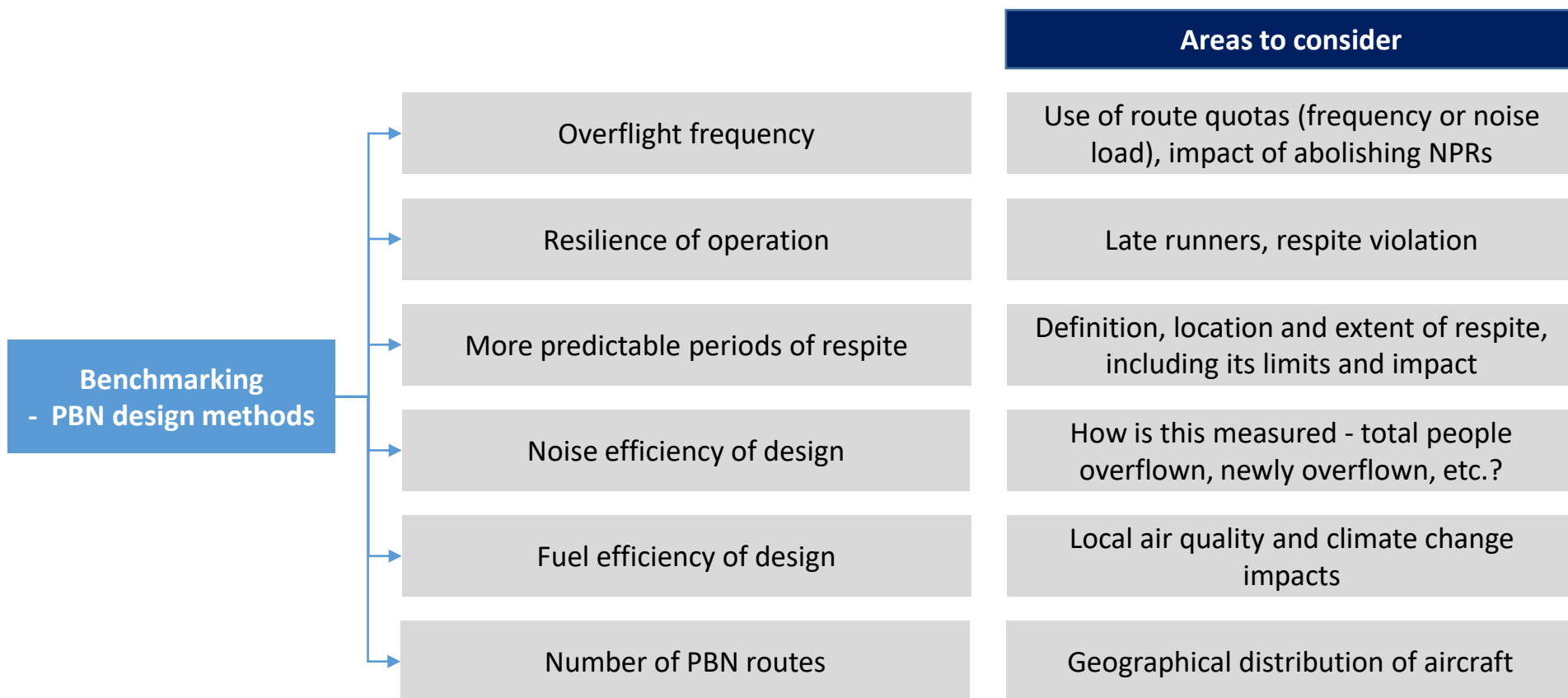
Scoring applied using published information in the public domain

Metric		Metric 8 Community engagement					Metric 9 Understanding					Metric 10 Use of feedback				
Location	Airport	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	UK			●					●						●	
2	NZ				●					●						●
3	Europe				●					●				●		
4	Europe				●				●					●		
5	Europe			●					●				●			
6	USA - East			●					●				●			
7	USA - East				●					●			●			
8	USA - East			●					●				●			
9	USA - West				●				●					●		
10	USA - West					●				●				●		
11	USA - West			●					●					●		
12	USA - Central	●					●					●				
13	USA - Central			●					●				●			
14	USA - Central				●					●			●			
15	USA - Central				●				●					●		
16	Canada					●			●					●		
17	Canada			●							●			●		
18	Canada			●						●				●		
19	Australia					●					●					●
20	Australia			●					●						●	
Average (decimal)		3.5					3.3					2.8				
Average		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Appendix III – Initial assessment categories (revised during community workshops)

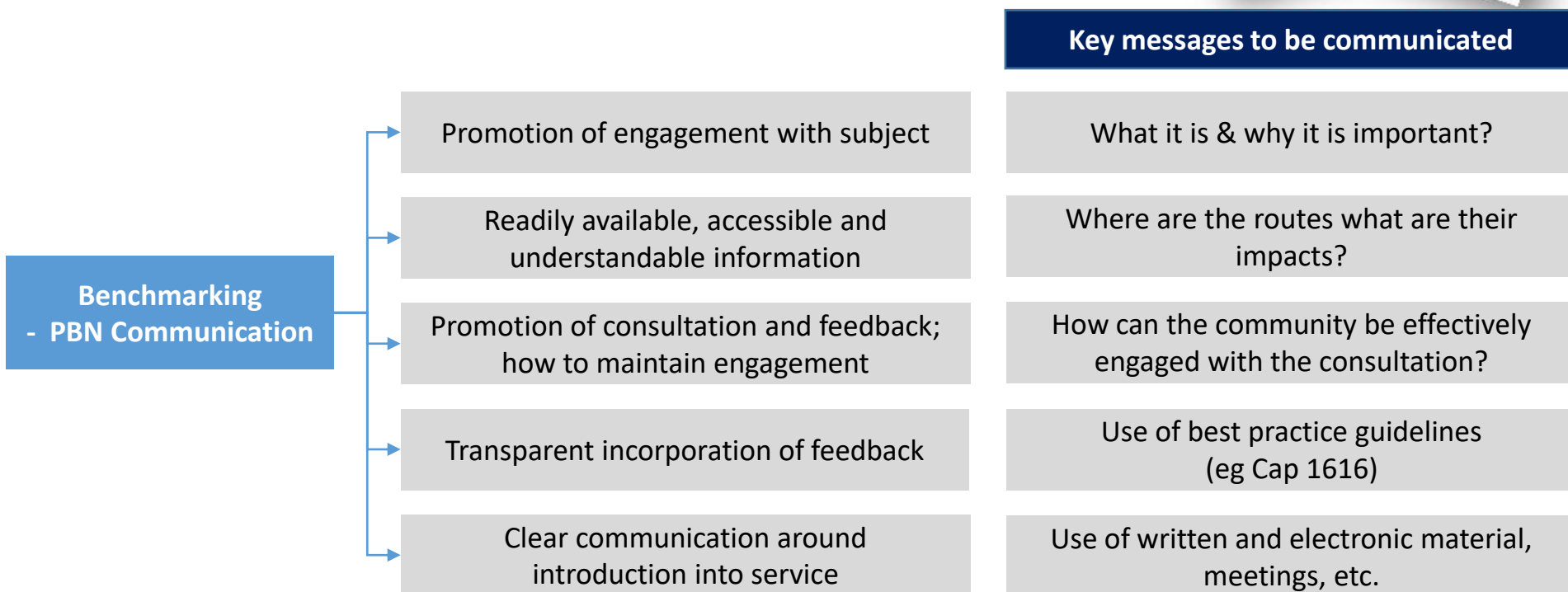
Benchmarking PBN – Design and Implementation

- Where will PBN routes be placed, when are they used & rationale?



Benchmarking PBN – Communication

- What mechanisms exist to engage the community?
- How best to understand concerns around PBN?



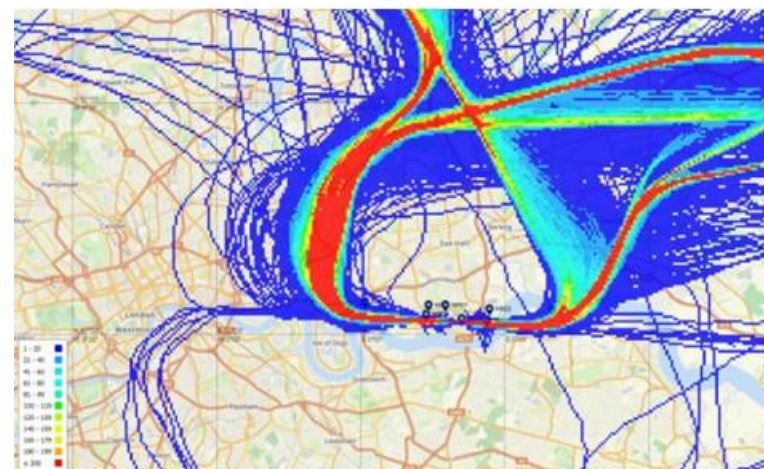
Appendix IV – Case studies

**Case studies:
London City, Auckland, Sydney, Vienna**

London City

London City was widely criticised for a lack of communication and consultation

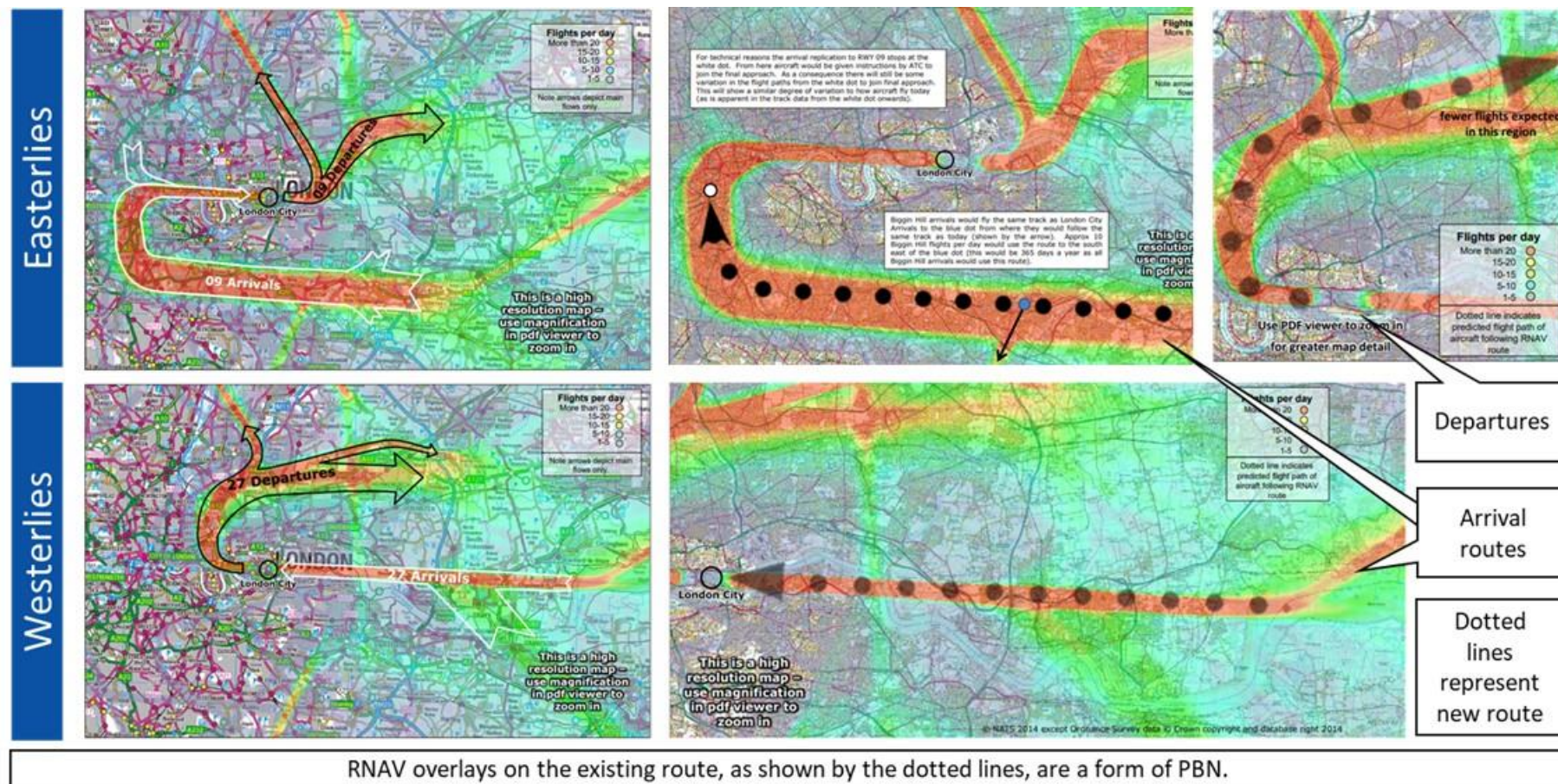
- In 2014/15 London City Airport generated extensive criticism for a relatively low level of engagement around flight path changes to introduce PBN
- Consultation was mainly conducted through the airport's consultative committee without public meetings, advertised community events, or engagement with local authorities; similarly no written communications were targeted at the affected areas
- The new routes were designed to mimic existing routes and reduce the overall number of people exposed to aircraft noise
- The lack of communication and wide consultation prior to the change attracted significant criticism
- Subsequent to this Airspace Change the CAA published refreshed guidelines on the process for Airspace change (CAP1616 replacing CAP725)
- London City is now following the revised process for airspace change; in November 2019 the CAA approved Stage 1 of the airport's flight paths as part of the Airport's Airspace strategy 'Our Future Skies – Design Principles'



This situation resulted in a deterioration of trust between the airport and the local community, generating the formation of opposition groups opposed not only to the flight path changes but also to airport expansion

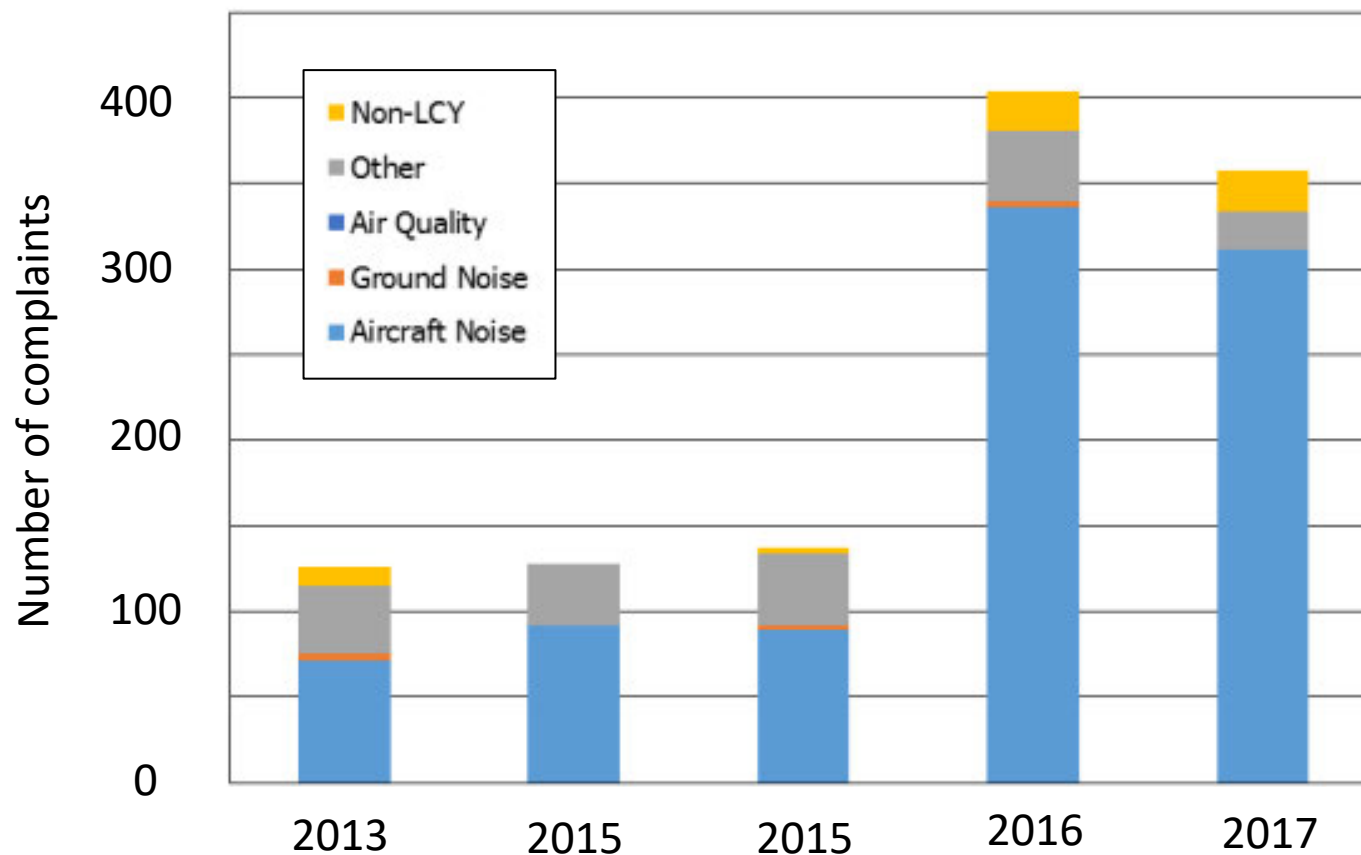
Source: CAP 725, CAA Guidance On The Application Of The Airspace Change Process, March 2007; CAP 724, CAA Airspace Charter which defines the authorities, responsibilities and principles; Civil Aviation Authority, Future Airspace Strategy for the United Kingdom 2011 to 2030 publicapps.caa.co.uk; HACAN East www.hacaneast.org.uk

Routes inside existing swathes generated a large increase in complaints



Source: Total Environmental complaints received by London City Airport(2013 – 2017), London City Airport Noise Action Plan 2018—2023, londoncityairport.com/corporate/ & London City Airport RNAV Replications Stakeholder Consultation Document, September 2015 & London City RNAV Replications Consultation Feedback Report February 2015, publicapps.caa.co.uk

London City Complaints



Source: Total Environmental complaints received by London City Airport(2013 – 2017), London City Airport Noise Action Plan 2018—2023, londoncityairport.com/corporate/ & London City Airport RNAV Replications Stakeholder Consultation Document, September 2015 & London City RNAV Replications Consultation Feedback Report February 2015, publicapps.caa.co.uk

The CAA conducted a Post Implementation Review following negative feedback from local communities

- London City did not forecast any impact on the airport's L_{eq} noise contours, so did not anticipate any increase in noise complaints
- However the airport did consider that there was likely to be some change in noise dispersion:
 - “Some residents should experience a reduction in noise impacts because they would have fewer flights overhead as a result of redistribution arising from concentration; no feedback identified from locations experiencing a decrease in noise impact. Some residents already under the nominal tracks of the conventional SIDs the subject of this proposal, were likely to experience more overflight and more noise as a result of this concentration.”
- The airport acknowledged that
 - a number of individuals challenged the adequacy of the consultation associated with this airspace change proposal
 - the majority of noise complaints were generated by individuals/organisations residing directly under the route centrelines
- These noise complaints focused on
 - the concentration of traffic patterns
 - the general burden of aircraft noise/overflight
 - the need to introduce respite routes
 - the unfairness of the regulatory decision

London City forecast a significant decrease in the numbers of people overflown by the new flight paths. However, they underestimated the strength of feeling against the concentration of traffic and the majority of noise complaints were generated by individuals directly under the route centrelines

Source: Report of the CAA's Post Implementation Review of the London Airspace Management Programme (LAMP) Phase 1A Module B Airspace Change Proposal – London City Airport RNAV-1 Replications, [CAA repository](#), 2016

Table 2 – Summary of overflights (persons overflown)

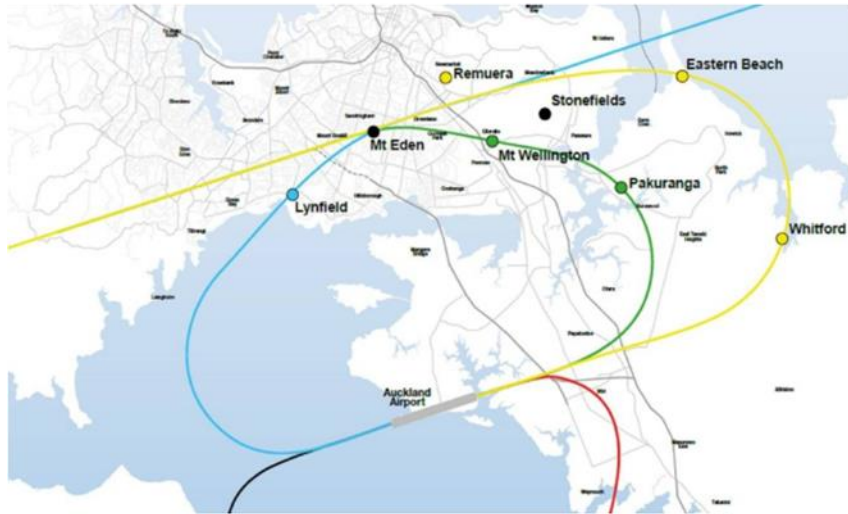
Modules B & C – London City	Pre-implementation (2013)	Post-implementation (2016)	Increase / decrease
Arrivals			
Direct overflight - Ground to below 4,000ft	881,000	331,000	-550,000
Direct overflight - 4,000ft to below 7,000ft	404,900	72,100	-332,800
Direct overflight - Ground to below 7,000ft	1,285,900	403,100	-882,800
"CAP1498 swathe"	2,439,700	1,231,300	-1,208,400
Departures			
Direct overflight - Ground to below 4,000ft	672,900	416,300	-256,600
Direct overflight - 4,000ft to below 7,000ft	184,800	115,100	-69,700
Direct overflight - Ground to below 7,000ft	857,700	531,400	-326,300
"CAP1498 swathe"	1,447,200	1,317,100	-130,200

Further references – London City

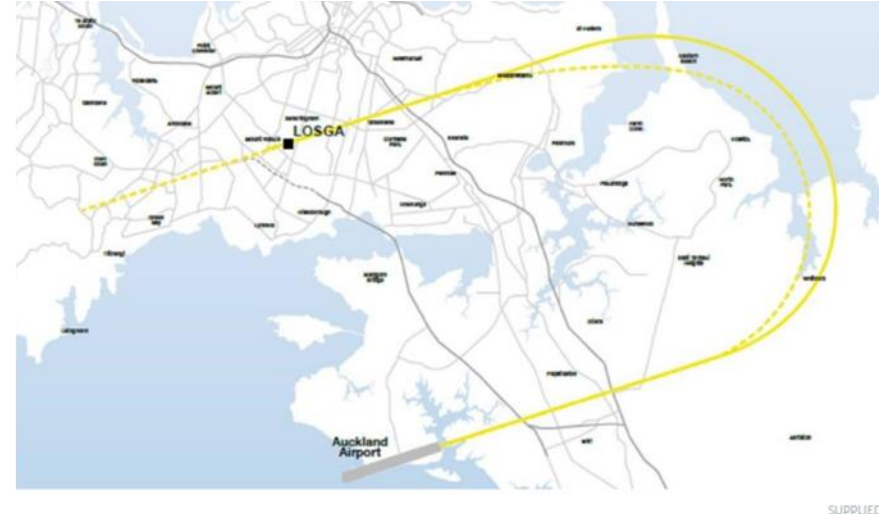
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Auckland

Auckland airport demonstrated good practice by undertaking trials prior to full implementation



Auckland Airport trialed multiple new approach options...



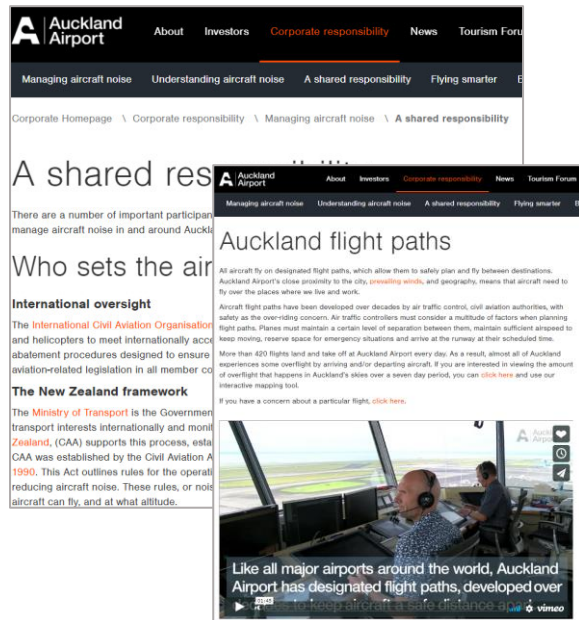
...feedback on the trials led to the approach route to the north of the city being moved further east

In particular, the airspace change process here provided good examples of:

- Clear communication between stakeholders, supported by in person events and suitable online resources
- Clear guidelines from government and transparent oversight of trials
- Active listening during a consultation / trial period, and the ability to alter the location of PBN routes in response to feedback

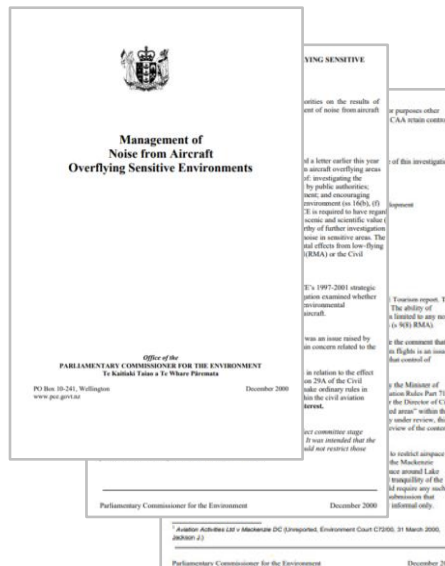
The airport provided clear communications, incremental implementation and a responsive design process

Easy to navigate and understand website



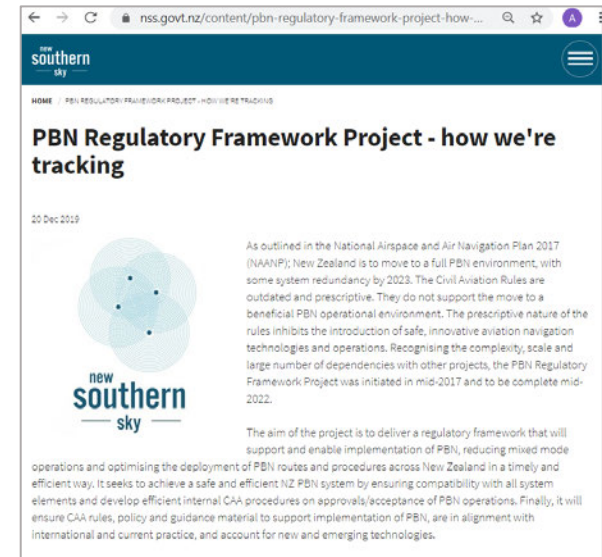
Online resources explain current and future operations & how they are governed using clear and accessible published material and easy to navigate websites

Clear guidance around airspace change



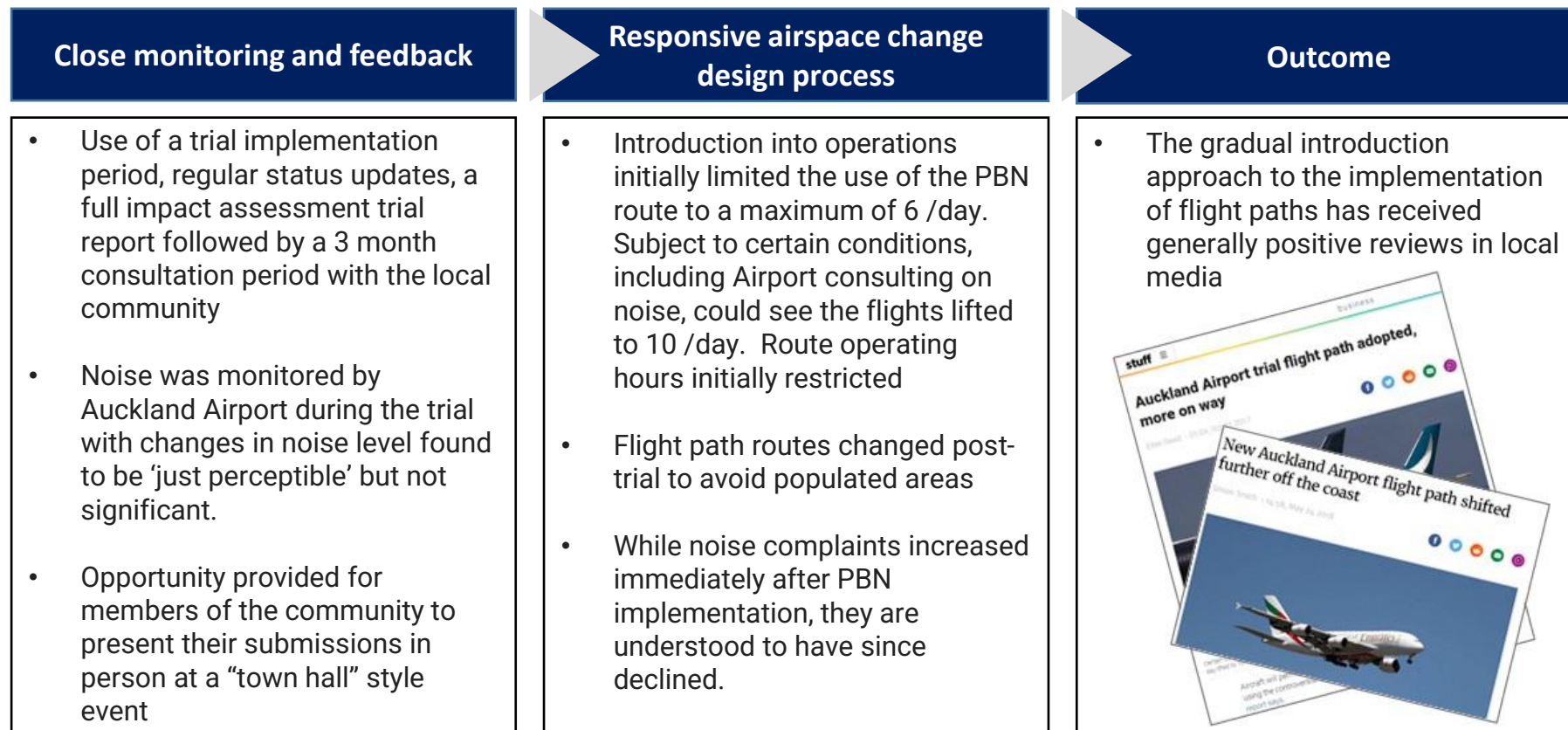
Clear guidelines are provided from government around the airspace change process and the implementation of PBN

Good communications around the airspace change



Regular updates keep stakeholders informed and engaged using a well defined reporting process and understandable status updates.

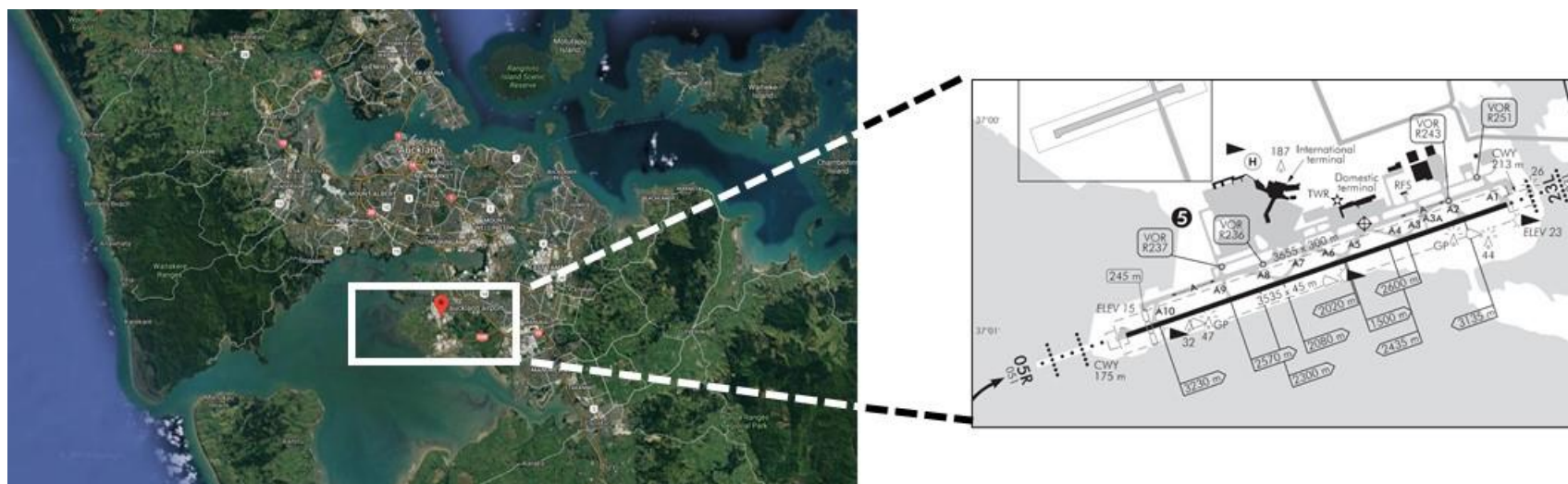
Government, airport and community worked collaboratively to produce an efficient airspace change process



While not all lessons may be applicable to Heathrow's situation, (due to the congested airspace and extensive urban conurbation surrounding Heathrow making overflight avoidance challenging) a key observation is the importance of good communications and iterative designs that incorporate local community feedback.

Further references – Auckland Airport

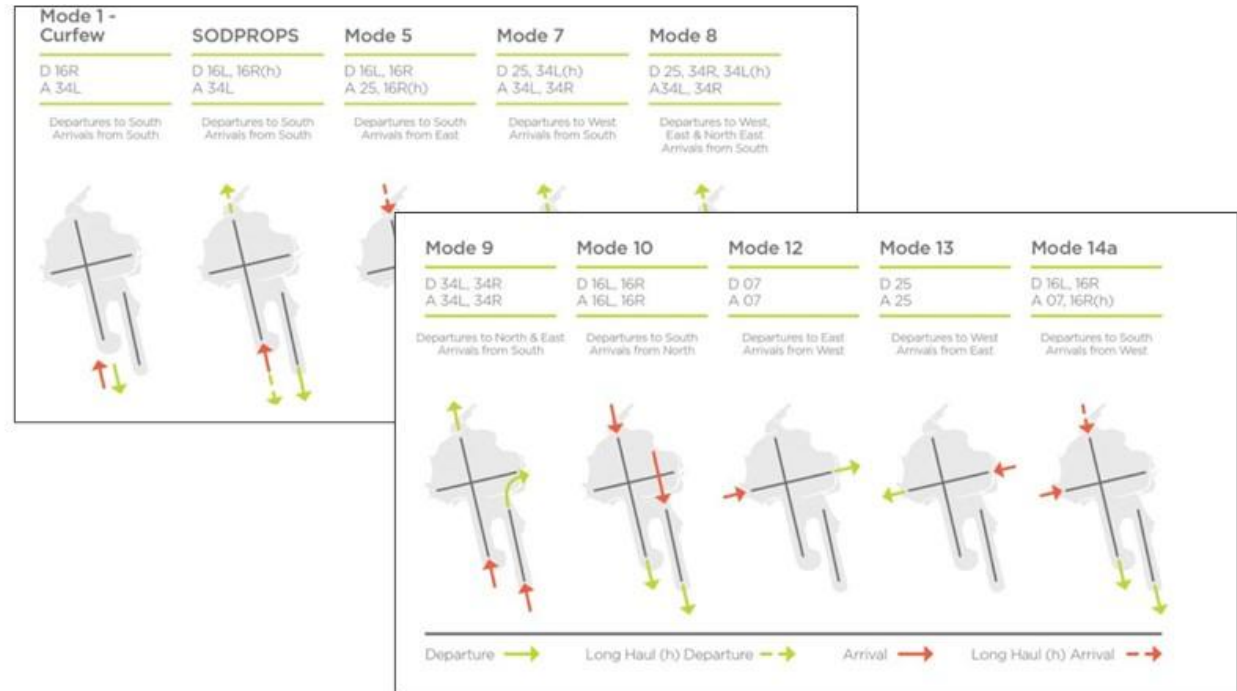
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Source: Diagram of Auckland Airport surroundings and Airport layout, Google Earth, New Zealand AIP <http://www.aip.net.nz/>

Sydney

Sydney Airport offers many runway operating modes



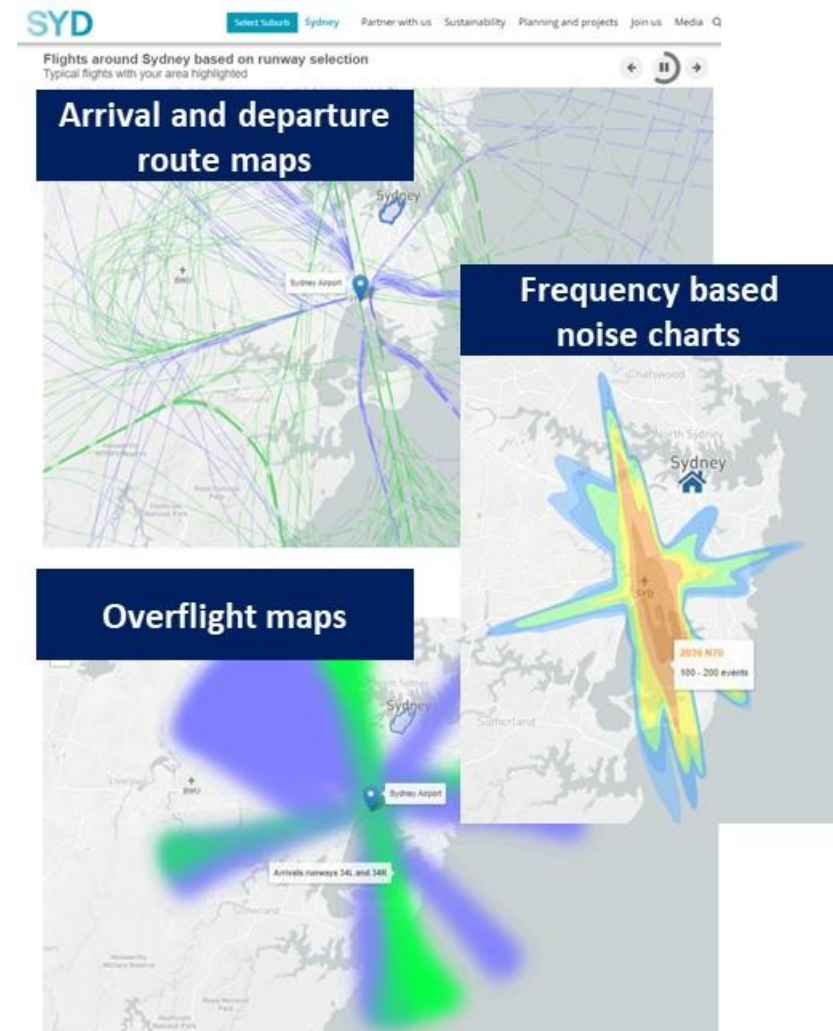
Airspace management and change processes appear well developed at Sydney. Extensive consultation and investment in community relations has taken place over a number of years

Source: Sydney Airport [Masterplan 2039](#), April 2019; Airservices Australia, [Key Airport Noise facts](#), 2020;

Sydney provides useful examples of clear communications around airport noise impacts

- Communication materials around the impact of noise are well presented using intuitive and engaging techniques including animations and videos
- In addition the airport's noise website offers a tailored experience for local communities
- Further information is readily accessible, including future planned developments as part of the 2039 airport Masterplan, role of governance bodies and frequency based noise charts
- Formal communication channels are also well developed, with the impact of overflight from the airport being reported in local land searches

Source: Sydney Airport Aircraft Noise website, <https://aircraftnoise.sydneyairport.com.au/>; Sydney Long Term Operating Plan (LTOP) <http://www.airservicesaustralia.com/>; Sydney Airport ANEF 2039; Home search solutions <https://www.homesearchsolutions.com.au/sydney-flight-paths/>



Sydney demonstrates a good level of engagement with local groups

Good level of engagement

Sydney Airport Community Forum monitors the operational restrictions imposed on Sydney Airport, acting as a powerful focal point for the local community, government & regulator to shape environmental and noise operating restrictions.

Long term operating strategy

A Long Term Operating Plan (LTOP) is set out by the Community forum and Airport, outlining:

- Noise abatement procedures, including runway alternation, respite, operating procedures (CDA, CCD)
- Future noise forecasts with a focus on the impact of frequency of overflight
- Curfews, noise certification, cap on total movements within a given timeframe (24 hour period)

Notable best practice from elsewhere in Australia

Melbourne: Implemented procedures for preferential runway use and flight paths to reduce flights over residential areas. When local operating conditions permit flights are directed over the 'green wedge' areas to the north and west of the airport and over non-residential areas; both using PBN procedures. If flying over suburbs cannot be avoided, a minimum height restriction is applied over these areas.

Brisbane: PBN arrivals routing make use of the 'River Track' (along the Brisbane River) to minimise the impact of noise over residential areas.

Source: Sydney Airport [Masterplan 2039](#), April 2019; Airservices Australia, [Key Airport Noise facts](#), 2020; Sydney Airport Traffic; <https://aircraftnoise.sydneyairport.com.au/#FutureNoiseExposure>

Vienna

Vienna airport is often cited as best practice in terms of open, fair and transparent stakeholder engagement

- This engagement utilises two primary channels:
 - **Neighbourhood Committee:** composed of the airport managing director and the mayors of surrounding municipalities
 - **Dialogue Forum:** non-profit organisation financed by the airport and functioning as an information and communication platform; provides mediation with 120 municipalities, regional provinces, and citizens' action groups representing 2 million people
- The Dialogue Forum:
 - Monitors the compliance with the agreements concluded during mediation process.
 - Deals with issues, questions and conflicts arising through the development of air traffic and enlargement of the airport
 - Topics covered include: night flight restrictions, noise caps, an environment fund and noise prevention programmes, PBN routings and timetable of implementation
 - Critically municipalities and citizens can use the leverage of the forum to influence rule-based changes and, as such, affect changes to how the airport is run

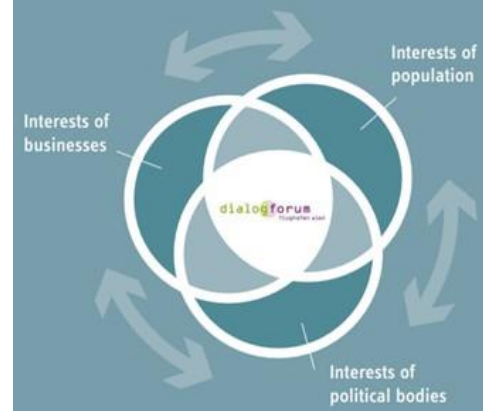


PBN was implemented in Vienna to reduce noise exposure and reduce track miles

- PBN implemented to reduce noise exposure to the local community, enable reduction in track miles and use curved approaches
- Extensive community engagement through the local dialogue forums has provided a useful platform from which consultations on specific route options can be developed with the local community
- PBN was implemented in line with existing operating restrictions including a
 - Preferential runway system
 - Ban on weekend night flights
 - Cap on aircraft movement numbers along given arrival and departure routes over a set period of time
- As part of SESAR (Single European Sky Research Project) the airport is investigating the possibility of recreating non-PBN 'swathes' by using multiple PBN routes

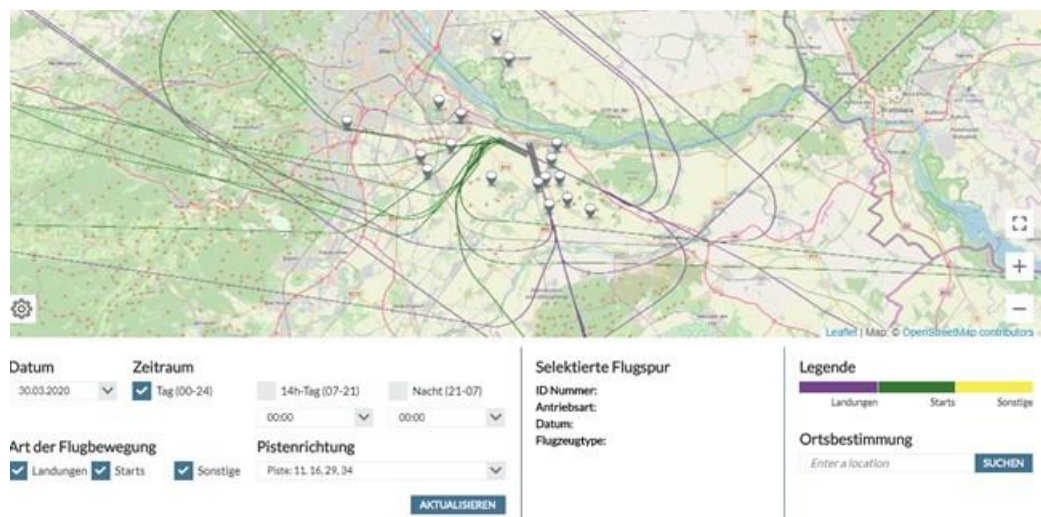


The focus of the Vienna International Airport Dialogue Forum is on reconciliation of interests.



Further references for Vienna

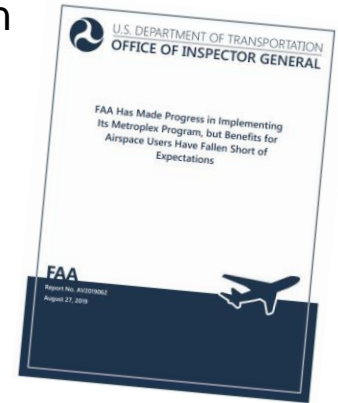
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- Noise Management, [Vienna Airport](#), 2020
- Online flight tracking and management system, [Vienna Airport](#), 2020



Appendix V – US PBN Summary

The HCNF highlighted a recent report from US authorities on the impacts and progress of PBN implementation in the US

- This report assessed the FAA's (Federal Aviation Administration's) progress in implementing its Metroplex¹ programme. It compared planned to actual benefits for PBN identified by FAA and assessed the soundness of the methods used by FAA to forecast PBN benefits
- Findings of the report included:
 - FAA has completed PBN implementation in 7 of 12 Metroplex locations. The Agency does not expect to complete all remaining locations until 2021, four years later than originally planned.
 - Delays have occurred largely due to increased community concerns about aircraft noise
 - Delays have been compounded by a lack of automated decision support tools for controllers, unclear terminology used by pilots and controllers for referring to flight paths, and the lengthy procedure amendment process
 - Metroplex benefits to airspace users have fallen short of predictions: in post-implementation reports, FAA estimated annual benefits of \$31.1 million, which is \$30.5 million (49.5%) less than the minimum amount initially expected when FAA first planned each Metroplex site
 - Finally, FAA's methods for estimating benefits overly rely on judgment and are not well documented, limiting the ability to readily test the estimates' robustness and replicate results
- The key recommendation of the report is that community engagement should be focused, supported by an action plan and accompanied by improved documentation



Note 1: A metroplex is a geographic area covering several airports, serving major metropolitan areas. Further details of the programme can be found at [Metroplex \(faa.gov\)](https://www.faa.gov/metroplex)

PBN implementation in the US demonstrates key learnings, including the risk of underestimating impacts

Airport	Impact assessment	Reported impact	Result
Baltimore	FAA issued a Finding of No Significant Impact . Implemented without proper environmental review and without the coordination with communities	Increase in frequency, density & concentration over limited area	Working group created <ul style="list-style-type: none"> - identify alternative routings - Examine alternative procedures
Boston Logan	FAA undertook an Environmental Assessment (EA)	EA showed that communities would be affected the same or more; but that certain communities would see a concentration of flights FAA projected noise changes as negligible from ground	FAA is working with Massport & Logan Airport Community Advisory Committee to develop a runway-use system to provide relief from noise
Charlotte	FAA issued a Finding of No Significant Impact. Changes were made without conversations involving most affected.	Concentrated flight paths	Airport Community Roundtable established
Chicago	Found that the FAA does not communicate the range of uncertainty or complex factors associated with NextGen implementation to Congress, aviation stakeholders, or the traveling public	Impacts compounded by a change in runway use at the same time as procedures introduced. Multi directional runways led to communities being constantly overflown	Noise mitigation plan (address airport noise) was proposed in 2015: focused abatement, mitigation, communication, reporting and citizen involvement). Increase the number of runways allowed at O'Hare from 8 to 10 to reduce jet noise affecting some neighbourhoods and suburbs. Runway rotation/ alternation.

Source: FAA Has Made Progress in Implementing Its Metroplex Program, but Benefits for Airspace Users Have Fallen Short of Expectations, US Department of Transportation, Office of Inspector General www.oversight.gov

PBN implementation in the US demonstrates key learnings, including the risk of underestimating impacts

Airport	Impact assessment	Reported impact	Result
Denver	FAA Environmental Assessment	Routes moved since 2013; with more concentration and higher frequency during the late evening/early night period.	FAA held community workshops in 2017 - procedures designed by communities.
Los Angeles	FAA issued a Finding of No Significant Impact and Record of Decision. Held public meetings	Flight path has moved and become more concentrated.	FAA has proposed adding a new 6,000-foot minimum altitude requirement Noise mitigation programme implemented
Phoenix	FAA made significant changes without properly notifying the public or allowing the public to provide input	Routes condensed and lowered flight corridors over homes, historic districts, natural preserves and parks	Following a court ruling the FAA agreed to reach out to residents while temporarily resuming the previous departure routes. FAA will develop satellite-based procedures for the original routes, seeking community feedback throughout the process
San Francisco	Significantly increased noise levels distributed in narrow corridors. Palo Alto found itself under flight paths from all three major Bay Area airports	Eastward shift in flight paths, more low-flying aircraft that previously travelled over water began flying over parts of Santa Cruz	A 12-member appointed committee and an airport roundtable committee made recommendations in 2016 to solve the identified problems

PBN implementation in the US demonstrates key learnings, including the risk of underestimating impacts

Airport	Impact assessment	Reported impact	Result
Seattle	FAA did not provide public with information or seek public comment or input	Narrower flight paths, resulting in a higher volume of aircraft travelling over effected homes. Some areas would be eliminated from the flight path, others that remained would be subjected to increased noise and pollution	Some flight patterns changed after legal action Quiet Skies Coalition
Washington DC - Ronald Reagan	Residents maintained that they were not given adequate notice of changes to flight patterns that resulted in a significant increase in noise.	Replaced old flight patterns with new ones Major departure path routes aircraft alongside historic Georgetown	Establishing of pressure group ' DC Fair Skies' FAA held community workshops
Calgary	Community outreach as part of the Canadian Airspace Change Protocol. This included: public comment period, information on websites and newspaper adverts; Introductory presentations to the Airport Community Consultative Committee (ACCC); Information published on www.yyc.com (presentations, informative video, feedback forms and Open House locations and dates); Newspaper advertisements; Eight open house events with (1 to 1 dialogues); and A public feedback survey	Reduction of complaints in relation to new flight paths, whose aim was to reduce excessive aircraft noise over populated areas in the city. Drop in quantity of complaints correlated with use of RNP approaches – community supportive of increased use of RNP to reduced noise over specific neighbourhoods	Results: process review after one year of implementation and every 5 years; Airport Community Consultative Committee engaged in dialogue; The airport was able to make use of particular local geography and direct flights along PBN routes away from noise sensitive areas, including along the course of rivers and over industrial estates

Appendix VI – Examples of good practice in airspace change communications

Community engagement workshops are increasingly being complemented with computer visualisations...

1

Visualisation

US Airports implementing PBN allow the proposed flight paths to be downloaded as .kml files for use in 3D visualisation software, (eg Google earth). These files are supported by websites detailing the route locations and traffic patterns. Other organisations in Europe are using 3D visualisation tools, webtrack applications to tracking flights either in near real-time or see traffic patterns averaged over a longer period.



The availability of clear and accessible maps (both current and proposed future operations) is vital

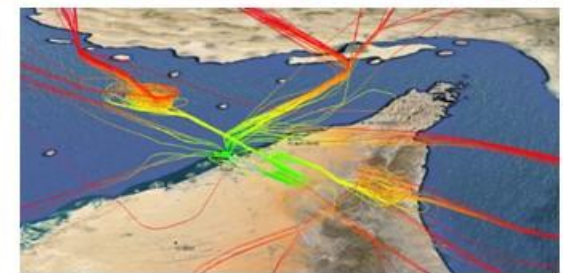
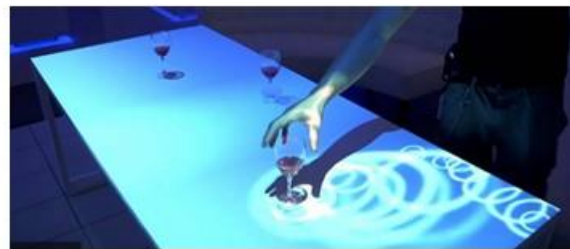
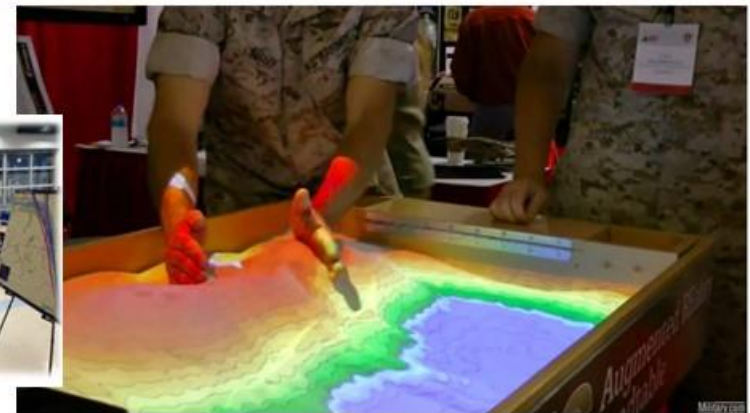
Source: Online sources of information and communication tools; faa.gov; metroplexenviornmnetal.com; <https://to70.com/intuitive-airspace-visualisation/>

...and increasingly innovative technologies, to communicate concepts and route locations

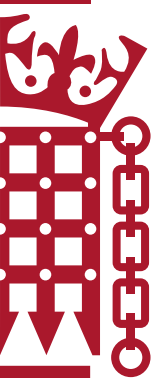
2

Innovative technologies

Innovative technologies are being used to support traditional community engagement activities such as workshops, newsletters mailshots and presentations. For example sound booths are being used at using Heathrow to provide a demonstration of the experienced sound levels.



Source: Examples of advanced technologies used to augment traditional community presentations (centre); Average departure route swathes from Heathrow, (Webtrackmyneighbourhood Heathrow.com), sound booths (<https://www.arup.com/projects/virtual-reality-soundbooths>) and possible examples of future technology - Tabletop visualisations from desktop research including www.Heathrowconsultation.com



HOUSE OF LORDS

Science and Technology Committee

2nd Report of Session 2022–23

The neglected pollutants: the effects of artificial light and noise on human health

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<u>Baroness Neville-Jones</u>	

Declaration of interests

See Appendix 1.

A full list of Members’ interests can be found in the Register of Lords’ Interests:

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Committee staff

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SUMMARY

Environmental noise and light pollution contribute to a range of adverse health outcomes including heart disease and premature death. Yet light and noise remain neglected pollutants, poorly understood and poorly regulated.

Both noise and light pollution can impact negatively on human health through disrupting sleep and circadian rhythms, which leads to negative social and economic impacts.

Epidemiological evidence suggests that noise pollution can both cause annoyance and increase the risk of stroke and heart disease. Whilst the increased risk to an individual may be low, the exposure of millions of people results in a significant aggregate health burden. The World Health Organization estimates that noise pollution from traffic results in one million healthy life years lost in Western Europe every year; research from the UK Health Security Agency suggests that in 2018, 130,000 healthy life years were lost in the UK and that 40% of the British population are exposed to harmful noise levels from road traffic.

Although there is a growing body of evidence that indicates adverse health impacts of noise and light pollution, there are still significant gaps. In the case of noise pollution, research to fill these gaps should include:

- larger-scale epidemiological studies, supported by laboratory research to determine the mechanisms of harm;
- updating burden-of-disease calculations with emerging evidence;
- new metrics: we do not know the importance of pitch, peak volume and intermittency in terms of health impacts because current metrics are based on average volume of noise over a defined time period such as 24 hours;
- the subjective experience of noise, particularly in indoor environments; and
- the efficacy of interventions to reduce noise pollution on health.

The Government should establish an expert advisory group on noise pollution, as exists for air pollution, to assess new evidence for health effects and advise the Government accordingly.

Despite the common experience that light pollution is getting worse, there is no central UK monitoring of the problem, but rather citizen science and satellite imagery. This makes understanding the sources and impacts of light pollution difficult. More research is needed into measures of exposure to light pollution, especially indoors, to quantify the effects on sleep and health. Research could also usefully be conducted into the positive effects of light on health, for example through light therapy to improve sleep.

Whilst more research is needed to update and refine our understanding, it is already recognised that noise and light pollution must be regulated. But the current Government approach is confused. Noise and light sit uncomfortably under the aegis of pollutants regulated by the Department for Environment, Food and Rural Affairs (DEFRA). The 25 Year Environment Plan briefly mentions noise and light pollution, but with no specific targets and seemingly little impetus from central government to address them.

DEFRA should lead the development of analysis for noise and light pollution in order for the next five-year Environmental Improvement Plan to include specific targets for their reduction, setting an overall framework for regulation. Noise targets should focus on reducing the overall burden of disease with targeted interventions. For light pollution, setting a target will require quantification of the problem—through an agreed methodology—and monitoring. The Government should explain how regulatory and policy action on noise and light pollution will be used to deliver the targets. The five principles for good environmental management set out in the Environment Act 2021 and the Environmental Policy Principles Statement should be applied to the management of light and noise pollution as well.

We welcome DEFRA's new noise pollution mapping tool and improved estimates for exposure, but unless this is followed up by policy action to reduce the impact of noise pollution, it will not result in public health benefits. The Government must use its new model to assess cost-effective interventions to reduce the disease burden from noise. Furthermore, the mapping tool measures only the average volume of noise over a defined time period, such as a whole day, and does not take into account the pitch of the sound or loud peaks of noise that could have a bigger health impact, for instance through sleep disturbance, than the average sound level.

DEFRA has the lead for regulating noise and light pollution, but many of the levers to act on these pollutants lie in other departments, such as the Department for Transport and the Department for Levelling Up, Housing and Communities (DLUHC). DEFRA told us it viewed its role as highlighting problems for other departments to act on, but this is not adequate. The Government must strengthen interdepartmental co-ordination on these issues; it must be clear where within each department responsibility lies.

However, there is further confusion which makes it impossible to know whether regulation is effective. Responsibility for acting on noise and light pollution generally lies with local authorities, which come under DLUHC, and there is no requirement for local authorities to report back to DEFRA on complaints about noise and light pollution and the impact, for example, of the National Noise Policy Statement for England. So even where there is a policy in place, the evidence is not being collected to see whether it is effective. Local authorities are under-resourced and have to balance a range of demands, leading to inconsistent policy implementation between local authorities, with some exemplary while others lag behind. DEFRA and DLUHC need to close the feedback loop between policy ownership and policy impact for noise. In the case of light, we urge the Government to set an overall national policy for light pollution and to provide local authorities with the resources they need to take action in line with national targets. In issuing guidance, the Government can make use of existing work from professional institutions: best practice is already understood, but not always followed.

Light and noise pollution are currently neglected pollutants, but research indicates that they are causing significant health impacts and they are of growing concern to the public. In some cases they are easy to avoid through good design, in other cases investment will be needed. A renewed focus on these pollutants, with strengthened co-ordination between departments and between central and local government, would lead to meaningful improvements in public health and quality of life in the UK.

The neglected pollutants: the effects of artificial light and noise on human health

CHAPTER 1: INTRODUCTION

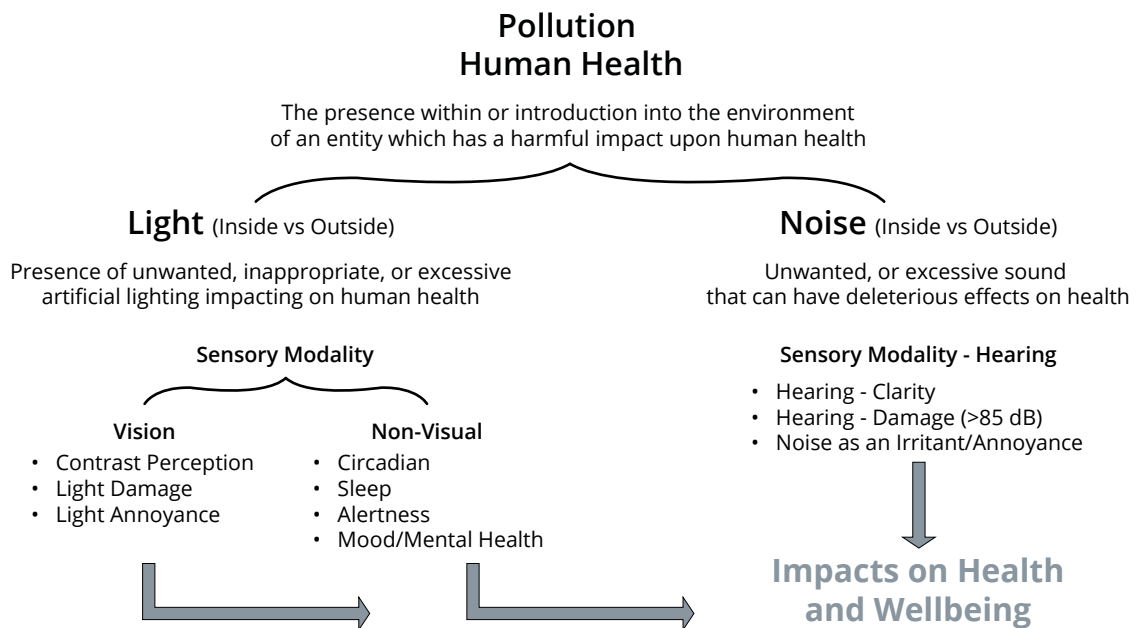
1. Artificial sources of light and noise are near-ubiquitous in the modern world. When light or noise is unwanted or excessive and impacts the health and well-being of humans and other organisms, they can be referred to as light or noise pollution. These pollutants are regulated in the UK at the local level by local authorities, under policy from the Department for Environment, Food and Rural Affairs (DEFRA).
2. Scientific evidence indicating that these pollutants have an impact on human health has been growing. The World Health Organization published guidelines in 2018 for noise pollution in the European region, building on a review of the scientific literature which concluded that the thresholds for negative health impacts of noise were lower than had previously been thought.¹ Although difficult to quantify using existing satellite technology, light pollution appears to be a growing problem, in part in consequence of the roll-out of LEDs. The Royal Commission on Environmental Pollution in 2009 warned of the effects that artificial light at night could have on ecosystems and the sky at night.² Levels of light in the built environment are thought to have increased, although rigorous measures are absent.
3. This report focuses on the health effects of chronic exposure to environmental light and noise and not on acute occupational exposures which would be regulated by the occupational health and safety authorities. The scope of our inquiry is effects on human health, but we acknowledge that there is also significant evidence for impacts on non-human animals.³ Our report first considers the scientific evidence for these health impacts and then the Government's overall policies on light and noise pollution.
4. We are grateful to all who provided their views in our seminars, committee visit and in oral or written evidence and to Professor Russell Foster, who acted as Specialist Adviser to the committee.

-
- 1 World Health Organization, *Environmental noise guidelines for the European Region* (30 January 2019): <https://www.who.int/europe/publications/i/item/9789289053563> [accessed 23 June 2023]
 - 2 The Royal Commission on Environmental Pollution, *Artificial Light in the Environment* (27 November 2009): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228832/9780108508547.pdf.pdf [accessed 23 June 2023]
 - 3 [Q 144](#) (Rebecca Pow MP); [Q 99](#) (Emma Marrington); and The Royal Commission on Environmental Pollution, *Artificial Light in the Environment* (27 November 2009): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228832/9780108508547.pdf.pdf included many citations to literature about the impact of artificial light at night on a range of ecosystems. [accessed 23 June 2023]

CHAPTER 2: SCIENTIFIC EVIDENCE OF HEALTH EFFECTS

5. This chapter summarises the scientific research basis for the current understanding of the impacts of artificial light and noise on human health. It outlines the existing literature and some uncertainties that need to be addressed by further research.

Figure 1: Schematic of light and noise pollution impacts on health and wellbeing



Source: Schematic prepared by Professor Russell Foster, outlining definitions of light and noise pollution and some mechanisms by which they can impact health and wellbeing.

Noise

6. 'Noise' generally refers to unwanted sound. Sound is characterised by acoustic properties including pitch and volume. Volume is usually measured in decibels (dB), on a logarithmic scale; when a sound is perceived to double in loudness, this corresponds to an increase of roughly 10 dB, a tenfold increase in power (see Table 1).⁴ Sounds can be continuous or intermittent; the timing and duration of a sound are also relevant to its potential effects on human health.

Table 1: The Decibel Scale

Decibel measure (dB)	Common sound
30	Leaves rustling/whisper
40–50	Average room noise
60	Background music
70	Average office noise
80	Inside an aeroplane or underground carriage

4 Sound science for schools and colleges, 'Decibel Scale': <https://salfordacoustics.co.uk/sound-waves/waves-transverse-introduction/decibel-scale> [accessed 23 June 2023]

Decibel measure (dB)	Common sound
90	Hairdryer
110	Nightclub or rock concert
135	Jet engines

Source: Common sounds and their relative volume in decibels. Levels of sound will vary depending on the distance from the source of the sound. Hearing Health Foundation, 'Decibel Levels': <https://hearinghealthfoundation.org/decibel-levels> [accessed 30 June 2023]

Evidence for the health impacts of noise

7. In 2018, the World Health Organization (WHO) published environmental noise guidelines for the European region, which were based on systematic reviews of the scientific literature.⁵ Professor Anna Hansell, Professor of Environmental Epidemiology and Director of the Centre for Environmental Health and Sustainability at the University of Leicester, summarised its findings:

“There is obviously good evidence for annoyance and for sleep disturbance. There is now good evidence for impacts on cardiovascular disease; the strongest evidence is on ischaemic heart disease, that is, heart attacks, in relation to road traffic noise. There is some evidence on metabolic impacts, for example diabetes.”⁶
8. One method of quantifying the health effects of environmental noise is by estimating the overall disease burden. The WHO and European Environment Agency estimated in 2018 that more than 100 million people were exposed to harmful levels of environmental noise pollution. They estimated that this contributed to “48,000 new cases of heart disease and 12,000 premature deaths every year in Europe. In addition, 22 million people suffer chronic high annoyance, and 6.5 million suffer chronic high sleep disturbance.”⁷ Research from the UK Health Security Agency (UKHSA) suggests that in 2018, 130,000 healthy life years were lost in the UK due to noise pollution; and that 40% of the population were exposed to harmful levels of noise pollution from road traffic.⁸
9. The mechanisms behind these health impacts remain a subject of research; we heard that there are multiple pathways by which noise can affect health, summarised by Professor Hansell as “noise annoyance, sleep disturbance, fight or flight reaction, and non-specific stressor.”⁹

5 The systematic reviews were published separately, ‘Special Issue “WHO Noise and Health Evidence Reviews”’, *International Journal of Environmental Research and Public Health*: https://www.mdpi.com/journal/ijerph/special_issues/WHO_reviews [accessed 23 June 2023]

6 Q 6 (Professor Anna Hansell) The harmful level was here defined as the long-term noise exposure level above which a significant increase in negative health effects occur; the WHO’s 2018 review found this threshold to be 55 dB (averaged over a 24-hour cycle) or 50 dB (averaged overnight). World Health Organization, *Environmental noise guidelines for the European Region* (30 January 2019): <https://www.who.int/europe/publications/i/item/9789289053563> [accessed 23 June 2023]

7 European Environment Agency, ‘Health risks caused by environmental noise in Europe’ (14 December 2020): <https://www.eea.europa.eu/publications/health-risks-caused-by-environmental> [accessed 23 June 2023]

8 Calvin Jephcote *et al.*, ‘Spatial assessment of the attributable burden of disease due to transportation noise in England’, *Environment International*, vol. 178 (7 May 2023): <https://www.sciencedirect.com/science/article/pii/S0160412023002398/pdf> [accessed 7 July 2023]

9 Written evidence from Professor Anna Hansell (ALN0092)

Sleep and circadian rhythm disruption

10. Both light and noise can influence health by disrupting circadian rhythms. Professor Kenneth Wright, Director of the Sleep and Chronobiology Laboratory at the University of Colorado Boulder, described negative health effects from circadian rhythm disruption as including “insomnia, prescription of hypnotic drugs in older adults, obesity, type 2 diabetes, heart disease, elevated blood pressure, depression and cancer.”¹⁰ However, Professor Dr Manuel Spitschan, Professor of Chronobiology and Health at the Technical University of Munich, emphasised that “good light exposure [supports] the circadian system”.¹¹
11. Professor Shantha Rajaratnam, Professor of Sleep and Circadian Medicine at Monash University, discussing the effects of artificial light exposure in occupational settings, noted that, while evidence is still building towards scientific recommendations for healthy light exposure, for “particularly vulnerable populations, such as in hospitals, age care settings, and so on, we should make recommendations early”.¹² Night-shift workers are particularly vulnerable owing to the persistent disruption to their circadian rhythms. Professor Rajaratnam said that there was an “urgent need for studies in that area.”¹³
12. We heard of studies which estimate the approximate cost of sleep disruption to economies. One study by the RAND Corporation suggested “that in the UK this is around 1.86% of GDP (\$50 billion/£42 billion).”¹⁴ Some researchers have set up large-scale studies on sleep in the UK, such as the UK Sleep Census, but these are independent research projects rather than public health actions.¹⁵

Emerging evidence for health impacts of noise

13. Some studies have examined possible associations between environmental noise and other health effects. Professor Charlotte Clark, Professor of Epidemiology at St. George’s, University of London, described one such area, noting: “We think that children’s cognition generally is affected, but we do not see it consistently across all the sources”.¹⁶ Owing to the lack of confidence around these emerging health effects, they have not always been included in burden-of-disease calculations.
14. The WHO guidelines included cognitive impairment of children and tinnitus in its burden-of-disease calculations.¹⁷ However, we heard from Professor Hansell that health effects outside those currently included by the WHO had a “much lower weight of evidence, but there are suggestions that there might be impacts outside the cardiovascular system. Some studies have

10 [Q 28](#) (Professor Kenneth Wright)

11 [Q 18](#) (Professor Dr Manual Spitschan)

12 [Q 22](#) (Professor Shantha Rajaratnam)

13 [Q 26](#) (Professor Shantha Rajaratnam)

14 Written evidence from Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy and Professor Russell Foster, University of Oxford ([ALN0074](#))

15 BBC Two Horizon, ‘The UK Sleep Census’: <https://www.bbc.co.uk/programmes/articles/10wh9mPTwTT740bz74MnY33/the-uk-sleep-census> [accessed 11 July 2023]

16 [Q 6](#) (Professor Charlotte Clark)

17 World Health Organization, *Environmental noise guidelines for the European Region* (30 January 2019) p 2: <https://www.who.int/europe/publications/i/item/9789289053563> [accessed 23 June 2023]

looked at cancer, although the findings have been quite inconsistent. A few studies have looked at noise and respiratory disease.”¹⁸

15. We heard that the evidence base for the health effects of environmental noise is growing rapidly. Dr Benjamin Fenech, Noise and Public Health Group Leader at the UKHSA, noted that, although the WHO guidelines were based on evidence published up to 2015, when UKHSA did its own review in 2022 half of the studies used were published in the last five years. This expansion of the evidence base meant that UKHSA felt the need to commission more up-to-date systematic reviews, “to make sure that we are capturing the latest evidence to inform decision-making”.¹⁹
16. **There is increasing epidemiological evidence of the harmful effects of noise on human health. Aggregated over the whole population, even small effects on the individual can be a significant public health concern. New evidence is likely to change the understanding of these effects, for example the role played by intermittency. DEFRA should work with the UK Health Security Agency and other organisations to assess the significant, growing evidence on the health effects of noise. This should include refining existing estimates for the disease burden from well-established health impacts of noise pollution, for example on the cardiovascular system. UKHSA should also assess whether health effects for which evidence is emerging, such as on the metabolic system, meet the evidentiary threshold for policy action.**

Areas for further research

17. The evidence for the negative health impacts of noise is predominantly epidemiological, as laboratory-based studies for population health are difficult to conduct.²⁰ The evidence base consists of plausible biological mechanisms with some laboratory-based studies and epidemiological studies which find a statistical association between exposure and health effects.
18. We heard that this evidence base could be expanded with additional types of study. On laboratory studies, Professor Clark said “it will be a good way to look at the mechanisms in a bit more detail, which is an area that traditionally has not been well researched.”²¹ Professor Hansell acknowledged the limitations of the epidemiological evidence when compared to the evidence for harm from other pollutants, noting “With air pollution, we tend to use much more complex models than we do in noise so far, because ... there are handfuls of studies on noise, compared with the thousands of studies on air pollution.”²²

18 [Q 6](#) (Professor Anna Hansell)

19 [Q 119](#) (Dr Benjamin Fenech) UKHSA sent the Committee examples of recently published epidemiological studies and meta-analyses: Supplementary written evidence from UK Health Security Agency ([ALN0089](#)); and Jing Huang *et al.*, ‘Road Traffic Noise and Incidence of Primary Hypertension: A Prospective Analysis in UK Biobank’, *JACC: Advances*, vol. 2, Issue 2, 100262 (31 March 2023): <https://www.sciencedirect.com/science/article/pii/S2772963X23000169> [accessed 23 June 2023]

20 Written evidence from Professor Anna Hansell ([ALN0092](#)) Professor Hansell’s written evidence includes more detail on the statistical methods used in epidemiology for noise pollution.

21 [Q 8](#) (Professor Charlotte Clark)

22 [Q 11](#) (Professor Anna Hansell)

19. One of the main ways by which noise affects health is through annoyance.²³ Annoyance generally rises with noise level, but also depends on the type of noise, with differing results found for aircraft, road and railway noise.²⁴ Dr Antonio Torija Martínez, Reader in Acoustic Engineering at the University of Salford, noted that “high-frequency or high-pitched sounds are perceived to be more annoying.”²⁵ Annoyance does not depend only on the properties of the sound but can also depend on one’s noise tolerance.²⁶
20. Annoyance is also influenced by non-acoustic factors. Professor Clark said that “sound accounts for only a small proportion of the annoyance we measure”, with non-acoustic factors including “your age, your biological sex, if it is airport noise your attitude to the airport”.²⁷ Dr Torija Martínez said perhaps as little as “30% of noise annoyance [is] related to acoustic factors”,²⁸ but more research is needed “to account for non-acoustic factors”.²⁹ Dr Fenech said “non-acoustic factors have a big role to play in improving health outcomes.”³⁰
21. The standard metrics used for measuring exposure to environmental noise involve averaging the noise levels over time.³¹ However, intermittent loud noises, with a high peak volume, might have different health impacts compared with a more constant, average, quieter noise. Professor Clark described Swiss studies that have defined metrics for intermittency and which found that the degree of intermittency of noise can explain differences in annoyance reactions.³²
22. Dr Fenech mentioned the “need [for] research using different noise exposure metrics” due to the limitations of long-term exposure metrics currently in use.³³ Asked whether DEFRA’s noise modelling included intermittency, Dr Bill Parish, Deputy Director for Air Quality and Industrial Emissions at

23 **Q 3** (Professor Charlotte Clark) ‘Annoyance’ is a term of art defined by a specific technical standard. ISO/TS 15666:2021, ‘Acoustics—Assessment of noise annoyance by means of social and socio-acoustic surveys, Abstract’ (May 2021): <https://www.iso.org/standard/74048.html> [accessed 23 June 2023]

24 **Q 3** (Professor Charlotte Clark)

25 **Q 3** (Dr Antonio Torija Martínez)

26 **Q 3** (Professor Anna Hansell)

27 **QQ 3, 5** (Professor Charlotte Clark)

28 **Q 7** (Dr Antonio Torija Martínez)—this figure specifically related to a study about aircraft noise.

29 **Q 3** (Dr Antonio Torija Martínez)

30 **Q 121** (Dr Benjamin Fenech)

31 Metrics include L_{eq} which is the hypothetical steady sound which contains the same sound energy as the variable sound over a defined measurement period. This is widespread in its use as a metric for traffic or aircraft noise. Other variants include L_{den} , which weights noise events as more severe if they occur in the evening or at night. Environmental Research and Consultancy Department and Civil Aviation Authority, *Metrics for Aircraft Noise* (January 2009): <https://publicapps.caa.co.uk/docs/33/ERCD0904.pdf> [accessed 23 June 2023]. Professor Hansell described the limitations of these metrics in her written evidence, stating: “Metrics in common use were developed in relation to annoyance and sleep e.g. L_{den} and LDN, often available as annual averages. In fact, noise at different times of day, number of noisy events (N60), divergence of a noise event from background levels (Intermittency Ratio) may be better metrics for health. As may frequency and vibration (not commonly measured).” Supplementary written evidence from Professor Anna Hansell (**ALN0092**)

32 **Q 3** (Professor Charlotte Clark) A description of the SIRENE study; SwissTPH, ‘SiRENE—Short and Long Term Effects of Transportation Noise Exposure’: <https://www.swisstph.ch/en/projects/project-detail/project/sirene-short-and-long-term-effects-of-transportation-noise-exposure>; and Mark Brink *et al.*, ‘A survey on exposure-response relationships for road, rail, and aircraft noise annoyance: Differences between continuous and intermittent noise’, *Environment International*, vol. 125 (16 January 2019) pp 277–290: http://www.sirene-studie.ch/pdf/Brink_2019_A%20survey%20on%20exposure-response%20relationships.pdf [accessed 23 June 2023]

33 **Q 121** (Dr Benjamin Fenech)

DEFRA, confirmed it did not, and said “We will need to develop how we apply a more sophisticated approach to those scenarios.”³⁴

23. Witnesses were asked what kinds of studies should be conducted to improve the evidence base for the impacts of environmental noise on health. Areas mentioned included:
 - Additional studies of railway and neighbour noise³⁵
 - Large-scale longitudinal epidemiological studies³⁶
 - Experimental and quasi-experimental (natural experiment) studies³⁷
 - Studies into the impacts of noise on mental health.³⁸
24. There are also limitations in understanding of indoor noise exposure; Professor Hansell noted that “there is little information at population level on sound indoors, which will depend on building characteristics, what else is going on in the house”.³⁹ This may be of concern because of socioeconomic disparities in the quality of housing stock, which could lead to “higher noise exposures from outdoor noise penetrating indoors.”⁴⁰
25. Witnesses agreed more research was needed into the impact of interventions to reduce noise exposure on health.⁴¹ Professor Clark said: “we do not have good studies of interventions where we change the noise exposure, or we try to, and then we assess how that impacted people’s sleep, annoyance, cardiovascular responses.”⁴²
26. Witnesses mentioned that researching the health effects of noise is intrinsically multidisciplinary and that this can cause problems in securing funding.⁴³ Dr Torija Martínez said: “We need some mechanisms to facilitate interdisciplinary research to do this. For example, it is difficult to work within different research councils.”⁴⁴
27. **More laboratory and field studies are needed to supplement epidemiological evidence and to establish the mechanisms by which noise might affect health. The current metrics used to characterise noise pollution are mostly long-term average intensity (decibel) metrics, which do not capture peak volume, pitch and intermittency. The latter influence annoyance and may correlate more closely with health outcomes but are not widely measured. Quantifying the health**

34 [Q 129](#) (Dr Bill Parish)

35 [Q 6](#) (Professor Charlotte Clark) and supplementary evidence from Professor Anna Hansell ([ALN0092](#))

36 [Q 15](#) (Professor Anna Hansell) and [Q 121](#) (Dr Benjamin Fenech)

37 [Q 6](#) (Professor Charlotte Clark). A natural experiment is an observational study which makes use of naturally occurring circumstances to observe and compare two groups—a control group and an experimental group—in order to determine the effect of a particular phenomenon. For example, a road might be closed for a period of time, allowing for the same population to be observed in experimental and control conditions to test the effect of closing the road.

38 [Q 6](#) (Professor Charlotte Clark)

39 Supplementary written evidence from Professor Anna Hansell ([ALN0092](#))

40 *Ibid.*

41 [Q 121](#) (Dr Benjamin Fenech) and supplementary written evidence from Professor Anna Hansell ([ALN0092](#))

42 [Q 6](#) (Professor Charlotte Clark)

43 Supplementary written evidence from Professor Anna Hansell ([ALN0092](#))

44 [Q 15](#) (Dr Antonio Torija Martínez)

effects of interventions to reduce exposure is important for cost-benefit analyses.

28. *The UK should seek opportunities to collaborate with similar countries, sharing research data and methodologies. Alongside these efforts, DEFRA should commission and fund a research programme into noise and health. This should include:*

- *large-scale epidemiological studies, including long-term longitudinal studies, which can make use of international big data;*
- *laboratory-based studies establishing mechanisms for health impacts;*
- *field studies establishing the indoor exposure to noise, which can contribute to mapping the indoor exposure to noise;*
- *interdisciplinary studies to understand the variation in response caused by non-acoustic factors;*
- *modelling and experimental studies into the health effects of interventions to reduce noise; and*
- *whether alternative metrics for noise, including pitch and intermittency, should be measured and used to better understand health outcomes.*

An independent advisory panel for noise

29. Some witnesses were concerned that there was no clear channel in place by which their evidence could inform Government policy. Professor Anna Hansell praised the work of the UKHSA noise team for calculating the “burden of disease from noise for all local authorities in England”, but noted that “there is no expert scientific advisory group for noise ... as there is for air pollution”.⁴⁵ She said “there is no clear policy group to go to.”⁴⁶
30. **Although UKHSA has a noise and health team which summarises research in this field for policymakers, there is no advisory group as there is for air pollution. *An interdisciplinary, independent advisory panel should be established to provide independent advice to the Government and a forum for new evidence, particularly on emerging health effects and technologies, to be assessed.***

Light

Evidence for the health impacts of artificial light at night

31. Artificial light is characterised by properties, including the intensity of the light or its wavelength. Intensity can be measured using the SI unit, lux,

45 Supplementary written evidence from Professor Anna Hansell ([ALN0092](#))

46 [Q 9](#) (Professor Anna Hansell)

while wavelengths are often characterised using the colour temperature.⁴⁷ The eye operates over a wide range of intensities in lux (see Table 2).

32. Artificial light at night could influence human health by disturbing sleep and circadian rhythms.⁴⁸ The science on how light exposure influences circadian rhythms is evolving. Professor Rajaratnam noted many properties of light exposure influence circadian rhythms, including: “the duration ... intensity and the wavelength composition ... as well as the timing of the light exposure and the history of the light exposure”. He suggested that these properties should be measured in “large-scale studies”.⁴⁹

Table 2: Common light scenarios and their measurements in lux

Lux	Comparison
0.0001	Starlight
0.25–1	Full moon
80	Typical indoor lighting
400	Sunrise or sunset
500	A well-lit office
1000	Overcast day outdoors
10,000	Daylight
100,000	Intense, direct sunlight

Sources: Trong-Hop Do, ‘Performance Analysis of Visible Light Communication Using CMOS Sensors’, ResearchGate (February 2016): https://www.researchgate.net/publication/296477842_Performance_Analysis_of_Visible_Light_Communication_Using_CMOS_Sensors; James Druzik, ‘Guidelines for Selecting Solid-State Lighting for Museums—Figure 13—The scale of light intensities from moonlight to candlelight to sunlight’, ResearchGate (December 2015): https://www.researchgate.net/figure/The-scale-of-light-intensities-from-moonlight-to-candlelight-to-sunlight-and-the-range_fig5_287207122; Torchspot, ‘Lumens, Lux and Candela Explained—Lux Comparison’: https://www.torchspot.com/lumens-lux-and-candela/#Lux_Comparison_Chart; and The Electrical Counter, ‘What are Lux levels?’: <https://www.electricalcounter.co.uk/lux-levels-chart> [accessed 10 July 2023]

33. Scientists have defined a new metric, “melanopic lux”, which accounts for the wavelengths to which the circadian system is most sensitive. Professor Dr Manuel Spitschan told us that “when we are assessing or trying to measure the impact of light exposure on human health or the human circadian system, we need to take this wavelength preference ... into account.”⁵⁰ However, this metric is not widely used⁵¹ and the Circadian Neuroscience Group at the University of Oxford recommended that “all

47 Lux is a unit of illuminance defined in terms of lumens per meter squared. Colour temperature is a measure of wavelength which uses the correspondence between the temperature of a perfectly absorptive “blackbody” emitter and the peak wavelength of the spectrum of radiation it emits. Higher temperatures emit more energetic, shorter-wavelength (higher-frequency) light, with 1,000–3,000 Kelvin perceived as red-orange while 7,000–10,000 Kelvin would be perceived as blue. Dr Rüdiger Paschotta, ‘Color Temperature’, *RP Photonics Encyclopedia*: https://www.rp-photonics.com/color_temperature.html; ‘lux, unit of energy measurement’, *Britannica*: <https://www.britannica.com/science/lux> [accessed 26 June 2023]

48 We summarise evidence on the effects of circadian rhythm disruption on health in the section on circadian rhythms below, as it cuts across both light and noise.

49 [Q 21](#) (Professor Shantha Rajaratnam)

50 [Q 21](#) (Professor Dr Manuel Spitschan)

51 *Ibid.*

studies on light pollution use appropriate units (mel-EDI) when considering the non-visual health effects of light.”⁵²

34. Guidelines are being developed for light exposure that promotes circadian health. Witnesses referred to the “expert consensus recommendations paper”⁵³ known as the Manchester Guidelines, published in 2022.⁵⁴ These values are based on “existing laboratory data for human dose-response curves to light” which characterise how the circadian clock shifts when it is exposed to light at different intensities.⁵⁵ Whilst such laboratory-based studies are informative, they may not capture how people are exposed to light in reality.⁵⁶
35. **There are concerns that light pollution has been increasing rapidly in recent years. Evidence for the health effects of light pollution is at a less mature stage than noise pollution, but it may influence health by disrupting circadian rhythms and sleep. The Government should commission research to establish how light intensity, wavelength, duration, time of exposure, light history and age affect the circadian system. This should move beyond laboratory-based studies and investigate more realistic light exposure patterns for humans. Such knowledge would provide an evidence base for guidelines that could mitigate the harmful effects of light pollution on human biology, including the circadian system, mood and alertness.**

Other health effects from artificial light

36. Artificial light can cause discomfort due to flicker and glare. Dr Christopher Kyba, Researcher at the Helmholtz Centre Potsdam, said that “flicker ... is an issue for a lot of individuals—again, not everybody, but some are very sensitive to it.”⁵⁷ Glare was described as “dangerous” for drivers in certain situations, and we were told it could “cause eye strain and headaches.”⁵⁸

52 Written evidence from Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy and Professor Russell Foster, University of Oxford (ALN0074). Measurement using melanopic lux defines levels of illuminance as would be detected by melanopsin-based photosensitive retinal ganglion cells (pRGCs). These convey light information from the eye to the brain for the regulation of the circadian system. However, pRGCs do not act alone; visual photoreceptors (rods and cones) can modulate the pRGCs. As a result, the circadian system can potentially respond to light across most of the visible spectrum. Melanopic EDI (equivalent daylight illuminance) is a new unit of light intensity that accounts for the different sensitivity of the light-sensitive cells in the eye and predicts the circadian effects of light better than existing light measurements.

53 Timothy Brown *et al.*, ‘Recommendations for daytime, evening, and nighttime indoor light exposure to best support physiology, sleep, and wakefulness in healthy adults’, *PLoS Biology*, vol. 20(3) (17 March 2022): <https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3001571> [accessed 23 June 2023]

54 Q 22 (Professor Dr Manuel Spitschan) Professor Dr Spitschan explained that “the recommendations included less than 1 lux melanopic EDI in the sleep environment, less than 10 lux melanopic EDI in the pre-sleep environment, and more than 250 lux melanopic EDI during daytime hours.”

55 Written evidence from Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy and Professor Russell Foster, University of Oxford (ALN0074)

56 Frida Rångtjell *et al.*, ‘Two hours of evening reading on a self-luminous tablet vs. reading a physical book does not alter sleep after daytime bright light exposure’, *Sleep Medicine*, Vol. 23 (July 2016) pp 111–118: <https://www.sciencedirect.com/science/article/pii/S1389945716300818> [accessed 23 June 2023]

57 Q 24 (Dr Christopher Kyba)

58 Q 89 (Ian Ritchie CBE)

37. Surveys have indicated that dazzle from car headlights is a growing problem, which may be related to the rollout of LEDs,⁵⁹ with studies suggesting they should be made dimmer in urban environments to aid contrast and avoid dazzle.⁶⁰ Dr Kyba said: “There is very little discussion between the people who create headlights and the people who create street lighting”, leading to poor interactions between the lighting types.⁶¹
38. Concerns have been raised around the LED rollout.⁶² LEDs are cheaper and more energy-efficient than traditional lighting, but this means that “more people are using more lights when they do not necessarily need to”.⁶³ Dr Luke Price, Principal Radiation Protection Scientist at UKHSA, told us “there is nothing intrinsically unhealthy about LEDs, but, if they are more energy efficient, we can use more of them and light more”.⁶⁴ Dr Kyba told us that there is evidence they contribute to light pollution: “the number of stars that people report they are able to see has dramatically decreased” since the rollout.⁶⁵
39. The UK Health Security Agency has a team that collates evidence for environmental noise and health, but there is no explicit team for light. Dr Luke Price is their light specialist and co-authored the Manchester Guidelines. He noted that they were “framed ... specifically for policymakers”.⁶⁶ Dr Edward Wynne-Evans, Director of the Radiation, Chemicals and Environmental Hazards Directorate at UKHSA, said that “On light, we want to work with other bodies to expand that [evidence] base” to quantify risks and costs from artificial light, but the evidence base was not yet good enough to carry out a cost-benefit analysis as can be done with traffic noise.⁶⁷
40. **Flicker, glare and dazzle can cause visual disturbance. There is not clear evidence that LEDs cause ill-effects in healthy people when used properly. However, there is widespread concern that the LED rollout has been associated with poor lighting practice and over-lighting. Research should be carried out in order to establish the level of risk from glare, flicker, and dazzle, for example in night-time driving.**

Mapping light pollution and human exposure to artificial light at night

41. Although there is a statutory requirement to map noise pollution, there is no such requirement for light. Emma Marrington of the charity CPRE told us

59 RAC, *Blinded by the lights—nearly one-in-four drivers think most car headlights are too bright... and the problem is getting worse* (8 March 2022): <https://www.rac.co.uk/drive/news/motoring-news/nearly-one-in-four-drivers-think-most-car-headlights-are-too-bright/> [accessed 23 June 2023]

60 Q 24 (Dr Christopher Kyba)

61 *Ibid.*

62 The EU’s 2018 review into the health effects of LEDs concluded that “there is no evidence of direct adverse health effects from LEDs emission in normal use (lamps and displays) by the general healthy population.” It found some evidence for circadian rhythm disruption from use in the evenings, but it was “not yet clear” if this was significant enough to lead to adverse health effects. Safety concerns from “high-luminance exterior sources used on some vehicles” were raised. Finally, it noted some LEDs presented health concerns due to “flicker ... at frequencies of 100 Hz and above” and concluded that as the use of LEDs is evolving, it was important to “closely monitor the risk of adverse health effects” from long-term LED use. Scientific Committee on Health, Environmental and Emerging Risks SCHEER, *Opinion on Potential risks to human health of Light Emitting Diodes (LEDs)* (June 2018): https://health.ec.europa.eu/system/files/2019-02/scheer_o_011_0.pdf [accessed 23 June 2023]

63 Q 70 (Andrew Bissell)

64 Q 124 (Dr Luke Price)

65 Q 24 (Dr Christopher Kyba)

66 Q 123 (Dr Luke Price)

67 Q 117 (Dr Edward Wynne-Evans)

that the 2016 Night Blight mapping, which they created “with consultants that looked at satellite data”, was “the baseline and currently the most detailed map for England”, but there was “a need to remap light pollution using the latest technology.”⁶⁸

42. Ruskin Hartley, CEO of the International Dark-Sky Association, explained that “scientists have estimated, based on the satellite data, that light pollution has been growing maybe by 2% or 3% per year”,⁶⁹ but this was contradicted by citizen-science projects that involve counting visible stars, which suggest that light pollution and sky glow is growing by 10% every year.⁷⁰ The reason for this discrepancy is that satellite measures are not always a reliable proxy for on-the-ground exposure.⁷¹
43. Asked about the idea of a central light map, Rebecca Pow MP, Minister for Environmental Quality and Resilience, said “We are doing it for some projects ... the CPRE does some of its own light mapping. There are a lot of limitations to our ability to do that right now ... We need more research ... to establish ... the methodology, the metrics and what we are measuring.”⁷²
44. We heard that, although it is possible to calculate a “burden of disease” estimate for noise pollution, this cannot yet be done for light. This is partially because of a lack of data about the light levels that people are exposed to at night. Dr Luke Price of UKHSA described “a series of longitudinal studies in Japan that measured the light in people’s environment, which we lack in the UK”.⁷³ Concerns were also raised about specific occupational exposures to light, such as in hospitals, which are not being measured.⁷⁴
45. **Regulating light pollution is difficult if it is not measured; our current approach is inadequate. It is also difficult to assess the health implications if it is not known how people are exposed to light pollution, particularly indoors at night. DEFRA should establish a standard methodology for tracking, monitoring and reporting on light pollution. This should be in place by the next five-year Environmental Improvement Plan cycle. The Government should commission a regular survey to track light pollution once the methodology is agreed. The research should aim to understand both indoor and outdoor exposure to artificial light at night, so its health impact can be quantified.**

Expert advisory group on circadian rhythms and light

46. There is no expert advisory group for the impacts of light pollution on human health, or on the environment more generally.⁷⁵ Ms Pow told us that “a review was done of the light issues after the Royal Commission on Environmental

68 [QQ 94–95](#) (Emma Marrington)

69 [Q 95](#) (Ruskin Hartley)

70 Witnesses pointed out that, while there must be some correlation between light pollution that affects the visibility of the night sky and light levels people are exposed to on the ground, it is not known precisely what that is. Christopher Kyba *et al.*, ‘Citizen scientists report global rapid reductions in the visibility of stars from 2011 to 2022’, *Science*, vol. 379, Issue 6629 (January 2023) pp 265–268: <https://www.science.org/doi/10.1126/science.abq7781> [accessed 23 June 2023]

71 [Q 72](#) (Andrew Bissell) explains why this is: satellites use the infrared window but blue LEDs have less in this spectrum.

72 [Q 147](#) (Rebecca Pow MP)

73 [Q 123](#) (Dr Luke Price)

74 [Q 76](#) (Andrew Bissell)

75 [Q 144](#) (Rebecca Pow MP, Dr Bill Parish)

Pollution report” in 2009, but that it concluded “there was not enough evidence to do anything to change the way we regulate”. She conceded that the “evidence is building and changing all the time.”⁷⁶ However, it is unclear who the Government would consult to assess the evidence base on the health impacts of artificial light at night, or for circadian science in general.

47. ***The Government should have a team of experts in UKHSA, on circadian rhythms and impacts of light on health to act as a single point for evidence gathering and co-opting external expertise. As the field develops, it may be appropriate to set up an independent advisory panel, as for noise and air pollution.***

Issues affecting noise and light

Possible beneficial effects of light and noise on human health

48. Professor Shantha Rajaratnam told us that, given the link between sleep and circadian rhythm disruption and mental health, there is “a unique opportunity to intervene and prevent” mental health conditions.⁷⁷
49. Light boxes can be used as treatment for mental ill-health. This involves exposing the patient to bright illumination (in excess of 10,000 lux) early in the morning to help reset the circadian clock. Professor Pierre Geoffroy, Professor of Psychiatry at Université Paris Cité, cited a meta-analysis that showed “light therapy is as efficient as antidepressant treatment [for] both seasonal and non-seasonal depression.”⁷⁸
50. Professor Geoffroy said that “the combination of the two treatments—light and antidepressants—is clearly superior to antidepressants alone.” He said that the “level of evidence ... depends on the disorder” and called for “larger, good-quality randomised controlled trials”, in particular long-term follow-up studies and effects of treatment on people with different natural sleep-wake cycles, or chronotypes.⁷⁹ The NHS website mentions light boxes as a possible treatment for seasonal affective disorder, but the NHS does not currently prescribe them.⁸⁰ Professor Geoffroy noted that research into light boxes was “much less supported compared to that for drugs, where pharmaceutical companies conduct or sponsor very large-scale studies.”⁸¹
51. Social prescribing is an approach to care that seeks to connect people to activities, groups and services in their community that can address their needs.⁸² Green social prescribing involves nature-based interventions and activities, such as walking-for-health schemes or gardening projects.⁸³ Dr Alison Greenwood, CEO of A Dose of Nature, told us that its schemes

76 Q 145 (Rebecca Pow MP)

77 Q 26 (Professor Shantha Rajaratnam). Daniel Freeman *et al.*, ‘The effects of improving sleep on mental health (OASIS): a randomised controlled trial with mediation analysis.’ *The Lancet Psychiatry*, vol. 4 (2017), pp 749–58: [https://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366\(17\)30328-0/fulltext](https://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366(17)30328-0/fulltext) [accessed 23 June 2023]

78 Q 41 (Professor Pierre Geoffroy)

79 QQ 41–43 (Professor Pierre Geoffroy)

80 NHS, *Treatment—Seasonal affective disorder (SAD)*, (20 May 2022): <https://www.nhs.uk/mental-health/conditions/seasonal-affective-disorder-sad/treatment/> [accessed 23 June 2023]

81 Q 45 (Professor Pierre Geoffroy)

82 Natural England, ‘Social Prescribing: the power of nature as treatment’ (12 April 2022): <https://naturalengland.blog.gov.uk/2022/04/12/social-prescribing-the-power-of-nature-as-treatment/> [accessed 23 June 2023]

83 NHS England, ‘Green social prescribing’: <https://www.england.nhs.uk/personalisedcare/social-prescribing/green-social-prescribing/> [accessed 23 June 2023]

had “over 800 referrals from GPs”.⁸⁴ Natural light and sounds may play a role in the positive psychological impacts of green social prescribing.⁸⁵

52. However, witnesses agreed that more research was needed to understand the precise effect sizes and mechanisms of these positive impacts, with Dr Greenwood noting that it was “difficult to look at the effects of nature in a randomised controlled trial”.⁸⁶
53. ***The National Institute for Health and Care Excellence should review evidence for the effectiveness of therapies such as light boxes that might promote improved circadian rhythms and therefore physical and mental health.***
54. ***The National Institute for Health and Care Research should commission research to establish the mechanisms by which green social prescribing may affect health.***

84 [Q 40](#) (Dr Alison Greenwood), [Q 41](#) (Dr Alison Greenwood)

85 [Q 40](#) (Alex Smalley)

86 [Q 44](#) (Dr Alison Greenwood) and [Q 41](#) (Alex Smalley)

CHAPTER 3: PUBLIC POLICY IMPLICATIONS

Noise

National noise policy

55. The Noise Policy Statement for England (NPSE) published in March 2010 sets out the Government's long-term vision for noise policy. The NPSE states that the Government wishes 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."⁸⁷ This is supported by three aims: to avoid significant adverse impacts on health and quality of life; to mitigate and minimise adverse impacts on health and quality of life; and where possible, contribute to the improvement of health and quality of life.
56. The Institute of Acoustics said that the NPSE did not need replacing; the focus should rather be on implementing it on the basis of the latest evidence.⁸⁸ Witnesses agreed that it provided a reasonable framework but there is a lack of implementation detail and the policy had not been emphasised enough. Paul McCullough, a member of the Chartered Institute of Environmental Health, said: "there could be a more strategic approach ... that would help to direct resources and competence in the field, which is required, particularly from a local government perspective."⁸⁹ The Institute of Acoustics set out its vision for a more strategic approach.⁹⁰
57. Stephen Turner, who was involved in drafting the NPSE, told us: "there has been an inconsistency between local policy and national policy." He added: "we need to re-emphasise to people that this is the policy and it should be used to direct our noise management."⁹¹
58. Several witnesses noted that although noise pollution is mentioned in the 25 Year Environment Plan, the five-year update does not refer to noise pollution.⁹² Stephen Turner said: "It is not one of the key areas of activity for the Office for Environmental Protection. If you go to its website to see what you can complain about, noise is not listed; nor is it mentioned in this year's environmental improvement plan."⁹³
59. It was suggested that if DEFRA wanted to reduce noise pollution effectively there should be a target or targets against which progress can be measured. Mr Turner gave an example: "reducing over a period of time the proportion of the population exposed to a certain level of noise ... Or [reducing] the

87 Department for Environment, Food and Rural Affairs, *Noise Policy Statement for England (NPSE)* (March 2010) p 3: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf [accessed 23 June 2023]

88 Written evidence from the Institute of Acoustics (ALN0064)

89 Q 56 (Paul McCullough)

90 Written evidence from the Institute of Acoustics (ALN0064)

91 Q 58 (Stephen Turner)

92 The 25 Year Environment Plan says "We must ensure that noise and light pollution are managed effectively." HM Government, *A Green Future: Our 25 Year Plan to Improve the Environment* (2018) p 83: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf. There is no explicit target. Neither noise or light pollution are mentioned in the Environmental Improvement Plan, which is intended as the five-year update. HM Government, *Environmental Improvement Plan 2023* (2023): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1133967/environmental-improvement-plan-2023.pdf [accessed 23 June 2023]

93 Q 66 (Stephen Turner)

number of disability-adjusted life years that noise impact causes”.⁹⁴ UKHSA’s Dr Luke Price emphasised the value of a target of the second kind: “it is about not just reducing the decibels—the noise exposure—but ultimately improving health outcomes”.⁹⁵

60. **The Noise Policy Statement for England sets a good overall framework for noise policy but should be re-emphasised. DEFRA does not collect the data that demonstrate national policy interfaces with local policy appropriately. *The Government should collect data to determine whether planning authorities and other relevant parties are making use of the Noise Policy Statement for England.***
61. *There should be a specific noise reduction target for the regulation of noise pollution. Strict decibel exposure limits are impractical, but a target based on reducing the calculated exposure to, and hence disease burden from, noise pollution would allow cost-effective interventions to be pursued. This target should be in place for the next five-year Environmental Improvement Plan cycle.*

Box 1: Mapping and burden-of-disease calculations for noise pollution

DEFRA’s noise model

DEFRA is investing in a new £6 million noise mapping system. It will model time-averaged metrics of noise.⁹⁶ There are internationally agreed-on standards for modelling the contribution of different sources, including road, rail and aircraft, to these metrics. This new model goes beyond earlier models of large urban areas and major transport sources and will cover road and rail for the whole country.

Model components

The model consists of three components: input data, propagation model and receptor model.

Input data for roads and rail takes into account the topography of the road or railway, average vehicle speeds, their types, etc., to assign each section of road or rail a noise emission level.

The propagation model then accounts for the terrain and meteorology between source and receiver and calculates how the noise will be attenuated on its journey to the receiver.

The receiver model calculates the acoustic energy at the exterior of every residential dwelling, which in turn allows the population exposure to noise above a threshold and the burden of disease to be calculated for road and rail.

94 [Q 60](#) (Stephen Turner)

95 [Q 127](#) (Dr Luke Price)

96 The main metric that it will use is LAeq. L denotes loudness, A denotes “A-weighting”, which in the acoustic field means that the sound has been weighted-averaged over the frequencies of human auditory response, and “eq” denotes a time average. It generates results to noise levels of LA_{den} 40 dB (day-evening-night-time averaging) and 35 dB LA_{night} at the exterior of dwellings. The model output includes LA averages across 16-hour, 24-hour, day-, evening- and night-time periods, but does not include measures of intermittency or pitch.

Use of the model

DEFRA says that its data will be made available to other public bodies by the end of 2023, and that local authorities will be able to view the output from the model and take it into account in planning decisions. For local authorities that have acoustic modelling resources, DEFRA says the model can be used for scenario evaluation. The model is also being shared with the devolved administrations.

The calculation methods used in the model have been developed by a process that involves verification of the model results against measurement campaigns, which increases confidence in the model results. DEFRA says that “there is no verification to date of the specific implementation of the model as developed by DEFRA ... however, cost-effective options for this are currently being explored.”

Source: adapted from DEFRA’s supplementary written evidence ([ALN0094](#)).

62. One of the main policy responses to noise pollution has been to map and quantify the problem. Dr Benjamin Fenech from UKHSA explained that the number of people exposed to transport noise is known “thanks to the mapping commissioned by DEFRA and by airports”. There was also “evidence of the exposure-response relationships—which link the exposure to the health outcomes”,⁹⁷ allowing the burden of disease to be calculated. Dr Fenech noted that “the WHO guidelines were informed by more recent evidence” and the DEFRA-led Interdepartmental Group on Cost and Benefits (noise subgroup) had “commissioned a number of reviews” to assess this new evidence.⁹⁸
63. Dr Fenech noted that the Environmental Noise Directive (2006) resulted in “strategic noise mapping across entire countries”, providing the data “which allow these epidemiological studies to take place.”⁹⁹ DEFRA’s Dr Bill Parish described its new mapping effort as “a game-changer” which goes “much further than the requirements of the current directive”¹⁰⁰ and which will guide “our policy interventions—where we should be targeting them and how.”¹⁰¹ Ms Pow described it as “the first of its kind in the world.”¹⁰² However, it currently maps only average metrics for noise exposure (see Box 1).
64. As noted in Chapter 2, the WHO concluded in its 2018 Guidelines on environmental noise that the health effects of noise are likely to be greater than previously thought. Professor Anna Hansell noted that as the UK’s mapping takes account of noise on minor as well as major roads, “if you take full account of all the traffic exposures, ... that gives you higher estimates of burden of disease.”¹⁰³ However, the Government can be slow to update policy on the basis of new evidence for burden of disease calculations, with Professor Charlotte Clark describing it as “really out-of-date”.¹⁰⁴
65. **The Committee welcomes DEFRA’s noise pollution mapping and modelling exercise, which provides an opportunity for a renewed focus on noise pollution. However, mapping is only the first step: interventions to reduce the noise burden must follow. *The Government***

97 [Q 117](#) (Dr Benjamin Fenech)

98 [Q 119](#) (Dr Benjamin Fenech)

99 *Ibid.*

100 [QQ 140, 129](#) (Dr Bill Parish)

101 [Q 140](#) (Dr Bill Parish)

102 [Q 143](#) (Rebecca Pow MP)

103 [Q 9](#) (Professor Anna Hansell)

104 [Q 9](#) (Professor Charlotte Clark)

should use its mapping to identify key cost-effective interventions. The noise mapping and modelling should be made public. The Government should use this to update the burden of disease calculations used for noise pollution, including any new scientific evidence. Policy on noise pollution should be updated accordingly. This should include funding to carry out public health interventions that reduce noise burden in line with its noise reduction target.

66. *It is essential that the Government commit to extending the mapping beyond 24-hour averaged noise exposure to include metrics of pitch, peak volume and intermittency of exposure.*

Interventions to reduce noise pollution

67. Stephen Turner noted that “understanding of how to mitigate noise is quite mature”.¹⁰⁵ Richard Greer, Fellow and Director at Arup, distinguished between addressing sound at source, intervening between source and receiver, and noise insulation at the receiver. The first includes changing tyres and road surfaces, the second sound barriers. “Noise barriers are very effective for railways, because we can put them very close to the trains. A noise barrier can straightforwardly halve the wayside noise level, a 10-decibel or greater reduction. That is a better reduction that can usually be achieved by measures at source.”¹⁰⁶
68. However, this is not the case for roads: “Because the noise source is so wide, with six lanes of highway, noise barriers might make a noticeable reduction at 3 decibels or more, but scarcely ever would we get to a halving. For highways, it is control at source, particularly through very low noise surfacing”.¹⁰⁷ (The Department for Transport’s Phil Earl noted that “there are trade-offs here between the noise emitted by a tyre and the safety of the tyre in keeping your vehicle gripping the road.”¹⁰⁸) In contrast:
- “insulation ... should always be the last place we go. We should only protect people in the home if we have exhausted everything that we can do at source and between source and receiver. None the less, noise is an unavoidable consequence of a growing, thriving and vibrant economy, so there will necessarily be times when we need to resort to noise insulation in homes to protect people.”¹⁰⁹
69. This was supported by DEFRA, which explained: “to obtain a reduction in sound ... of only 3 dB requires half of the energy in the source to be removed ... This contextualises how difficult it can be to engineer sound reduction solutions and therefore early consideration in the design phase of a project is generally more cost-effective than seeking solutions once operational.”¹¹⁰
70. John Stewart, Chair of the UK Noise Association, told us that “the two areas that most affect people are traffic noise and neighbour and neighbourhood noise.” He highlighted lower speed limits and low noise road surfaces as interventions that could be deployed “starting where the roads are noisiest.”

105 [Q 63](#) (Stephen Turner)

106 [Q 81](#) (Richard Greer)

107 *Ibid.*

108 [Q 134](#) (Phil Earl)

109 [Q 83](#) (Richard Greer)

110 Supplementary written evidence from Department for Environment, Food and Rural Affairs ([ALN0094](#))

For neighbour noise, enforcement is the key: “the laws tend to be there ... but they are not being enforced properly, partly because of a lack of resources among local authorities.”¹¹¹

71. Interventions at source are not always possible. Mr Stewart highlighted freight trains, where the problem includes vibration as well as noise. But for passenger trains “there are technical ways of improving the rails and the trains’ wheels, which can reduce the noise quite considerably.”¹¹²
72. In assessing different interventions to reduce noise pollution, cost-effectiveness and practicability are two considerations. Richard Greer made the case that “there is an important distinction to be made between new projects ... and our existing network. For new projects ... the UK is on a par and in many respects leads the way.” However, retrofitting the existing network is less common. As Mr Greer told us: “building a noise barrier next to a new road or railway is one thing, but retrofitting it can be much more expensive and there can be engineering practicability issues.”¹¹³
73. **The hierarchy of interventions for noise pollution should be: reduce, restrict, remodel. It is generally more effective to reduce noise at source, through planning and engineering, than it is to restrict transmission using sound barriers or to remodel the receiver’s environment with sound insulation. Mapping and modelling tools should be used to identify the most cost-effective interventions to reduce the disease burden of noise pollution, including determining where retrofits make sense. Information on how to reduce noise pollution must be made available at the planning stage for infrastructure projects, as intervention at source is generally more effective.**

Light

A national statement of light pollution policy

74. In contrast to noise pollution, there is no national Government strategy for tackling light pollution. Witnesses said little attention was paid to the topic. Stuart Morton, Professional Head of Highways and Aviation Electrical Design at Jacobs, told us “it would absolutely be beneficial to have a national strategy.”¹¹⁴
75. In 2009 the Royal Commission on Environmental Pollution published *Artificial Light in the Environment*.¹¹⁵ This considered the loss of viewing of the stars, the effects of poorly designed lighting and the effects of artificial

111 [Q 109](#) (John Stewart)

112 *Ibid.*

113 [Q 81](#) (Richard Greer)

114 [Q 74](#) (Stuart Morton)

115 The Royal Commission on Environmental Pollution, *Artificial Light in the Environment* (27 November 2009): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228832/9780108508547.pdf.pdf [accessed 23 June 2023] The report made a number of recommendations, including that: the highways authorities and local authorities reassess the lighting of roads against road safety and crime reduction benefits; the sale of all new external and floodlighting be accompanied by best practice guidance on avoiding light pollution and minimising nuisance; there should be explicit consideration of light in planning policy; and that DEFRA—and equivalent bodies elsewhere in the UK—take the lead in co-ordinating inter-departmental activity on artificial light.

light on nature. The All-Party Parliamentary Group for Dark Skies in 2021 set out ten policies for the Government to reduce light pollution.¹¹⁶

76. DEFRA responded to the royal commission in 2010,¹¹⁷ and again in 2014 with a Policy Update.¹¹⁸ This set out the steps that DEFRA had taken to address light pollution since the report, including a consultation on statutory nuisance exemptions, providing information—drawn up in collaboration with CPRE, the Campaign for Dark Skies and the Institute of Lighting Professionals (ILP)—on minimising light pollution and research projects on a range of light-related topics. However, Ruskin Hartley, CEO of the International Dark-Sky Association, said that “almost every recommendation ... is still valid and should still be done but has not been”.¹¹⁹
77. WSP, an international consulting firm, said that “there have not been any definitive updates to Government policy in the intervening years [since the RCEP report] other than tweaks to relevant paragraphs of the [National Planning Policy Framework (NPPF)], of which there are few in relation to light pollution.”¹²⁰ The relevant section of the NPPF says that “Planning policies and decisions should [take] into account the likely effects ... of pollution on health.” It explicitly refers to both noise and light pollution, saying that policies and decisions “[should] limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”¹²¹
78. The ILP noted that the NPPF replaced *Planning Policy Statement 23: Planning and Pollution Control* (PPS 23) and removed lighting requirements. Allan Howard, past-President of the ILP, told us that “it was agreed that PPS 23 would be expanded specifically to include a detailed lighting section, ... but then the Government changed the planning rules and wanted to reduce a lot of red tape.”¹²²
79. Emma Marrington noted the absence of light pollution in the Environmental Improvement Plan 2023, in contrast to its mention in the 25 Year Environment Plan, alongside noise pollution. She acknowledged the existence of a national planning policy on light pollution as set out in the NPPF, but then added “there is a variable approach to it in local authorities.”¹²³
80. The Minister acknowledged that although DEFRA’s response to the 2009 royal commission report “concluded that there was not enough evidence to do anything to change the way we regulate”, this “was quite some time ago

116 All-Party Parliamentary Group for Dark Skies, *Ten Dark Sky policies for the government* (2021): <https://static1.squarespace.com/static/5e567fb65a380a76eb3c8133/t/60c72d0311d31c3137515f31/1623665931233/APPG+for+Dark+Skies+-+10+dark+sky+policies.pdf> [accessed 23 June 2023]

117 Department for Environment, Food and Rural Affairs, *The Royal Commission on Environmental Pollution (RCEP) Report on Artificial Light in the Environment: Government response* (18 March 2010): https://webarchive.nationalarchives.gov.uk/ukgwa/20130403180815mp_/http://archive.defra.gov.uk/environment/quality/local/nuisance/light/documents/rcep-artificial-light-report.pdf [accessed 23 June 2023]

118 Department for Environment, Food and Rural Affairs, *Artificial Light in the Environment: Policy Update* (December 2013): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/269402/pb14108-artificial-light-progress-dec2013.pdf [accessed 23 June 2023]

119 Q 97 (Ruskin Hartley)

120 Written evidence from WSP (ALN0076)

121 Ministry of Housing, Communities and Local Government, *National Planning Policy Framework* (July 2021) paragraph 185: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf [accessed 23 June 2023]

122 Q 70 (Allan Howard)

123 Q 97 (Emma Marrington)

now and evidence is building and changing all the time.”¹²⁴ Rebecca Pow accepted that a national policy statement on light “is certainly something that could potentially be considered.”¹²⁵

81. ***The Government should issue a Light Policy Statement for England which details the Government’s policy on minimising light pollution and the roles it expects different departments to play.***

Promoting good lighting practice

82. A significant proportion of light pollution is unnecessary and caused by bad design or poor use of LEDs.¹²⁶ The ILP told us that options existed that could help address this. For example, Andrew Bissell highlighted the adaptive tunability of LEDs: one example he discussed “has a whiter colour temperature early on in the evening but ... shifts towards a much warmer, calmer colour temperature and decreases in intensity as the evening passes, so you have a lower level of light.”¹²⁷ Ruskin Hartley described

“simple things [that] can be done to tackle light pollution ... ensuring that all new [outdoor] lights are fully shielded and point down at the ground where they are needed, and ensuring that all new lights are put on control systems so that they can be dimmed down when there are fewer people and turned off when people are no longer around.”¹²⁸

83. Organisations such as the Institution of Lighting Professionals have developed guidance on lighting installations that can minimise unwanted light pollution. Mr Howard had “developed a guidance document for the ILP, *Domestic Exterior Lighting: Getting it Right*”. However, this guidance has not always been followed by industry. Mr Howard said: “you cannot go to any of the major retail outlets and buy a luminaire, a security light with a sensor, that would do what we want it to do.”¹²⁹
84. ***Good practice guidance for lighting already exists. The Light Policy Statement and planning guidance should incorporate up-to-date guidance from the Society of Light and Lighting, the Institution of Lighting Professionals and the Chartered Institute of Building Services Engineers, on best practice for lighting.***

Light pollution as a statutory nuisance

85. Artificial light can be classed as a statutory nuisance under the Environmental Protection Act 1990 if it “substantially interferes” with the use of a home or other premises or could injure health. Councils must look into complaints of this kind and can then serve an abatement notice if they agree that a statutory nuisance is occurring.¹³⁰ A number of witnesses expressed dissatisfaction with the statutory nuisance regime, which allows for certain exemptions, including “railways and airports and transport infrastructure”.¹³¹

124 [Q 145](#) (Rebecca Pow MP)

125 [Q 148](#) (Rebecca Pow MP)

126 [Q 68](#) (Allan Howard)

127 [Q 73](#) (Andrew Bissell)

128 [Q 96](#) (Ruskin Hartley)

129 [Q 71](#) (Allan Howard)

130 Department for Environment, Food and Rural Affairs, ‘Artificial light nuisances: how councils deal with complaints’ (7 April 2015): <https://www.gov.uk/guidance/artificial-light-nuisances-how-councils-deal-with-complaints> [accessed 23 June 2023]

131 [Q 89](#) (Arfon Davies) and [Q 97](#) (Emma Marrington)

Allan Howard said: “We want those exclusions removed, and we would like it to cover any artificial light, not just from one premise affecting another premise.”¹³²

86. Asked about the nuisance regime, Ms Pow told us: “While DEFRA owns the policy on statutory nuisance legislation, it is still for the local authority to operate it”. In contrast to noise as a nuisance, “we do not have 150 years of case law on light because we brought light into consideration only in 2005.”¹³³ It is not clear whether Government tracks complaints under this regime: we were told that the analysis of complaints is “taking place at a local level.”¹³⁴
87. ***The Government should make clear that exempt facilities are still expected to conform to best-practice lighting guidelines.***
88. ***Local authorities should report on complaints about light pollution to Department for Levelling Up, Housing and Communities so that central government can compare local authorities and highlight any issues.***

Issues affecting noise and light

Implications of net-zero policy

89. The move to net zero requires widespread infrastructure changes, for example the possible widespread use of heat pumps and electric cars, which may have implications for light and noise pollution. For example, Ms Pow acknowledged that for “heat pumps, noise is now one of the issues that [we have] to deal with.”¹³⁵ Dr Antonio Torija Martínez described the “transition towards electric mobility” as “the most radical change in the soundscape we have experienced”, due to the lack of engine noise from electric cars.¹³⁶
90. Dr Edward Wynne-Evans pointed out that adapting to climate change can entail trade-offs between different risks: “if you open a window to improve your ventilation, for example, you potentially make your risk of noise exposure greater.”¹³⁷ Dr Torija Martínez highlighted the importance of researching the noise impacts of the net-zero transition, so that noise does not become a “showstopper ... a barrier to the wider adoption of air source heat pumps, electric mobility, drones etc.”¹³⁸
91. ***The Government should take steps to ensure that the implications of the technological shifts required for net zero and adapting to climate change for noise and light pollution are understood and addressed early on.***

Cross-departmental co-ordination

92. Witnesses told us that responsibility for both noise and light pollution policy is spread across Government and the lines of accountability are not always clear. Professor Anna Hansell said: “There is no clear government department to involve, so DEFRA, DfT, BEIS and [DHSC] might be involved”.¹³⁹ The

132 [Q 74](#) (Allan Howard)

133 [Q 149](#) (Rebecca Pow MP)

134 [Q 145](#) (Rebecca Pow MP)

135 [Q 151](#) (Rebecca Pow MP)

136 [Q 6](#) (Dr Antonio Torija Martínez)

137 [Q 120](#) (Dr Edward Wynne-Evans)

138 [Q 15](#) (Dr Antonio Torija Martínez)

139 [Q 9](#) (Professor Anna Hansell)

Department for Levelling Up, Housing and Communities is also involved in enacting national policies at the local level. Emma Marrington said that this means light pollution can “[fall] through the cracks.”¹⁴⁰

93. Aspects of existing DEFRA policy and existing legislation provide regulatory frameworks that can be applied across departments to regulate light and noise pollution. For example, the five environmental principles of integration, prevention, rectification at source, “polluter pays”, and the precautionary principle, set out in the Government’s Environmental Principles Policy Statement,¹⁴¹ are intended to apply to policymaking across government. These have already been legislated for in the Environment Act 2021.¹⁴²
94. Rebecca Pow told us that “while DEFRA is responsible for protecting the environment and this area, an awful lot of the levers are in other departments. A lot of them are conducting their own research. We highlight the issues to them”.¹⁴³ She added: “DEFRA works incredibly closely with at least 10 different departments and agencies ... DEFRA could not possibly hold all the experts on all those areas just to do with light and noise, because we cover all pollutants.”¹⁴⁴
95. **Light and noise pollution cut across a number of departments. The levers for acting on problems identified by DEFRA often sit in other departments, such as the Department for Transport. This is unlike other pollutants, where DEFRA takes ownership of mapping and, through public bodies, regulation. There seemed to be little co-ordination between departmental policies in these areas. *The status of light and noise pollution as policy areas under the aegis of DEFRA should be reviewed and interdepartmental co-ordination on these issues strengthened. The Government should make clear where in each affected department responsibility for noise and light pollution lies. Other departments should apply the environmental principles in the Environment Act 2021 to their approach to light and noise pollution.***

Co-ordination with local authorities

96. Witnesses told us that there is a gap between policy as set by the Government and how that policy is applied by local authorities. Emma Marrington said that, even where guidance or advice exists, “it is about having awareness among our local authorities ... [and] there are different approaches in councils.”¹⁴⁵ Andrew Bissell said that every local authority “does the minimum of asking for a light pollution assessment or statement, but some take it far more seriously than others.”¹⁴⁶

140 [Q 102](#) (Emma Marrington)

141 Department for Environment, Food and Rural Affairs, ‘Environmental principles policy statement’ (31 January 2023): <https://www.gov.uk/government/publications/environmental-principles-policy-statement/environmental-principles-policy-statement#the-5-environmental-principles> [accessed 11 July 2023]

142 Environment Act 2021, [section 17](#)

143 [Q 144](#) (Rebecca Pow MP)

144 [Q 148](#) (Rebecca Pow MP)

145 [Q 98](#) (Emma Marrington)

146 [Q 68](#) (Andrew Bissell)

97. DEFRA's Dr Parish accepted this:

"We do not audit what [local authorities] do ... nor have we imposed a burden on them to provide reports on how they are managing nuisance. In all honesty, we do not have an accurate handle on what every single local authority is doing ... if we were to ... ask for something ... we would inadvertently be providing them with an extra burden on top of the environmental health officer trying to sort out a nuisance problem."¹⁴⁷

98. These problems with inconsistent application are compounded by shortages in resources. Guy Harding, Technical Manager at the Institution of Lighting Professionals, said that "there is not always the expertise in the local authority ... they do not necessarily have the funds to go to an external consultant."¹⁴⁸

99. Pressed on whether local authorities had the resources to tackle the problems of noise and light pollution and enforce the existing regulations, Ms Pow responded that "that does not fall under DEFRA, because local authority funding is ring-fenced and that is a matter for DLUHC and the Treasury. It is not for DEFRA to answer that question."¹⁴⁹

100. **It is unclear how, and how consistently, national policies are implemented at local authority level. The Committee remains unconvinced that co-ordination on these issues is sufficiently effective. DEFRA does not appear to be receiving the information it needs to conclude whether its policies are being effectively implemented by local authorities and trends in that effectiveness over time. It is also unclear whether local government actions on noise and light pollution feed back data into DEFRA about whether the policies are successful. *The Department for Levelling Up, Housing and Communities should set out what resources local authorities should have to respond adequately to light and noise pollution policies. Local authorities should be sufficiently resourced and incentivised, both in funding and access to information and expertise, to ensure they can properly regulate light and noise pollution.***

147 [Q 149](#) (Dr Bill Parish)

148 [Q 74](#) (Guy Harding)

149 [Q 149](#) (Rebecca Pow MP)

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Scientific evidence of health effects

1. There is increasing epidemiological evidence of the harmful effects of noise on human health. Aggregated over the whole population, even small effects on the individual can be a significant public health concern. New evidence is likely to change the understanding of these effects, for example the role played by intermittency. (Paragraph 16)
2. *DEFRA should work with the UK Health Security Agency and other organisations to assess the significant, growing evidence on the health effects of noise. This should include refining existing estimates for the disease burden from well-established health impacts of noise pollution, for example on the cardiovascular system. UKHSA should also assess whether health effects for which evidence is emerging, such as on the metabolic system, meet the evidentiary threshold for policy action.* (Paragraph 16)
3. More laboratory and field studies are needed to supplement epidemiological evidence and to establish the mechanisms by which noise might affect health. The current metrics used to characterise noise pollution are mostly long-term average intensity (decibel) metrics, which do not capture peak volume, pitch and intermittency. The latter influence annoyance and may correlate more closely with health outcomes but are not widely measured. Quantifying the health effects of interventions to reduce exposure is important for cost-benefit analyses. (Paragraph 27)
4. *The UK should seek opportunities to collaborate with similar countries, sharing research data and methodologies. Alongside these efforts, DEFRA should commission and fund a research programme into noise and health. This should include:*
 - *large-scale epidemiological studies, including long-term longitudinal studies, which can make use of international big data;*
 - *laboratory-based studies establishing mechanisms for health impacts;*
 - *field studies establishing the indoor exposure to noise, which can contribute to mapping the indoor exposure to noise;*
 - *interdisciplinary studies to understand the variation in response caused by non-acoustic factors;*
 - *modelling and experimental studies into the health effects of interventions to reduce noise; and*
 - *whether alternative metrics for noise, including pitch and intermittency, should be measured and used to better understand health outcomes.* (Paragraph 28)
5. Although UKHSA has a noise and health team which summarises research in this field for policymakers, there is no advisory group as there is for air pollution. (Paragraph 30)
6. *An interdisciplinary, independent advisory panel should be established to provide independent advice to the Government and a forum for new evidence, particularly on emerging health effects and technologies, to be assessed.* (Paragraph 30)
7. There are concerns that light pollution has been increasing rapidly in recent years. Evidence for the health effects of light pollution is at a less mature stage

than noise pollution, but it may influence health by disrupting circadian rhythms and sleep. (Paragraph 35)

8. *The Government should commission research to establish how light intensity, wavelength, duration, time of exposure, light history and age affect the circadian system. This should move beyond laboratory-based studies and investigate more realistic light exposure patterns for humans. Such knowledge would provide an evidence base for guidelines that could mitigate the harmful effects of light pollution on human biology, including the circadian system, mood and alertness. (Paragraph 35)*
9. Flicker, glare and dazzle can cause visual disturbance. There is not clear evidence that LEDs cause ill-effects in healthy people when used properly. However, there is widespread concern that the LED rollout has been associated with poor lighting practice and over-lighting. (Paragraph 40)
10. *Research should be carried out in order to establish the level of risk from glare, flicker, and dazzle, for example in night-time driving. (Paragraph 40)*
11. Regulating light pollution is difficult if it is not measured; our current approach is inadequate. It is also difficult to assess the health implications if it is not known how people are exposed to light pollution, particularly indoors at night. (Paragraph 45)
12. *DEFRA should establish a standard methodology for tracking, monitoring and reporting on light pollution. This should be in place by the next five-year Environmental Improvement Plan cycle. The Government should commission a regular survey to track light pollution once the methodology is agreed. The research should aim to understand both indoor and outdoor exposure to artificial light at night, so its health impact can be quantified. (Paragraph 45)*
13. The Government should have a team of experts in UKHSA, on circadian rhythms and impacts of light on health to act as a single point for evidence gathering and co-opting external expertise. As the field develops, it may be appropriate to set up an independent advisory panel, as for noise and air pollution. (Paragraph 47)
14. *The National Institute for Health and Care Excellence should review evidence for the effectiveness of therapies such as light boxes that might promote improved circadian rhythms and therefore physical and mental health. (Paragraph 53)*
15. *The National Institute for Health and Care Research should commission research to establish the mechanisms by which green social prescribing may affect health. (Paragraph 54)*

Public policy implications

16. The Noise Policy Statement for England sets a good overall framework for noise policy but should be re-emphasised. DEFRA does not collect the data that demonstrate national policy interfaces with local policy appropriately. (Paragraph 60)
17. The Government should collect data to determine whether planning authorities and other relevant parties are making use of the Noise Policy Statement for England. (Paragraph 60)
18. *There should be a specific noise reduction target for the regulation of noise pollution. Strict decibel exposure limits are impractical, but a target based on reducing the*

calculated exposure to, and hence disease burden from, noise pollution would allow cost-effective interventions to be pursued. This target should be in place for the next five-year Environmental Improvement Plan cycle. (Paragraph 61)

19. The Committee welcomes DEFRA's noise pollution mapping and modelling exercise, which provides an opportunity for a renewed focus on noise pollution. However, mapping is only the first step: interventions to reduce the noise burden must follow. (Paragraph 65)
20. *The Government should use its mapping to identify key cost-effective interventions. The noise mapping and modelling should be made public. The Government should use this to update the burden of disease calculations used for noise pollution, including any new scientific evidence. Policy on noise pollution should be updated accordingly. This should include funding to carry out public health interventions that reduce noise burden in line with its noise reduction target. (Paragraph 65)*
21. *It is essential that the Government commit to extending the mapping beyond 24-hour averaged noise exposure to include metrics of pitch, peak volume and intermittency of exposure. (Paragraph 66)*
22. The hierarchy of interventions for noise pollution should be: reduce, restrict, remodel. It is generally more effective to reduce noise at source, through planning and engineering, than it is to restrict transmission using sound barriers or to remodel the receiver's environment with sound insulation. (Paragraph 73)
23. *Mapping and modelling tools should be used to identify the most cost-effective interventions to reduce the disease burden of noise pollution, including determining where retrofits make sense. Information on how to reduce noise pollution must be made available at the planning stage for infrastructure projects, as intervention at source is generally more effective. (Paragraph 73)*
24. *The Government should issue a Light Policy Statement for England which details the Government's policy on minimising light pollution and the roles it expects different departments to play. (Paragraph 81)*
25. Good practice guidance for lighting already exists. (Paragraph 84)
26. *The Light Policy Statement and planning guidance should incorporate up-to-date guidance from the Society of Light and Lighting, the Institution of Lighting Professionals and the Chartered Institute of Building Services Engineers, on best practice for lighting. (Paragraph 84)*
27. *The Government should make clear that exempt facilities are still expected to conform to best-practice lighting guidelines. (Paragraph 87)*
28. *Local authorities should report on complaints about light pollution to Department for Levelling Up, Housing and Communities so that central government can compare local authorities and highlight any issues. (Paragraph 88)*
29. *The Government should take steps to ensure that the implications of the technological shifts required for net zero and adapting to climate change for noise and light pollution are understood and addressed early on. (Paragraph 91)*
30. Light and noise pollution cut across a number of departments. The levers for acting on problems identified by DEFRA often sit in other departments, such as the Department for Transport. This is unlike other pollutants, where DEFRA takes ownership of mapping and, through public bodies, regulation.

There seemed to be little co-ordination between departmental policies in these areas. (Paragraph 95)

31. *The status of light and noise pollution as policy areas under the aegis of DEFRA should be reviewed and interdepartmental co-ordination on these issues strengthened. The Government should make clear where in each affected department responsibility for noise and light pollution lies. Other departments should apply the environmental principles in the Environment Act 2021 to their approach to light and noise pollution.* (Paragraph 95)
32. It is unclear how, and how consistently, national policies are implemented at local authority level. The Committee remains unconvinced that co-ordination on these issues is sufficiently effective. DEFRA does not appear to be receiving the information it needs to conclude whether its policies are being effectively implemented by local authorities and trends in that effectiveness over time. It is also unclear whether local government actions on noise and light pollution feed back data into DEFRA about whether the policies are successful. (Paragraph 100)
33. *The Department for Levelling Up, Housing and Communities should set out what resources local authorities should have to respond adequately to light and noise pollution policies. Local authorities should be sufficiently resourced and incentivised, both in funding and access to information and expertise, to ensure they can properly regulate light and noise pollution.* (Paragraph 100)

APPENDIX 1: LIST OF MEMBERS AND DECLARATIONS OF INTEREST

Members

Lord Borwick (Member since 31 January 2023)
 Baroness Brown of Cambridge (Chair)
 Viscount Hanworth
 Lord Holmes of Richmond MBE
 Lord Krebs
 Lord Mitchell (Member until 25 April 2023)
 Baroness Neuberger (Member since 31 January 2023)
 Baroness Neville-Jones (Member since 31 January 2023)
 Baroness Northover (Member since 31 January 2023)
 Lord Rees of Ludlow
 Lord Sharkey (Member since 31 January 2023)
 Viscount Stansgate (Member since 27 April 2023)
 Baroness Warwick (Member until 27 April 2023)
 Lord Wei
 Lord Winston

Declaration of interest

Lord Borwick (Member since 31 January 2023)
Trustee of The Ewing Foundation for Deaf Children (a registered charity)
 Baroness Brown of Cambridge
Shares in Rolls-Royce plc, maker of aeroengines
 Viscount Hanworth
No relevant interests declared
 Lord Holmes of Richmond MBE
No relevant interests declared
 Lord Krebs
Fellow of Royal Society
Fellow of Academy of Medical Sciences
Chair of World Cancer Research Fund CUP-global review panel
 Lord Mitchell (Member until 25 April 2023)
No relevant interests declared
 Baroness Neuberger (Member since 31 January 2023)
Chair, University College London Hospitals NHS Foundation Trust
Chair, Whittington Health NHS Trust
 Baroness Neville-Jones (Member since 31 January 2023)
No relevant interests declared
 Baroness Northover (Member since 31 January 2023)
No relevant interests declared
 Lord Rees of Ludlow
Co-Chair and founder of the All-Party Parliamentary Group for Dark Skies
 Lord Sharkey (Member since 31 January 2023)
No relevant interests declared
 Viscount Stansgate (Member since 27 April 2023)
President, Parliamentary and Scientific Committee
Fellow, Royal Society of Biology

Trustee, Foundation for Science and Technology

Trustee, Parliamentary Science and Technology Information Foundation

Baroness Warwick (Member until 27 April 2023)

No relevant interests declared

Lord Wei

No relevant interests declared

Lord Winston

Salaried employee of Imperial College London

Fellow, Academy of Medical Sciences

Fellow, Royal College of Physicians

Hon Fellow, Royal Academy of Engineering

Fellow, Royal College of Music

A full list of Members' interests can be found in the Register of Lords Interests: <http://www.parliament.uk/mps-lords-and-offices/standards-and-interests/register-of-lords-interests/>

Specialist Adviser

Professor Russell G. Foster CBE, Director of Sir Jules Thorn Sleep and Circadian Neuroscience Institute (SCNi) and Head of Nuffield Laboratory of Ophthalmology (NLO), Fellow, Brasenose College, University of Oxford

Fellow, Royal Society

Fellow, Academy of Medical Sciences

Fellow, Royal Society of Biology

Recipient of research funding from the Wellcome Trust, UKRI, Leducq Foundation and The Novo Nordisk Foundation

Co-Founder of the University of Oxford biomedical spin-out Circadian Therapeutics

Editor, Interface Focus. Publication by The Royal Society

Scientific Advisory Board, The Eden Project

Trustee, ATOM Festival of Science and Technology, Abingdon-on-Thames

Jury member for The Daylight Award

Board Member, Feldberg Foundation for Anglo-German Scientific Exchange

Vice Patron, Blind Veterans UK

Honorary Professor, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)

APPENDIX 2: LIST OF WITNESSES

Evidence is published online at <https://committees.parliament.uk/work/7256/the-effects-of-artificial-light-and-noise-on-human-health/publications/> and available for inspection at the Parliamentary Archives (020 7219 3074).

Evidence received by the Committee is listed below in chronological order of oral evidence session and in alphabetical order. Those witnesses marked with ** gave both oral evidence and written evidence. Those marked with * gave oral evidence and did not submit any written evidence. All other witnesses submitted written evidence only.

Oral evidence in chronological order

- | | | |
|----|---|---------------------------------|
| * | Professor Charlotte Clark, Professor of Epidemiology, St George's, University of London, Population Health Research Institute | <u>QQ 1–15</u> |
| ** | Dr Antonio Torija Martínez, Reader in Acoustical Engineering, Acoustics Research Centre, University of Salford | |
| ** | Professor Anna Hansell, Professor of Environmental Epidemiology and Director of the Centre for Environmental Health and Sustainability, University of Leicester | |
| * | Dr Christopher Kyba, Researcher, German Research Center for Geoscience, Helmholtz Centre Potsdam | <u>QQ 16–26</u> |
| * | Professor Shantha Rajaratnam, Professor of Sleep and Circadian Medicine, Monash University | |
| * | Professor Dr Manuel Spitschan, Professor of Chronobiology and Health, Technical University of Munich (TUM) | |
| * | Professor Stuart Peirson, Professor of Circadian Neuroscience, University of Oxford | <u>QQ 27–39</u> |
| * | Professor Kenneth Wright, Director of the Sleep and Chronobiology Laboratory, University of Colorado Boulder | |
| * | Dr Alison Greenwood, Chief Executive Officer, Founder and Lead Psychologist, Dose of Nature | <u>QQ 40–54</u> |
| * | Alex Smalley, PhD Fellow, University of Exeter | |
| * | Professor Pierre Geoffroy, Professor of Psychiatry, Université Paris Cité | |
| ** | Stephen Turner, Immediate Past-President, Institute of Acoustics | <u>QQ 55–66</u> |
| ** | Peter Rogers, Chair of the Parliamentary and Public Liaison Group, Institute of Acoustics | |
| * | Paul McCullough, Member, Chartered Institute of Environmental Health (CIEH) | |

- * Somayya Yaqub, Member, Chartered Institute of Environmental Health (CIEH)
- ** Guy Harding, Technical Manager, Institution of Lighting Professionals [QQ 67–77](#)
- ** Allan Howard, Past-President, Institution of Lighting Professionals
- * Stuart Morton, Professional Head, Highways and Aviation Electrical Design, Jacobs
- * Andrew Bissell, President, Society of Light and Lighting
- ** Richard Greer, Fellow and Director, Arup [QQ 78–86](#)
- * Poppy Szkiler, CEO, Quiet Mark
- * Colin Ball, Architect, Building Design Partnership [QQ 87–93](#)
- * Arfon Davies, Leader of Lighting UKIMEA, Arup
- * Ian Ritchie CBE, Architect, Ritchie Studio
- * Ruskin Hartley, CEO and Executive Director, International Dark-Sky Association [QQ 94–105](#)
- ** Emma Marrington, Landscape Enhancement Lead, CPRE, the Countryside Charity (Campaign to Protect Rural England)
- ** John Stewart, Chair, UK Noise Association [QQ 106–114](#)
- * Lisa Lavia, Managing Director, Noise Abatement Society
- ** Dr Edward Wynne-Evans, Director of Radiation, Chemicals and Environmental Hazards Directorate, UK Health Security Agency (UKHSA) [QQ 115–127](#)
- ** Dr Benjamin Fenech, Noise and Public Health Group Leader, UK Health Security Agency (UKHSA)
- ** Luke Price, Principal Radiation Protection Scientist, UK Health Security Agency (UKHSA)
- ** Dr Bill Parish, Deputy Director for Air Quality and Industrial Emissions, Department for Environment, Food and Rural Affairs (DEFRA) [QQ 128–142](#)
- ** Phil Earl, Deputy Director for International Vehicle Standards, Department for Transport (DfT)
- * Erin Cowburn, Deputy Director, Planning Policy, Department for Levelling Up, Housing and Communities
- ** Rebecca Pow MP, Parliamentary Under Secretary of State (Minister for Environmental Quality and Resilience), Department for Environment, Food and Rural Affairs (DEFRA) [QQ 143–154](#)

- ** Dr Bill Parish, Deputy Director for Air Quality and Industrial Emissions, Department for Environment, Food and Rural Affairs (DEFRA)
- ** Rhian Thomas, Policy Lead, Noise and Statutory Nuisance, Department for Environment, Food and Rural Affairs (DEFRA)
- ** Hilary Notley, Evidence Lead, Noise, Department for Environment, Food and Rural Affairs (DEFRA)

Alphabetical list of witnesses

- | | | |
|----|---|--|
| | Acoustics and Air Quality Modelling and Assessment Unit (AQMAU), Environment Agency | <u>ALN0052</u> |
| | Adfree Cities | <u>ALN0068</u> |
| | Alzheimer's Research UK | <u>ALN0022</u> |
| ** | Arup (<u>QQ 78–86</u>) | <u>ALN0088</u> |
| | Awdurdod Parc Cenedlaethol Eryri National Park Authority | <u>ALN0019</u> |
| | Dr Christopher Baddiley | <u>ALN0071</u> |
| * | Colin Ball, Building Design Partnership (<u>QQ 87–93</u>) | |
| | Professor Timothy Brown and Professor Robert Lucas, University of Manchester | <u>ALN0012</u> |
| | BSI (British Standards Institution) | <u>ALN0061</u> |
| | Buglife—The Invertebrate Conservation Trust | <u>ALN0057</u> |
| | Professor Zameel Cader, Professor Vladyslav Vyazovskiy, Professor Russell Foster, Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath and Professor Sridhar Vasudevan, University of Oxford | <u>ALN0074</u> |
| * | Chartered Institute of Environmental Health (CIEH) (<u>QQ 55–66</u>) | |
| * | Professor Charlotte Clark, University of London, Population Health Research Institute (<u>QQ 1–15</u>) | |
| ** | CPRE, the Countryside Charity (<u>QQ 94–105</u>) | <u>ALN0083</u> |
| | Cranborne Chase AONB | <u>ALN0024</u> |
| | Dark Sky London | <u>ALN0020</u> |
| * | Arfon Davies, Leader of Lighting UKIMEA, Arup (<u>QQ 87–93</u>) | |
| ** | Department for Environment, Food and Rural Affairs (<u>QQ 128–142</u>) (<u>QQ 143–154</u>) | <u>ALN0066</u>
<u>ALN0094</u> |
| * | Department for Levelling Up, Housing and Communities (<u>QQ 128–142</u>) | |
| ** | Department for Transport (<u>QQ 128–142</u>) | <u>ALN0091</u> |

	Professor Nick Dunn, Lancaster University	<u>ALN0053</u>
	Eclipse Light Sensitive Support Group for Lupus Patients, attached to LUPUS UK	<u>ALN0004</u>
	Mark Edwards	<u>ALN0021</u>
	Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy, Professor Russell Foster, Professor Stuart Peirson and Professor Simon Kyle, University of Oxford	<u>ALN0074</u>
	Isabelle Ficker	<u>ALN0081</u>
	Dr Robert Fosbury, Hon. Professor (until 2022), University College London, Institute of Ophthalmology	<u>ALN0017</u>
	Professor Steve Fotios, University of Sheffield	<u>ALN0036</u>
	Dr Tom Foulsham and Professor Arnold Wilkins, University of Essex	<u>ALN0023</u>
	Professor Russell Foster, Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader and Professor Vladyslav Vyazovskiy, University of Oxford	<u>ALN0074</u>
	Joy Geerrens, Brunel University London	<u>ALN0063</u>
*	Professor Pierre Geoffroy, Université Paris Cité (<u>QQ 40–54</u>)	
	Gerard Gilligan	<u>ALN0044</u>
*	Dr Alison Greenwood, Dose of Nature (<u>QQ 40–54</u>)	
	HACAN (Heathrow Association for the Control of Aircraft Noise)	<u>ALN0056</u>
	Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy, Professor Russell Foster, Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie and Professor David Ray, University of Oxford	<u>ALN0074</u>
	Professor Anna Hansell, University of Leicester (<u>QQ 1–15</u>)	<u>ALN0092</u>
	Heathrow Airport	<u>ALN0050</u>
**	Institute of Acoustics (<u>QQ 55–66</u>)	<u>ALN0064</u> <u>ALN0093</u>
	Institute of Acoustics and the UK Acoustics Network	<u>ALN0038</u>
**	Institution of Lighting Professionals (<u>QQ 67–77</u>)	<u>ALN0055</u>
*	International Dark-Sky Association (<u>QQ 94–105</u>)	

- ★ Jacobs ([QQ 67–77](#))
 Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy, Professor Russell Foster, Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray and Professor Mark Hankins, University of Oxford [ALN0074](#)
- ★ Dr Christopher Kyba, Helmholtz Centre Potsdam ([QQ 16–26](#))
 Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy, Professor Russell Foster and Professor Stuart Peirson, University of Oxford [ALN0074](#)
 Professor Timothy Leighton, University of Southampton [ALN0009](#)
 LightAware [ALN0037](#)
 Sian Lloyd Jones [ALN0010](#)
 Dr Karen Lloyd, Lancaster University Future Places Centre [ALN0032](#)
 Professor Robert Lucas and Professor Timothy Brown, University of Manchester [ALN0012](#)
 Dr Paul Marchant [ALN0035](#)
 Neurodiverse Connection [ALN0075](#)
- ★ Noise Abatement Society ([QQ 106–114](#))
- ★ Professor Stuart Peirson, University of Oxford ([QQ 27–39](#))
 Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy and Professor Russell Foster, University of Oxford [ALN0074](#)
- ★ Quiet Mark ([QQ 78–86](#))
- ★ Professor Shantha Rajaratnam, Monash University ([QQ 16–26](#))
 Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy, Professor Russell Foster, Professor Stuart Peirson, Professor Simon Kyle and Professor Colin Espie, University of Oxford [ALN0074](#)
 Dr Gavin Charles Rider [ALN0026](#)

- ★ Ian Ritchie CBE, Ritchie Studio ([QQ 87–93](#))
 ROCKWOOL UK [ALN0086](#)
 Royal Astronomical Society [ALN0029](#)
 Professor Debra Skene, University of Surrey [ALN0065](#)
- ★ Alex Smalley, University of Exeter ([QQ 40–54](#))
- ★ Society of Light and Lighting ([QQ 67–77](#))
 Soft Lights Foundation [ALN0060](#)
- ★ Professor Dr Manuel Spitschan, Technical University of Munich (TUM) ([QQ 16–26](#))
 Dr Wayne Thomas, University Hospitals Plymouth NHS Trust [ALN0014](#)
 Stephen Tonkin [ALN0058](#)
- ★★ Dr Antonio Torija Martínez ([QQ 1–15](#)) [ALN0087](#)
 UCL Centre for Research in Autism and Education (CRAE) [ALN0033](#)
 UK Acoustics Network and the Institute of Acoustics [ALN0038](#)
 UK Dark Skies Partnership [ALN0039](#)
- ★★ [ALN0089](#)
 UK Health Security Agency (UKHSA) ([QQ 115–127](#)) [ALN0090](#)
- ★★ UK Noise Association ([QQ 106–114](#)) [ALN0002](#)
 University of Surrey [ALN0054](#)
 Professor Sridhar Vasudevan, Professor Zameel Cader, Professor Vladyslav Vyazovskiy, Professor Russell Foster, Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins and Professor Aarti Jagannath, University of Oxford [ALN0074](#)
 Peter Veto, PhD [ALN0043](#)
 Professor Vladyslav Vyazovskiy, Professor Russell, Professor Stuart Peirson, Professor Simon Kyle, Professor Colin Espie, Professor David Ray, Professor Mark Hankins, Professor Aarti Jagannath, Professor Sridhar Vasudevan and Professor Zameel Cader, University of Oxford [ALN0074](#)
 Dr Alexander Waller [ALN0085](#)
 Professor Arnold Wilkins and Dr Tom Foulsham, University of Essex [ALN0023](#)
 Peter Woolliams [ALN0048](#)
- ★ Professor Kenneth Wright, University of Colorado Boulder ([QQ 27–39](#))
 WSP [ALN0076](#)
 The Zoological Lighting Institute [ALN0078](#)

APPENDIX 3: CALL FOR EVIDENCE

The House of Lords Science and Technology Committee is conducting an inquiry into the effects of artificial light and noise on human health. The committee invites written contributions by Friday 3 March 2023.

Background

Artificial light and noise are pervasive in the modern world and the committee will explore the extent to which unwanted, inappropriate, or excessive artificial lighting or ambient noise may have negative impacts on human health. For example, claims have been made that artificial light can disrupt sleep and circadian rhythms, which can increase the risk of heart attacks and stroke. The committee will explore the strength of the evidence for claims made about the effects of artificial light and noise on human health, the adequacy of the existing policy and regulatory framework for addressing light and noise pollution in the UK and options for reform to address any harmful effects identified.

The Committee is seeking evidence on the following questions (there is no requirement to answer all questions in your submission):

Questions

Light pollution

1. What is the state of the evidence base regarding the causes and impacts of light pollution in the UK as it relates to human health?
 - What are the mechanisms by which light pollution has an impact on human health—for example, by disrupting circadian rhythms? What are the negative impacts it can have?
 - What are the primary sources of light pollution and how well do we understand them? Is there evidence regarding which types of artificial light, in terms of frequency, duration of exposure, or intermittency, are the most harmful?
 - Is there evidence that light pollution is worsening—for example, with the introduction of LEDs and cheaper forms of lighting, or lighting with a different wavelength spectrum?
 - How reliable is our evidence base for these impacts—are there areas where we are less confident or additional studies that are needed?
 - Does the UK have a sufficient research base? Who are the main organisations conducting research into light pollution and how are they funded?
2. Where does light pollution intersect with public policy in the UK? Is the existing regulatory regime effective?
 - Are the Government agencies, departments, or local authorities currently responsible for monitoring and regulating light pollution appropriately resourced? Is there sufficient expertise within organisations charged with regulating or enforcing regulations on artificial noise?
 - Have there been any changes to Government policy following the Royal Commission on Environmental Pollution's 2009 report into artificial light in the environment? Have these been adequate?

- What role should planning authorities play in determining plans or restrictions on light pollution? Are the current guidelines on light pollution set under the Government's advice for planning authorities adequate?
3. What recommendations would you make for changing Government policy on light pollution?
 - What are the possible interventions that could be deployed to mitigate the effects of light pollution and how well understood are their effects?
 - Are there any interventions that have been pursued effectively in other countries that could be replicated in the UK?

Noise pollution

4. What is the state of the evidence base regarding the causes and impacts of noise pollution as it relates to human health?
 - What are the mechanisms by which noise pollution has an impact on human health? What are the negative impacts it can have?
 - What are the primary causes of noise pollution and how well do we understand them? Is there evidence regarding which types of noise pollution, in terms of frequency or intermittency, are the most harmful?
 - Is there evidence that the impacts of noise pollution are worsening over time? Has our understanding of this issue evolved recently (e.g. in the last 10–15 years)?
 - How reliable is our evidence base for these impacts—are there areas where we are less confident or additional studies that are needed?
 - Does the UK have a sufficient research base? Who are the main organisations conducting research into noise pollution and how are they funded?
5. Where does noise pollution intersect with public policy in the UK? Is the existing regulatory regime effective?
 - Are the Government agencies, departments, or local authorities currently responsible for monitoring and regulating noise pollution appropriately resourced? Is there sufficient expertise within organisations charged with regulating or enforcing regulations on artificial noise?
 - Have there been any changes to Government policy following the updated World Health Organization guidelines on noise pollution issued in 2018? Have these been adequate?
 - What role should planning authorities play in determining plans or restrictions on noise pollution? Are the current guidelines on noise pollution set under the Government's advice for planning authorities, or the Noise Policy Statement for England, adequate?
6. What recommendations would you make for changing Government policy on noise pollution?
 - What are the possible interventions that could be deployed to mitigate the effects of noise pollution and how well understood are their effects?
 - Are there any interventions that have been pursued effectively in other countries that could be replicated in the UK?

APPENDIX 4: SEMINAR HELD AT THE HOUSE OF LORDS ON 28 JUNE 2022

Members of the Committee present were Baroness Brown of Cambridge (Chair), Baroness Blackwood of North Oxford, Viscount Hanworth, Lord Holmes of Richmond, Baroness Manningham-Buller, Lord Mitchell, Lord Rees of Ludlow, Baroness Rock, Baroness Sheehan, Baroness Walmsley, Baroness Warwick of Undercliffe and Lord Wei.

Presentations were heard from:

- Dr Hannah Dagleish, Postdoctoral Research Assistant, Department of Physics, University of Oxford; and
- Professor Charlotte Clark, Professor of Epidemiology in the Population Health Research Institute, St George's, University of London.

APPENDIX 5: PRIVATE MEETING HELD AT THE HOUSE OF LORDS ON 21 FEBRUARY 2023

Members of the Committee present were Baroness Brown of Cambridge (Chair), Viscount Hanworth, Lord Holmes of Richmond, Lord Krebs, Lord Mitchell, Baroness Neuberger, Baroness Neville-Jones, Baroness Northover, Lord Rees of Ludlow, Lord Sharkey, Baroness Warwick of Undercliffe, Lord Wei and Lord Winston.

Remarks were heard from:

- Professor Russell Foster CBE, Professor of Circadian Neuroscience, University of Oxford; and
- Professor Stephen Stansfeld, Emeritus Professor of Psychiatry, Queen Mary University of London.

APPENDIX 6: COMMITTEE VISIT TO ARUP'S SOUNDLAB ON 3 MAY 2023

Members of the Committee present were Baroness Neville-Jones, Baroness Neuberger and Baroness Northover.

The Committee visited the ARUP SoundLab and ARUP ExperienceLab at Fitzroy Street, in London, where they heard presentations and experienced demonstrations of the SoundLab for road, rail, aviation and construction noise, demonstrations of virtual reality Heathrow consultation equipment, and demonstrations of the ExperienceLab for HS2 and urban planning. Members met with Richard Greer and Grace Lampkin for the SoundLab presentation, David Edge, Charles Ingea and Jamie Curran in the ExperienceLab, David Owen and Viviam Reyes presenting the demonstration on medical drones, and Henry Harris presenting the SoundLab VR demonstration on Heathrow.

APPENDIX 7: GLOSSARY

Term	Definition
Annoyance	A metric used to characterise noise pollution which relates to how disruptive the listener finds the noise. It has an international technical standard ¹⁵⁰ associated with it, and it is determined by the response to a standard set of socio-acoustic and social surveys. This metric is often used in surveys of noise and health.
colour temperature	Colour temperature ¹⁵¹ is a measure of wavelength which uses the correspondence between the temperature of a perfectly absorptive “blackbody” emitter and the peak wavelength of the spectrum of radiation it emits. Higher temperatures emit more energetic, shorter-wavelength (higher-frequency) light, with 1,000–3,000 Kelvin perceived as red-orange while 7,000–10,000 Kelvin would be perceived as blue.
circadian rhythms	Circadian rhythms, or the circadian system, refers to the body’s internal clock which results in a number of processes occurring with a 24-hour cycle. The sleep-wake pattern is an example of a prominent circadian cycle in humans.
dazzle	Refers to temporary impairment of vision due to light that is excessively bright. Can refer to the dazzle reflex, an involuntary aversion response such as blinking in response to a sudden bright light.
decibels	A measure of the energy transmitted by a sound, correlating to sound intensity. Volume is usually measured in decibels (dB), on a logarithmic scale; when a sound is perceived to double in loudness, this corresponds to an increase of roughly 10 dB. Sometimes dBA is used—the A indicates a weighting over the frequencies that the human ear responds to.
disease burden	An estimate over the sum of mortality and morbidity caused by a pollutant or illness—typically measured in “Disability-Adjusted Life Years”, or DALYs, this attempts to measure and aggregate the impact of living with illness and injury as well as premature death from the pollutant.
flicker	Flicker in lighting is rapid variation in the intensity of the lighting over time—for example, due to the way the light is wired to the mains.
glare	Glare is a general term for the reduction of visual performance or the disturbance of perception, as caused by high luminances or contrasts in luminance within a visual environment. It can refer to difficulty in seeing or discomfort due to the excessive brightness in the field of view.

150 ISO/TS 15666:2021, ‘Acoustics—Assessment of noise annoyance by means of social and socio-acoustic surveys, Abstract’ (May 2021): <https://www.iso.org/standard/74048.html> [accessed 10 July 2023]

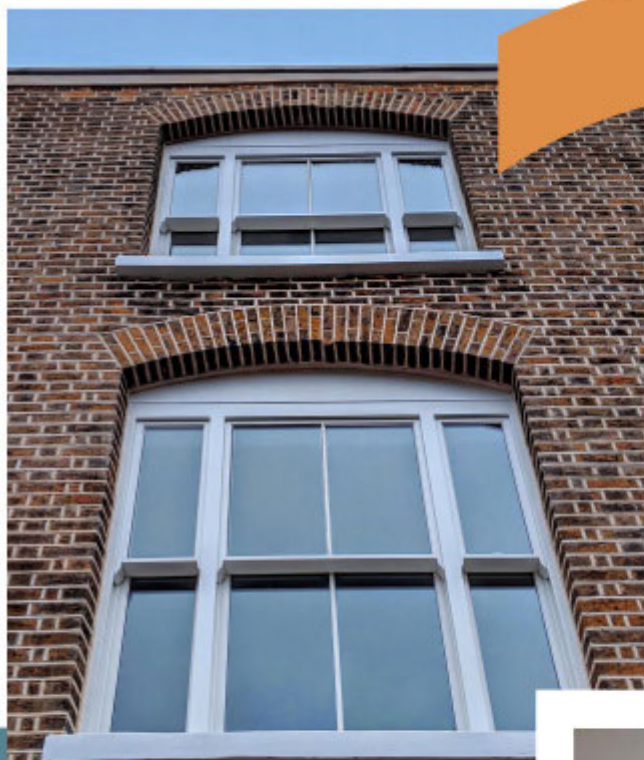
151 Lighting design studio, ‘Colour temperature’: <https://lightingdesignstudio.co.uk/colour-temperature/> [accessed 10 July 2023]

Term	Definition
ischaemic heart disease	Heart problems caused by narrowed arteries or blood vessel inflammation which can lead to heart attacks.
LED	Light-emitting diodes—a semiconductor device which emits light when current flows through it.
longitudinal studies	Long-term studies of the health effects of some external factor which involve studying a cohort over a long period of time, collecting data on any changes that may occur.
Lux	The lux is the unit of illuminance, or luminous flux per unit area, in the International System of Units. It is equal to one lumen per square metre. It is a standard measure of light intensity as perceived by the human eye.
melanopic lux / EDI	Melanopic lux is a new unit that weights the illuminance from a source by the wavelengths that the melanopsin system, and hence the circadian system, are most sensitive to. It is therefore a better measure of light intensity as it influences the circadian system. EDI stands for “equivalent daylight illuminance” which indicates the equivalent illuminance from ordinary daylight which would provide the same stimulus to the melanopic system.
non-acoustic factors	Non-acoustic factors are factors not directly related to the acoustic properties of a sound, i.e. volume, which nevertheless influence how a person responds to a sound, including annoyance and similar effects. These factors can include personal and social factors, such as the person’s attitude towards the noise or expectations of the noise, as well as a person’s own noise sensitivity, personality traits, and ability to adapt to the noise. These can affect the level of annoyance and stress caused by noise, and the likelihood of sleep disturbance, which varies from person to person. ¹⁵²
NPPF	The National Planning Policy Framework ¹⁵³ sets out the Government’s planning policies for England and how these are expected to be applied.
NPSE	The Noise Policy Statement for England ¹⁵⁴ sets out the UK’s overall approach to noise pollution at the national level.

152 Susanne Bartels *et al.*, ‘Coping with Aviation Noise: Non-Acoustic Factors Influencing Annoyance and Sleep Disturbance from Noise’, *SpringerLink* (31 January 2022): https://link.springer.com/chapter/10.1007/978-3-030-91194-2_8#Abs1 [accessed 30 June 2023]

153 Ministry of Housing, Communities and Local Government, *National Planning Policy Framework* (20 July 2021): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf [accessed 10 July 2023]

154 Department for Environment, Food and Rural Affairs, *Noise policy statement for England (NPSE)* (15 March 2010): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf [accessed 10 July 2023]





Price Summary

Product	Description	Quantity	Amount GBP
1	High Performance Soundproof+ (47dB) Location: Dimensions: 2370mm x 1180mm	2	£6,644.03
2	High Performance Soundproof (43dB) Location: living room Dimensions: 2370mm x 1480mm	1	£3,370.02
3	High Performance Soundproof (43dB) Location: Kitchen Dimensions: 1175mm x 1020mm	1	£1,181.54
4	High Performance Soundproof (43dB) Location: Staircase Dimensions: 600mm x 1350mm	1	£564.34

Product	Description	Quantity	Amount GBP
	Quantity discount 5%		£-588.00
	Order by 4th of December		£-500.00
	Window Standard Installation Removing the old windows, installing new ones, painting architraves and windows boards, and repairing any damage caused. The service does not cover the following tasks: painting and decorating the repaired areas; reinstalling window covers, shutters, curtains, alarm systems etc. (if not otherwise priced)	5	£2,500.00
	Rubbish Disposal Rubbish Disposal	5	£200.00
	Hardwood window sill (painted) 32x170mm Hardwood window sill (painted) 32x170mm	8.12	£284.20
	Scotia Beading 15mm Scotia Beading 15x15mm	18.38	£79.03
	Acoustic Trickle Vent VT 1301 45 dB Acoustic Trickle Vent VT 1301 45 dB	7	£817.25
	External window sill (+55mm extension) External hardwood window sill (+55mm extension)	8.32	£268.32
Subtotal			£14,820.74
Total VAT 20%			£2,964.15
TOTAL GBP			£17,784.89

Payment scheduled:

50% - deposit Value **£8,892.44**, due: 4 December 2023

25% - week 8 Value **£4,446.22**, due: 29 January 2024

20% - Value **£3,556.98**, due: on installation TBC (week 12-16)

5% - Value **£889.24**, due: 14 days post installation

THE SOUNDPROOF WINDOWS Unit 6, Tempo House, 15 Falcon Rd, London SW11 2PJ

1. High Performance Soundproof+ (47dB)

GENERAL: 1-1, 1-2

View: From inside

Design: High Performance - Tilt/Turn

Opens to: Inwards

Frame thickness: 78mm

Timber spec: Engineered/Laminated, finger jointed pine

Timber type: Softwood with hardwood sill

Shape: Rectangle

Weather-strip: Double

Weather strip colour: White

Tilt: Yes

Trim: Ovolo

FINISH: 1-1, 1-2

Finish: Satin

Finish type: Factory spray painted with water-based paint

Top coat: RAL 9016 - Traffic white

Dual colour: Yes

>>**Inside:** natural stain tbc

>>**Outside:** standard white ral 9016

Silicon Yes

>>**External** White

>>**Internal:** White

IRONMONGERY: 1-1, 1-2

Handle Yes

>>**Colour** White (Ral 9016)

>>**Position** Center

>>**Type** Standard (with key)

Window Restrictor: None

Hinges: Siegenia Si-line Titan AF

GLASS 1-1, 1-2

Name: 47 dB Acoustic double glazing

Glazing Type: Acoustic

Outer Pane: SGG STADIP 44.2 SILENCE (8.8 Acoustic)

Cavity: Argon filled - 20mm

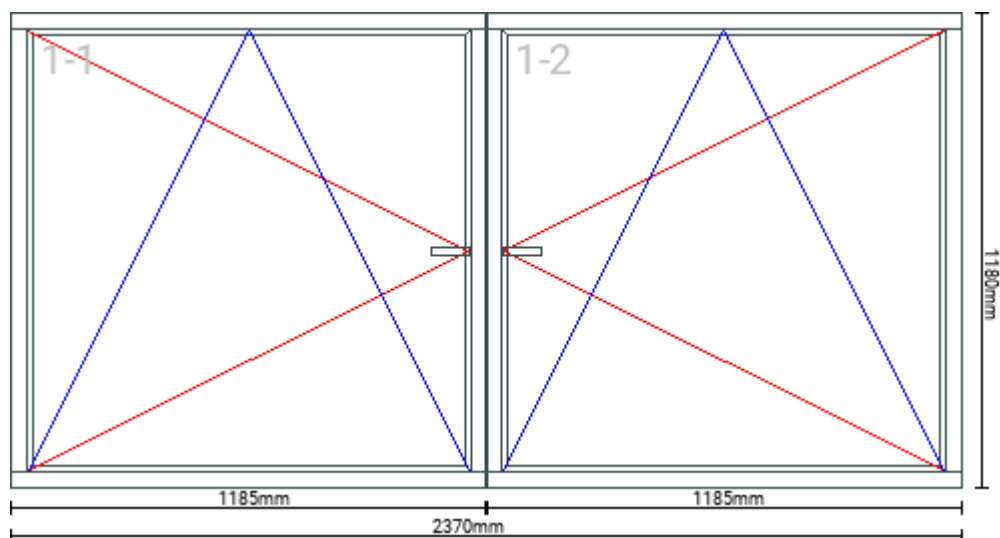
Inner Pane: SGG STADIP 64.2 SILENCE (10.8 Acoustic)

Ug Value [W/m2K]: 1.1

Rw - noise reduction index: 47 dB (Ctr - 41dB Traffic)

Unit Spacer Type: Warm edge SWISSPACER

Product	Description	Quantity	Amount GBP
1	High Performance Soundproof+ (47dB) Location: Dimensions: 2370mm x 1180mm	2	£6,644.03



2. High Performance Soundproof (43dB)

GENERAL: 1-1-1, 1-1-2

Timber type: Softwood with hardwood sill
View: From inside
Opens to: Inwards
Design: High Performance - Tilt/Turn
Frame thickness 68 mm
Tilt: Yes
Timber spec: Engineered/Laminated, finger jointed pine
Weather-strip: Double
Weather strip colour: White
Shape: Rectangle
Trim: Ovolo

GENERAL: 1-2-1, 1-2-2

Timber type: Softwood with hardwood sill
Opens to: Fixed
View: From inside
Frame thickness 68 mm
Timber spec: Engineered/Laminated, finger jointed pine
Weather-strip: Double
Weather strip colour: White
Shape: Rectangle
Trim: Ovolo
Shape Radius: £0.00

FINISH: 1-1-1, 1-1-2

Finish: Satin
Finish type: Factory spray painted with water-based paint
Top coat: RAL 9016 - Traffic white
Dual colour: Yes
 >>**Inside:** natural stain tbc
 >>**Outside:** standard white ral 9016
Silicon Yes
 >>**External** White
 >>**Internal:** White

FINISH: 1-2-1, 1-2-2

Finish type: Factory spray painted with water-based paint
Finish: Satin
Top coat: RAL 9016 - Traffic white
Dual colour: Yes
 >>**Inside:** natural stain tbc
 >>**Outside:** standard white ral 9016

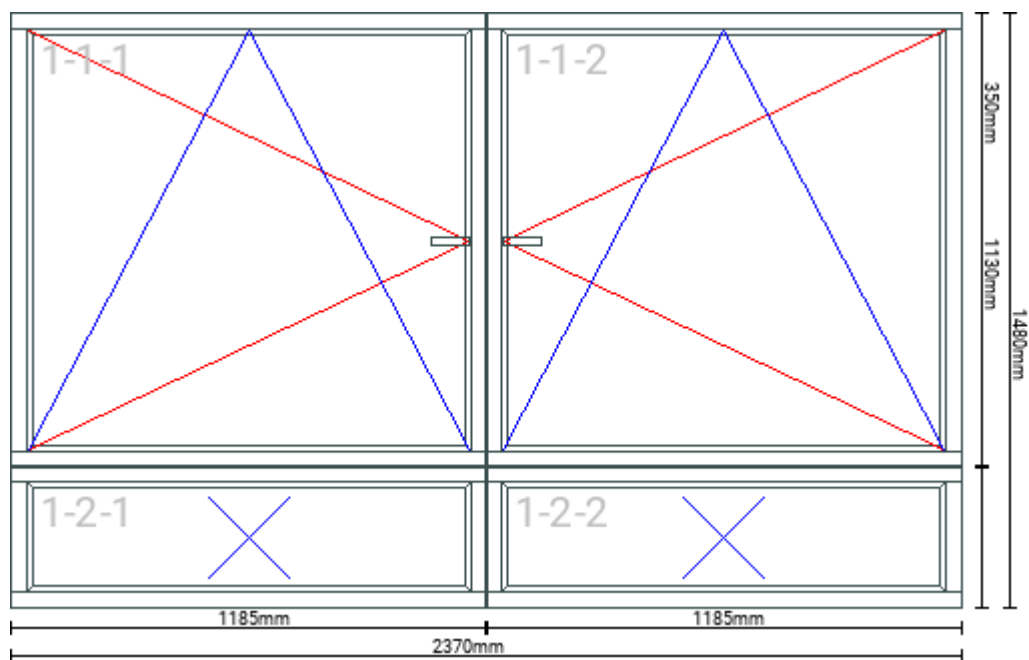
IRONMONGERY: 1-1-1, 1-1-2

Hinges: Siegenia Si-line Titan AF
Handle Yes
 >>**Colour** White (Ral 9016)
 >>**Position** Center
 >>**Type** Standard (no key)
Window Restrictor: None

GLASS 1-1-1, 1-1-2, 1-2-1, 1-2-2

Name: 43dB Acoustic double glazing
Glazing Type: Acoustic
Outer Pane: SGG STADIP 33.1 SILENCE (6.8 Acoustic)
Cavity: 14 mm Argon
Inner Pane: SGG STADIP 44.2 SILENCE (8.8 Acoustic)
Ug Value [W/m2K]: 1.1
Rw - noise reduction index: 43 dB (36 dB Ctr- Traffic)
Unit Spacer Type: Warm edge SWISSPACER

Product	Description	Quantity	Amount GBP
2	High Performance Soundproof (43dB) Location: living room Dimensions: 2370mm x 1480mm	1	£3,370.02



3. High Performance Soundproof (43dB)

GENERAL: 1

Timber type: Softwood with hardwood sill
View: From inside
Opens to: Inwards
Design: High Performance - Tilt/Turn
Frame thickness 68 mm
Tilt: Yes
Timber spec: Engineered/Laminated, finger jointed pine
Weather-strip: Double
Weather strip colour: White
Shape: Rectangle
Trim: Ovolo

FINISH: 1

Finish: Satin
Finish type: Factory spray painted with water-based paint
Top coat: RAL 9016 - Traffic white
Dual colour: Yes
 >>**Inside:** natural stain tbc
 >>**Outside:** standard white ral 9016
Silicon Yes
 >>**External** White
 >>**Internal:** White

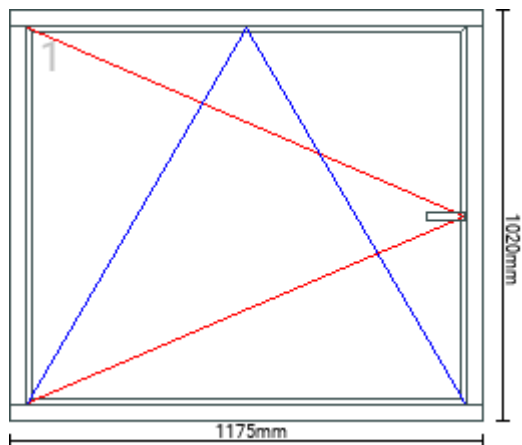
IRONMONGERY: 1

Hinges: Siegenia Si-line Titan AF
Handle Yes
 >>**Colour** White (Ral 9016)
 >>**Position** Center
 >>**Type** Standard (no key)
Window Restrictor: None

GLASS 1

Name: 43dB Acoustic double glazing
Glazing Type: Acoustic
Outer Pane: SGG STADIP 33.1 SILENCE (6.8 Acoustic)
Cavity: 14 mm Argon
Inner Pane: SGG STADIP 44.2 SILENCE (8.8 Acoustic)
Ug Value [W/m2K]: 1.1
Rw - noise reduction index: 43 dB (36 dB Ctr- Traffic)
Unit Spacer Type: Warm edge SWISSPACER

Product	Description	Quantity	Amount GBP
3	High Performance Soundproof (43dB) Location: Kitchen Dimensions: 1175mm x 1020mm	1	£1,181.54



4. High Performance Soundproof (43dB)

GENERAL: 1

Timber type: Softwood with hardwood sill
Opens to: Fixed
View: From inside
Frame thickness 68 mm
Timber spec: Engineered/Laminated, finger jointed pine
Weather-strip: Double
Weather strip colour: White
Shape: Rectangle
Trim: Ovolo
Shape Radius: £0.00

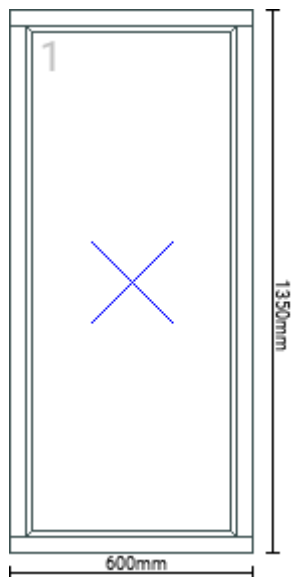
FINISH: 1

Finish type: Factory spray painted with water-based paint
Finish: Satin
Top coat: RAL 9016 - Traffic white
Dual colour: Yes
 >>**Inside:** natural stain tbc
 >>**Outside:** standard white ral 9016

GLASS 1

Name: 43dB Acoustic double glazing
Glazing Type: Acoustic
Outer Pane: SGG STADIP 33.1 SILENCE (6.8 Acoustic)
Cavity: 14 mm Argon
Inner Pane: SGG STADIP 44.2 SILENCE (8.8 Acoustic)
Ug Value [W/m2K]: 1.1
Rw - noise reduction index: 43 dB (36 dB Ctr- Traffic)
Unit Spacer Type: Warm edge SWISSPACER

Product	Description	Quantity	Amount GBP
4	High Performance Soundproof (43dB) Location: Staircase Dimensions: 600mm x 1350mm	1	£564.34



Payment schedule for Trade, DIY and Supply Only:

- Deposit: 50%
- Final payment: of 50% payable 48 hours before delivery.

Payment schedule for Supply and installation:

- 50% - deposit Value **£8,892.44**, due: 4 December 2023
- 25% - week 8 Value **£4,446.22**, due: 29 January 2024
- 20% - Value **£3,556.98**, due: on installation TBC (week 12-16)
- 5% - Value **£889.24**, due: 14 days post installation

Lead Time: Our lead time is currently up to 10-14 weeks from the final survey and receiving a deposit. Please note the lead time might vary on larger and special orders.

Our account details:

Bank: **HSBC**
Company name: **The Soundproof Ltd**
Sort Code: **400233**
Account Number: **22105853**

Payment reference: **Purchase Order No. SP8576**

1. I agree to purchase from The Soundproof Ltd the installation specified in this schedule of work, in accordance with all additional terms set out.

2. I confirm that the property has the necessary permission from local authorities for the windows quote if the property is listed or in the conservation area.

3. I have read and fully understood all terms and condition overleaf.

4. I fully understand that this is agreement is subject to a survey to be carried out by The Soundproof Ltd

5. I hereby acknowledge receipt of a copy of this agreement

Please ensure that you have read the conditions above and overleaf before signing the agreement

Signature of Purchaser

Joint Signature

Signature of The Soundproof Ltd

Date

Print Name

Installation Options

Basic Installation

What's included:
Our 'Building site' or 'basic installation' fitting service includes the installation of our products but does not include any internal or external 'making good'.

Standard Installation

What's included:

- Internal protection from dust and dirt.
 - Making good on both inside and outside walls.
 - Where possible we use our factory-painted architrave and window cills.
 - New external 'mortar pointing' around the outer edge (brick wall) or filler (stone or rendered wall).
 - Cleaning and tidying up after the job.
 - Fensa certification.
- Continued on Next Page



Standard Installation

What's not included:

- Painting and decorating of repaired areas, architraves and cills.
- Repairs of wooden panelling or any bespoke carpentry.
- Final sanding of all repaired areas.
- Where possible, we use our factory-painted architraves; please check with your project manager if that will be your option.

*We cannot be liable for bad plaster condition.

Premium Installation

What's included:

- Internal protection from dust and dirt.
- Painting and decorating of architraves and window cills.
- Making good on both inside and outside walls painting and decorating of repaired areas (customer supplies the paint).
- New external 'mortar pointing' around the outer edge.
- Cleaning and tidying up after the job.
- Fensa certification

What's not included:

Repairs of wooden panelling, or any bespoke carpentry

*We cannot be liable for bad plaster condition.

Bespoke installation

For more details please refer to a separate email.

THE SOUNDPROOF WINDOWS OVERVIEW OF GUARANTEES

<https://thesoundproofwindows.co.uk/guarantees/> (<https://thesoundproofwindows.co.uk/guarantees/>)

The Soundproof Ltd, Unit 6, Tempo House, 15 Falcon Rd, London SW11 2PJ

~~THE SOUNDPROOF WINDOWS Unit 6, Tempo House, 15 Falcon Rd, London SW11 2PJ~~



The Soundproof Ltd, trading at Unit 6, Tempo House, 15 Falcon Rd, London SW11 2PJ

Company Registration Number: 10267299; FENSA Number: 38264

THE SOUNDPROOF WINDOWS - TERMS AND CONDITIONS OF AGREEMENTS

FOR TRADE, DIY AND SUPPLY ONLY CUSTOMERS. NO LABOUR. SURVEYOR TRIM FORM PART OF THE CONTRACT.

1. DEFINITIONS:

- a. "The Soundproof Ltd" shall be called "TSPW"
- b. "Head Office" shall mean Unit 6, Tempo House, 15 Falcon Rd, London SW11 2PJ.
- c. Written notice where required shall be given by you, the Customer, to TSPW Windows Head Office. It is recommended that such notices be sent by recorded delivery.
- d. "Premises" shall mean the installation address.

2. PARTIES:

This agreement is made between TSPW and you, the Customer and shall not be assigned without TSPW's written agreement.

3. ILLUSTRATIONS:

Any illustrations in TSPW's promotional literature & documentation are for your guidance only and are not binding on TSPW or to scale. All colour stain swatches are for your guidance purposes only, exact colour matches cannot be guaranteed due to the manufacturing process.

4. CANCELLATION:

- a. Where the Contract is negotiated away from business premises, it can be cancelled if you are unhappy with it and your deposit will be refunded provided you write to Head Office within 14 days of the date on the contract. We recommend sending this letter by recorded delivery.
- b. TSPW are entitled to cancel the Contract, for whatsoever reason, by giving you written notice prior to the commencement of manufacture.
- c. Customer is entitled to cancel the Contract, in case of planning refusal, by giving a written notice prior to the commencement of manufacture.
- d. If the contract is cancelled in accordance with either (a), (b) or (c) TSPW will refund any deposit paid within seven days of your notice to us (a and c) Or our notice to you of cancellation (b).
- e. The company reserves the right to charge a reasonable fee or manufacturing and administration costs, if cancellation is not covered by sub-section a, b or c. (A breakdown of these costs would be provided upon request).

5. VARIATION:

- a. Any additional terms, conditions or verbal arrangements must be written down on an official Variation of Contract Form for the purposes of clarity and signed by both parties.
- b. The estimated period of delivery will be from the date of such Variation, or, when the Contract is financed by a Bank, Building Society or Finance Company, from the date that confirmation of approval of the loan is received, whichever is later.

6. PREMISES

The sole purpose of TSPW's Surveyor's inspection is to ascertain the feasibility of the installations shown in the Schedule of Work. He will not undertake a general survey of the Premises. His inspection will be confined to those areas of the Premises which directly relate to the proposed installation. TSPW will only be responsible for remedying defects arising from installation and cannot be held responsible for defects existing before the installation date.

7. DELIVERY:

- a. The time of delivery shown overleaf, (or as varied in clauses 5 or 6 above), is only an estimate. installation dates added to the contract by the customer will be viewed as requests only, although every effort will be made to comply with such requests
- b. If work is not commenced within the estimated delivery period stated in these terms, you may serve written notice on TSPW requiring the work to be completed within a reasonable period of time (in general, TSPW would accept 6 weeks as being reasonable). If work is not substantially completed within this extended period, you may cancel the outstanding work covered by this Agreement without penalty to yourself by the service of written notice on TSPW to this effect. In addition, you will be entitled to a refund of any monies which represent a payment for the installation of goods by TSPW in excess of any work actually carried out by TSPW.
- c. Notwithstanding the foregoing TSPW shall not be liable for any delay in completion of the work which arises from causes beyond its reasonable control (for example fire, flooding, civil disturbances, strike action, action by suppliers, criminal damage and acts of war). In the event that time has been made the essence of the Contract, time shall not run during any period when there is a delay on such accounts.
- d. Upon receipt of notice that the goods are ready for installation by TSPW, you must allow us by arrangement, access to the Premises forthwith. Non-acceptance of the installation could render you liable to further charges. If within six weeks of notification, you are unable to accept an appointment for installation, up to 80% of the purchase price may be payable. Installation or delivery will follow as soon as is reasonably practicable, by agreement and the remaining balance will then be payable.

8. ADDITIONAL WORK:

- a. It shall be your responsibility to ensure that every applicable government requirement has been complied with, including all necessary local and other authority Licences, such as planning permission and building regulation approval.
- b. TSPW does not undertake to move services, fixtures or fittings which are ancillary to the basic structure of the Property, e.g. radiators, pipes, electricity, telephone, television cables or aerials, burglar alarms or gas services. You must make such arrangements yourself.
- c. TSPW will endeavour to ensure that works match existing finishes, but will not be liable for non-matching due to unavailability or weathering of existing materials and cannot guarantee the matching of external specialist finishes such as pebble-dashing, tyrolean or similar materials. When variations occur in existing plaster lines, TSPW cannot guarantee that equal amounts of sub-frame will be visible all around the frame.
- d. TSPW cannot undertake to remove intact any existing glass, frames or secondary double glazing units or guarantee to remove existing secondary double glazing units without causing damage.
- e. TSPW will make good any damage caused by us in the course of installation, to plaster or brickwork immediately surrounding any window or door installed but does not undertake to provide matching ceramic or other tiles or specialised finishes (like panelling, architraves, picture rails, covings, cornices or wallpaper) or to avoid damage to surrounding wall finishes or to remove intact any panes of glass or frames from old windows required to be retained by the customer. We accept no responsibility for any loss or damage resulting from structural or any other defects in your property. Any complaint or claim you have for compensation for damage done by us for which we may be liable under these conditions must be made in writing to our Head Office, in default of which we shall accept no liability thereof.

- f. All materials removed during the course of installation will be cleared from the site and cannot be retrieved thereafter. If any materials are required to be retained (but see clause (e) above) this must be clearly stated on the contract.
- g. TSPW shall render all finishes in one coat sand and cement and you will be liable for all specialist finishes
- h. It shall be your responsibility to arrange for, and pay for, the removal and replacement of curtains, blinds, pelmets, etc.
- i. TSPW will not undertake the removal of secondary double glazing without the appropriate charge. Under no circumstances will TSPW refit secondary double glazing.

9. PRODUCT SPECIFICATION:

The maximum size of any top hung vent is 1000mm wide x 1000mm deep.

The maximum size of any side hung vent is 650mm wide x 1250mm deep.

The maximum width of any single frame is 3000mm.

Frames and vents manufactured outside these parameters will not be covered by the warranty.

10. NEW BUILD OR PREPARED OPENINGS:

If you choose to supply us with sizes, we will take them as correct and manufacture to them. If it subsequently appears that the sizes you supplied were incorrect, you will be liable for the cost of goods manufactured at the incorrect sizes.

11. PAYMENT:

- a. TSPW has quoted its price to you on the understanding that you will pay the balance in full when the job is completed. Accordingly, TSPW relies on you to pay the whole balance of the contract when given notice of completion by the way of invoice. Any sum outstanding following completion may be subject to interest, which shall run from the date of the invoice to the date of actual payment at the rate of 5% above the base rate for the time being of Barclays Bank Plc
- b. TSPW personnel are authorised to accept cash, cheques or Home Improvement Loan documents in favour of TSPW only. If there is some minor defect in the work, TSPW will allow you to set-off a reasonable amount until the issues regarding the goods or services have been satisfactorily resolved. Failure to pay the balance upon final completion will be a breach of this Agreement.

12. PASSING OF TITLE:

- a. The goods supplied shall remain the property of TSPW until you have paid the full purchase price for them.
- b. Notwithstanding clause (a), the goods shall be at your own risk from the time of delivery to your premises, if you do not allow installation immediately, you shall insure the goods against loss or damage accordingly. In the event of such loss or damage, you shall hold the proceeds of your insurance as trustee for TSPW.
- c. Your right to ownership of the goods would be put at risk if:
 - i. you do not pay the full purchase price in accordance with our terms.
 - ii. you are declared bankrupt or make any proposal to creditors or make any other voluntary arrangement prior to installation: or

iii. A Receiver, Liquidator or Administrator is appointed in respect of your financial affairs prior to installation. In the event of any of the above, you shall, at your own expense, make the goods available to TSPW by way of a licence as described in clause (d) below.

d. TSPW may require the customer, upon reasonable notice, to return the goods to us, or allow us to inspect them, failing which we may take legal action as necessary.

13. GUARANTEE:

- a. TSPW's Guarantee, detailed below, is given only to the original Purchaser, & is not automatically assignable to a third party. TSPW, however, have a chargeable procedure by which transfer of the residual guarantee to a new owner of the Premises is made possible. Details of the scheme and fee may be obtained by application to Head Office, quoting the Agreement Number
- b. TSPW guarantees to repair or replace free of all charge any Timber, PVCu or Aluminium frame installed by TSPW which develops a fault due to defective materials or workmanship within 10 years of the date of installation in accordance with TSPW's written form of Warranty issued upon receipt of payment, if properly maintained once a year by the purchaser and every 3 years by TSPW staff. TSPW must be notified in writing, quoting the Agreement Number, if any claim is to be made.
- c. TSPW guarantees to repair or replace free of all charge, any double glazed unit installed by TSPW which develops condensation between the panes within 5 years of the date of installation. TSPW must be notified in writing, quoting the Agreement Number if a claim is to be made.
- d. Despite the fact that the Purchasers Statutory Rights remain unaffected this Guarantee does not extend to:
 - i. Minor imperfections within the glass, which are outside the scope of the visual quality standards of the Manufacturer. The glass used in TSPW's units is of the best available quality but may have minor imperfections. You will have the benefit of the glass manufacturers Warranty where applicable but TSPW cannot promise a higher standard of glass than that currently provided by the manufacturer
 - ii. Damage due to misuse, neglect or lack of maintenance by you. We strongly advise you to refer to the maintenance information provided in your Customer Care Pack.
 - iii. Goods that have been removed or repositioned by persons other than TSPW personnel.
 - iv. Timber that you have insisted remains in situ adjacent to the Companies installation.
 - v. Specialist items installed; other than those shown in section (vi); but for such items the manufacturer of the items normal guarantees will apply.
 - vi. Deterioration of finish or other conditions beyond our control on handles, hinges, letter plates, knockers and all other furniture. The manufacturers 1-year guarantee will apply.
 - vii. White gaskets or the build-up of atmospheric debris behind external gaskets.
 - viii. Matching stained glass colours as these vary from batch to batch.
 - ix. Double glazed units with ventilation holes cut in for extractor fans.
 - x. Any works, carried out by others associated with this installation; or those parts of this installation affected by works by others, other than the works carried out by TSPW or its employees.
- e. For the first 12 months after installation, cracks which appear in glass units may be covered by warranty, subject to inspection by TSPW to confirm the cause.
- f. Replacement items must be paid for at the point of sale. Customer will be reimbursed upon return of item covered under guarantee.

14. CONDENSATION WITHIN THE PROPERTY:

- a. TSPW's double glazed units are designed primarily to reduce heat loss which occurs through single glazing. The presence of condensation depends on the environment within the dwelling. For the avoidance of misunderstanding, please refer to TSPW's leaflet about condensation.
- b. TSPW gives no warranty concerning incidence, prevention or elimination of condensation following the installation of its products, nor may TSPW personnel give any such warranty.

15. COMPLAINTS:

- a. In the interest of efficiently dealing with any query, written notice must be given to Head Office
- b. In signing this agreement you are agreeing to afford TSPW a reasonable opportunity to respond to, and remedy, any complaint for which TSPW are liable. The customer must allow reasonable access to enable TSPW to meet its responsibilities under the terms and conditions of this contract. If the customer fails to do so, the full outstanding balance becomes due immediately.
- c. If any complaint is not remedied by TSPW to your reasonable satisfaction in the event of a dispute, we will, at your request, provide details of the CPA Conciliation and Mediation.

16. All the terms of the Contract between TSPW and you, the customer, are contained in this Agreement and/or any Variation of Contract Forms signed by both parties. All orders are accepted subject to the terms and conditions contained herein, which neither employees or agents have power to vary. No variation or addition to the work specified in the Schedule overleaf shall have effect unless agreed by both parties and documented.

17. LAW:





The rights set out above are given in addition to and not in substitution of all your rights under the common law or by statute.

This Agreement shall be governed by the Law of England & Wales and should any dispute arise in relation to this Agreement, dispute resolution in the form of litigation shall be resolved according to English law.

THE SOUNDPROOF WINDOWS Unit 6, Tempo House, 15 Falcon Rd, London SW11 2PJ

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