AtkinsRéalis

Final Report

Civil Aviation Authority

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NOISE ACTION PLAN REVIEW

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Executive Summary

The Civil Aviation Authority (CAA) has commissioned AtkinsRéalis to undertake a critical review of existing Noise Action Plans for airports on their behalf for the Department for Transport (DfT). The review aims to determine how noise management practices can be enhanced and to identify areas where the existing guidance for airport operators on Noise Action Plans could be improved or revised. The project has three main objectives:

1. To evaluate the process for developing Noise Action Plans to manage noise around the relevant airports;
2. To assess the clarity of the Defra guidance in assisting the competent authorities in the development of their Noise Action Plans; and
3. To assess the effectiveness of Noise Action Plans in managing noise and its effects around airports.

The review encompassed the Noise Action Plans produced at Round 2 (2013 to 2018), Round 3 (2018 to 2023) and Round 4 (2024 to 2028) at ten airports selected by the CAA. All UK Round 4 Noise Action Plans reviewed were in draft form except for London Southend and London Gatwick. The airports selected by the CAA were:

- London Heathrow Airport
- London Gatwick Airport
- London Southend Airport
- Leeds Bradford Airport
- East Midlands Airport
- Manchester International Airport
- Edinburgh Airport
- George Best Belfast City Airport
- Amsterdam Schiphol Airport
- Frankfurt am Main Airport

The corresponding guidance available at the time of each noise action planning round was also reviewed. To support the review, airport operators, Airport Consultative Committees and local community stakeholders were contacted for feedback on the Noise Action Plans, including the process for developing them and their effectiveness.

The review has provided some evidence to show that Noise Action Plans are effective. This is demonstrated most clearly where progressive decreases in noise are achieved over time and where measures are revised to become more ambitious once the original desired outcome is achieved. The most effective Noise Action Plans were detailed, with clearly stated achievable measures and success criteria. However, the optimism presented in the Noise Action Plans can contrast with community stakeholder perspectives, whom might not be experiencing the expected noise improvements. The ability of the airport operator to enforce their measures and actions is an important aspect of ensuring compliance, and their mechanisms to do so require regular review to ensure that they are effective.

As the circumstances vary from airport to airport and air traffic reductions during the COVID-19 pandemic affected the noise emissions reported in the Round 4 Noise Action Plans, there is not enough evidence to conclude that Noise Action Plans are effective or ineffective overall. It is clear that Noise Action Plans can be more effective than they currently are. Building more transparency and accountability into the process at all levels is fundamental to achieving this. This includes the use of action plan measures that are specific, measurable, achievable, realistic, and time-bound (SMART), using non-technical documents to share information with community stakeholders, explaining changes to the Noise Action Plan resulting from consultation to local communities, and regulators making the process for approving Noise Action Plans clearer. The efficiency of the Noise Action Plan approval and adoption process can be improved by making Defra guidance clearer and more informative. This will help airport operators produce higher quality plans.

In the near future, some airport operators may start to operate test flights linked to future aviation technologies. The next round of Noise Action Plans will need to consider the potential noise impacts from these technologies. A suitable approach for appraising impacts from future aviation technologies in a Noise Action Plan context needs to be developed so that airport operators are consistent in how this is approached and managed.

1. Introduction

1.1 Project Background

The Environmental Noise Regulations 2006 [1], which transpose the Environmental Noise Directive 2002/49/EC [2] into national law, require that competent authorities produce Noise Action Plans every five years and implement measures and actions to reduce noise impacts. In the United Kingdom (UK), airports are the competent authorities for aviation noise and are required to produce Noise Action Plans if they have more than 50,000 air movements per year or if air traffic noise exceeds specified noise levels within agglomerations. The first Noise Action Plans (Round 1) were adopted around 2008 and since then three further rounds of noise action planning have been undertaken, covering the period 2013 to 2028.

The Department for Environment, Food and Rural Affairs (Defra) produces guidance documents to support the airport operators in England with the development of their Noise Action Plans, which are updated for each round of noise action planning [3] [4] [5] [6]. Specifically, it provides advice on the general requirements for Noise Action Plans, the regulatory context in the UK, determination of actions to be implemented, and the process for developing and updating the Noise Action Plans.

The Civil Aviation Authority (CAA) has commissioned AtkinsRéalis to undertake a critical review of existing Noise Action Plans for airports on their behalf for the Department for Transport (DfT). The review aims to determine how noise management practices can be enhanced and to identify areas where the existing guidance for airport operators on Noise Action Plans could be improved or revised. The project has three main objectives:

1. To evaluate the process for developing Noise Action Plans to manage noise around the relevant airports;
2. To assess the clarity of the Defra guidance in assisting the competent authorities in the development of their Noise Action Plans; and
3. To assess the effectiveness of Noise Action Plans in managing noise and its effects around airports.

Following completion of the review, the CAA will make recommendations to Defra and the Department for Transport on potential areas for improvement in the Noise Action Plans or the Defra guidance. Implementation of these recommendations and any subsequent guidance updates are intended to support the Round 5 strategic noise mapping and action plan production.

This report provides the outcomes of the review, which takes into consideration views provided by airports, airport consultative committees (ACCs) and community stakeholders.

1.2 Project Scope

The scope of this project is to undertake a critical review of Noise Action Plans and the corresponding Defra guidance for airport operators. The review is focussed on the Noise Action Plans and Defra guidance produced at Round 2 (2013 to 2018), Round 3 (2018 to 2023) and Round 4 (2024 to 2028). This would cover approximately 15 years of aviation noise management and reduction measures linked to the Environmental Noise Regulations (2006). The scope of the review is centred on the following themes:

- The process for producing Noise Action Plans;
- The measures and actions within Noise Action Plans, including how they are implemented;
- The consistency of the Noise Actions Plans;
- The effectiveness of the Noise Action Plans; and

- The clarity of the Defra guidance for airport operators.

The review also identifies examples where Noise Action Plans have been an effective tool when managing aviation noise, as well as examples where they have not been effective.

Additional relevant topics are explored where they provide direct insight into the five themes above. However, several topics are outside the scope of this study and are not investigated in depth. These topics include:

- The methodology for creating aviation noise contours;
- The suitability of different noise indices for appraising or managing aviation noise;
- Noise-related health outcomes at each airport;
- Compliance with International Civil Aviation Organization (ICAO) policies and standards;
- Impacts of COVID-19 on aviation noise;
- Ongoing planning applications at any of the airports;
- Section 106 agreements;
- Drones and future aviation technologies;
- The potential impact of airspace modernisation on noise management.
- How differences in calculations or guidance at airports outside England may affect the selection of measures and actions within Noise Action Plans;
- The influence of economic viability on the implementation of actions and measures within Noise Action Plans.

A limited review of Noise Action Plans produced for other strategic noise sources in England is included so that comparisons can be made with airport Noise Action Plans.

In addition to reviewing the Noise Action Plans from airports in different regions over time, the project also requires the Defra guidance for airport operators to be compared with equivalent guidance that may be used by non-England airports.

The scope of the review is limited to a total of ten airports located in the United Kingdom and European Union (EU) as shown in Table 1-1. These airports were selected by the CAA so that a variety of airport contexts could be considered, and comparisons could be made between airports in different parts of the UK and the European Union.

Table 1-1: Airports

Area	Airport	CAA Selection Criteria
England	London Heathrow Airport	Biggest airport with the highest impact
	London Gatwick Airport	Second largest airport, rural, different character
	London Southend Airport	Agglomeration based
	East Midlands Airport	Significant night flights and cargo
	Leeds Bradford Airport	Stakeholder selection
	Manchester International Airport	Large airport in the North, has two runways
Devolved administrations	Edinburgh Airport (Scotland)	Devolved airports
	George Best Belfast City Airport (Northern Ireland)	
European Union	Frankfurt am Main Airport (Germany)	Overseas airports
	Amsterdam Schiphol Airport (The Netherlands)	

Table 1-1 shows that no Welsh airports were considered in this study. This is because airport operations are not a devolved issue in Wales and no airports in Wales currently qualify for noise action planning under the Environmental Noise Regulations [7].

To achieve the project's objectives, the CAA requires that a robust qualitative review methodology is designed and implemented for the critical review. The methodology needs to include the following elements:

- A method for the qualitative evaluation of the Noise Action Plan development process;
- Measures to evaluate the clarity of the Defra guidance for developing Noise Action Plans; and
- Measures to evaluate whether Noise Action Plans are an effective noise management tool.

The methodology also requires a set of research questions to be identified and agreed with the CAA for each of the five project themes as part of the assessment process. To support the development of research questions and to provide further contextual information for the review, the project's scope includes a literature review of the key noise and aviation policies that were current during each of the noise action planning rounds. This allows individual Noise Action Plans to be evaluated against the relevant noise policy and overarching noise objectives that were applicable at the time they were produced.

Where potential areas for improvement have been identified in the review, recommendations are made to Defra and the DfT. Any recommendations on guidance updates would contribute to Noise Action Plan development during Round 5 (expected: 2028 to 2033).

1.3 Document Structure

To address the key areas of the study, this report is structured as follows:

- Section 2 – Project approach
- Section 3 – Literature review
- Section 4 – Research questions
- Section 5 – Description of Airports
- Section 6 – Overview of Outcomes
- Section 7 – Process for Noise Action Plan Production
- Section 8 – Measures and Actions
- Section 9 – Consistency
- Section 10 – Effectiveness
- Section 11 – Defra Guidance
- Section 12 – Discussion
- Section 13 – Recommendations
- Section 14 – Conclusions.

2. Project Approach

This section describes the methodology used to undertake the critical review of the Noise Action Plans and the supporting guidance for airport operators.

2.1 Overarching Methodology

The overall project methodology is a five-step process, as outlined in Figure 2-1. Data acquisition is the first step, where the Noise Action Plans and any corresponding guidance for airports are obtained. The relevant documentation for the literature review is also obtained at this time, consisting of the wider noise and aviation policy that was active at the time of each round of noise action planning.

Following the data acquisition and literature review, the next activity is the development of research questions to address the project's three objectives linked to the Noise Action Plan development process, the effectiveness of Noise Action Plans, and the clarity of the Defra guidance.

The third step of the project's methodology is to contact the selected airports and their community stakeholders to obtain missing information and to obtain feedback on Noise Action Plans. This critical component provides valuable insight into Noise Action Plans by those who work with them the most, uncovering information that would not be readily available from a desktop review. Questionnaires were the main tool used to obtain feedback in a standardised and consistent way.

The fourth and fifth steps of the methodology are to review the Noise Action Plans, guidance, stakeholder feedback and other relevant information to answer each of the research questions for each airport. The outcomes to each research question are reviewed together to identify trends and further data insights, that are ultimately used to identify recommendations and draw conclusions to address the project's objectives. The collated responses are used to identify similarities and differences between the airports so that the impacts of the different airport contexts on the Noise Action Plans and guidance can be better understood.

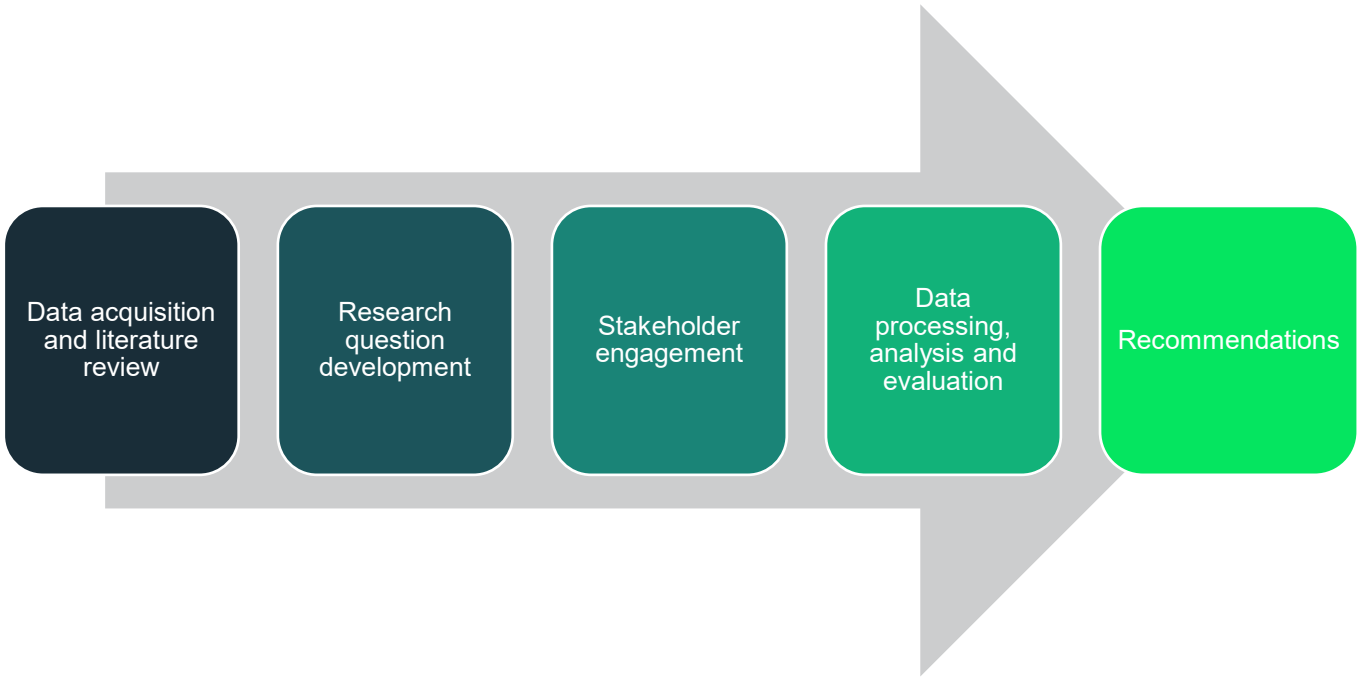

Figure 2-1: Overarching methodology

As part of the project, proactive engagement was undertaken with the following parties who provided input into the methodology and outcomes:

- A Steering Group of government bodies who provided strategic oversight and direction for the project. This included providing feedback on the project at key points to support the development of technical documentation. The Steering Group comprised members of the following organisations: CAA, Defra, DfT, UK Health Security Agency and Ministry of Communities, Housing and Local Government; and
- A Stakeholder Engagement Group, which was established to serve as a platform for diverse stakeholders to engage with the Noise Action Plan review project and facilitate meaningful dialogue, information exchange and feedback collection. These stakeholders include both those who possess executive authority for noise improvement actions as well as community stakeholders. Feedback during these meetings provided additional perspectives on airport Noise Action Plans and informed the project methodology.

Further information on each of the five steps is provided in the sections below.

2.2 Data Acquisition

The data used as part of this project consisted of the Noise Action Plans, the guidance documents, the material within the literature review and opinions from the airport operators and stakeholders.

The Noise Action Plan data gathering is limited to the ten airports shown in Table 1-1. The review consisted of the Round 2 (2013 to 2018), Round 3 (2019 – 2023) and Round 4 (2024 – 2028) Noise Action Plans. To conduct the review, each airport's Noise Action Plan was sought, firstly using the airport websites and generalised internet searching. Some Noise Action Plans were not readily available; therefore, a thorough search of the National Archives online source was conducted and any email requests for missing Noise Action Plans were sent to airport operator/contacts. It should be noted the Noise Action Plans for Frankfurt and Amsterdam Schiphol were not available in English and were translated using Foxit PDF Editor.

Most of the Defra guidance documents were readily available on the Defra website or through general internet searching. As four of the airports were outside of England and not under the remit of the Defra guidance, the relevant guidance documents used to support the airport operators with preparing their Noise Action Plans were acquired in consultation with the airport contacts, where available.

The material utilised in the literature review was obtained utilising a variety of methods. Within the Noise Action Plans useful material was provided/named, leading to an internet search to find these documents and other relevant search results. Further material was identified through AtkinsRéalis experts in the noise and aviation sectors. Additionally, relevant material was provided by the Client.

As part of the study subjective data was collected from airport operators and key stakeholders for each airport. Each contact was sent a survey on Microsoft Forms containing a list of research questions to further aid the study.

2.3 Literature Review

A literature review was undertaken to identify key aspects of the Environmental Noise Directive and the Environmental Noise Regulations that are relevant to Noise Action Plans for airports. The literature review also explored the wider regulatory context in the UK, which may influence changes to the Noise Action Plans between successive rounds. This information was also used to develop a policy timeline to further inform the review. The outcomes of the literature review were used to inform the development of research questions that would be addressed by this project.

An initial review of the Defra guidance for airport operators was also completed at the literature review stage of the project. The initial review focussed on the type of content that is included in the Defra guidance so that suitable research questions could be developed to investigate the clarity of the guidance, how it helps airport operators comply with the Environmental Noise Regulations and its influence on the Noise Action Plans for airports in England.

2.4 Research Question Development

2.4.1 Themes

The research questions are principally focussed on the five themes discussed in Section 1, namely:

- The process for producing Noise Action Plans;
- The measures and actions within Noise Action Plans, including how they are implemented;
- The consistency of the Noise Actions Plans;
- The effectiveness of the Noise Action Plans; and
- The clarity of the Defra guidance for airport operators.

Detailed descriptions of the scope of the research questions developed for each of the five themes are provided in the subsections below.

Process for Noise Action Plans Development

Whilst Noise Action Plans are based on strategic noise mapping results, airports can also consider other relevant noise issues. Each airport will have balanced the results of the strategic noise mapping with its own individual circumstances to develop its plan, incorporating a series of proportionate measures.

Noise Action Plans need to meet the requirements set out in the Defra Guidance, which are taken from the Environmental Noise Regulations 2006 and Environmental Noise Directive. The main action plan elements are:

- Giving the context of the airport;
- Summarising noise mapping results and population exposure;
- Recording consultation;
- Setting out existing and proposed measures and actions;
- Estimating potential benefits of measures and actions; and
- Describing how measures and actions will be evaluated.

The research questions designed to review the process for developing Noise Action Plans seek to identify the following:

- That Noise Action Plans contain all required information;
- That Noise Action Plans reflect policy and regulations;
- The extent of consultation during production;
- The method or process used to prepare the Noise Action Plan;
- If there are any obvious omissions;
- Where professional judgement has been used; and
- If the Noise Action Plan appears constrained, for example by time, data, or responses.

Measures and Actions Within Noise Action Plans

Measures and actions within the Noise Action Plans can fall into several categories;

- Controls on the types of aircraft using the airport;
- Controls on the timing of arrivals and departures of aircraft from the airport;
- Controls on the approaches and departures from the airport;
- Controls on ground operations at the airport;
- Consultation with local communities and stakeholders;
- Measures for existing noise sensitive receptors near the airport;
- Influencing planning for potential noise sensitive receptors near the airport;
- Appropriate consideration of noise in airport development plans;
- Using monitoring to assess the success of measures;
- Procedures for dealing with complaints and relevant issues raised;
- Prioritising noise when consulting on the development of new types of aircraft, components or technologies; and
- Working with Local Authorities to managing noise together.

The questions designed to review the measures and actions set out within the Noise Action Plans aim to identify:

- That the measure relates to a relevant noise issue;
- That the expected change from the action is described;
- If the measure would relate to a change in noise levels or a change in the perception of noise;
- If the measure requires action from or interface with external parties or stakeholders;
- How the success of the measure is expected to be assessed;
- If the action plan sets out a counterfactual for the measure; and
- If the measure is likely to be perceptible to the people affected.

Where action plans use several separate measures together to achieve a specific change, these measures were grouped together accordingly in the review process.

Consistency of Noise Action Plans

Once the Noise Action Plans had been reviewed, a comparison was made between airports and over time. Research questions on the consistency of Noise Action Plans aim to identify:

- Consistency between airports;
- Consistency from year to year;
- Consistency on approach;
- Consistency on consultation;
- Consistency with the guidance;
- Consistency on circumstances when plans would be revised; and
- Consistency with policy.

Where inconsistencies were identified, the project aimed to establish if these occurred due to specific situation(s) at the airport(s) or from the interpretation of the guidance for producing action plans.

Effectiveness of Noise Action Plans

The effectiveness of the Noise Action Plans as a noise management tool relies on there being a change from the measures and actions set out in each plan. The research questions on effectiveness aim to identify:

- If significant or adverse noise effects have been reduced;
- If areas of good noise quality have been preserved;
- If there are perceptions of positive change around noise issues near the airport;
- If changes in noise are expected to be short-term or long-term;
- If measures are present in several plans, if they have longitudinal effectiveness;
- If the airports are monitoring the effectiveness of their plans;
- If the plans consider changes in policy, regulation, aircraft or technologies; and
- If the plans are appropriately shared with communities and stakeholders.

These questions are used after the review of the measures and actions in each plan, allowing the effectiveness of plans to be evaluated.

Where observations were made about the effectiveness of Noise Action Plans, the review examines common threads to identify if this was due to the design or implementation of the actions, from communication about outcomes, or other reasons. Where common threads are identified, recommendations are made for potential improvements to the process that enable airports to make adjustments to their Noise Action Plans.

Clarity of the Defra Guidance for Airport Operators

The Defra guidance documents available at Rounds 2, 3, and 4 were reviewed. This review took into account the assessment methodology and findings from the review of the Noise Action Plans. In particular, outcomes were considered in the context of the guidance prepared by Defra for airports in England. The research questions were developed to consider different aspects of the guidance, for example the clarity of the language used and that of the guidance itself.

Additionally, stakeholder feedback was used to gain further insight into the clarity of the guidance. Further research questions were developed to better understand the changes or improvements to the guidance that airport operators would find useful.

The guidance review also considered the potential benefits of consistency amongst the approaches to Noise Action Plans in the devolved authorities of Scotland and Northern Ireland. The review also compares and contrasts with the approaches used for the two airports based in mainland Europe.

2.4.2 Shortlisting Questions

After the literature review was completed, a long list of over 150 research questions was compiled that covered the above themes and some additional relevant topics. These research questions were developed based on information obtained from the literature review, a high-level review of the Noise Action Plans and the Defra guidance received at the time, and items discussed at a Stakeholder Engagement Group meeting hosted by the CAA in October 2024.

Following a further review, a short-list of research questions was identified to focus on key issues relevant to the project. The question prioritisation process excluded questions where:

- Duplicates or similarly worded questions were identified – in this case the most appropriate research question was retained;
- Two questions could be merged together easily to form one research question;

- The question was found to be outside the project scope (for example, seeking detailed information on noise indicators);
- The question requested sensitive information and would not significantly help the review in meeting the project's objectives if the information was provided (for example, financial information).

The shortlisted research questions were finalised after they were reviewed by the CAA and the Steering Group. Further modifications were made while developing the stakeholder questionnaires, where opportunities were identified to obtain additional relevant qualitative information. The finalised research questions are discussed further in Section 4.

2.5 Stakeholder Engagement

2.5.1 Airport Operators, ACCs and Local Communities

A key part of the methodology is to engage with key stakeholders to better understand their views of the Noise Action Plan development process, how actions and measures are selected, roles and responsibilities for implementation and monitoring, and the overall effectiveness of Noise Action Plans. The stakeholders contacted to support this study are:

- Each of the ten participating airports;
- Defra, to better understand the process for adopting Noise Action Plans and the minimum requirements for compliance with the regulatory framework;
- Airport Consultation Committees (ACCs) for each airport, to better understand the perspectives of local communities and interest groups affected by aviation noise;
- One community group for each of the eight UK airports, who were put forward by stakeholders to provide further insight into the perspectives of local communities.

Questionnaires were issued to the airport operators, ACCs and community groups that were based on a selection of the research questions for the project. The questionnaire for the airport operators was different to the one issued to the ACCs and community groups to reflect the different roles of the stakeholders in the Noise Action Plan process. The questionnaires were created using Microsoft Forms so that respondents could complete them online, and following feedback, a Microsoft Word version was also made available.

The questionnaires contained a mixture of question types, including those that required using a five-point Likert scale (for example, strongly disagree to strongly agree) and open box questions for the respondent to provide text-based answers. The questionnaires were designed to minimise the time taken to complete them, noting that respondents may wish to consult with various documentation prior to responding. Copies of the questionnaires are available in Appendices C and D.

The response period for the questionnaires was from 2 December 2024 to 10 January 2025. Reminder emails were sent to the stakeholders to encourage participation. Responses received after this period have been included in the analysis as far as possible and shared with the CAA where this was not possible.

2.5.2 Steering Group and Stakeholder Engagement Group

The Steering Group engaged with the project and provided technical feedback at the following project stages:

- Development of the project's methodology and research questions;
- Creation of questionnaires to issue to airport operators, ACCs and local communities to obtain feedback on Noise Action Plans as well as Defra or local guidance where applicable; and

- Review of the draft findings of the project.

AtkinsRéalis attended Stakeholder Engagement Group meetings about the project in October 2024, February 2025 and March 2025. Attendees included DfT, Defra, CAA and industry and community stakeholders. The discussions from these meetings provided insight into differing perspectives on the successes and limitation of Noise Action Plans, and the wider context of managing aviation noise. Points raised at the October 2024 meeting contributed to the research question and assessment methodology development. Subsequent communications led to the identification of additional stakeholders to contact for feedback on Noise Action Plans. The remaining meetings provided opportunities to share emerging results for feedback.

2.6 Analysis and Evaluation

2.6.1 Data Processing and Analysis

The Noise Action Plans were evaluated and critically reviewed for consistency and effectiveness, taking into account the feedback of airport operators and ACCs / stakeholders. Opportunities for improvement have been identified and provided in this document (see Section 13). For each airport, three Noise Action Plans were reviewed to help establish the extent they have been effective. This was not the case for George Best Belfast City Airport (Round 4 Noise Action Plan draft omitted) or Frankfurt (Round 3 issued Noise Action Plan omitted).

AtkinsRéalis gathered information from the Noise Action Plans for each research question using artificial intelligence (AI). AI was used to identify relevant information in large documents and automate data analysis where necessary. AI summarised how each Noise Action Plan addressed the research questions. However, it was also asked to consider what information/themes the plans had included beyond that outlined in the research questions. In addition to the data retrieval using AI and survey responses, a manual review of the Noise Action Plans was undertaken to assess how the required regulatory information is presented and to allow comparisons of the level of detail between Noise Action Plans.

The AI used to support this project was Microsoft Copilot for Business[1], which does not share data outside of the AtkinsRéalis business environment. Each Noise Action Plan was uploaded to the software along with instructions for the AI about how to use the document, which prevented the AI from retrieving unwanted information from the internet. Prompts used in the AI software included requests for page references to enable quality assurance of the responses generated.

The airport and ACC / community stakeholder survey responses provided via the online form were collated by Microsoft Forms and exported in a Microsoft Excel format. Several respondents requested the survey be issued as a Microsoft Word and/or pdf document, for example the operator of London Gatwick and Manchester ACC. This was facilitated to enable a greater response rate, with the resulting submissions stored with the exported data collected from the online survey. This enabled the rapid coding of survey questions that required either binary or multiple-choice responses. Survey questions with free text responses were analysed in batches to allow a comparative analysis. This enabled the identification of trends among the submissions. The uniformity of format for the survey responses enabled more coherent analysis.

2.6.2 Evaluation and Critical Review

The data collected from the airport Noise Action Plans and stakeholder feedback were matched to each relevant research question to provide a holistic response. This allowed differences between the Noise Action Plans to be considered over time at individual airport level and for comparisons to be drawn between airports located in England, devolved administrations and large airports in the EU. As several research questions had common

[1] Version history: From November 2024 (v23.1115.01) through to February 2025 (v23.0204.01)

themes, the data for each question could be reviewed together to identify further trends. This approach allowed examples of best practice and effective management of aviation noise to be identified where available.

To gain further insights, the aviation Noise Action Plans were compared against a limited selection of Noise Action Plans produced for roads, railways and agglomerations.

3. Literature and Policy Review

This section describes the outcomes of the literature review, which is focussed on the noise and aviation policies that influenced the Noise Action Plans at the time they were written. The wider policy context may explain some changes to Noise Action Plans between successive noise action planning rounds.

3.1 Data Sources

The key legislation, regulations and guidance for considering the impacts of aviation noise on communities near to airports in the context of preparing noise action plans have been reviewed. The key documents include:

- The European Environmental Noise Directive and its transposition into UK law through the Environmental Noise Regulations 2006 (as amended) for England and the devolved administrations;
- Defra guidance for airport operators to produce action plans;
- Aviation policy and regulatory context, such as the Aviation Policy Framework [8], ICAO Guidance on Balanced Approach to Aircraft Noise Management [9], Civil Aviation Act 2012 [10], and the Aviation Noise (Amendment) (EU Exit) Regulations 2019 [11];
- Environmental noise policies and guidance, such as the Noise Policy Statement for England [12], Overarching Aviation Noise Policy [13], National Planning Policy Framework, Transport Analysis Guidance [14], and World Health Organization guidelines [15] [16] [17].

The review of the legislative context has been undertaken to understand the timeline of active policies, which informed the development of research questions and supported the research undertaken. All documents considered in the literature review are presented in Appendix B.

3.2 Regulation and Guidance Review

3.2.1 International Guidance

Reducing aircraft noise impact is one of the International Civil Aviation Organization's (ICAO) main priorities and key environmental goals. In 2001, the ICAO Assembly developed the principle of the 'Balanced Approach' to aircraft noise management as a coherent method to address aircraft noise.

The balanced approach has been adopted by European Union through directive 2002/30/EC, establishing rules and procedures to introduce noise related operating restrictions at airports. In 2008, the second edition of the of the Guidance on the Balanced Approach to Aircraft Noise Management was published and further detailed guidance was provided [9]. The balanced approach is currently adopted into European legislation through Regulation 598/2014 [18], which states that "Noise-related operating restrictions should be introduced only when other Balanced Approach measures are not sufficient to attain the specific noise abatement objectives".

The balanced approach has been introduced into UK legislation through the Aerodromes (Noise Restrictions) (Rules and Procedures) Regulations 2003 [19] which implement 2002/30/EC. Subsequently the Airports (Noise-related Operating Restrictions) (England and Wales) Regulations 2018 [20] and the Airports (Noise-related Operating Restrictions) (Scotland) Regulations 2019 implement EU Regulation 598/2014.

Alongside these policies, the following noise targets have been set for aviation in Europe:

- Vision 2020: Reducing noise by an average of 10 dB per aircraft operation (departure or landing), taking into account technology benefits as well as operational improvements [21];

- Zero Pollution Action Plan: Reduce the share of people chronically disturbed by transportation noise by 30% relative to 2017 levels [22]; and
- Flightpath 2050: Target for 2050 that the perceived noise emission of flying aircraft is reduced by 65% relative to the capabilities of typical new aircraft in 2000 [23].

3.2.2 European Directive 2002/49/EC

The European Directive 2002/49/EC of the European Parliament covers various environmental noise sources including road vehicles, rail vehicles, aircraft, general outdoor industrial sources and their impacts on residential and built-up areas, quiet areas, hospitals, schools and other noise sensitive buildings and areas. The Directive is commonly known as the Environmental Noise Directive (END) and seeks action to manage noise impacts in priority areas through Noise Action Plans. The objectives of the END relate to the assessment and management of environmental noise, and are highlighted in Article 1:

4. "The aim of this Directive shall be to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. To that end, the following shall be implemented progressively:

   (a) the determination of exposure to environmental noise, through noise mapping, by methods of assessment common to the Member States;

   (b) ensuring that information on environmental noise and its effects is made available to the public;

   (c) adoption of action plans by the Member States, based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.
5. This Directive shall also aim at providing a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft, outdoor and industrial equipment and mobile machinery".

The END sets out how noise levels from each source affecting identified receptors should be assessed and reported. The directive also sets out in Article 8 and Annex V the information which should be reported in Noise Action Plans. Annex V specifies that Noise Action Plans must include the following elements:

- A description of the agglomeration, the major roads, the major railways or major airports and other noise sources taken into account,
- The authority responsible,
- The legal context,
- Any limit values in place in accordance with Article 5,
- A summary of the results of the noise mapping,
- An evaluation of the estimated number of people exposed to noise, identification of problems and situations that need to be improved,
- A record of the public consultations organised in accordance with Article 8(7),
- Any noise-reduction measures already in force and any projects in preparation,
- Actions which the competent authorities intend to take in the next five years, including any measures to preserve quiet areas,
- Long-term strategy,
- Financial information (if available): budgets, cost-effectiveness assessment, cost-benefit assessment,
- Provisions envisaged for evaluating the implementation and the results of the action plan.

Annex V also states that each Noise Action Plan should contain estimates in terms of the reduction of the number of people affected (annoyed, sleep disturbed, or other).

Airports that are required to produce a Noise Action Plan as those that are a “major airport” or are located in agglomerations with more than 250,000 inhabitants. Plans for agglomerations are also required to protect quiet areas against an increase in noise.

A further key requirement is that the public is consulted about proposals for action plans, given early and effective opportunities to participate in the preparation and review of the action plans, that the results of that participation are taken into account and that the public is informed on the decisions taken.

The United Kingdom governments implemented the END through the Environmental Noise (England, Scotland, Northern Ireland and Wales) Regulations 2006. These regulations set out requirements for how to prepare noise action plans, including for aviation noise.

Three implementation and evaluation reviews of European Directive 2002/49/EC have been carried out, covering a number of topics including; legislative transposition, review of the strategic mapping, noise action plans, noise limits and targets. The Directive's objectives were found to remain relevant for policy needs. However, action planning has been delayed in many member states. The language used in the Directive and the subsequent interpretations of different competent authorities is considered below.

3.2.3 Defra Guidance: A Response to the Regulations

In March 2009, following the implementation of the END via the 2006 Regulations, Defra published guidance for airport operators in advance of the second round of Noise Action Plans. The document ‘Guidance for Airport Operators to produce airport noise action plans under the terms of the Environmental Noise (England) Regulations 2006 (as amended)’ [3] introduced the format structure for airport Noise Action Plans that remain familiar, with the aims of the END at its core including Article 1(c) and Annex V.

In February 2013 and July 2013, updated guidance documents were issued in Northern Ireland (Department of the Environment) and England (Defra) respectively [24] [4]. These documents incorporated updates from the Aviation Policy Framework (2013) [8] and, in England, the Noise Policy Statement for England (2010) [12]. Updated guidance was provided for new and existing Noise Action Plans.

In July 2017, updated guidance was issued in England by Defra [5]. This document still referenced the END in the immediate aftermath of Brexit. The guidance was weighted towards the updating of existing Noise Action Plans rather than creating new ones.

In England, the Defra guidelines were revised once more in September 2022 [6] to incorporate changes ahead of the Round 4 Noise Action Plan submissions. This document permitted airports to use alternative data than the strategic noise maps for their action planning, as the 2021 flight patterns used for the strategic mapping were considered likely to be affected by the COVID-19 pandemic. The 2022 document also placed more emphasis on consultation than the previous iteration and omits reference to Article 1(c) and Annex V of the END. A similar set of guidelines was issued by the Scottish Government in April 2024 [25].

3.2.4 National Policies and Guidance Relevant to Aviation Noise

There are further noise-related policies relevant to aviation alongside the END and Environmental Noise Regulations 2006 (as amended). In 2010, the Noise Policy Statement for England (NPSE) was published [12]. This policy sets out the Government’s aim: to avoid significant adverse impacts on health and quality of life; mitigate and minimise adverse impacts on health and quality of life; and where possible, contribute to the improvement of health and quality of life. Decisions on noise should be made in the context of sustainable development. It also advocates for the use of lowest observed adverse effect levels (LOAELs) and significant observed adverse effect levels (SOAELs) as a basis for assessing noise impacts to health. There is no direct NPSE equivalent for Wales and Scotland.

The Civil Aviation Act 2012 [10] sets out a general objective for environmental effects "…take reasonable measures to reduce, control or mitigate the adverse environmental effects…". This objective is reflected with a noise context in the Aviation Policy Framework 2013 [8] where the overall objective is "to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise", which is described as consistent with NPSE.

In 2013 the Government published its Transport Appraisal Guidance (TAG) with guidance how to monetise health impacts from aircraft noise. The NPPF and TAG guidance are updated regularly, with the latest NPPF version published in 2025 and the latest TAG version published in 2024.

In 2014, the Government produced Guidance to CAA on Environmental Objectives. This added the context of the National Planning Policy Framework (NPPF) to the mix of policies to be considered. The NPPF identifies that developments should not contribute to unacceptable levels of noise pollution. In 2015 the Government published the Airports Commission final report: noise. This added the context of the World Health Organisation (WHO) Night Noise (2009) [16], WHO 1999 Community Guidelines [15], and Building Bulletin 93 to the mix of policies to be considered. The WHO documents set out recommendations for protecting human health from exposure to environmental noise hazards. Building Bulletin 93 sets out more information about how noise affects educational establishments. In 2018 the WHO published updated guidelines with specific advice for aircraft noise [17].

3.3 Policy Timeline

This project considers noise action plans made over a 15-year period. During this time there have been many changes to relevant policy. To assist in understanding the policy context informing each round of noise mapping, timelines of the relevant policy changes are given. This sets out the dates when key policies were published in the context of the noise mapping rounds.

Table 3-1: Policy Timeline

Era	Date	Policy
Pre - END	2001	ICAO Assembly developed the principle of the 'Balanced Approach' to aircraft noise management as a coherent method to address aircraft noise
	2001	ACARE Vision 2020: [21] Reducing noise by an average of 10 dB per aircraft operation (departure or landing), taking into account technology benefits as well as operational improvements
	2002	Directive 2002/30/EC on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Community airports EU adopts the balanced approach
END	2002	Environmental Noise Directive, 2002/49/EC
Round 1 production	2003	Aerodromes (Noise Restrictions) (Rules and Procedures) Regulations 2003 [19] Implements 2002/30/EC in UK law
Round 1 production	2006	Environmental Noise Regulations 2006 (as amended) for England and the devolved administrations Implements 2002/49/EC in UK law
Round 1 active	2008	The second edition of the of the Guidance on the Balanced Approach to Aircraft Noise Management was published and more detailed guidance was provided [9].
Round 1 active	2009	WHO publishes Night Noise Guidelines for Europe [16]

Era	Date	Policy
Round 1 active	2010	Noise Policy Statement for England [12]
Round 2 production	2012	National Planning Policy Framework
		European Commission publishes Flightpath 2050 [23] Target for 2050 that the perceived noise emission of flying aircraft is reduced by 65% relative to the capabilities of typical new aircraft in 2000.
		Civil Aviation Act 2012 [10]
Round 2 production	2013	Aviation Policy Framework [8]
		Defra guidance for Round 2
		Transport Appraisal Guidance first published, updates regularly thereafter (roughly annually) [14]
Round 2 active	2014	DfT publishes Guidance to CAA on Environmental Objectives [26]. Brings together noise and aviation policies, and advises on airspace, noise preferential routes, respite and navigational measures
		Regulation (EU) No 598/2014 - the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC [18] “Noise-related operating restrictions should be introduced only when other Balanced Approach measures are not sufficient to attain the specific noise abatement objectives”
Round 2 active	2015	Airports Commission publishes its final report reviewing airport expansion proposals at Heathrow and Gatwick [27] [28].
Round 3 production	2017	Defra guidance for Round 3
		DfT publishes Air Navigation Guidance 2017 (updates 2014 document to reflect policy updates and consultation outcomes) [29]
Round 3 production	2018	WHO Environmental Noise Guidelines [17]
		Airports (Noise-related Operating Restrictions) (England and Wales) Regulations 2018 [20] Implements EU Regulation 598/2014.
		Environmental Noise (England) (Amendment) Regulations 2018 [30]
		National Planning Policy Framework updated
Round 3 active	2019	National Planning Policy Framework updated
		Airports (Noise-related Operating Restrictions) (Scotland) Regulations 2019 Implements EU Regulation 598/2014.
Round 3 active	2020	Vision 2020 target. COVID 19 pandemic
Round 3 active	2021	European Commission publishes Zero Pollution Action Plan, part of the Green New Deal [22] Reduce the share of people chronically disturbed by transportation noise by 30% relative to 2017 levels by 2030
		National Planning Policy Framework updated

Era	Date	Policy
Round 4 production	2022	Defra guidance for Round 4
		Flightpath to the future - a strategic framework for the future of aviation, focusing on the next 10 years [31] Focus on sustainability, 'Jet Zero'. Echoes the aspirations of Flightpath 2050.
		Jet Zero Strategy – delivering net zero aviation by 2050 [32] 65% perceived noise reduction per aircraft by 2050, relative to 2000 Fuel efficiency targeted and airspace modernisation programme to 2040 outlined
Round 4 production	2023	National Planning Policy Framework updated twice (September and December) [33]
Round 4 production	2024	Scottish guidance for airport operators developing Noise Action Plans published
Post Round 4 production	2024	National Planning Policy Framework updated (December) [34]
Post Round 4 production	2025	National Planning Policy Framework updated (February) [35]

3.4 Outcomes

The relevant international regulations, European Regulations and UK Regulations described above have been reviewed. The objectives of these Regulations are similar to each other, seeking to reduce aviation noise levels where possible and manage noise impact to an appropriate level where reduction is not possible. The most pertaining UK Regulation at present is the Overarching Aviation Noise Policy [13] which consists of the following two statements:

- "The government's overall policy on aviation noise is to balance the economic and consumer benefits of aviation against their social and health implications in line with the International Civil Aviation Organisation's Balanced Approach to Aircraft Noise Management. This should take into account the local and national context of both passenger and freight operations, and recognise the additional health impacts of night flights."
- "The impact of aviation noise must be mitigated as much as is practicable and realistic to do so, limiting, and where possible reducing, the total adverse impacts on health and quality of life from aviation noise."

The European Noise Directive sets its objective in 2002 as to "define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise". This approach is informed by the historical aim of reducing environmental noise, as per item (2) of the preamble of the Directive. The UK government has opted to produce strategic noise maps and subsequent action plans to achieve the overarching objectives of the END. The legislative context for the devolved administrations is set out in separate regulations for England and Wales, Scotland, and Northern Ireland.

Reducing aviation noise impact can involve many aspects such as; aircraft types, noise mapping results, airport noise restrictions, noise management approaches, and the context of nearby agglomerations, affected people and quiet areas. The situation at each airport is likely to be unique, and Noise Action Plans are expected to differ between airports to account for their situations.

In order to ensure that Noise Action Plans capture and present the most relevant information in a consistent format to meet the regulations, Defra published guidance to help competent authorities prepare and revise action plans. However, even with this guidance, differences between the Noise Action Plans prepared by airports may be greater than expected from their unique situations.

The emerging questions from the review are built around the following themes:

- Reasons for differences in the interpretation of noise policy or guidance;
- Consistency on the quality and level of detail provided in the action plans; and
- Gaps between public consultation/engagement and the resulting effects of action plans on communities.

These themes have been taken forward in the development of research questions for the project.

4. Research Questions

This section details the agreed set of research questions selected to appraise the Noise Action Plans and supporting guidance for airport operators. The research questions, individually and collectively, are used to obtain qualitative data to address the project's objectives.

4.1 Production of Noise Action Plans

A total of 18 research questions are used in this project to review the process of producing Noise Action Plans for aviation noise. The role of the Defra guidance in supporting the airport operators with developing their Noise Action Plans is considered separately in Section 4.5.

The research questions are centred on three core sub-topics: legislative and regulatory requirements, the development and approval process, and the consultation aspect of Noise Action Plan development. The research questions for each of these sub-topics are shown in Table 4-1, Table 4-2, and Table 4-3.

Table 4-1: Legislative and Regulatory Requirements

ID	Research Question
Q1	Does the regulatory framework prevent/hinder/constrain airports from taking action to reduce noise?
Q2	Does the Noise Action Plan clearly identify the most important areas exposed to aviation noise and the noise problems?
Q3	Do the Noise Action Plans meet the requirements set out in the Environmental Noise Regulations, including to avoid, prevent or reduce the harmful effects of exposure to environmental noise and preserve good quality areas?
Q4	Does the Noise Action Plan describe how it fulfils the Aviation Policy Framework and related guidance?
Q5	Does the Noise Action Plan contain the information stated in Annex V of the Environmental Noise Directive?

Table 4-2: Development of Noise Action Plans

ID	Research Question
Q6	What are the roles and responsibilities of the airlines and local authorities in the development and implementation of the Noise Action Plan?
Q7	Does the Noise Action Plan describe how the measures and actions have been selected?
Q8	Does the Noise Action Plan explain why measures were not selected or included?
Q9	Do Noise Action Plans take account of current guidance, planning, and local planning?
Q10	Are there any inter-airport consultations on Noise Action Plan development or to share measures / lessons learned?
Q11	Is the timeframe of the Rounds realistic and useful?
Q12	What is the legal compliance or 'pass criteria' for Noise Action Plans to be adopted?

Table 4-3: Stakeholder Engagement and Consultation

ID	Research Question
Q13	What are the stakeholder views (community, airlines, local authorities) on the ease of responding to consultations?
Q14	How often is the community consulted during the Noise Action Plan development?
Q15	What is the quality of consultations and level of inputs received?
Q16	To what extent does feedback from consultation result in changes to draft proposals?
Q17	Is the level of stakeholder engagement consistent between noise action planning rounds and airports? And if not, does this affect the perceptions of stakeholders?
Q18	Is the language and presentation of the Noise Action Plans understandable to the general public?

4.2 Actions and Measures within Noise Action Plans

A total of 16 research questions are used in this project to review the actions and measures in the airport Noise Action Plans. The role of the Defra guidance in supporting the airport operators with selecting and implementing actions and measures is considered separately in Section 4.5.

The research questions are centred on three core sub-topics: the control measures and their success criteria, the implementation of the Noise Action Plan's actions and measures, and regimes for monitoring and enforcing the Noise Action Plan. The research questions for each of these sub-topics are shown in Table 4-4, Table 4-5, and Table 4-6.

Table 4-4: Control Measures

ID	Research Question
Q19	What measures and actions are included in the Noise Action Plan?
Q20	Are the measures proportionate to the size of the airport and its air traffic volume?
Q21	Does the measure clearly state the success criteria or key performance indicator to be achieved?
Q22	Are the measures, actions and their target success criteria ambitious enough?

Table 4-5: Implementation

ID	Research Question
Q23	How are the Noise Action Plan measures actioned (e.g. contractual)?
Q24	How are measures prioritised for implementation?
Q25	To what extent do community perceptions influence the selection or prioritisation of measures?
Q26	How are stakeholders informed of progress in implementing and achieving the Noise Action Plan measures? How often?
Q27	What obstacles or constraints are preventing the measures and actions from being fully implemented or from realising their full benefits?

Table 4-6: Monitoring and Enforcement

ID	Research Question
Q28	How are the Noise Action Plan measures monitored and by whom?
Q29	If airports produce noise contours annually, how are these used to track progress and inform measures in the Noise Action Plan?
Q30	How are less-effective measures changed over time?
Q31	How are Noise Action Plan measures enforced, including any noise limits or restrictions?
Q32	What are the consequences if the measure is not effective or implemented?
Q33	Are there any penalties for not meeting the objectives of the Noise Action Plan? If so, who incurs the penalties?
Q34	How are complaints analysed to monitor noise issues?

4.3 Consistency

Some additional questions on consistency are included in the other sets of research questions where it is more appropriate to do so. A total of seven research questions are used in this project to review how consistent the Noise Action Plans are.

The consistency research questions are focussed on three core sub-topics: comparisons between airports and noise action planning rounds, legislative and policy requirements, and control measures. The research questions for each of these sub-topics are shown in Table 4-7, Table 4-8, and Table 4-9.

Table 4-7: Comparison Between Airports and Noise Action Planning Rounds

ID	Research Question
Q35	Is the quality, content and detail in the Noise Action Plans consistent from year to year (Round 2 through to Round 4) and between airports?
Q36	Are the noise contours used for Noise Action Plan development consistent between airports and Noise Action Plan periods?
Q37	Are there differences between airports and Noise Action Plan periods in the use of complaint data to develop actions and monitor success?

Table 4-8: Legislative and Policy Requirements

ID	Research Question
Q38	Has the noise policy objective been interpreted consistently by the airports?
Q39	Are the stated controls and strategies in the Noise Action Plans consistent with the Defra guidance and wider policy aims?

Table 4-9: Control Measures

ID	Research Question
Q40	Are night-time (23:00 to 07:00) aircraft movements appraised and managed consistently?
Q41	Is there consistency on the approach to control measures with changes in demand for aircraft?

4.4 Effectiveness

A total of 29 research questions are used in this project to review the effectiveness of airport Noise Action Plans.

The research questions are centred on six core sub-topics: noise changes, noise impacts, monitoring and performance, additional considerations, and comparisons with non-airport Noise Action Plans. The research questions for each of these sub-topics are shown in Table 4-10 to Table 4-14.

Table 4-10: Noise Changes

ID	Research Question
Q42	Does the Noise Action Plan describe how noise has changed since the previous one?
Q43	Do the airports describe reasons for changes in populations exposed to noise levels?
Q44	Are changes in population exposure able to be linked to specific Noise Action Plan measures or other things?
Q45	Are changes in noise reliant on changed behaviours?
Q46	Are perceptions of changes in noise from the local community described?

Table 4-11: Noise Impacts

ID	Research Question
Q47	Has implementation led to better outcomes on noise impacts and other relevant issues?
Q48	Have significant or adverse noise effects been reduced?
Q49	Have noise impacts improved over time, taking into account air traffic volumes?

Table 4-12: Monitoring and Performance

ID	Research Question
Q50	Are there some good examples of monitoring compliance and progress?
Q51	Are additional noise metrics outside those used for Strategic Noise Mapping used to track the effectiveness of the Noise Action Plan measures?
Q52	How does the use of different metrics help achieve the intended objectives of the Regulations?
Q53	Where controls remain in place between plans, is there evidence of longitudinal effectiveness?
Q54	Which control measures are used to meet the requirements of the ICAO Balanced Approach, Aviation Policy Framework and Designated Airports (where applicable)?
Q55	Is there a difference in effectiveness between measures developed for the Noise Action Plan process and those developed to meet wider policy requirements?

ID	Research Question
Q56	Have Noise Action Plans helped in increasing awareness about noise impacts?
Q57	Are all of the measures within the Noise Action Plan implemented and do they achieve their stated success criteria?
Q58	If non-standard or innovative measures are used in the Noise Action Plan, are they effective?

Table 4-13: Additional Considerations

ID	Research Question
Q59	Are all socio-economic groups treated equally in the development of the Noise Action Plan?
Q60	Are the airports and Noise Action Plans consistent on how their actions are considered with respect to the socio-economic aspect of aviation?
Q61	Are changes to health effects in the most important areas monitored?
Q62	How are TAG outcomes from strategic noise mapping used to inform the Noise Action Plan measures and track improvements?
Q63	Are the most recent Noise Action Plans consistent in their approach for sustainable strategies/decisions?
Q64	How is the effectiveness of the action plan or controls within the plan being measured?
Q65	Have the plans, the plans process or specific measures led to better relationships with local communities?
Q66	What are the limitations of the Noise Action Plans?
Q67	What are the successes of the Noise Action Plans?
Q68	Is there any extra support that airports need to develop and adopt the Noise Action Plan?

Table 4-14: Non-airport Noise Action Plans

ID	Research Question
Q69	Are airport Noise Action Plans substantially different from the road/rail/industry ones?
Q70	Do the differences affect the quality and effectiveness of the Noise Action Plan?

4.5 Defra Guidance

A total of 12 research questions are used in this project to review the Defra guidance for airport operators on Noise Action Plans.

The research questions are centred on three core sub-topics: clarity of the guidance, content of the guidance, and how the guidance compares with similar guidance for airports located outside of England. The research questions for each of these sub-topics are shown in Table 4-15 to Table 4-17.

Table 4-15: Clarity of the Defra Guidance

ID	Research Question
Q71	Is the language in the Defra guidance clear and unambiguous?
Q72	Does the Defra guidance clarify how the legislative requirements should be interpreted?
Q73	Is the Defra guidance interpreted differently by different airports?

Table 4-16: Content of the Defra Guidance

ID	Research Question
Q74	Is the Defra guidance appropriate for all airport types requiring a Noise Action Plan?
Q75	The original guidance focuses on noise preferential routes - did this put other measures at a lower priority?
Q76	Does the guidance's emphasis on Directive Annex V more than Directive Article 1(c) lead to inconsistency or non-compliance?
Q77	Should the guidance be explicit about the 57 dB onset of significant effects from the Aviation Policy Framework?
Q78	Should the guidance give clarity on the level of cost benefit analysis required for actions?
Q79	What are the limitations of the Defra guidance in supporting the production and implementation of Noise Action Plans?

Table 4-17: Equivalent Guidance for non-England Airports

ID	Research Question
Q80	Is there consistency between the Defra guidance and the approach of the devolved administration airports considered in this study?
Q81	What is working well / not so well in comparison?
Q82	How have non-England devolved authorities developed Noise Action Plans if there is no guidance equivalent to that produced by Defra?

5. Description of the Airports

This section provides contextual information on the airports assessed in this review, to highlight differences in size, scale of operations and how the airports are used and to give an insight into the proportionality of approaches used to manage aviation noise.

5.1 Designated Airports

A designated airport is one that has operational restrictions for noise reasons under the Civil Aviation Act 1982 [36]. Two designated airports are included in this study – Heathrow and Gatwick.

5.1.1 London Heathrow

Heathrow Airport is located in the South East, approximately 21 km (13 miles) west of the city of London. A mixture of suburban housing and business premises surround the airport, including those located at Harmondsworth, Longford, Sipson, Stanwell Moor, Stanwell, Feltham and Hounslow. Some infrastructure and areas of open land are located adjacent to the airport's boundary, which include three large reservoirs to the west, two motorways (the M25 and M4), and railway links.

Heathrow Airport has two runways, four passenger terminals and a cargo terminal with two aprons. According to the Round 4 Noise Action Plan, it handled just under 478,000 aircraft movements and around 80.9 million passengers at its peak in 2019 [37]. In 2023, there were just over 456,600 aircraft movements [38], serving 79.2 million passengers [39] and 1.43 million tonnes of cargo [40].

The airport is subject to an annual cap of 480,000 air transport movements and uses voluntary agreements to avoid flights arriving in the early hours before 4.30 am. It is seeking to expand in the future, which would be facilitated by using a third runway to be consented using a Development Consent Order.

5.1.2 London Gatwick

Gatwick Airport is located in the South East, approximately 2 miles (3 km) north of Crawley and 28 miles (45 km) south of London. The immediate area around the airport is sparsely populated, with the closest population centres at Crawley and Horley.

It is the UK's second largest airport, accommodating 47 million passengers and just under 285,000 aircraft movements in 2019 (257,000 aircraft movements in 2023) [41]. The airport operates 24 hours a day all year round. A mixture of scheduled, charter and low-cost airlines operate at the airport, providing travel to a range of short-haul and long-haul destinations. Gatwick Airport also provides cargo services, handling approximately 150,000 tonnes in 2019 [42]. The airport has two parallel runways – a 'main' runway that located to the south, and a northern 'standby' runway [43]. Night-time aircraft movements take place at Gatwick Airport, although these are restricted in accordance with Government requirements for Designated Airports.

The airport is seeking to grow and increase capacity by bringing the northern runway into routine use, which would allow growth in long haul connectivity and the annual cargo throughput to reach 380,000 tonnes by 2038 [42]. To accommodate this growth, the airport is extending Pier 6 to provide 8 new gates, extending hangar 9 (maintenance facility), and installing a rapid exit taxiway [43].

5.2 Non-Designated Airports

5.2.1 London Southend

London Southend Airport is located in the South East, between Southend-on-Sea and Rochford. Rayleigh is located to the west of the airport, and the Thames Estuary to the south of Southend-on-Sea. It is 35 miles (56 km) from London. Flights for passengers and freight take place at the airport.

In 2019, the airport served over 2 million passengers and used approximately 36,000 aircraft movements (31,500 aircraft movements in 2023) for passengers and freight. No passenger flights are permitted at night unless they are delayed or diverted, but 90 passenger flight arrivals each month can be scheduled between 23:00 and 23:30 [44].

The airport has one runway and as part of a planning application to extend it, the airport is subject to a section 106 agreement which imposes an annual cap of 53,300 air traffic movements. There is a further annual limit on dedicated cargo movements of 5,330 per annum (or 10% of the total number of air traffic movements) and a limit upon Boeing 737-300 aircraft of 2,150 per annum [44].

London Southend Airport is seeking to increase its current number of air traffic movements to operate at maximum capacity within the constraints of its section 106 agreement.

5.2.2 East Midlands

East Midlands Airport is located in north west Leicestershire, approximately 13 km from Derby and Nottingham. The area around the airport is largely rural in character, with villages such as Kegworth, Castle Donington and Melbourne close by. It is part of the East Midlands Freeport.

The airport has one runway and provides flights to Europe and North America using a mixture of low-cost airlines, charter and scheduled flights for 4.9 million passengers in 2019. It is also a nationally significant cargo airport, providing the UK's largest express air cargo services and is a base for three freight operators and Royal Mail. Demand for cargo flights increased during the pandemic to accommodate 400,155 tonnes of freight and mail in 2022. The total number of aircraft movements was just under 75,600 in 2019 [41] and 66,200 in 2023 [38].

East Midlands Airport is operational 24 hours daily all year round, with 55% of aircraft movements taking place during the day and 45% at night during 2022. These encompassed passenger flights, cargo, training, and general aviation use [45]. The airport anticipates significant long-term growth to accommodate 10 million passengers and 1 million tonnes of cargo per year.

5.2.3 Leeds Bradford

Leeds Bradford Airport is in West Yorkshire and is positioned 8 miles northwest of Leeds City Centre and 7 miles northeast of Bradford. The immediate areas surrounding the airport include the small towns and villages of Guisely, Menston, Burley-in-Wharfdale, Horsforth, Cookridge, Carlton, Bramhope, Yeadon and Otley.

The airport is operational 24 hours daily all year round and has a mixture of daytime and night-time flights, which served approximately 4 million passengers in 2023. The airport is targeting growth to accommodate 7 million passengers by 2030.

According to the CAA, just over 35,600 aircraft movements occurred during 2019 and 36,400 in 2023 [41] [38]. Although Leeds Bradford is not a major airport as defined in the Environmental Noise Directive, a Noise Action Plan is required due to the airport's proximity to the West Yorkshire Urban Area agglomeration. Night-time flights are

limited to quieter aircraft, with a maximum of 2,800 and 1,200 night-time flights permitted for the summer and winter seasons respectively, excluding delayed flights and emergency landings [46].

5.2.4 Manchester International Airport

Manchester International Airport is located 10 miles southwest of Manchester city centre and is surrounded by suburban housing to the north and east. The area to the southwest of the airport is mostly lightly populated countryside characterised by farming with some population centres. The noise-sensitive areas in the vicinity of the airport that are identified in the Round 4 Noise Action Plan include the village of Styal, Quarry Bank Mill and Styal Estate (National Trust), Wilmslow, Alderley Edge, and the suburbs of Hale and Hale Barns. The M56 motorway is located towards the northwest boundary of the airport [47].

Manchester International Airport is the UK's third busiest airport and the largest outside of the South East. It provides scheduled and charter passenger flights to destinations in Europe, the Middle East and North America, serving 29 million passengers in 2019. The airport also has express cargo and air-freight flights and a small number of general aviation flights including helicopter operations.

The airport is operational 24 hours daily all year round and has two parallel runways. The total number of air movements in 2019 was approximately 203,000 [41] and 181,000 in 2023 [47]. The airport has recently completed extensions to Terminal 2 and can grow its capacity for medium and long-haul flights.

5.2.5 Edinburgh Airport

Edinburgh Airport is located in Scotland, approximately 13 km west of Edinburgh City Centre. It is bounded to the north by the River Almond, to the west by the M9 and to the east by the Edinburgh-Fife rail mainline. The Royal Highland Showground lies to the south of the site, where land is allocated for new city neighbourhood. This new neighbourhood – West Edinburgh – will provide 14,000 new homes to the local area.

According to the Round 4 Noise Action Plan [48], 35 airlines operate at the airport, serving 14.7 million passengers in 2019 and 14.3 million passengers in 2023. Edinburgh Airport is forecasted to increase annual passenger volumes to 20 million by 2030. The airport has one runway and during the time period of interest for this project, air transport movements have increased from 98,000 in 2012 to 115,000 in 2023 [48].

Edinburgh Airport also provides Scotland's largest air cargo gateway, supporting the movement of 40,000 tonnes of cargo every year. Approximately 2 million freight and mail items are processed through Edinburgh Airport every week. No night-time curfews are in effect for cargo operations [49].

5.2.6 George Best Belfast City Airport

George Best Belfast City Airport is located in Northern Ireland at the south shore of Belfast Lough. It is adjacent to the A2 – one of the main arterial routes into Belfast. Residential properties are located to the south and east of the airport towards Belfast City Centre. Belfast Lough and the Belfast Harbour Industrial Estate are sited to the north and west of the airport.

George Best Belfast City airport is a regional airport with one runway and its operations are focussed on offering short haul flights to destinations in the United Kingdom and some European cities. In 2019, the airport served 2.4 million passengers [50] and just under 35,400 aircraft movements took place [41]. Approximately 29,300 aircraft movements occurred in 2023 [38]. Although the airport does not have enough aircraft movements to be considered a major airport as defined in the Environmental Noise Directive and transposed legislation, the airport produces Noise Action Plans as it is located within the Belfast agglomeration.

The airport's scheduled operating hours are 06:30 to 21:30 with extensions for delayed aircraft permissible to 23:59 in exceptional circumstances. The Round 3 Noise Action Plan [51] indicates that the airport is subject to a planning agreement that limits the airport to no more than 48,000 air traffic movements in any 12 month period. Additionally, the planning agreement places restrictions on the aircraft that are permitted to operated based on their certified noise limits.

5.3 European Airports

5.3.1 Amsterdam Schiphol Airport

Amsterdam Schiphol Airport is located in The Netherlands, approximately 9 km south west from the city centre in the district of Haarlemmermeer. Several other residential areas are located close the boundary of the airport, including Haarlem, Vijfhuizen, Hoofddorf, Rozenburg, Aalsmeerderbrug, Oosteinde, Bovenkerk and Amstelveen.

The airport has one terminal and six runways, and is one of the busiest airports in Europe. A mixture of low-cost, scheduled and charter flights use the airport for a variety of domestic, European and long-haul destinations. However, it has high landing fees to deter low-cost airlines from using the airport. In the future, Amsterdam Schiphol intends to provide a new terminal and additional runways.

In 2019, 72 million passengers and 1.6 million tonnes of cargo passed through the airport, with 496,823 air transport movements taking place. Amsterdam Schiphol Airport is subject to a flight cap of 500,000 aircraft movements per year and has restrictions on night-time operations [52]. To reduce noise emissions, a more restrictive flight cap of 460,000 aircraft movements per year was proposed in November 2023 and is reflected in the Round 4 Noise Action Plan. Following complaints and legal action [53], the reduced flight cap was blocked by a court in May 2024 but was later repealed. By December 2024, a less onerous flight cap of 478,000 aircraft movements was proposed [54] and some of the airlines using Amsterdam Schiphol committed to renewing their fleet with quieter, lower emission aircraft.

5.3.2 Frankfurt am Main Airport

Frankfurt am Main Airport in Germany is the sixth largest European airport and is located 12 km southwest of Frankfurt city centre. It extends over the municipal areas of Frankfurt am Main, Rüsselsheim, Mörfelden-Walldorf, and Kestlerbach.

The airport has four runways and two terminals, with a third terminal due to open in 2026. In 2019, approximately 70.5 million passengers used the airport and 513,912 aircraft movements took place. As aviation began to recover after the pandemic in 2022, 48.9 million passengers and 2 million tonnes of cargo passed through the airport and 382,111 aircraft movements occurred. No night-time flights are permitted at Frankfurt am Main Airport (23:00 to 05:00) and no more than 133 scheduled aircraft movements can take place during shoulder periods each day (22:00 to 23:00, 05:00 to 06:00) [55].

As the fourth runway is now operational, the airport is starting to grow after having been at capacity for a number of years [56]. This growth encompasses both passenger and cargo flights. A new logistics hub is also planned to grow air freight volumes and expand handling facilities [57].

6. Overview of Outcomes

This section provides an overview of the information obtained by desktop review and questionnaire responses from the airport operators, ACCs and community stakeholders. The outcomes for each of the research questions are presented in Section 7 to Section 11.

6.1 Noise Action Plans Assessed

The airport Noise Action Plans that were successfully obtained and reviewed are shown in Table 6-1. A near full set (28/30) of Noise Action Plans was reviewed, with one Round 2 and one Round 4 Noise Action Plan omitted as they were unavailable. Nearly all of the Round 4 Noise Action Plans included a disclaimer that they were in draft form and had not yet been formally adopted.

Table 6-1: Reviewed Noise Action Plans

Airport	Round 2	Round 3	Round 4
London Heathrow [58] [59] [37] [60]	✔	✔	✔ (Draft)
London Gatwick [61] [62] [43]	✔	✔	✔ (Draft)
London Southend [63] [64] [44]	✔	✔	✔
East Midlands [65] [66] [45]	✔	✔	✔ (Draft)
Leeds Bradford [67] [68] [46]	✔	✔	✔ (Draft)
Manchester International [69] [70] [47]	✔	✔	✔ (Draft)
Edinburgh [71] [72] [48]	✔	✔	✔ (Draft)
George Best Belfast City [73] [51]	✔	✔ (Adopted 2024)	x
Amsterdam Schiphol [74] [75] [52]	✔	✔	✔
Frankfurt am Main [76] [77] [55]	✔ (Summary only)	✔	✔

Six non-airport Noise Action Plans for agglomerations [78] [79], roads [80] [81] and railways [82] [83] in England that were produced at Rounds 2 and 3 were also reviewed for comparative purposes. Round 4 Noise Action Plans were not available at the time of the review.

6.2 Questionnaire Responses

The response rate to the questionnaires issued to the selected airports, the corresponding ACCs and the community groups is provided in Table 6-2. In some instances, multiple responses were received from community groups for a particular airport. Where this occurred, the number of responses received is shown in brackets.

Table 6-2: Received Questionnaire Responses

Airport	Airports	ACCs	Other Community Groups
London Heathrow	✔	✔	x
London Gatwick	✔	✔	✔ (2)
London Southend	✔	✔	x
East Midlands	✔	✔	✔ (4)
Leeds Bradford	✔	x	✔
Manchester International	✔	✔	✔
Edinburgh	✔	✔	x
George Best Belfast City	x	x	✔
Amsterdam Schiphol	✔	x	N/A
Frankfurt am Main	x	✔	N/A

Table 6-2 shows that eight of the ten airports responded to the questionnaire, covering a mixture of airports located in England, devolved administrations and the EU. The airport respondents also cover a range of airport contexts, including a designated airport, different scales of operations, and different proportions of day/night flights and passenger/freight flights.

Questionnaire responses were received from seven ACCs and nine community groups, corresponding to eight of the selected airports altogether. No community groups for Amsterdam Schiphol and Frankfurt am Main were approached for this study.

6.3 Guidance for Airport Operators

Four iterations of guidance for airport operators produced by Defra were identified and assessed, which were published in 2009, 2013, 2017 and 2022 [3] [4] [5] [6]. Table 6-3 shows the guidance documents that were identified and assessed for the airports in devolved administrations.

Table 6-3: Guidance for Airports in Devolved Administrations

Territory	Guidance document
Northern Ireland	'Noise Mapping and Action Planning Technical Guidance – Noise from Airports', *Department of the Environment* (2013) [24]
Scotland	'Airport Noise Action Plans - Guidance to Airport Operators on how to prepare or revise Noise Action Plans under the Environmental Noise (Scotland) Regulations 2006 (as amended)', *Scottish Government* (2024) [25]

No additional guidance for the devolved administrations for other noise action planning rounds was identified.

Equivalent guidance was unavailable for the EU-based airports considered for this project. Through the questionnaire responses received from Amsterdam Schiphol airport, it was confirmed that no equivalent guidance exists for the Netherlands. No equivalent guidance was identified that is used by Frankfurt airport. As the Noise Action Plan for Frankfurt is produced by the local government, it is considered that the Noise Action Plans refer directly to the Environmental Noise Directive to draft the Plan without additional supporting guidance. However, as Frankfurt airport did not respond to the questionnaire, the existence of equivalent guidance could not be confirmed.

7. Noise Action Plan Production

This section collates the results to research questions covering the production of Noise Action Plans. The results are based on information obtained by desktop review of the plans and questionnaire responses from the airport operators, ACCs and community stakeholders.

7.1 Legislative and Regulatory Requirements

Q1: Does the regulatory framework help, hinder or constrain airports from taking action to reduce noise?

Noise Action Plans across all airports and rounds agree that the regulatory framework helps the airport to take action to reduce noise. This includes the compliance with the ICAO balanced approach, national policy frameworks and environmental noise regulations. The multitude of regulations at international, national, and local levels can create a complex environment for implementing noise reduction measures.

None of the Noise Action Plans explicitly state that the regulatory framework hinders or constrains the airport from taking action to reduce noise. However, one may infer that the current landscape can be cumbersome to navigate. For example, as per Heathrow's draft Round 4 submission:

"In line with the principles of the ICAO Balanced Approach, we agree that restrictions should not be considered as a first resort, and we are committed to developing voluntary measures through collaborative approaches. These can be quicker to implement and more effective."

"We will also continue to press the Government to provide more detailed guidance on planning around airports, and to restrict noise sensitive development in high noise areas."

Restrictions on planning and development can limit the ability of airports to implement certain noise reduction measures. Feedback received from the airport operators highlights that many new measures are required to go through a multiple stage approval, which slows down the implementation process. Manchester has echoed Heathrow's concerns on planning permissions being granted close to their premises. Manchester has provided feedback expressing that measures designed to prevent the strategic spread of noise contours can be rendered null if planning consent is granted in proximity to their premises.

When consulting airport operators, the most common opinions were that the regulatory framework helps empower the airports to take action to reduce noise. Most airports stated they did not feel the regulatory framework hindered the airports' ability to take action to reduce noise.

Q2: Does the Noise Action Plan clearly identify the most important areas exposed to aviation noise and the noise problems?

All Noise Action Plans identified the most important areas exposed to aviation noise. This is commonly undertaken through the production of noise contour maps to demonstrate the noise impact of aviation upon the surrounding area. Production of noise contour maps as part of the noise action planning process is a requirement of the END and Environmental Noise Regulations.

24 of the 28 Noise Action Plans also identified the most important areas using community feedback, such as complaints data and location evaluation. Manchester Airport did not use community feedback or location evaluation in its Round 2 or Round 4 Noise Action Plans when identifying most important areas exposed to aviation noise, nor did East Midlands Round 3 and Leeds Bradford Round 4.

22 of the 28 Noise Action Plans identified the specific type of noise issues that were/are affecting the important areas. George Best Belfast City did not mention the specific type of noise issue in either of the Noise Action Plans, whilst Southend only mentioned the specific type of noise issue in their Round 4 Noise Action Plan. Furthermore, Frankfurt only made mention of the specific type of noise issue in their Round 2 Noise Action Plan. Furthermore, Manchester only mentioned the specific type of noise issue in their Round 3 Noise Action Plan, Leeds Bradford did not mention the specific type of noise in their Round 4 Plan nor did East Midlands in their Round 3.

Q3: Do the Noise Action Plans meet the requirements set out in the Environmental Noise Regulations, including to avoid, prevent or reduce the harmful effects of exposure to environmental noise and preserve good quality areas?

All Noise Action Plans include measures to reduce the harmful effects of exposure to environmental noise. A common measure utilised to reduce harmful effects is the implementation of insulation schemes for homes deemed to be within a certain noise level boundary; the insulation scheme can include additional window glazing or loft insulation.

25 of 28 Noise Action Plans take steps to avoid and prevent the harmful effects of exposure to environmental noise. The most frequently reported measure used to avoid the harmful effects of noise exposure is the alteration of flight operations, such as continuous flight descent, or limited landing/take-off flight paths. A common example of a measure used to prevent the harmful effects of exposure to environmental noise is the use of night-time flight restrictions and penalties for airlines when they do not comply. The Round 2 Noise Action Plans were found to be the weakest of the three noise action planning rounds for referring to the avoidance or prevention the harmful effects of noise exposure. The Round 2 Noise Action Plans for Edinburgh, George Best Belfast City and Amsterdam Schiphol do not address the avoidance of harmful effects of exposure to environmental noise, and the Round 2 Plans for Edinburgh, George Best Belfast City and East Midlands do not mention the prevention of harmful effects of exposure to environmental noise.

All Noise Action Plans mention the preservation of good quality areas apart from George Best Belfast City (Round 2), Leeds Bradford (Round 2) and Edinburgh (Round 4), which do not mention the subject. For example, preservation of good quality areas is seen at Heathrow through consistent correspondence with local authorities and community groups to develop plans to protect the areas once they are defined.

Q4: Does the Noise Action Plan describe how it fulfils the Aviation Policy Framework and related guidance?

All UK based Noise Action Plans describe how they fulfil the Aviation Policy Framework and related guidance apart from the Manchester Round 2 which only has a small mention of the guidance and how it is fulfilled.

All Noise Action Plans include noise reduction strategies and measures to ensure they meet the Aviation Policy Framework objective to limit, and, where possible, reduce the number of people in the UK significantly affected by aircraft noise. A common measure, (found in Manchester Round 4 Noise Action Plan) is the use of quieter aircraft and phasing out older models. Another key factor to adhering to the Aviation Policy Framework is collaboration and transparency with the stakeholders, this ensures a good relationship between the airport and the residents in the surrounding area.

Q5: Does the Noise Action Plan contain the information stated in Annex V of the Environmental Noise Directive?

The relevant governmental bodies for England, Scotland and Northern Ireland have produced and revised guidance on how to incorporate the (former) requirements of the END on environmental noise into national law. The latest guidance for England and Scotland (issued since Brexit) omits references to Annex V and its parent EU Directive, but the substantive content of Annex V and Article 1(c) remains in place via parent legislation.

The Noise Action Plans have several commonalities relating to Annex V, irrespective of the authoring body and Round:

- Specific reference to 'Regulation 18' of the Environmental Noise Regulations is not made. It states that a Noise Action Plan for aviation is required for 'major airports' that have 50,000 or more air movements per year or alternatively if a non-designated airport has aircraft noise resulting in an L_{den} value of 55 dB(A) or greater or an L_{night} value of 50 dB(A) or greater anywhere in an agglomeration. This means that it isn't always obvious which of these reasons led the airport to create a Noise Action Plan to fulfil requirements under the Environmental Noise Regulations.
- With the exception of George Best Belfast City Airport (Round 3), no UK Noise Action Plans state that 'quiet areas' are near to or within their neighbouring agglomeration. Whilst 'quiet areas' are not prominent in England, the English Noise Action Plans could state that no 'quiet areas' are present to discharge this obligation of Annex V. Frankfurt (Round 3) also specifically namechecked its 'quiet areas'.
- With the exception of Southend (Round 3), each Noise Action Plan omits reference to the benefit of *all* the proposed measures contained within.
- Similarly, whilst monitoring regimes are discussed for several measures, they are not specified for every measure. A monitoring regime could mean noise measurements, but could also include a SMART objective (specific, measurable, achievable, relevant, and time-bound) or key performance indicator (KPI). Gatwick, Heathrow, and London Southend all incorporate some SMART objectives into their Round 4 Noise Action Plans.

The Noise Action Plans have several general trends in relation to Annex V:

- Whilst a description of the existing national framework is present, an explanation of how the airports have complied with the existing national framework is generally not present, particularly in Rounds 2 and 3. Notable exceptions to this include the Round 4 Noise Action Plans of Heathrow, Gatwick, East Midlands, and Edinburgh. A progression is observable across Rounds whereby an assessment of the national framework is more commonplace in Round 4.
- Whilst a description of the existing local framework is present, an assessment of the existing local framework is generally not present. East Midlands is noted as bucking this trend and delivering this.
- Generally, the costs of implementation for every measure in the Noise Action Plans is not considered or provided, although some airports provide this for some of their measures. For example, the Gatwick Round 4 Noise Action Plan offers costs breakdowns of thematically linked expenditure, but adopts umbrella terms such as "progressive activities not captured elsewhere in this table" to collate measures and expenditure. Similarly, the Manchester Round 4 Noise Action Plan collates into one expenditure "consultancy and research, including future noise contours, studies and support of industry collaboration initiatives such as Sustainable Aviation all research".
- No airports make explicit reference to the number of people that have an increased risk of health issues, such as ischaemic heart disease. Of the Round 4 Noise Action Plans that do mention health, content is usually confined to a discussion of the LOAEL/SOAEL with reference to the Government Airspace Policy threshold noise level values that have been issued since Round 3. The reader is typically invited to draw conclusions on health effects by combining noise contour population data with dB metrics established elsewhere in the document.
- A table that clearly shows changes in the number of people exposed to a health condition is absent from the Round 4 Noise Action Plans. For example, Gatwick's Round 4 Noise Action Plan identifies LOAEL/SOAEL but does not thematically connect SOAEL exceedances or contour bands with health impacts, but it does provide data to allow a comparison against LOAEL criteria to be made. Similarly, sleep disturbance effects are not discussed in relation to the affected populations at night-time (L_{night} contours). This means that the reader infers that the entirety of the affected population report is sleep disturbed without being able to identify how many people would be 'highly' sleep disturbed.

- The health effects of noise that are unrelated to air travel are also not generally discussed. Where this does occur, the remarks are typically introductory in nature to the issue of transport noise in general, for example London Southend (Round 4).
- It is not made clear in Noise Action Plans when the preservation or creation of quiet areas is the specific purpose of a Noise Action Plan measure.

An improved adherence to Annex V is observable in several areas over time. A progression can be seen between Round 2 and Round 4, whereby the information required by Annex V is almost uniformly present in the Round 4 Noise Action Plans in the following areas:

- Reference made to the protection of quiet areas, not the identification of quiet areas.
- Specificity around the timetable of each consultation stage.
- Estimates of the reduction in the number of people affected by the Noise Action Plan measures (as a whole).

A comparison of the Round 3 and Round 4 Noise Action Plans shows a similar progression towards adherence to Annex V between Rounds. A cost benefit analysis of the 'balanced approach' principles is typically not present across the Round 3 documents, nor are detailed breakdowns around noise sensitive premises other than dwellings made available. Conversely, the Round 4 submissions typically offer information for each of these points.

A comparison has been made relating to Annex V between the UK airports and the two European airports considered in this study The Noise Actions Plans of Amsterdam Schiphol and Frankfurt generally follow the trends described above; however the Round 4 Noise Action Plans of both airports show some differences. For example, the Noise Action Plans for both airports include an assessment of both the local and national frameworks. Similarly, information on the non-residential noise-sensitive receptors is contained in the analysis of noise contours, and measures specifically designed to preserve 'Quiet Areas' are included. Beyond these differences, the adherence to Annex V observed in the Amsterdam Schiphol and Frankfurt Noise Action Plans is similar to that of the Noise Action Plans provided by UK airports.

7.2 Development of Noise Action Plans

Q6: What are the roles and responsibilities of the airlines and local authorities in the development and implementation of the Noise Action Plan?

A variety of roles and responsibilities were noted for airlines and local authorities across the Noise Action Plans including mention of collaboration between the airlines and local authorities.

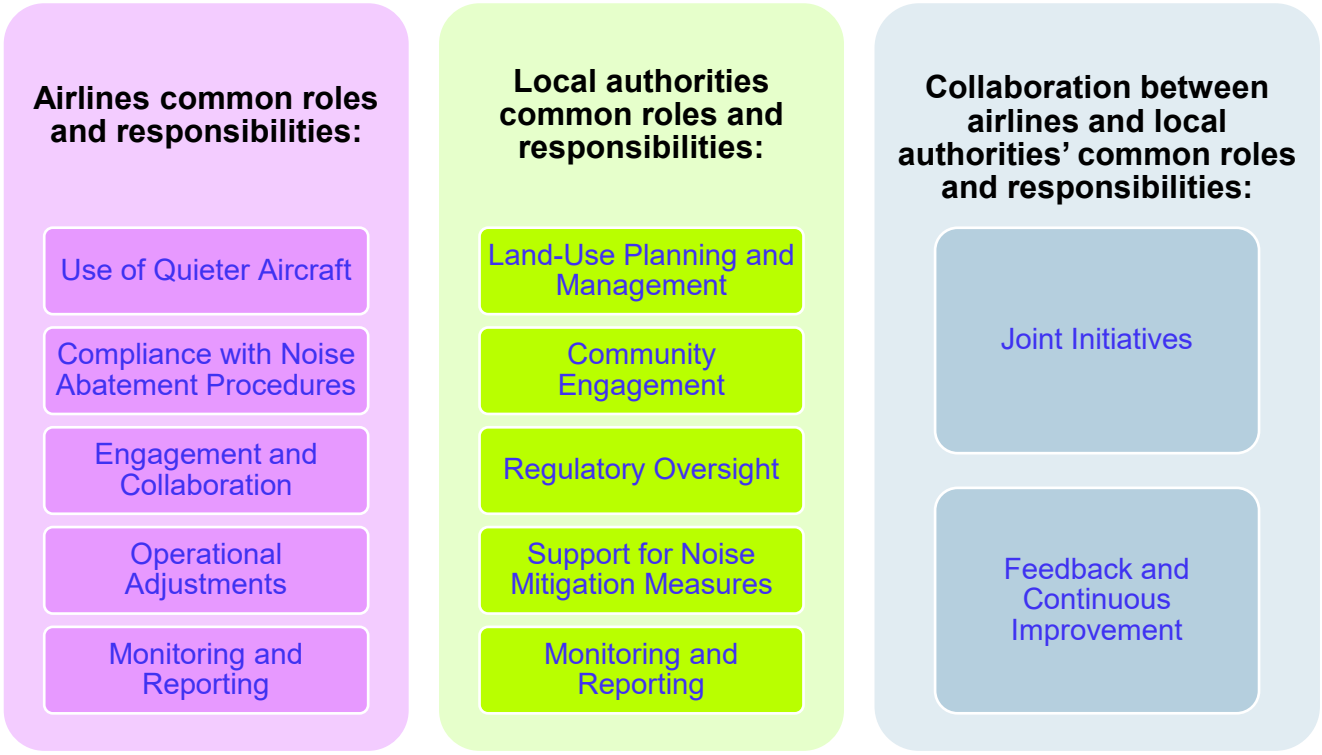

Figure 7-1: Common roles and responsibilities seen across all airports and Noise Action Plan rounds

The frequent roles and responsibilities seen across all the airports changed per Round, with Round 2 focussing on compliance with noise abatement procedures and community engagement. Round 3 saw emphasis on fleet modernisation and operation movements with enhanced community engagement and regulatory oversight. Round 4 continued the fleet modernisation focus looking specifically at using quieter aircraft and complying with noise abatement procedures. Whilst also emphasising the importance of collaboration, performance monitoring and participation in trials and studies.

It should be noted similar roles and responsibilities were noted in the Noise Action Plans for all airports.

Q7: Does the Noise Action Plan describe how the measures and actions have been selected?

All Noise Action Plans describe how the measures and actions were selected. The measures were most commonly selected through evaluation of the relevance of measures, stakeholder engagement, public consultation of suggested measures and advisory group feedback. Furthermore, some Noise Action Plans included criteria for selection of measures, for example, Manchester Round 4 evaluated the measures on effectiveness, feasibility, compliance and best practice.

All of the UK airports that responded to the questionnaire agreed or strongly agreed that that community acceptance is a consideration when selecting measures.

Q8: Does the Noise Action Plan explain why measures were not selected or included?

20 of the 28 Noise Action Plans describe why the measures were not selected or included, this included all EU airport and non-England airport Noise Action Plans. 8 Noise Action Plans did not explain why measures were not selected, this included Heathrow Rounds 3 and 4, Southend Rounds 3 and 4, Manchester Round 4 and all Edinburgh Rounds. Some common reasons included:

- Stakeholder feedback

- Feasibility and practicality
- Cost-benefit analysis
- Technical or operational limitations
- Interdependencies between noise, local air quality and carbon emissions.

Additionally, measures may not have been selected due to planning permission restrictions. An example of this is if new infrastructure or significant airspace changes are awaiting planning permission, the measure may be excluded due to time constraints.

In terms of regulatory constraints, specifically at Heathrow Airport and other UK based airports, some noise management responsibilities do not always fall on the airport itself. Some responsibilities lie with the Department for Transport (DfT), National Air Traffic Services (NATS), or the Civil Aviation Authority (CAA). This can limit their ability to implement certain measures independently.

Q9: Do Noise Action Plans take account of current guidance, planning and local planning?

All of the reviewed Noise Action Plans from Rounds 2, 3 and 4 take into account current guidance such as the Aviation Policy Framework and ICAO Balanced Approach.

Planning and local planning requirements are taken into account when selecting measures. Manchester Airport in its Round 4 submission included a summary of the planning conditions affecting its operational footprint (Round 4 Appendix G). These include limits on engine testing, the requirement of annual reporting to the local authority, etc. Similarly, Leeds Bradford is subject to planning conditions that include, among other requirements, a noise monitoring regime and night flight restrictions.

Feedback received from the airport operators suggests that if a measure requires a level of planning permission it may not be selected as it can incur additional costs, restrict the speed of measure implementation and lead to difficulties with approval.

Q10: Are there any inter-airport consultations on Noise Action Plan development or to share measures / lessons learned?

Most of the airport operators consulted stated there are inter-airport consultations on Noise Action Plan development and sharing measures or lessons learned. Airports often collaborate through various forums and industry groups to address noise management issues. For example, Heathrow Airport engages with airlines, air traffic controllers, the government, and local communities to manage and reduce aircraft noise. They also participate in stakeholder engagement forums to share best practices and lessons learned.

Airport operators at Manchester, East Midlands, Heathrow and London Gatwick airports stated they work with other airports to share lessons learnt, best practices, interpretation of the Noise Action Plan guidance or relevant sources. However, one regional airport in England and one large airport in the EU stated they never worked with other airports during the development of their Noise Action Plans or to share lessons learned.

Q11: Is the timeframe of the Rounds realistic and useful?

The airport operators had varying opinions on the whether the timeframe of the Noise Action Plan Rounds is realistic and useful:

- Three responses were received stating that they found the timeframe realistic, which were provided by a mixture of large and regional airports in England,
- Three responses stated that they did not find the timeframe realistic, which were provided by a mixture of airports in England and Scotland,
- Two responses neither agreed or disagreed, which were provided by large airports in the UK and EU.

Two of the airport operators located in England stated that they found the timeframe to be useful, whilst the remaining airports did not agree or were neutral. No further insights were provided on the reasons behind the airport operators' perspectives on the realism and usefulness of action planning timeframes.

Q12: What is the legal compliance or 'pass criteria' for Noise Action Plans to be adopted?

Defra reviews each Noise Action Plan against the legal requirements of Annex V, which are also articulated in their guidance documents for airport operators. The documents are checked to ensure that they contain the correct elements to meet the minimum requirements for Noise Action Plans set out in Annex V. The review is focussed on the presence or absence of the required information, with the level of detail provided in the Noise Action Plans not necessarily affecting whether it is approved. This approach means that all airports are appraised equally irrespective of their size or their types of operations.

Many of the draft Noise Action Plans received by Defra do not initially meet the requirements set out in Annex V. Where this occurs, Defra works with the individual airports to resolve these issues. The airport operator then submits a revised draft Noise Action Plan to Defra, who continue to review iterations of the Noise Action Plan until it is deemed compliant with the requirements. This corresponds with feedback from airport operators provided in the questionnaire that it can take a long time for Noise Action Plans to be adopted.

7.3 Stakeholder Engagement and Consultation

Q13: What are the stakeholder views (community, airlines, local authorities) on the ease of responding to consultations?

The questionnaire responses from airports, ACCs and community groups on the ease of responding to consultations are provided in Figure 7-2. The perspectives of the questionnaire respondents on the accessibility of the Noise Action Plan material are show in Figure 7-3.

Figure 7-2 suggests that airports feel more strongly/positively than the community groups that consultations are easy to access. It is be noted that most of the disagree and strongly disagree responses are from multiple community groups for East Midlands and Gatwick.

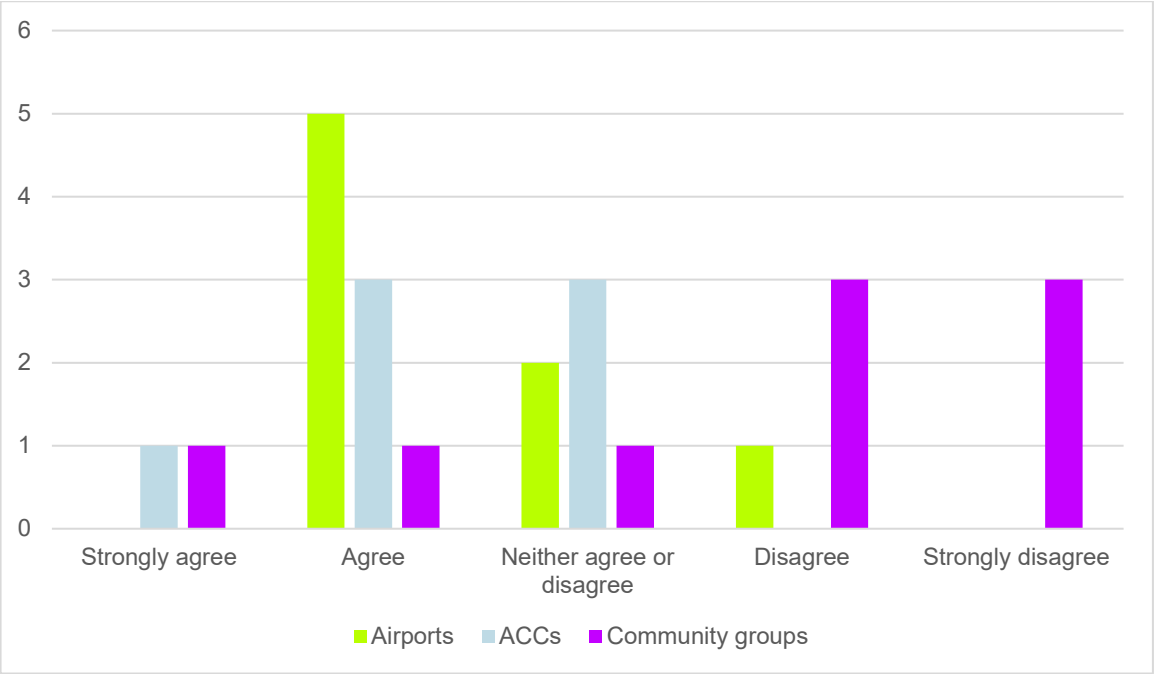

Figure 7-2: Questionnaire responses to the statement "It is easy to respond to consultations about Noise Action Plans"

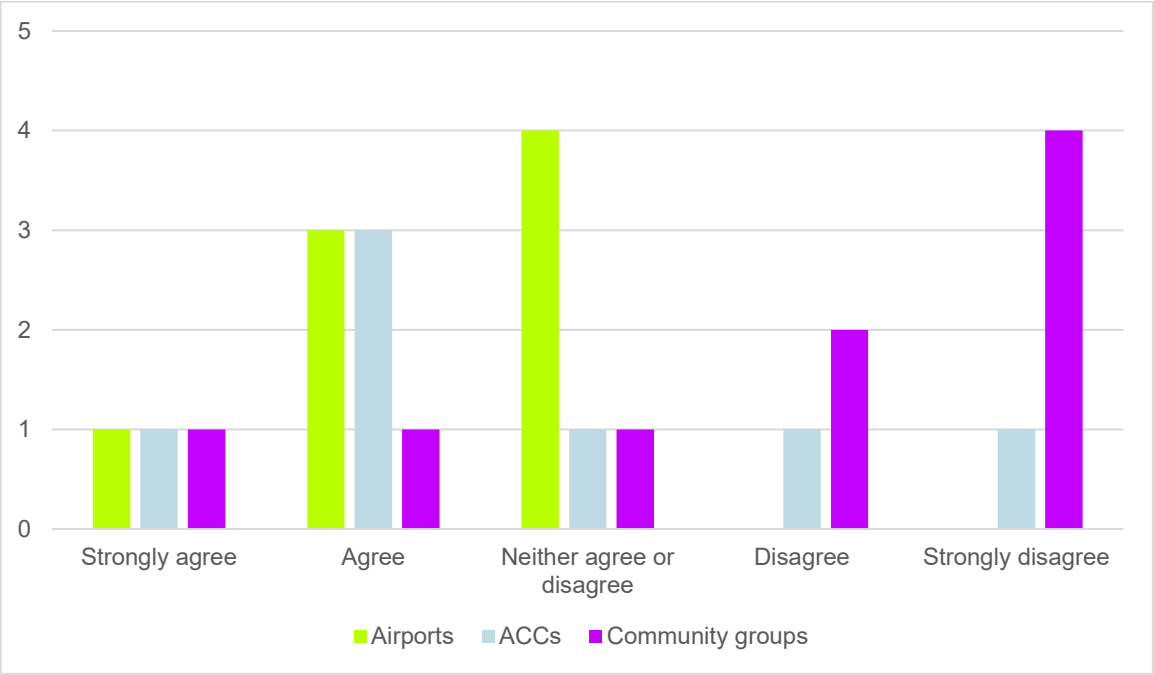

Figure 7-3: Questionnaire responses to the statement "Noise Action Plan material is easy to access"

The community groups for East Midlands airport had mixed views on the ease of responding to consultations, with one group agreeing with the statement and the remaining three respondents disagreeing or strongly disagreeing. Similarly, the two community groups for Gatwick disagreed or strongly disagreed. Overall, when analysing the stakeholder opinions, the dataset shows a variety of opinions across all airports on the ease of responding to consultations.

Five of the eight airports who responded to the questionnaire indicated that they believed that the consultations are well promoted. One airport indicated that their consultation was not well promoted, which was also reflected in community stakeholder responses to the questionnaire.

The responses indicates that airports perceive the Noise Action Plans to be easier to access than community stakeholders do. However, it should be noted that the disagree/strongly disagree responses are biased towards East Midlands airport (three responses across these categories) due to the number of community groups that responded to the questionnaire.

Q14: How often is the community consulted during the Noise Action Plan development?

On average, during Rounds 3 and 4 of the Noise Action Plan development the community was consulted once during the Noise Action Plan development. This most commonly occurred during the initial development of the Plan.

19 of the Noise Action Plans mentioned the use of a public consultation process during the Noise Action Plan development. This was across all airport regions but most commonly appeared from Round 3 onwards.

18 of the 28 Noise Action Plans stated the use of ongoing engagement with the community. Alike the use of public consultation, continuous engagement was most commonly seen in Noise Action Plans from Round 3 onwards.

The majority of community stakeholders mentioned they would prefer to be informed more frequently during the implementation of the Noise Action Plans. Currently, the stakeholders for English airports are most commonly consulted quarterly or annually.

Q15: What is the quality of consultations and level of inputs received?

When evaluating the 28 Noise Action Plans three levels of quality were used to judge the quality of consultations and inputs received within each Noise Action Plan, good, average and poor:

- Good quality of consultations and levels of inputs received is representative of in-depth consultations with high levels of inputs received ensuring that the Noise Action Plan was well-informed, comprehensive, and responsive to the needs of all stakeholders.
- Average quality is representative of consultations and inputs that were not quite as detailed yet still very useful to the development.
- Poor quality of consultations and inputs received is representative of either a lack of detail regarding the consultation or only a small amount of input from stakeholders received.

26 of 28 Noise Action Plans suggest that they good quality consultations and detailed inputs from the stakeholders, Southend Round 3 and Edinburgh Round 2 had poor and average quality respectively. However, this contrasts with feedback by some of the community stakeholders in their questionnaire responses. The use of technical jargon can affect their ability to respond effectively and examples of poor or low quality engagement with the airport were shared. Despite this, the community groups that are ACC members have praised the independence of the ACC chair, which can help them to navigate some of these issues.

Southend Round 3 saw minimal inputs from ACCs, with no responses from ACC members. Although this could indicate satisfaction it is expected the lack of response was due to minimal engagement from the committee members. Edinburgh Round 2 had a reasonable level of detail for the consultation with minimal responses from stakeholders.

Figure 7-4 shows that half of the airports that responded to the questionnaire believed that their consultation responded were of high quality. The responses also showed that several of the airports received a high degree of

diverging views in consultation responses received between different community stakeholders and different types of aviation stakeholder. For example, at East Midlands and Manchester airports, aviation stakeholders were reported to be in favour of maintaining the status quo due to investment in quieter technology, whereas community groups requested more restrictive operations.

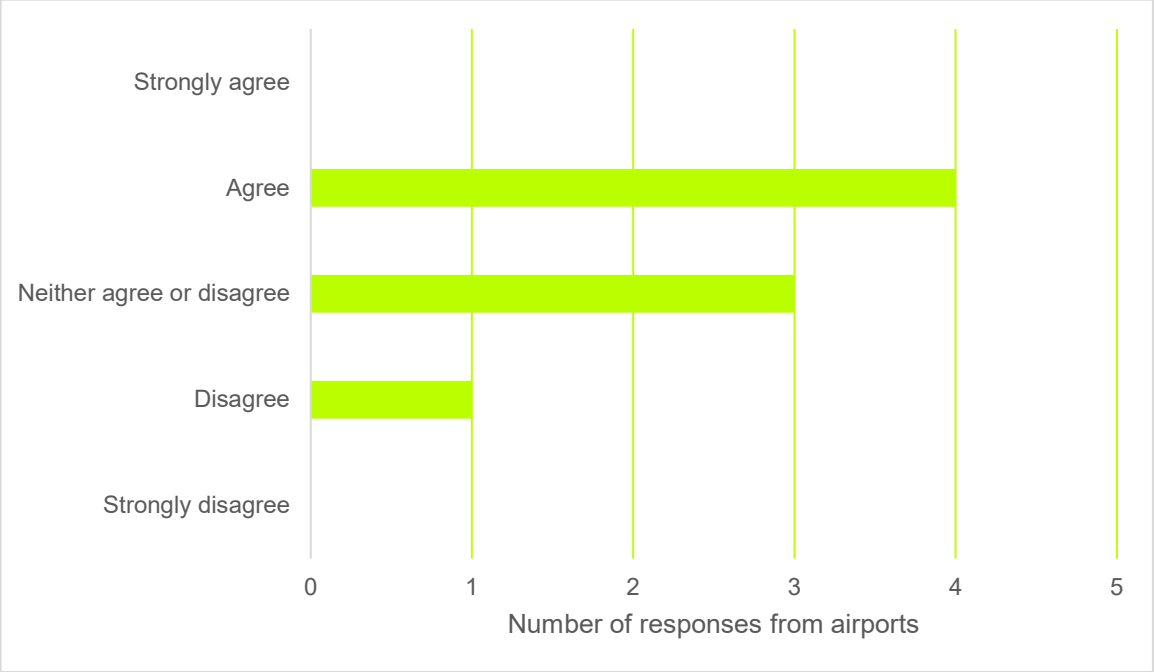

Figure 7-4: Questionnaire responses from airports to the statement "The quality of stakeholder responses is high"

A further issue affecting the quality of consultations is the level of engagement and response rate. For example, the airport operator at Edinburgh reported in their questionnaire responses that there was a high level of engagement at public consultations but low levels of online or paper responses were received. This meant that the responses received did not fully reflect the community views.

Q16: To what extent does feedback from consultation result in changes to draft proposals?

Feedback from consultations was used by multiple airports when finalising draft Noise Action Plans. The questionnaire responses from airport operators showed that all agreed or strongly agreed that the consultations resulted in changes to their draft proposals. 80% of the airports also agreed that stakeholders are confident that their feedback is considered. Half of the responses stated that the consultation process caused larger changes, this included both devolved administration airports and a variety of other English airports (Manchester, East Midlands and Edinburgh), whilst the remaining regional and European airports stated some changes occurred.

However, when gathering opinions from community stakeholders only five out of the sixteen respondents stated that they felt they had influence over the selection of measures in the Noise Action Plan for their airport. These five responses tended to be from ACCs for larger airports, such as Heathrow, Gatwick and Frankfurt. 56% of community stakeholder respondents stated they did not feel able to influence the selection of measures in the Noise Action Plans for their airport.

Some of the responses from community groups in England state that the final version of the Noise Action Plan is not shared with them prior to submission to Defra. This leads the community groups perceive that some of their suggestions or ideas have not been included, which could lead to the perception that they are being ignored and have limited influence over the draft proposals.

Q17: Is the level of stakeholder engagement consistent between noise action planning rounds and airports? And if not, does this affect the perceptions of stakeholders?

The level of stakeholder engagement is consistent between Noise Action Plans across all airports excluding Southend and Edinburgh.

Southend Round 2 Noise Action Plan had a poor quality of consultation with minimal interaction from the stakeholders and ACC's and minimal detail displayed in the Noise Action Plan. At Round 3, there was still minimal stakeholder responses during the consultation process. By Round 4, there is a much larger involvement from the stakeholders and ACCs and a much-improved quality of stakeholder engagement.

Edinburgh Noise Action plans began with an average level of quality of consultation (some details included with some responses from stakeholders) at Round 2, this became much more extensive during Round 3 and Round 4 with a much larger response rate from stakeholders.

The Noise Action Plans did not explicitly describe how the lack of consistency of stakeholder engagement affected the perception of stakeholders.

Q18: Is the language and presentation of the Noise Action Plans understandable to the general public?

Sixteen of the Noise Action Plans are considered to have used understandable language. This included limiting the use of jargon, and where needed it was explained or defined in a glossary. Following consultation, some Noise Action Plans were updated or summarised following feedback from stakeholders to enable better understanding of the Noise Action Plan documents.

Some examples of tools used to improve the language and presentation of Noise Action Plans to non-technical audiences included:

- The use of plain English;
- A glossary of terms and a table of contents;
- Headings and subheadings;
- Balance between text and white space on page; and
- Visual aids such as figures, tables, charts and graphs to visually represent data and illustrate trends and comparisons and engagement with community.

Furthermore, some airports, such as Heathrow, Edinburgh, Southend and Manchester, produced non-technical summaries of at least one of their Noise Action Plans, intended for local communities. For example, Manchester airport produced a Community Flyer during Round 4, which provided updates about the Noise Action Plan in a concise and accessible format.

Seven Noise Action Plans showed that improvements had been made between successive noise action planning rounds in terms of language and presentation. The improvements included greater explanation of jargon and technical aspects of the Plans, and simpler language to ensure the general public could understand the Plans without prior aviation or noise knowledge.

Across all the Noise Action Plans reviewed, the Round 2 Noise Action Plan for Leeds Bradford airport appeared to be the least understandable document, with both language and presentation evaluated as not very understandable to a general audience. It contained a high level of detail making it quite a large document. Technical concepts were explained but not simply enough for the general public with prior aviation or environmental knowledge and there was a lack of infographics or simplified diagrams. An improvement was seen at Rounds 3 and Round 4 with a more logical structure, use of plain language, additional maps and simple diagrams to aid explanation and summary sections.

The Round 2 Noise Action Plan for East Midlands airport was also not considered to be very understandable in terms of presentation and language. This was due to the use of technical jargon with limited explanation, the complexity and length of the Plan and confusing explanations for technical aspects. Whilst visual aids were used, the presentation of data could be improved with more user-friendly graphics and clearer explanations of what the data represents.

Alongside the review of the Noise Action Plans, community stakeholders were asked whether they felt that the Noise Action Plans were understandable via the questionnaire. Half of the responses showed that they disagreed or strongly disagreed that the Noise Action Plans are understandable, with no consistency among the responses from multiple community groups discussing the same airport. A view expressed by one of the East Midlands community groups was that "*the Noise Action Plans are excessively long, difficult to understand and assess, especially for non-aviation experts*". These views are reiterated in responses from several other community groups and ACCs for other airports and correspond with the findings of the review.

8. Noise Action Plan Actions and Measures

This section collates the results to each of the research questions related to the noise control measures and actions within Noise Action Plans. The results are based on information obtained by desktop review and questionnaire responses from the airport operators, ACCs and community stakeholders.

8.1 Control Measures

Q19: What measures and actions are included in the Noise Action Plan?

Noise Action Plans for all airports include specific measures to reduce noise. All of the airports include measures and actions in the following themes in at least one of their Noise Action Plans: take-off, landing, ground movements, ground operations, maintenance, using quieter planes and working with stakeholders.

Each Noise Action Plan may have several specific actions and measures for each of these themes, for example, the Round 4 Noise Action Plan at Edinburgh has ten measures related to working with communities encompassing stakeholder engagement, the independence of the ACC chair, a noise insulation scheme and actions related to noise surveys, monitoring and reporting. At all airports across all action planning rounds, the greatest number of measures are for; working with stakeholders, take-off and landing.

Gatwick and Manchester have implemented comprehensive strategies, including engine testing restrictions, reduced-engine taxiing, and the use of Auxiliary Power Units (APUs) and Ground Power Units (GPUs). These measures are supported by noise monitoring systems and community engagement initiatives to ensure transparency and address community concerns. Many of these activities were also reported in the Noise Action Plans for other airports in the UK.

In the devolved administrations, Edinburgh and George Best Belfast City airports have similar measures in place, with additional emphasis on community engagement and reporting. Edinburgh also prioritises stand allocation and high-power engine running locations to manage noise effectively.

In the European Union, Amsterdam Schiphol and Frankfurt airports have adopted air traffic management optimisation, quieter braking at night, and the electrification of ground vehicles in addition to the measures previously mentioned. These measures reflect a high level of technological innovation, benefiting both local and distant communities by reducing noise.

The scale and size of the airport operations also influence the proportionality of the measures. Larger airports like Heathrow and Frankfurt have more extensive and technologically advanced measures due to their higher traffic volumes and greater impact on surrounding areas. Smaller airports, such as Leeds Bradford and Southend, implement proportionate measures that reflecting their scale of operations, focusing on specific noise sources like ground engine running and taxiing restrictions.

Q20: Are the measures proportionate to the size of the airport and its air traffic volume?

When assigning proportionality to a series of measures, the number of measures present, their categorisation, the budgetary commitment to undertake each measure, and the TAG outcomes on valuation of health impacts for each measure can be considered. A detailed breakdown of TAG data is not available in the Noise Action Plans, for either an individual measure or a set of measures. Budgetary information is not presented consistently across the Noise Action Plans and this method of analysis is not possible. Regardless, the categorisation of the measures and the number of commitments made in each Noise Action Plan can still be assessed.

All airports had measures which were proportionate to the size of the airport and its air traffic volume. This was seen through airport adaptability and consistent success in the reduction of noise impact on the surrounding area. This can be evidenced with reference to the following three airports:

- London Southend, which had 31,500 air movements in 2023;
- Edinburgh, which had 115,000 air movements in 2023; and
- Heathrow, which had 456,000 air movements in 2023 [38].

These airports are tiered by the number of flights per annum as reported by the CAA. In 2023, Heathrow experienced approximately four times more flight movements than Edinburgh, who in turn experienced approximately four times more flight movements than London Southend.

London Southend, in its Round 4 submission has committed to 14 measures. These can be broken down into the following categories; 'Reduction at Source' (1 measure), 'Operating Procedures' (8 measures), 'Land Use Planning and Management' (2 measures), and 'Operating Restrictions' (3 measures). The reduction at source measure is a noise related system of fees and charges. The operating procedures reflect best practices such as preferred runways, NPR, reductions in ground noise and engine testing. Land use measures comprise a property purchase scheme and sound insulation packages. The operating restrictions reference an annual cap set by a section 106 agreement, night flight and daytime restrictions.

Edinburgh, in its Round 4 submission, has committed to 54 measures. These can be broken down into the following categories; 'Working with Communities' (19 measures), 'Operating Restrictions' (12 measures), 'Land Use Planning and Mitigation' (4 measures), 'Quieter Planes' (10 measures), and 'Quieter Procedures' (9 measures). The measures in place in the Round 4 Edinburgh submission effectively build upon the measures seen at London Southend with multiple additional commitments to aircraft type, community engagement, a ground operating procedures.

Heathrow, in its Round 4 submission, has also committed to 54 measures. These can be broken down into the following categories; 'Working with Communities' (7 measures, 'Research' (7 measures), 'Operating Restrictions' (2 measures), 'Land Use Planning and Mitigation' (3 measures), 'Quieter Procedures' (20 measures), 'Quieter Planes' (6 measures), and 'Responsible Business Actions' (9 measures). The responsible business actions listed are in several cases pre-existing commitments, such as adherence to DfT Night Noise Restrictions.

It isn't clear at this stage whether the measures employed at Heathrow or Edinburgh will result in a greater level of efficacy, nor can it be easily quantified without itemised TAG outcomes at each airport. On the number of commitments alone, it is reasonable to conclude that London Southend offers measures that are proportional to its size when compared to Edinburgh and Heathrow. Budgetary information for various measures is not available, so a resources gap analysis cannot be used as a measure of proportionality.

Q21: Does the measure clearly state the success criteria or key performance indicator to be achieved?

The Noise Action Plan review has identified some good examples of clearly stated success criteria or key performance indicators, demonstrating that those actions are 'SMART'. Manchester and East Midlands airports have clearly stated success criteria for most types of action plan measures, including take-off, landing, ground movements, ground operations, and maintenance. For instance, Manchester's Noise Action Plan for Round 2 demonstrates a high level of detail, with clearly defined KPIs for various noise management actions, which allows for precise tracking and evaluation. For example:

> "NAP7: The average level of noise of the 10% noisiest departures will remain lower than that in 2001 and will also be compared against the average level of the previous 5 years" (Manchester Round 2)

"NAP8: Maintain our target of 90% continuous descent approach performance" (Manchester Round 4)

This is also observed for other airports. For example, the Heathrow Round 3 Noise Action Plan provides quantifiable targets for phasing out Chapter 3 and Chapter 4 aircrafts with target dates stated. An extract of the Heathrow Round 4 Noise Action Plan is provided below as an example of how the actions and their success criteria are clearly defined:

Actions	Date	Performance indicator	Target	Impact	Communities affected
For all new aircraft types with scheduled operation at LHR and a representative data set, we will undertake comparative noise studies relative to older equivalent aircraft types with the CAA to show the relative performance of new aircraft types.	Whenever appropriate	Report published	One study commissioned per each new aircraft type	Ground, arrivals, departures Noise	Communities within and beyond 55dB L_{den}
We will revise the Conditions of Use to require operators of A320 family aircraft to inform the BSC of those aircraft registrations that have not been retrofitted with vortex deflectors.	2024	% A320-family movements retrofitted	90 % A320-family movements retrofitted	Arrivals Noise	Communities within and beyond 65dB L_{den}
We will publish a Chapter 3 league table of operators continuing to use these aircraft and increase the differential with the quietest group of aircraft.	2024	% Ch3 movements	0% Chapter 3 by 2028	Ground, arrivals, departures Noise	Communities within and beyond 55dB L_{den}

Figure 8-1: Extract from the Heathrow Round 4 Noise Action Plan

However, there are also many actions and measures with less clearly defined success criteria. These include actions that are not time-bound or where the success criteria are vague or not mentioned at all, such as the examples given for Gatwick, Leeds Bradford and East Midlands airports below:

> "P.7: We will review the departure noise limits and fines for airlines that breach noise limits…within the life of this Noise Action Plan" (Gatwick Round 4)

> "2: We will develop and work with appropriate bodies towards introducing continuous decent approaches…timescale: ongoing" (Leeds Bradford Round 3)

> "NAP 23: Preferred runway direction. Where conditions allow we prefer aircraft to operate in a westerly direction. Regular reports on runway usage to continue to be produced." (East Midlands Round 3)

This lack of clear criteria or quantifiable targets can make it challenging to assess the effectiveness of the measures and track progress accurately. Vague actions and measures also appear in the Noise Action Plans for Manchester. Southend, Edinburgh, George Best Belfast City, Amsterdam and Frankfurt.

There are no clear trends on whether measures become more quantifiable or 'SMART' over time, or if there are differences between England, the devolved administrations and the EU airports. However, it is noted that some measures and actions do not necessarily lend themselves KPIs, but could be worded to become more specific. For the three examples above, this could be achieved by specifying dates for completing review and investigatory actions (Gatwick Round 4 and Leeds Bradford Round 3), and stating how often reports would be produced (East Midlands). For community engagement actions, the number of events that an airport representative will attend each year could be stated.

Q22: Are the measures, actions and their target success criteria ambitious enough?

The ambition of the Noise Action Plan measures is evaluated on:

- The stated success criteria for each measure and progress made towards achieving it between Plans;
- Whether 'stretch' goals are in successive Noise Action Plans where good progress is being made; and
- Whether the airports are targeting noise reductions or other improvements that go beyond current regulatory or legal requirements.

As discussed in Q21, many measures and actions across the Noise Action Plans do not provide clearly defined success criteria, which creates difficulties in assessing their efficacy and success of implementation. However, there are numerous examples of airport operations setting stretch goals or targeting improvements that exceed regulatory requirements.

An example of an ambitious approach to noise management was identified at Amsterdam Schiphol, whereby its newest measures focus on reducing flights, including at night. The Noise Action Plan also includes route adjustments and the use of quieter aircraft. The plan sets clear, quantifiable targets, such as a 5% reduction in the number of people seriously annoyed by noise and specific reduction targets for ground noise. Flight reduction was not one of the considerations for reducing noise at the UK airports included in this research, several of whom are mindful towards expansion.

Frankfurt's Noise Action Plan contrasts with Amsterdam Schiphol's approach and is considered to reflect a moderate approach to noise management. The plan includes progressive steps like the electrification of ground vehicles and stationary power systems, and forward-thinking initiatives such as the "Fly Quiet" program and shifting short-haul flights to environmentally friendly modes.

In comparison with Amsterdam Schiphol, the measures proposed in the UK Noise Action Plans could be considered to be less ambitious. This point ignores the economic balance between community disturbance and economic gain that is at the heart of the Defra guidance and often reproduced in the introductory remarks of the Noise Action Plans, which the airport operators would cite as a reason to increase annual flight movements.

Against this backdrop, UK airports demonstrate ambition in other ways. For example, East Midlands Airport demonstrates ambition through financial penalties for exceeding noise limits, aiming to ensure compliance and reduce noise exceedances. It is true that stricter noise limits or higher penalties could be enforced, however, these would need to be balanced against wider operational constraints. East Midlands Round 4 Noise Action Plan links three measures to the system of fines in place, one of which states a desire to consult in the first year of the Noise Action Plan's operation to ensure the fines are 'fair', though little information is provided on how this will be achieved.

Also at East Midlands, the restriction of high-noise aircraft during night hours with a target of 100% compliance with Chapter 4 noise standards is ambitious. Aiming for a 95% compliance rate for Continuous Descent Approach reflects a high standard for operational procedures. Monitoring and reporting compliance with Noise Preferential Routes (NPRs) is effective, but setting specific compliance rates could enhance ambition. Limiting the use of Auxiliary Power Units and promoting Ground Power Units is practical, but specific reduction percentages or compliance rates would be more easily quantifiable.

The general absence of specific, measurable success criteria inherent to the UK Noise Action Plans, makes analysis of the measures and their targeting complex. This is perhaps where a lack of ambition is best evidenced. Measures within the UK Noise Action Plans are often labelled as 'ongoing' in their delivery date. This inadvertently ensures that accountability is limited as progress cannot be readily demonstrated in these areas. Gatwick, Heathrow, and London Southend do incorporate SMART goals into the Round 4 Noise Action Plans to a limited degree, and an increased reliance on this method of goal setting could be incorporated in the next generation of Noise Action Plans at UK airports.

8.2 Implementation

Q23: How are the Noise Action Plan measures actioned?

A variety of mechanisms are used to action Noise Action Plan measures. Figure 8-2 shows the methods for implementing measures and actions reported by the eight airports that responded to the questionnaire, with

contractual arrangements with airlines and voluntary agreements being the most commonly used implementation practices.

Figure 8-2: Questionnaire responses on how Noise Action Plan measures are implemented

According to Figure 8-2, contractual arrangements and voluntary agreements are favourites as the primary route for actioning Noise Action Plan measures.

Heathrow and Gatwick often include specific noise reduction measures in their contracts with airlines and other stakeholders. These contracts may outline requirements for using quieter aircraft, adhering to Noise Preferential Routes (NPRs), and complying with noise limits. Financial incentives, such as penalties for non-compliance and variable landing charges, are also included in these agreements to encourage adherence to noise abatement procedures. Additionally, compliance with national and local regulations is a fundamental aspect of actioning Noise Action Plan measures, with oversight from regulatory bodies such as the CAA and the DfT. At George Best Belfast City the approach involves additional voluntary measures and financial incentives to encourage compliance with noise regulations.

Three airports marked "Other" in the questionnaire responses presented in Figure 8-2, two of which are Manchester and East Midlands. These two airports implement Noise Action Plan measures through a combination of commercial arrangements and dedicated monitoring units. Their owner incentivises the quietest possible fleet through commercial arrangements with operators and a published charging structure. They have a dedicated Flight Evaluation Unit that monitors and reports on all aspects of flight operations. Relationships are built with operators to ensure aircraft are operated in accordance with published rules and regulations, addressing any operational issues directly with operators. Actions within the Noise Action Plan are owned by various departments within airport, including the Flight Evaluation Unit, Planning, Airfield Operations, and Community Relations Teams.

Q24: How are measures prioritised for implementation?

The approach taken to prioritise of measures in Noise Action Plans shows similar trends across airport sizes and regions, reflecting their common challenges and regulatory environments.

The Noise Actions in the at Heathrow, Gatwick, Edinburgh and George Best Belfast City indicate that stakeholder engagement and the need to meet regulatory requirements informs their prioritisation of measures. Heathrow also

undertakes impact assessments. As Noise Management Areas are located in the Belfast agglomeration, George Best Belfast City also considers the noise impacts at these locations to inform their Noise Action Plan. The practicality of the Noise Action Plan measures is also a key consideration.

Amsterdam Schiphol and Frankfurt airports prioritise measures based on legal necessity, stakeholder input, past effectiveness, and potential impact on noise reduction. Amsterdam Schiphol conducts initial assessments and feasibility studies, followed by consultation and expert verification. Frankfurt emphasises noise impact as a primary criterion and uses collaborative decision-making and community consultation to support the prioritisation of measures.

Q25: To what extent do community perceptions influence the selection or prioritisation of measures?

Community perceptions play a role in the selection and prioritisation of Noise Action Plan measures. Responses to the questionnaire issued to airports operators showed that three airports prioritised community acceptance when selecting measures for the Noise Action Plans, which included Heathrow and Edinburgh airports. The remaining airports neither agreed nor disagreed that community acceptance is prioritised. However, the questionnaire responses also demonstrate that all airport operators believe that feedback from consultation results in changes to draft proposals, which can include the selection of measures.

Heathrow and Gatwick place a strong emphasis on community engagement and feedback when developing and implementing their Noise Action Plans. Heathrow, for example, involves the Heathrow Strategic Noise Advisory Group (HSNAG) and conducts public consultations to gather community input. This feedback helps to shaping the noise reduction strategies and ensuring that the measures address the specific concerns of local residents. Gatwick follows a similar approach, incorporating community feedback into its strategic themes and objectives, which helps prioritise measures that are most relevant to the affected communities.

In the European Union, the Noise Action Plans show that airports also prioritise community perceptions in their noise management strategies. Amsterdam Schiphol, for instance, conducts public consultations and engages with community noise forums to gather feedback and ensure that the measures are aligned with the needs of local residents. This input is used to prioritise measures that have the greatest potential to reduce noise impacts and improve the quality of life for surrounding communities. Frankfurt follows a similar approach, involving community consultation in the decision-making process and incorporating feedback into its noise reduction strategies.

Q26: How are stakeholders informed of progress in implementing and achieving the Noise Action Plan measures? How often?

Stakeholders are kept informed about the progress of Noise Action Plan measures through regular reports, community engagement, and public consultations. In England, airports like Heathrow and Gatwick provide updates via annual reports, community noise forums, and noise advisory groups.

All airports who responded to the questionnaire stated that they communicated updated through community groups. Meetings either online or in-person were also a common means of providing updates (4 and 7 airports respectively). Three major airports also used “internet consultation” or websites to report progress, although responses from community stakeholders for these airports (where available) did not refer to these. Meetings and direct contact with airports were the main methods referred to by community stakeholders where they obtained progress updates.

In terms of frequency of progress updates, the airport questionnaire responses showed that:

- 1 airport provides weekly updates;
- 1 airport provides monthly updates;
- 5 airports provide quarterly updates; and

- 1 airport provides annual updates

Responses from ACCs on progress updates tend to match with those provided by the airports, although some community groups indicated that they are contacted less frequently. For example, all of the community groups at East Midlands airport stated they were updated annually, whereas the ACC reported quarterly updates. Some community stakeholders reported never receiving updates (Gatwick, Leeds Bradford, George Best Belfast City and Frankfurt). In all cases where community stakeholders reported either never being updated or where the responses showed they were provided updates less frequently than the airports indicated, they would like more frequent updates. Four of the ACCs and one community group reported that the current frequency of updates is about right.

There were no clear differences in methods for providing updates or update frequency between airports located in England and elsewhere, or the differing scales of operations at the airports considered in this study.

Q27: What obstacles or constraints are preventing the measures and actions from being fully implemented or from realising their full benefits?

Several obstacles and constraints can prevent Noise Action Plan measures from being fully implemented or realising their full benefits. Examples provided by airport operators in their questionnaire responses are shown in Table 8-1.

Table 8-1: Obstacles and Constraints Reported in the Questionnaire Responses

Factor	Obstacle or constraint	Airport responses (max 8)
Regulations	International agreements	1
	Regulations such as the Balanced Approach procedure and other EU Regulations	1
	Legal constraints (unspecified)	1
	Airspace modernisation	3
Technology	Modern aircraft	2
	Night-time aircraft movement restrictions from the government disincentivise the use of the quietest aircraft	2
	Limitations in Noise Track Keeping technology	1
Financial	Budget constraints for some of the measures	1
	Regulatory funding decisions	1
	Airports needing to fund the Noise Action Plan, using funds that could be spent on mitigation measures	1
	Commercial constraints (unspecified)	1
External factors	External factors or unforeseen circumstances impacting operations and resources, including the COVID-19 pandemic or economic downturns	4
Competing priorities	Changing circumstances at the airport or airfield, prioritising safety	1
	Competing environmental considerations	1
Stakeholders	Reliance on industry partners	1
	Regulator resource constraints	1
	Actions involve multiple stakeholders	1

Factor	Obstacle or constraint	Airport responses (max 8)
	Unwillingness to cooperate by airlines and the airport	1
Noise Action Plan Process	The Noise Action Plan process is not positioned within the context of achieving a SMART objective	1
	Benefits are quantified in different ways or from different starting points	1

Regulatory compliance, financial constraints, and operational complexities can affect the ability of airport operators to implement measures and actions, irrespective of where they are located. Regulatory requirements can be stringent and time-consuming, making it difficult for airports to implement measures swiftly. Manchester Airport and East Midlands Airport highlight the importance of airspace modernisation and the delivery of modern aircraft from manufacturers. However, they claim that their ability to incentivise the uptake of the quietest aircraft has been constrained by government-imposed night-time aircraft movement limits.

Financial constraints, including the costs associated with noise monitoring systems, operational adjustments, and community engagement initiatives, can also limit the extent to which measures are implemented. Unforeseen events such as economic downturns can exacerbate financial constraints, as income to invest in quieter aircraft or other measures reduces. Additionally, the operational complexities of large airports, such as coordinating with multiple stakeholders and managing high traffic volumes, can hinder the effective implementation of noise reduction strategies.

The need to work with others to achieve the Noise Action Plan goals presents a further challenge to airport operators. They are reliant on industry partners and stakeholders to fully engage with the Noise Action Plan, implement measures and follow operating and maintenance procedures developed to minimise noise emissions. Each stakeholder has their own constraints and pressures, and if they are unwilling to cooperate then delays to implementation can occur.

8.3 Monitoring and Enforcement

Q28: How are the Noise Action Plan measures monitored and by whom?

The Noise Action Plans indicate that the responsibility for monitoring Noise Action Plan measures lies with the airport operator. Noise Action Plan measures are often established that are independent of external oversight. This is because of the voluntary nature of goal setting of many Noise Action Plan measures. For example, an airport that commits to ‘review the noise initiatives for their effectiveness on a regular basis’ has created a measure that is entirely in-keeping with the multitude of national and internal policy objectives for limiting operational noise at airports. However, it is clear that such a measure cannot be subject to external scrutiny and lacks specificity as to how the progress of the measure will be monitored or reported on.

To improve transparency, the Noise Action Plans tend to include measures that require placing data in the public domain, for example, online via a dedicated web page or a quarterly report commitment directly to an ACC. This is often cited as a means of illustrating the progress or conclusion of a measure, but also ensures that the general public can participate in monitoring the measures and hold the airport operator accountable.

The use of section 106 agreements offers greater oversight in the sense that they are legally enforceable measures. Indeed, several survey respondents stated the utility of section 106 agreements to be greater than that of a Noise Action Plan. Several Noise Action Plans include section 106 agreement criteria as measures. This benefits

transparency as the agreements are private contracts between the airport operators and the relevant public body. It is considered best practice for this information to be provided where it arises.

Several airports report directly to local authorities. For example, Heathrow's Round 4 Noise Action Plan states that they submit fleet forecasts on an annual basis to local authorities that are affected by the 55 dB L_{den} noise contour.

Airports reliably report the number of complaints received as part of a broader requirement to document their complaints process. For example, the use of complaint responses as a means to monitor noise management practices is listed in Edinburgh's Round 4 submission. This is also a low cost measure that is available to all airports. It is suggested that further research be undertaken to assess the benefits of using this approach.

Q29: If you produce noise contours annually, how are these used to track progress and inform measures in the Noise Action Plan?

Annual production of noise contours is a useful tool for tracking progress and informing measures in the Noise Action Plan. At least four of the airports produce noise contours annually and use them to assess the effectiveness of implemented noise reduction strategies and identify areas requiring further action. For example, Gatwick airport used annual contours to show the benefits of fuel overpressure protector modifications on Airbus A320 aircraft. The contours help in visualising noise impact over time, allowing for data-driven adjustments to the Noise Action Plan. Airports like Amsterdam Schiphol and Frankfurt utilise noise contours to comply with EU regulations and optimise noise reduction measures.

Manchester Airport and East Midlands Airport produce summer noise contours annually, providing trend data for the impact of airport operations and tracking whether the airport is producing greater or lesser impacts. They also engage with ACCs and Community Representatives to produce Number Above contours, which they consider to provide a clearer picture of local noise conditions compared to the L_{Aeq} contours. London Southend Airport produces contours every two years, which inform the Noise Action Plan process but are not used to track progress. London Gatwick uses annual Summer L_{Aeq} Noise Exposure Contours to show specific benefits of significant Noise Action Plan mitigation measures, such as the noise reduction achieved through the Fuel Over Pressure Protector modification on Airbus A320s. London Heathrow produces a contour report with required and supplementary metrics, using the contours to monitor trends and provide transparency to stakeholders.

Q30: How are less-effective measures changed over time?

A variety of actions are used to address less-effective measures. Figure 8-3 shows the responses from eight airports on how less-effective measures are changed over time. The most commonly reported actions include reviewing the efficacy of the measure, replacing measures with alternatives and consulting with stakeholders.

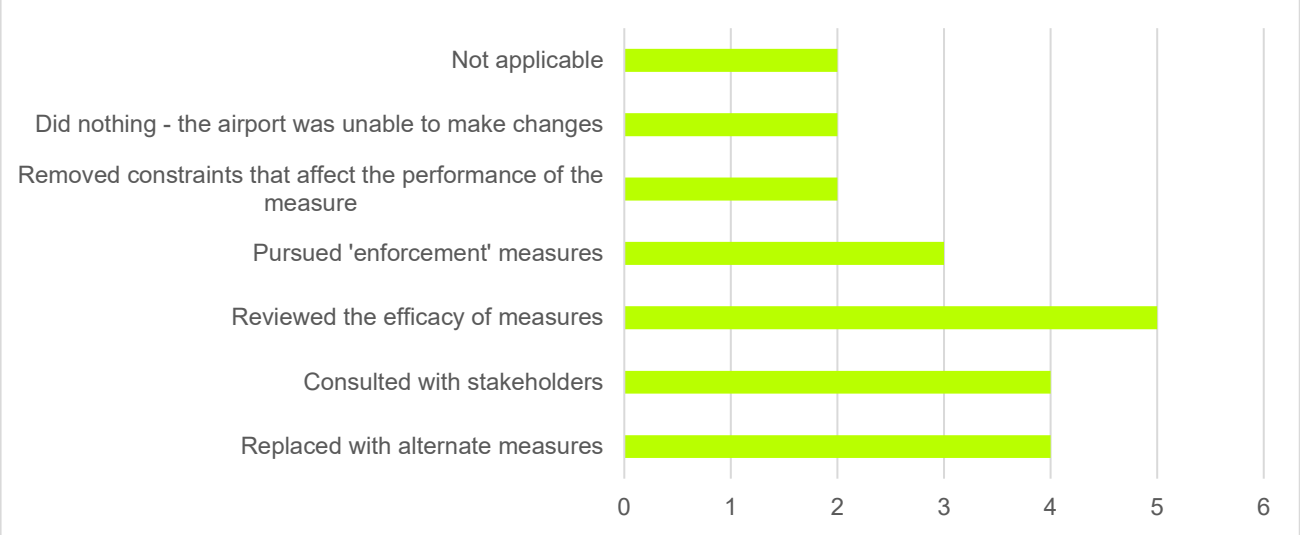

Figure 8-3: Questionnaire responses on how less-effective measures are changed over time

Manchester Airport and East Midlands Airport consult with stakeholders, review the efficacy of measures, and pursue enforcement measures when necessary. However, there have been instances where these airports were unable to make changes. Edinburgh Airport reviews the efficacy of measures and replaces them with alternate strategies. London Gatwick and London Heathrow also consult with stakeholders, review the efficacy of measures, remove constraints affecting performance, and replace less-effective measures with alternative ones.

For example, measures implemented at East Midlands Airport to control aircraft noise have evolved to address their initial shortcomings. In Round 2, the penalty for noisy aircraft (NAP11) was straightforward: departing aircraft exceeding the noise limit between 11pm and 7am were fined £750 plus £150 for each decibel above the limit. However, this measure proved less effective as it did not account for the inaccuracies in noise monitoring due to the fixed monitors' positions. By Round 3, the airport introduced NAP3, which applied correction factors to the monitored noise results to ensure more accurate recordings. Additionally, the maximum noise limit for departing aircraft under 100 tonnes was reduced from 83 dB to 81 dB, with penalties remaining the same.

Q31: How are Noise Action Plan measures enforced, including any noise limits or restrictions?

A number of mechanisms exist to ensure that measures are enforced, which were found to be similar across the airports reviewed for the project. Airport operators use a number of monitoring systems to check for compliance with the stated measures or operating procedures, and use this evidence as a basis for enforcement. For example, Noise and Track Keeping systems are used to monitor compliance with Noise Preferential Routes, and fixed noise monitors are used to measure departure/arrival noise levels for compliance with noise limits.

A system of fines and penalties is commonplace at several airports, with funds raised often being redistributed to local communities. Further information on fines and penalties is provided in the response to Question 33.

A further mechanism for enforcement is through the planning system. For example, Leeds Bradford airport has noise restrictions as part of their planning consent for 24-hour operations. This means that the local authority can take enforcement action if the airport is found to be non-compliant with these restrictions. Additionally, many airports enter into legally enforceable agreements with local authorities in the form of section 106 agreements. These can come with the disadvantage of privacy between the contracting parties prior to agreement being reached. It is understood that section 106 agreements should be entered into the public domain. However, a clear difference in terms of accessibility exists between the active supply of complete section 106 agreements, and their archived presence within a local authority planning portal.

There is evidence of airport operators engaging with ACCs and community stakeholders to support enforcement practices, typically through reporting. For example, the ACC at Manchester airport is involved in developing community noise monitoring practices and airline league tables. This suggests that the risk of reputational damage is being used to encourage compliance. Gatwick airport monitors operational Noise Action Plan actions through the Noise and Track Monitoring Advisory Group (NaTMAG) and enforces them through direct engagement with airlines, including sessions on operational performance and penalties. Strategic objectives are pursued by the airport or the Noise Management Board.

Q32: What are the consequences if the measure is not effective or implemented?

If Noise Action Plan measures are not effective or implemented, it can lead to regulatory penalties for the airport, reputational risk, ongoing noise pollution for surrounding communities and increased complaints. The Noise Action Plans for UK airports have not indicated any evidence of fines or regulatory actions being taken against them by the government or the CAA, but there is some evidence of local authorities issuing Breach of Condition Notices where planning conditions are contravened (Leeds Bradford Round 4). However, Amsterdam Schiphol has faced legal challenges due to non-compliance with its Noise Action Plan, and has been ordered to improve environmental

compliance. Despite this, it is reported that the government is not upholding an enforcement action against the airport operators or airlines using the airport. Amsterdam Schiphol had to take more drastic measures in their Round 4 Noise Action Plan by reducing flights, as other measures implemented in previous rounds were ineffective.

Ineffective or unimplemented measures can damage relationships with stakeholders and cause reputational damage. This can affect the airport operators' from achieving their long-term strategies for their airports, for example, if they need consent for future development proposals. Delays in implementing measures can have similar consequences, as observed in the Round 4 Noise Action Plan and questionnaire responses from Edinburgh. The COVID-19 pandemic resulted in delays to Edinburgh airport implementing their planned measures, which caused their community stakeholders to question the commitment of the airport to the Noise Action Plan.

A further consequence is that if a measure is implemented and found to be ineffective, the airport operator will review and revise it. For example, the questionnaire responses from Gatwick airport mention that ineffective measures require follow-on actions or an evolution of actions, impacting noise management planning, resource allocation and costs. Heathrow has also introduced new measures to replace ineffective ones or observed static performance for ineffective measures.

Q33: Are there any penalties for not meeting the objectives of the Noise Action Plan? If so, who incurs the penalties?

Airports in England can face regulatory penalties from bodies such as CAA and the DfT if they fail to comply with noise regulations, especially if they are 'designated airports'. These penalties can include fines and other sanctions. Where airports are considered to not be operating within their planning constraints, local authorities can issue a Breach of Condition Notice to the airport operators. The consultation feedback in the Leeds Bradford Round 4 Noise Action Plan indicates that the airport received one in 2022. Reputational risks from non-compliance are also acknowledged by Manchester, East Midlands and Southend airports, which can negatively affect stakeholder relationships and future developments.

The questionnaire responses and Noise Action Plans suggest that airport operators are largely responsible for day to day enforcement, which includes issuing fines or penalties to airlines found to be non-compliant with the stated noise reduction measures. There is a trend that income from fines is returned to the local communities, regardless of the airport's scale of operations. Examples of this include:

- East Midlands Airport imposes financial penalties for exceeding noise limits, with fines starting at £750 for the first decibel over the limit and increasing by £150 for each additional decibel. The money raised from these penalties is donated to the East Midlands Airport Community Fund.

- Leeds Bradford Airport has a noise penalty scheme where airlines can be fined for non-compliance with permitted noise levels, with penalties put into a community fund

- Manchester Airport fines airlines that persistently fly outside of Noise Preferential Routes and donates the fines to the Manchester Airport Community Trust Fund. Airlines are also fined for off-track departures.

London Gatwick notes that Defra does not explicitly include penalties as part of Noise Action Plan guidance for airports, but there are charges and penalties related to specific Noise Action Plan actions, such as noise charges and departure noise limit penalties. London Heathrow highlights that fines issued to airlines who breach noise limits are used to support community projects. Adherence to night restrictions results in cancellations, incurring costs for airlines, businesses, and passengers. Heathrow has consistently exceeded forecasted outcomes in terms of noise contours through each Noise Action Plan cycle, with noise levels decreasing each noise action planning round.

Airports in the devolved administrations also issue penalties to airlines that are found to be non-compliant with Noise Action Plan objectives. Edinburgh enforces noise limits with fines to airlines, where exceeding the night-time noise limit incurs a minimum penalty of £1,000, rising to £2,000 if the exceedance is greater than 3 dB. All money

received from fines is donated to the community fund for local good causes. The Round 3 Noise Action Plan for George Best Belfast City airport states that airlines are not fined for noise exceedances because "*there are no noise limit values set under the END for the UK nor do the 2006 regulations set limit values*". However, airlines are charged up to £600 for each flight that requires the airport to extend its scheduled opening hours (at night), with the proceeds donated to a community fund [51].

Amsterdam Schiphol and Frankfurt are subject to fines and legal challenges imposed by EU regulatory bodies if they fail to meet the objectives of their Noise Action Plans. In the case of Amsterdam Schiphol, a local news outlet is reporting that despite a recent district court ruling that residents near Schiphol are not adequately protected from noise pollution, the government is not taking enforcement action against the airport due to differing interpretations of local noise regulations or environmental permits for the airport [84]. However, airlines have been threatened with fines of up to €100,000 due to violations of night-time flight rules [85].

Q34: How are complaints analysed to monitor noise issues?

All of the airports use similar methods to review and analyse noise complaints. The approach used to do this typically involves reviewing a combination of flight data and noise monitoring data to identify potential aircraft that generated an individual complaint. Further analysis is also undertaken of the full dataset of complaint data to establish wider trends, such as how the complaints correlate to seasonal variations in air traffic patterns, aircraft types, time of day and weather conditions.

Looking at the full dataset in this way also allows the airport operators to establish whether complaint rates are higher in certain locations than others, which can inform the noise action plan measures. Data from persistent complainants is also identified to support this analysis, which is sometimes presented in the Noise Action Plans (for example, Round 4 at Edinburgh and Manchester).

9. Consistency

This section collates the results to the research questions examining the consistency of Noise Action Plans, taking into account the different aspects of consistency discussed in Section 2.4. The results are mostly based on information obtained by desktop review, with additional insights using questionnaire responses from the airport operators, ACCs and community stakeholders as required.

9.1 General

Q35: Is the quality, content and detail in the Noise Action Plans consistent from year to year (Round 2 through to Round 4) and between airports?

Six out of the 10 airports had consistent quality of their Noise Action Plans between Rounds 2 to 4, whilst airports such as Edinburgh, East Midlands, Southend and Manchester saw improvements in the quality of their Noise Action Plans as the Rounds progressed.

Only 2 out of the 10 airports had consistent content between Rounds 2 to 4, this was seen at East Midlands and Frankfurt. All other airports saw expansion and improvements of the content for the core Noise Action Plan elements included in the previous Round of Noise Action Plan. A further observation is an increased awareness of sustainability in successive Noise Action Plans, with many Round 4 Noise Action Plans referring to their sustainability strategy. In the case of Edinburgh airport, several pages of their Round 4 Noise Action Plan are dedicated to carbon reduction measures, green energy and commitments to air and water quality.

In terms of the level of detail seen across the Rounds of the Noise Action Plans, half of the airports (Gatwick, Leeds Bradford, Amsterdam Schiphol, Frankfurt and Manchester) were consistent across their Noise Action Plan rounds whilst the other half of airports (Heathrow, Edinburgh, East Midlands, Geroge Best Belfast and Southend) saw some slight differences between rounds which were improvements such as the inclusion of more advanced tools for noise monitoring and community engagement, or more detail regarding the measures implemented and their expected outcomes.

Overall, the quality, content and detail contained within the Noise Action Plans were consistent across all airport Noise Action Rounds. Where consistency a level of consistency was not observed, it was due to improvements upon the quality, detail or content. No worsening of the quality, content or detail was observed in any airport Noise Action Plan.

When comparing the Noise Action Plans of different airports, the content within the Noise Action Plan is reasonably consistent across all airports with key topics such as relevant guidance, population impacted due to airport noise, measures to reduce impact, noise contour maps and consultation feedback. The key differences across all airports was related to the level of detail within the Noise Action Plans, a higher level of detail is seen in the Noise Action Plans for larger airports such as Heathrow, Frankfurt, Manchester and Amsterdam Schiphol. The quality of the Noise Action Plans also varies across the airports with reasonably uniform quality by Round 4 observed for most Plans.

Q36: Are the noise contours used for Noise Action Plan development consistent between airports and Noise Action Plan periods?

All airports have used noise parameters such as L_{night} and L_{den} consistently to develop their noise contours. Further details of the specific noise metrics used at each airport are provided in Section 10.3.

Between Round 2 and Round 3 all airports had consistent noise contours overall (location/area, shape, noise contour bands and overall size) with further consistency seen across the shape of the noise contours, where the

coverage of the maps appeared similar in size and location to the previous round, and similar contour bands were utilised. All airports that provided an L_{night} noise contour map showed overall consistency between Rounds 2 and 3 apart from Leeds Bradford where some slight differences were observed.

Across Rounds 3 to 4 more differences were seen between the noise contours at all the airports. Some airports utilised 2019 noise contours within the Round 4 Noise Action Plans whilst some used 2021 contours only. Where 2021 noise contours were used, differences were most likely due to the impact of COVID-19 causing a large reduction in air traffic and therefore reducing noise levels. Four out of the 9 airports (not applicable to George Best Belfast as Round 4 is yet to be published) had consistent noise contours overall, this was seen at Heathrow, Edinburgh, East Midlands and Amsterdam Schiphol. All other airports either had some small or large differences overall across the noise contours for Round 3 and 4. Five of the 9 airports (Gatwick, Edinburgh, East Midlands, Leeds Bradford and Amsterdam Schiphol) had consistent shape of contours between Rounds 3 and 4 with all other airports showing slight differences in the shape/size of the noise contours.

All airports utilised the same contour bands between Rounds 3 and 4 apart from Heathrow and Gatwick, who saw different noise contour bands used. Only Edinburgh airport had a consistently shaped L_{night} noise contour between Rounds 3 and 4, all other airports either had some small differences (Leeds Bradford, Amsterdam Schiphol, Frankfurt, Southend and Manchester) or some large differences (Heathrow).

Q37: Are there differences between airports and Noise Action Plan periods in the use of complaint data to develop actions and monitor success?

Heathrow, Edinburgh, Amsterdam Schiphol, and Frankfurt showed a consistent approach to using complaints data throughout the three noise action planning rounds. At these airports, the use of complaints data was used to understand noise issues and inform noise management priorities.

The review has identified some examples of six airports changing how they used complaint data over time, especially between Round 2 to Round 3. During Round 2, the Noise Action Plans at these airports included measures focussed on responding to complaints. However, during Round 3 the focus shifted to detailed analysis of complaints. This led to the introduction of additional, targeted measures at Leeds Bradford, Manchester, Southend and George Best Belfast City airports. Complaints data also started to be seen as a metric for measuring success of the noise management measures or community annoyance.

All airports have consistently improved complaints management practices by introducing new technologies to analyse and report the complaint data including real-time update and assessment.

9.2 Legislative and Policy Requirements

Q38: Has the noise policy objective been interpreted consistently by the airports?

All of the reviewed airport Noise Action Plans included the following information to meet the requirements of the END, as transposed into national regulations: noise mapping, publication of information, action plans and community measures. The definition of a common approach was also included in all of the Noise Action Plans except for George Best Belfast City Airport.

The interpretation of noise policy objectives, such as those stated in the NPSE, NPPF and Aviation Policy Framework, have also been considered for UK Noise Action Plans. All of the Noise Action Plans provide information on the relevant noise policies in a regulatory framework chapter, which tends to summarise the policy objective and mirror the phrasing used.

There is evidence of the Noise Action Plans referring to other government policies to demonstrate that they are approaching noise policy objectives in a similar way. For example, the Gatwick Round 4 Noise Action Plan refers to

the Airspace Consultation in 2017 to acknowledge specific daytime and night-time LOAEL values of 51 dB $L_{Aeq,16h}$ and 45 dB $L_{Aeq,8h}$ respectively. Separate population exposure tables are then provided to show the population sizes exposed to aviation noise levels above the LOAEL, which demonstrates how they have interpreted and applied the NPSE to their Noise Action Plan. However, most of the Noise Action Plans reviewed do not seem to demonstrate how policy has been applied in this way. An exception to this being that Noise Action Plans tend to show the current set of results against those from previous noise action planning rounds, which has the potential to demonstrate that they are achieving the requirement of the Aviation Policy Framework and Overarching Aviation Noise Policy if the area of the noise contours and/or affected population sizes are not increasing.

Q39: Are the stated controls and strategies in the Noise Action Plans consistent with the Defra guidance and wider policy aims?

There is some evidence of consistency between the controls and strategies stated within the Noise Action Plans for UK airports, however this varies depending on the airport's circumstances. As stated in Section 3, there are several policies that are focussed on noise reduction and noise management in the context of sustainable development. Although the wording differs from policy to policy, the common goals are centred around limiting or reducing noise impacts using reasonable measures to reduce, control or mitigation noise. The Noise Action Plans include controls and strategies that are consistent with this, including but not limited to:

- Fleet modernisation so that noisier aircraft are phased out and quieter ones are phased in over time, so that noise is reduced at source;
- Night flight bans or restrictions;
- Requiring air traffic to use Noise Preferential Routes to prevent noise impacts occurring at additional locations, with flightpaths monitored using Noise and Track Keeping systems;
- Controls on how the aircraft is operated to reduce noise impacts or generating excess noise, such as Continuous Descent Approach, Continuous Climb Departure, and Reduced Engine Taxiing;
- Use of preferred runways or directions where wind conditions allow;
- Controls on ground operations and maintenance; and
- Land use and planning measures, such as noise insulation, purchasing properties or helping people relocate to quieter locations.

Each airport's Noise Action Plan does not necessarily include measures for each of the examples above, but all include a selection of them. Further information on whether the selected measures in the Noise Action Plan achieve reductions in affected populations or significant effects is provided in Section 10.

The Defra guidance [6] refers to the Aviation Policy Framework aim of "ensuring that benefits are shared between the aviation industry and local communities, and aims to encourage better engagement between airports and local communities and greater transparency to facilitate an informed debate". As the Noise Action Plans tend to include a large number of measures and actions specifically related to stakeholder engagement and preparing information for local communities for transparency, this suggests that airport operators are working to achieve this aim. Additionally, as discussed in Section 8, donations to community funds (including income from fines issued to non-compliant airlines) is a further practice that is used to share the benefits of aviation as an industry. However, it can be seen in the questionnaire responses from local communities (as well as feedback provided at Stakeholder Engagement Group meetings) that despite these measures, more work is still required to transparently demonstrate compliance with policy aims.

The Aviation Policy Framework also provides threshold noise levels of 63 dB $L_{Aeq,16h}$ for noise insulation and 69 dB $L_{Aeq,16h}$ for airport operators to assist households with moving costs. The Aviation Policy Framework also recommends the use of other noise control measures that are common features of many Noise Action Plans. These include, for example, the use of noise metrics other than dB $L_{Aeq,T}$, fees linked to noise emissions, noise insulation schemes, and preferential routes. These requirements are reflected in corresponding Noise Action Plan measures for noise insulation, where airports include them. For example, the Round 4 Noise Action Plans for Edinburgh and Southend use a threshold noise level of 63 dB $L_{Aeq,16h}$ for their noise insulation schemes, and Heathrow uses both values for their relocation and noise insulation schemes. However, not all UK airports apply this – the Leeds Bradford Round 4 Noise Action Plan states that no noise insulation schemes are currently open, and its previous two noise insulation schemes were specifically linked to previous developments (a runway extension and night-time flights).

9.3 Control Measures

Q40: Are night-time (23:00 to 07:00) aircraft movements appraised and managed consistently?

All airports have acknowledged that night-time noise impacts are more adverse than daytime impacts and have appraised night-time aircraft movements in a consistent way. There are differences in how night-time aircraft movements are managed, which link to the scale of operations at the airport and its local context. All airports are required to be compliant with any night-time noise-related planning conditions they may have, but these conditions vary from airport to airport. Designated airports (Heathrow and Gatwick) are subject to night-time restrictions that are set by the Department for Transport and are periodically reviewed. These restrictions are additional to any other planning-related restrictions at these airports.

There is also evidence of night-time noise management practices improving over time at some of the airports. This is most evident in the Noise Action Plans for Leeds Bradford airport, which show that the measures have progressed from establishing a system for managing night-time noise during Round 2 to enforcing night-time restrictions during Round 4. “Measure 24” also states that Leeds Bradford airport is seeking to improve its ability to monitor compliance with Noise Preferential Routes by investing in new air navigation technology, which would further improve its ability to manage night-time noise.

Q41: Is there consistency on the approach to control measures with changes in demand for aircraft?

Where measures have changed or new measures added over the years, the Noise Action Plans generally do not comment on whether these measures or changes are specifically linked to air traffic demand. Sometimes air traffic growth is referred to as a reason that more generally underpins revision of some measures but is not discussed in detail. For example:

> “*To ensure that future growth at Manchester Airport remains within our noise contour limit, it will be necessary to impose noise-based limits on aircraft operations for the 8-hour period between 23:00 and 07:00. Therefore, during this Noise Action Plan we will develop, consult on and introduce a new seasonal quota count limit which will cover the full 8-hour night period from 23:00 to 07:00. Until this limit is introduced, we will maintain our existing seasonal quota count point noise budget*.” (Manchester, Round 4)

Heathrow and Manchester airports are examples of airports where air traffic has grown between Rounds 2 and 4 but noise impacts have improved. This can be linked to the successful implementation of measures stated in the Noise Action Plan and revising some measures over time to achieve ‘stretch’ goals. For example, the Manchester Round 2 Noise Action Plan targets use of Continuous Descent Approach at night-time only, but by Round 4 is targeting 90% of all arriving aircraft using the Continuous Descent Approach. The proposal by Amsterdam Schiphol to reduce the number of flights in their Round 4 Noise Action Plan provides an atypical example of challenging the

supply and demand dynamics at the airport. The use of high landing fees and other methods to disincentivise airlines from using Amsterdam Schiphol airport provide further evidence of this, but require regular review to ensure they have the desired effect.

Some of the questionnaire responses received from airport operators mentioned economic downturns and global events such as the COVID-19 pandemic as external factors that reduce demand for air traffic. Where this occurs, there are economic consequences for the airport and airlines as passenger numbers decline. Although the Noise Action Plan commitments remain, economic pressures may influence which measures are prioritised and how achievable those measures are within their stated timeframes.

10. Effectiveness

This section collates the results of the research questions concerning the effectiveness of the Noise Action Plans for airports. The results are based on information obtained by desktop review and questionnaire responses from the airport operators, ACCs and community stakeholders.

10.1 Noise Changes

Q42: Does the Noise Action Plan describe how noise has changed since the previous one?

All Noise Action Plans describe how noise has changed since the previous Noise Action Plan. This was observed for all of the reviewed airport Noise Action Plans in England, devolved administrations and the EU.

The Noise Actions Plans refer to the noise contour maps for the current and previous noise mapping round(s), and either describe the change in the noise contour areas and/or the size of the affected populations for each noise contour band. For Round 2 Noise Action Plans, in the absence of a formal Round 1 Noise Action Plan, most plans provided 2006 Defra noise contour maps to compare the current noise levels to.

Q43: Do the airports describe reasons for changes in populations exposed to noise levels?

All Noise Action Plans described reasons for changes in populations exposed to noise levels. This was observed for all of the reviewed airport Noise Action Plans in England, devolved administrations and the EU.

The most common cause of a reduction in populations exposed to aviation noise across all airports was the implementation and enhancement of measures to reduce noise levels, and therefore, reduce the population impacted. Similarly, the Noise Action Plans frequently mention changes in air traffic volume and its impact on population exposure, with particular attention on the large reduction of impact during the COVID-19 pandemic in the Round 4 Noise Action Plans.

Changes to urban development and land use around the airport were mentioned across a variety of airports (such as Amsterdam Schiphol, Heathrow and Manchester airports where changes included new residential developments or expansion of the airport runways) as a cause of change in population exposed to noise levels. Likewise, the expansion of airports including additional runways and operations caused an increase in populations impacted by noise.

Some changes in population exposure were noted as due to technological advances in aircraft and therefore fleet composition changes. An example is the reduction in use of Chapter 3 (noisy) aircraft, which reduced noise impact surrounding the airports.

Q44: Are changes in population exposure able to be linked to specific Noise Action Plan measures or other things?

It is possible to link specific measures to changes in population exposure at some airports. It should be noted, none of the 28 Noise Action Plans specifically report the noise reductions achieved from implementing each measure, but infer changes of impact from successful measures, therefore, inference from changes of impact and particularly successful measures have been made. It should be noted that where the Round 4 Noise Action Plans show a reduction in impact during 2021 all Plans note this is mainly due to the impact of COVID-19, therefore, it is not possible to link specific measures to changes in population exposure between Round 3 and 4 without taking this other effect into consideration.

The designated airports (Heathrow and Gatwick) and EU airports provide detailed reasons for changes in population exposure including specific measures that were seen to cause changes in impact such as fleet modernisation and continuous descent approaches. All other airports within the UK provide reasons for changes in populations exposed to noise levels but do not link them directly to measures. For example, George Best Belfast City Round 2 and 3 Noise Action Plans mention changes in aircraft movement and aircraft types as a cause of change in population impact.

Consistent fleet modernisation, which was frequently mentioned within the designated airport Noise Action Plans (also included in all Noise Action Plans for all airports) has reduced impact upon populations with a reduction in noise level due to phasing out of Chapter 3 aircraft.

Q45: Are changes in noise reliant on changed behaviours?

All Noise Action Plans provide information to suggest that changes in noise shown in the Noise Action Plans are reliant on changed behaviours, typically brought about by the implementation of measures. Some examples of key measures that are reliant on changed behaviours included in the Noise Action Plans are night-flight restrictions, modifications to ground operations and continuous descent approaches.

Both designated airports mentioned measures that cause a change of pilot behaviour such as operational procedures including continuous descent approaches, noise preferential routes and low power/low drag procedures. Furthermore, incentive programs are used to rank airlines based on their noise performance, and an increase in community engagement was seen to improve understanding of noise impacts for local communities and stakeholders concerns to incorporate into noise management strategies.

The Noise Action Plans for the two EU airports state similar changed behaviours as to those at the UK's designated airports. Strict preferential runway use is a key strategy utilised to reduce noise disturbance at airports with multiple runways, alongside incentives and noise associated charges to encourage use of modern quieter aircraft and comply with night flight restrictions.

Q46: Are perceptions of changes in noise from the local community described?

All Noise Action Plans detailed how the perceptions of noise from the local community have changed, stating that transparency with local communities is vital. Noise Action Plans used consultation and complaints data to evaluate changes in perceptions of noise. All Noise Action Plans utilise the local communities' perceptions of noise changes during the development of noise reduction measures.

At Heathrow, Gatwick and Southend airports, the perceptions of changes of noise by the local community were analysed within the Noise Actions Plans through complaints data. Complaints analysis looked to evaluate improvements of perceptions (a reduction in complaints) or dissatisfaction (with an increase in complaints). Further analysis of complaints data evaluated the changes in perceptions of different types of noise, such as daytime or nighttime noise.

Furthermore, Heathrow and Gatwick airports used additional data from consultations, surveys and public meetings to evaluate perceptions of noise. Heathrow formed a noise forum (Heathrow Community Noise Forum) to receive feedback from local residents at any time. Other smaller airports such as Edinburgh and Manchester describe the use of a consultative committee or noise forum to gain data on the perceptions of noise from the local community.

George Best Belfast City airport was the only airport to use community attitude surveys to gather local community perceptions. The Noise Action Plans provided detailed findings and trends from the data. There was a slight increase in dissatisfaction with aircraft noise between Round 2 and Round 3, however, overall satisfaction levels were higher than 2013.

EU airports noted specific areas with increased noise annoyance using noise complaints and public feedback. Key findings were noted within Amsterdam Schiphol's Noise Action Plans, commenting on an increase in awareness of noise pollution alongside some dissatisfaction with the measures in place as the stakeholders do not feel the measures adequately reduce noise.

10.2 Noise Impacts

Q47: Has implementation led to better outcomes on noise impacts and other relevant issues?

All Noise Action Plans show how the implementation of the Noise Action Plan has led to better outcomes on noise.

Every Noise Action Plan noted that the implementation of the plans has led to the use of noise reduction measures which aim to reduce impact on the surrounding communities. All airports excluding Southend, Leeds Bradford and Amsterdam Schiphol have seen an improvement of noise impacts because of the implementation of Noise Action Plans across all rounds. The key parts leading to better outcomes are measures such as fleet modernisation, night flight restrictions and operational movements. Another example is the increase in community engagement through consultation, forums and surveys. The Noise Action Plans suggest that increased community engagement and transparency across the airports has led to improved relationships with stakeholders which allows the airports to alter and create measures to specifically reduce impacts noted by local communities. However, it is acknowledged from the questionnaire responses from airport operators and community stakeholders that in most cases, the relationship between each other tends not to change.

Although Amsterdam Schiphol's Noise Action Plans provide details to suggest the implementation of the Noise Action Plan has improved outcomes on noise, the noise results and consultation data suggests otherwise. Amsterdam Schiphol has seen an increase in noise impact since the implementation of the Noise Action Plan and therefore, shows it has not been effective in reducing impact from noise but without the Noise Action Plan there may have been an even greater impact.

All Noise Action Plans infer that the implementation of Noise Action Plans has led to better non-noise outcomes. These include better community engagement, economic benefits, environmental sustainability and air quality (Edinburgh Noise Action Plan Rounds 3 and 4 specifically mention the effects to monitor and improve air quality around the airport).

Frankfurt airport mentions the economic benefit of the Noise Action Plan, where property values have increased near the airport due to the implementation of noise reduction measures.

Most airports (including designated, EU and some UK airports) mention the impact the implementation has had on the health and wellbeing of the residents in the surrounding area and how measures have been put in place to reduce impact.

Q48: Have significant or adverse noise effects been reduced?

It is difficult to conclude whether a reduction of significant or adverse noise effect can be seen throughout the three Noise Action Plan rounds for each airport. This is because the Round 4 noise contours and affected populations were heavily influenced by the impact of COVID-19, which significantly reduced air traffic. Although a large reduction can be seen in noise effects when comparing the Round 4 Noise Action Plans to earlier Plans, it is not possible to determine what proportion of the reported noise reductions for the year 2021 are attributable to implemented measures (as no success rate was provided in most Noise Action Plans). Some of the airports reported additional data for 2019, which offers some clues. With this in mind, the following statistics have been determined.

A large reduction in significant or adverse noise impact was seen across the three Noise Action Plan rounds at Heathrow, Edinburgh and George Best Belfast City. For example, the Noise Action Plans for Heathrow airport reported the following changes in the affected population based on the L_{den} contour band (dB):

- In 2011 (Round 2), 766,100 people were reported within the +55 dB contour band,
- In 2016 (Round 3), 689,400 people were reported within the +55 dB contour band,
- In 2019, (Round 4) 664,300 people were reported within the +55 dB contour band,
- In 2021 (Round 4) this had reduced down to 215,000 people within the +55 dB contour band (noting that this was influenced by COVID-19).

Some reduction in significant or adverse noise impacts was seen at Gatwick, Manchester and Frankfurt airports between Rounds 2 and 4. But this was not necessarily consistent across all noise metrics. For example, the Manchester Noise Action Plans show a decrease in the populations exposed to 55 dB L_{den} or more over time, but also increases in the population exposed to aviation noise at night.

East Midlands airport showed an increase in population impacted based on the L_{den} noise contour band:

- In 2011 (Round 2), 12,800 people were within the +55 dB noise contour band,
- In 2016 (Round 3), this had increased to 12,900 people within the +55 dB noise contour band,
- By 2019 (Round 4), 14,650 people were affected within the +55 dB noise contour band,
- By 2022 (Round 4), a slight reduction to 14,400 people in the +55 dB noise contour band was seen.

When considering the increase in demand of aircraft at this airport, specifically cargo air traffic from 2011 to 2022, the sizes of the exposed populations may have been larger if the Noise Action Plan measures had not been implemented. Further examples of increases in exposed populations over time can be seen at Southend, Leeds Bradford and Amsterdam Schiphol airports, where the increases at Leeds Bradford shown in Round 3 are linked to an expansion of operations at night. The changes at Southend are shown below for the L_{den} noise indicator:

- In 2011 (Round 2), 1,000 people were within the +55 dB L_{den} noise contour band,
- By 2016 (Round 3), this had increased to 2,200 within the +55 dB noise contour band,
- In 2021 (Round 4), it had further increased to 3,700 people within the +55 dB L_{den} noise contour band.

All Noise Action Plan noise contours were overall consistent throughout Round 2 to Round 3 suggesting the success of implemented measures whilst operating with an increase in aircraft demand.

Q49: Have noise impacts improved over time, taking into account air traffic volumes?

Similarly to Question 48, noise contour and impacted population data within the Noise Action Plans showed whether noise impacts had improved at each airport over time alongside the increases in air traffic volumes at each airport. Furthermore, it is hard to decipher whether the noise impact has improved over time due to the Round 4 noise impact data being heavily influenced by the impact of COVID-19. The following data identifies where noise improvements occurred but these may have been due to COVID-19.

Since Round 2, all airports have had an increase in traffic volumes (excluding reductions related to COVID-19). If the noise impact has been reduced since the implementation of the Round 2 Noise Action Plan, it shows the Noise Action Plans were effective at reducing noise impact even when considering air traffic volumes.

With consideration to the air traffic volumes at the airports, a large improvement of noise impact can be seen at Heathrow, East Midlands, Manchester, Edinburgh, George Best Belfast City and Frankfurt. For example, between 2011 and 2019, Heathrow saw an approximately 100,000 person reduction of population impact within the +55 dB L_{den} contour band. Further reduction was seen in 2021, however, this was mainly caused by the impact of COVID-19.

The noise impact has not improved or has worsened when considering the air traffic volumes at Southend and Amsterdam Schiphol airports. Amsterdam Schiphol saw an increase in impacted dwellings between 2016 and 2021, during 2016 there was 21,800 dwellings within the +55 dB L_{den} noise contour, by 2021 this had increased to 29,500.

10.3 Monitoring and Performance

Q50: Are there some good examples of monitoring compliance and progress?

All Noise Action Plans include good examples of monitoring compliance and progress. All airports include noise contour maps, significantly impacted population details, implementation of preventative mitigation within their Noise Action Plans.

Some examples of good monitoring compliance and progress at Edinburgh airport are the implementation of noise monitoring, fining aircraft over specific noise levels, by Round 4 Edinburgh airport had implemented a noise and track keeping system to consistently monitor progress of noise impact. Progress was also monitored using KPIs, comparing noise contour mapping between Noise Action Plans, annual reporting of noise levels and community engagement.

At Manchester airport the implementation of the noise and track monitoring system was also seen, with annual reporting of noise levels to monitor progress, independent verification and performance indicators (KPIs). Manchester also introduced an online portal for the community to raise any concerns they have related to noise impact.

Frankfurt similarly utilised continuous monitoring to ensure compliance with measures and guidance, alongside active noise abatement measures and noise respite periods to reduce noise impact on the surrounding area.

Q51: Are additional noise metrics outside those used for Strategic Noise Mapping used to track the effectiveness of the Noise Action Plan measures?

Each of the 10 airports studied utilised additional noise metrics outside of the those used for strategic noise mapping. The strategic noise mapping metrics referred to in the Environmental Noise Directive are L_{day}, L_{eve}, L_{night} and L_{den}. The Environmental Noise Directive also refers to the number of noise events, L_{Amax} (maximum noise level) and Sound Exposure Level (SEL) as potential supplementary noise indicators that may be used. Table 10-1 shows the noise indicators referred to in any of the Noise Action Plans for each airport.

Table 10-1: Noise Metrics Utilised in any Noise Action Plan Round for Each Airport

Airport	L_{den}	L_{night}	L_{day}	$L_{evening}$	L_{max}	L_{Aeq} (16 or 8hr)	Summer period	N above	SEL	Other
Heathrow	✔	✔				✔	✔	✔		Single mode
Gatwick	✔	✔	✔	✔	✔	✔	✔	✔		Low noise arrival metric
Southend	✔	✔				✔	✔	✔		
East Midlands	✔	✔			✔		✔	✔	✔	
Leeds Bradford	✔	✔			✔			✔	✔	Target Noise Levels

Airport	L_{den}	L_{night}	L_{day}	$L_{evening}$	L_{max}	L_{Aeq} (16 or 8hr)	Summer period	N above	SEL	Other
Manchester	✔	✔	✔	✔		✔	✔			Average noise level of 100 noisiest departures. Number above (N-contours)
Edinburgh	✔	✔			✔	✔		✔		
George Best Belfast City	✔	✔				✔			✔	
Amsterdam Schiphol	✔	✔			✔			✔	✔	Kosten Unit
Frankfurt	✔	✔								FFI (Frankfurt Aircraft Noise Index)
Total	10	10	2	2	5	6	4	7	4	

A variety of additional noise metrics were utilised across the airports Noise Action Plan Rounds, Amsterdam included sound exposure level (SEL) which is the total energy in noise event, normalised to a one second period. Amsterdam Schiphol also used the Kosten Unit which is an older metric used before L_{den} or L_{night} providing the cumulative noise exposure over a specific period. Frankfurt created its own metric, the Frankfurt aircraft noise index (FFI) is used to assess the impact of noise reduction measures and track progress over time. Leeds Bradford used target noise levels, which show specific noise levels set for daytime and night-time operations to identify aircraft generating above-average noise levels. The most common additional metric seen by UK airports was the N-above contours.

Q52: How does the use of different metrics help achieve the intended objectives of the Regulations?

Summertime is the busiest period for airport operators and is where the most flights take place each year. The use of summer period contours and affected population data (where generated) help the airport operator understand the worst-case noise levels from their operations and to use this information to inform their Noise Action Plan measures. This contrasts from the annual noise contours which are based on average figures. For example, some of the Noise Action Plans refer to quota counts for the summer and winter period, and this information can help to monitor compliance.

The use of $L_{Aeq,16h}$ and $L_{Aeq,8h}$ contours and data on affected populations can be useful for establishing a link between aviation noise and health effects. This becomes more effective where the Noise Action Plan specifies values to represent the LOAEL and the SOAEL so that it is clear how the onset of adverse and significant adverse effects is defined.

The N-above metric is also commonly used, with some airport operators sharing that they have found it best reflects how their local communities respond to aviation noise. While this may not specifically with the Environmental Noise Regulations, the N-above metric may also help demonstrate compliance with planning obligations.

Event-based indicators, such as L_{Amax} and SEL, are used to support noise monitoring and enforcement activities. For example, where a departure noise limit based on these noise indicators is exceeded, this provides evidence to support fining the relevant airline.

Q53: Where controls remain in place between plans, is there evidence of longitudinal effectiveness?

All Noise Action Plans provide a level of evidence to show that where control measures remain in place between plans, there is longitudinal effectiveness. All UK based airports provided detailed evidence to show longitudinal effectiveness, examples of evidence types provided are noise contour reductions, fleet modernisation, operational improvements and night noise reduction. Both EU airports had limited evidence of effectiveness provided, where a measure was extended to the next Round minimal or no details on how the measure was effective were given.

Table 10-2 shows the most common controls used across all the airports study and which airports provided evidence of longitudinal effectiveness of each control within their Noise Action Plans.

Table 10-2: Common Controls seen in Noise Action Plans and where Each Airport Provides Evidence of Longitudinal Effectiveness

Airport	Fleet renewal	Operational improvements	Noise monitoring and reporting	Community feedback and engagement	Noise insulation grant scheme	NPR	Night-time restrictions
Heathrow	✔	✔	✔				✔
Gatwick	✔	✔	✔		✔	✔	✔
Southend			✔	✔	✔		
East Midlands	✔	✔		✔	✔		✔
Leeds Bradford			✔	✔	✔	✔	✔
Manchester		✔	✔		✔	✔	✔
Edinburgh	✔	✔	✔	✔	✔		
George Best Belfast City		✔	✔	✔			✔
Amsterdam Schiphol	✔	✔	✔	✔			
Frankfurt	✔	✔	✔				✔

Q54: Which control measures are used to meet the requirements of the ICAO Balanced Approach, Aviation Policy Framework and Designated Airports (where applicable)?

Overall, all Noise Action Plans include control measures to ensure they meet the requirements of ICAO balanced approach, the Aviation Policy Framework (not applicable to EU airports) and designated airports (where applicable). Some key categories of success were reduction of noise at source, land-use planning and management, noise abatement operational procedures and implementation and monitoring. It should be noted the Noise Action Plans did not specify which measures were used to meet each piece of guidance, overall categories for both the ICAO Balanced Approach and Aviation Policy Framework have been determined.

Below shows the measures used at Heathrow airport to meet the requirements of the ICAO Balanced Approach and Aviation Policy Framework. Most of the below measures are also detailed within the UK based airports.

- Reduction of noise at source: fleet modernisation, variable landing charges, noise certification standards.
- Land-use planning and management: noise insulation schemes, local planning guidance and monitoring encroachment, restricted areas and noise protection zones.
- Noise abatement operational procedures: continuous descent approaches, noise preferential routes, night flight restrictions, ground noise management, preferential runway use, optimised flight procedures.
- Implementation and monitoring: noise monitoring terminals, incentivised programs, annual noise contour reports, independent audits and community engagement.

The EU based airports provided less measures than those within the UK Noise Action Plans, however still ensured they met the requirements of ICAO balance approach using similar measures to those seen above whilst including some additional ones.

Q55: Is there a difference in effectiveness between measures developed for the Noise Action Plan process and those developed to meet wider policy requirements?

It does not appear that there is an obvious difference between effectiveness of measures developed for the Noise Action Plan Process and those developed to meet wider policy requirements. It was not possible to find evidence to state either way, due to a lack of data within the Noise Action Plans detailing how effective each noise measure was.

Each Noise Action Plan aimed to evaluate the impact the airport had on the surrounding area and to improve this through control measures. If the measures developed for the Noise Action Plan process were not found to be reducing the noise impact enough, airports would modify or create new measures to ensure a reduction of noise occurred.

Q56: Have Noise Action Plans helped in increasing awareness about noise impacts?

All Noise Action Plans infer that the Noise Action Plans help to increase awareness about noise impacts. The consultation process is a key aspect of Noise Action Plan development which improves levels of knowledge on the noise impacts from each airport.

The questionnaire responses from community stakeholders also suggest that over time additional community groups wish to join ACCs or participate in the process. This could be due to improved awareness of opportunities to share their views and influence the process aside from raising complaints directly to the airport operator. It is unclear whether their increased awareness is also linked to becoming newly affected by aviation noise due to air traffic growth or expansion, prompting a willingness to engage in the process.

Q57: Are all of the measures within the Noise Action Plan implemented and do they achieve their stated success criteria?

The implementation and success of measures within the Noise Action Plans vary across different airports and regions. In England, Gatwick and Manchester airports have implemented comprehensive strategies, including engine testing restrictions, reduced-engine taxiing, and the use of Auxiliary Power Units (APUs) and Ground Power Units (GPUs). These measures are supported by noise monitoring systems and community engagement initiatives to ensure transparency and address community concerns. In the devolved administrations, Edinburgh and George Best Belfast City, similar measures are in place with additional emphasis on community engagement and reporting. Amsterdam Schiphol and Frankfurt have adopted advanced measures, including air traffic management optimisation, quieter braking at night, and the electrification of ground vehicles. The scale and size of airport operations influence the proportionality of the measures, with larger airports implementing more extensive and technologically advanced measures.

The clarity and achievement of success criteria or key performance indicators in Noise Action Plans also vary significantly. Manchester and East Midlands airports have clearly stated success criteria for some of the measures, allowing for precise tracking and evaluation. However, Heathrow and Gatwick airports have less clearly defined criteria, making it challenging to assess the effectiveness of the measures accurately. Similarly, airports in the devolved administrations and European airports like Frankfurt exhibit variability in the clarity of their success criteria. Overall, while most measures within the Noise Action Plans have been implemented at each airport, the clarity and achievement of success criteria vary, highlighting the need for more consistent and clearly defined criteria to ensure that all measures achieve their intended outcomes.

Q58: If non-standard or innovative measures are used in the Noise Action Plan, are they effective?

All Noise Action Plans included innovative or non-standard measures. Some examples of innovative or non-standard measures from a selection of airports is described below.

The Round 4 Noise Action Plan for Leeds Bradford provides examples of where improvements or expansions upon common measures were proposed to meet the required guidance. These included:

- Creating an online system which provide publicly available noise and flight tracking website for transparency and compliance monitoring.
- The introduction of Favourable Landing Fees which included landing fees that favour the quietest and most fuel-efficient aircraft to encourage airlines to operate modern fleets.
- Implementation of Delayed Deployment of Landing Gear which, whilst working with airlines, introduced procedures to delay the deployment of landing gear to reduce airframe noise during arrivals.

The Heathrow airport Noise Action Plans detailed three key measures which were all very effective. This consisted of the following:

- The Quiet Night Charter, which aimed to reduce night-time noise by working with airlines and NATS to implement quieter night operations. Most Noise Action Plans include fines for night-time flights outside of a specific time frame, the Quiet Night Charter is a measure which goes above just fining airlines and ensures cooperation with airlines and NATs to achieve the best possible management of night flights.
- The Heathrow Community Noise Forum which enhances community engagement and ensure transparency. As not all airports have noise forums for the local community and stakeholders other than through an ACC, this is an innovative way to keep the communities involved.

- The Ground Noise Management Plan which was developed to monitor and manage ground noise activities, including engine ground runs at night. Not all Noise Action Plans include ground operation management in great detail.

Amsterdam Schiphol, specifically Round 3 also provided three innovative measures which were effective:

1. The Microclimate Leimuiden Project which investigated alternatives to the eastern take-off routes from the Kaagbaan Runway, resulting in a new route that reduced noise in Leimuiden.

2. The Noise Abatement Departure Procedures, which aimed to reduce noise exposure by optimising the climb profile during take-off.

3. SESAR Programme which is part of the Single European Sky ATM Research programme, this involved modernising air traffic management to reduce noise pollution.

Airspace modernisation is a recurring theme in the Round 4 Noise Action Plans for UK airports, which would achieve similar benefits as the SESAR Programme when implemented. The modernisation of airspace is expected to bring about noise reductions by improving congestion of air traffic, which would avoid aircraft needing to loop around airports until they can land and also reduce delays at take-off.

In addition to the above, Amsterdam Schiphol constructed noise-reducing ridges and parks to help attenuate noise and its Round 4 Noise Action Plan proposed a reduction in its number of flights to reduce noise impacts. Specifically, the Noise Action Plan targets reducing its night-time capacity to 27,000 flights and its overall capacity to between 460,000 to 470,000 flights per year. Whilst this non-standard measure may be effective at reducing noise impact it is not likely to be easily achievable considering the high air-traffic demand.

10.4 Additional Considerations

Q59: Are all socio-economic groups treated equally in the development of the Noise Action Plan?

Seven of the eight airports that responded to the survey agreed that all socio-economic groups were treated equally in the development of the Noise Action Plan. Four out of the eight airports ‘strongly agreed’ with the notion whilst three ‘agreed’. The remaining airport responded ‘neither agree or disagree’.

The ACC / stakeholder survey responses were less certain of this than the airport operators, with most respondents stating that either they disagreed or did not know whether this is the case. Two East Midlands and one Gatwick respondent strongly disagreed that all socio-economic groups are treated equally. Some of the negative responses were linked to community groups who felt that they had not been adequately included in the process. The ACCs for Gatwick and Edinburgh were the only community stakeholders that agreed that socio-economic groups are treated equally in the development of the Noise Action Plan.

Q60: Are the airports and Noise Action Plans consistent on how their actions are considered with respect to the socio-economic aspect of aviation?

The Noise Action Plans are consistent in their belief that the prosperity offered to local communities (or indeed, to the nation) is a satisfactory trade-off for the noise generated by the airport. This is often cited as a reason for expansion. This perspective is given authority by the Defra guidance, which echoes the notion. For example, as per the 2022 iteration of the Defra guidance (para 1.8):

"When managing the environmental noise that arises from aircraft, a fair balance needs to be struck between the negative impacts of noise (on health, amenity (quality of life) and productivity) and the positive economic impacts of flights".

Q61: Are changes to health effects in the most important areas monitored?

Of the eight airport respondents to the questionnaire, four stated that they do not monitor health effects in the most important areas and one neither agreed or disagreed that this type of monitoring took place. Two UK-based airports stated that they do monitor health effects in the most important areas, these being Edinburgh, and Heathrow.

Responses from relevant community stakeholders for Heathrow and Edinburgh airports show that they agree that Heathrow undertakes monitoring and disagree that Edinburgh undertakes monitoring for health effects. Heathrow does not report the specific details of the health effect monitoring in the Noise Action Plans. Reporting on these figures in the Noise Action Plan forms part of the obligations imposed under Annex V, and so are considered to be mandatory KPIs. Although several of the Noise Action Plans indicated a link between a particular noise level (or LOAEL / SOAEL) and a health condition, none of the UK Noise Action Plans directly report on the changes to health effects. Without a commentary on health effects directly related to the affected populations reported, the reader is left to infer that all affected people, irrespective of the noise metric or noise band reported, would have the health effects of annoyance and sleep disturbance. A distinction between highly annoyed/highly sleep disturbed is generally not made.

The totality of questionnaire responses from community stakeholders generally agrees with the responses from airports, in that the respondents state that no monitoring takes place, or they are unsure if this happens.

Q62: How are TAG outcomes from strategic noise mapping used to inform the Noise Action Plan measures and track improvements?

Figure 10-1 shows the questionnaire responses from airports, ACCs and community groups on the use of health effects as a tool to inform Noise Action Plan measures. It shows that only one airport uses health effect information in this way, which is Amsterdam Schiphol. The Round 4 Noise Action Plan also shows reporting of health effects alongside estimates of the affected populations in each noise contour band. It can be inferred that this information may have supported the decision by the airport to try to reduce the number of flights over the current action planning period.

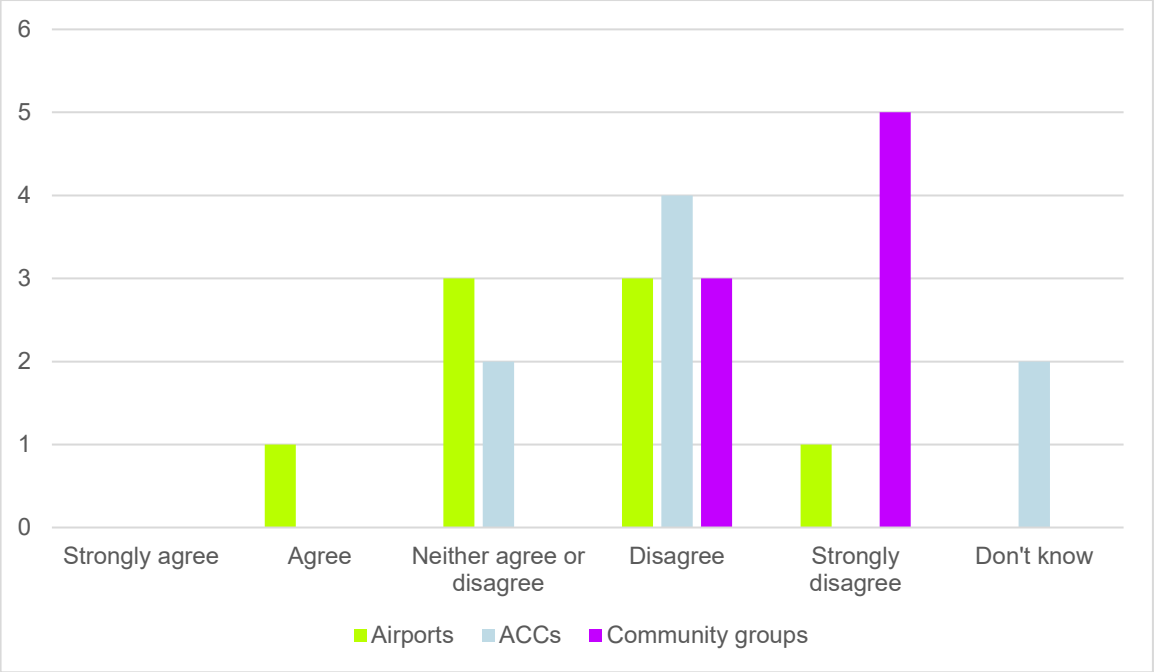

Figure 10-1: Questionnaire responses to the statement "Cost benefit analyses on health effects inform the Noise Action Plan measures"

The majority of the responses from other airports demonstrate that health effect data, monetised or otherwise, currently has a limited role in informing Noise Action Plan measures or tracking improvements.

Q63: Are the most recent Noise Action Plans consistent in their approach for sustainable strategies/decisions?

All of the Round 4 Noise Action Plans reviewed for this study include information on sustainability, reflecting the growing importance of sustainability since the previous round of noise action planning. The need to improve air quality was referenced as a sustainability goal in some of the Noise Action Plans, as well as other actions that could be taken to reduce carbon emissions or water quality.

The level of detail included on sustainability varied between the airports, from some limiting their discussion on the subject to their sustainability strategy or Sustainable Aviation (Southend, Leeds Bradford), whereas others provided a summary of several initiatives covering aviation and airport operations (Edinburgh).

Figure 10-2 shows the questionnaire responses from airports, ACCs and community groups related to the relationship between noise reduction and wider sustainability goals. The totality of responses suggest that respondents do not perceive there to be a conflict between noise reductions and sustainability. However, the Noise Action Plans report independencies between noise reductions and achieving sustainability goals. For example, modernisation of the aircraft fleet is key to achieving goals for noise, air quality and fuel efficiency. Using the quietest aircraft may not yield the best outcomes for air quality or fuel efficiency, so a slightly noisier aircraft (but still a quieter one overall) may be selected to optimise outcomes for all goals.

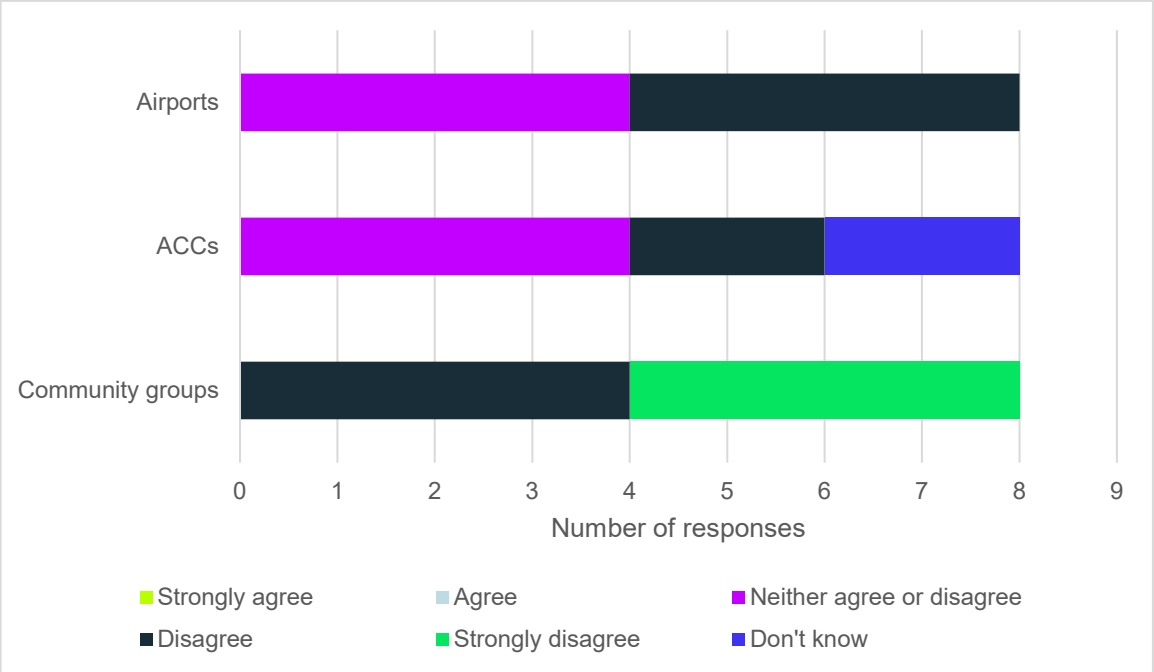

Figure 10-2: Questionnaire responses to the statement "Reducing noise emissions conflicts with sustainability goals"

Q64: How is the effectiveness of the action plan or controls within the plan being measured?

Gatwick, Heathrow, and London Southend have introduced the limited use of SMART objectives in some aspects of their goal monitoring at Round 4. The use of SMART goals is informed in some cases by stakeholder feedback requesting as much. The use of SMART objectives at these airports does not go so far as to encompass all measures in the relevant Noise Action Plans. This is attributed to practicality issues. London Southend has committed at Round

4 to annual review progress towards achieving targets, and “where reasonably practical” use SMART objectives. Gatwick cite similar concerns regarding practicality, stating:

> “In general, it is not practicable to disaggregate the benefit of individual actions, however, it is proposed that for some actions, that case studies are developed during the life of the Round 4 action plan, to quantify resultant benefits more clearly”.

Heathrow like several other airport operators publish an annual progress report. In Heathrow’s case, the claims in the annual progress report are independently audited and detail progress against each measure in the Noise Action Plan. Heathrow has also set KPIs that will provide a check on Noise Action Plan measure progress, for example one of the KPIs requires 90% of Noise Action Plan measures to be on target or achieved.

Open ended action/completion dates for measures are also common amongst the Round 4 Plans. For example, whilst interesting ideas are put forth in East Midlands Round 4 Noise Action Plan, it is noted that the majority of their measures do not have a specified action date. This obviously raises issues of the suitability of the measures as actionable goals, regardless of their beneficial purpose.

Q65: Have the plans, the plans process or specific measures led to better relationships with local communities?

The perspectives of airports and community stakeholders on their relationships with one another linked to the Noise Action Plans are shown in Figure 10-3. The majority of the responses indicate a ‘no change’ situation irrespective of whether the relationship is good or bad. Only one airport operators (Heathrow) stated that there has been an improvement in its relationship with the local communities.

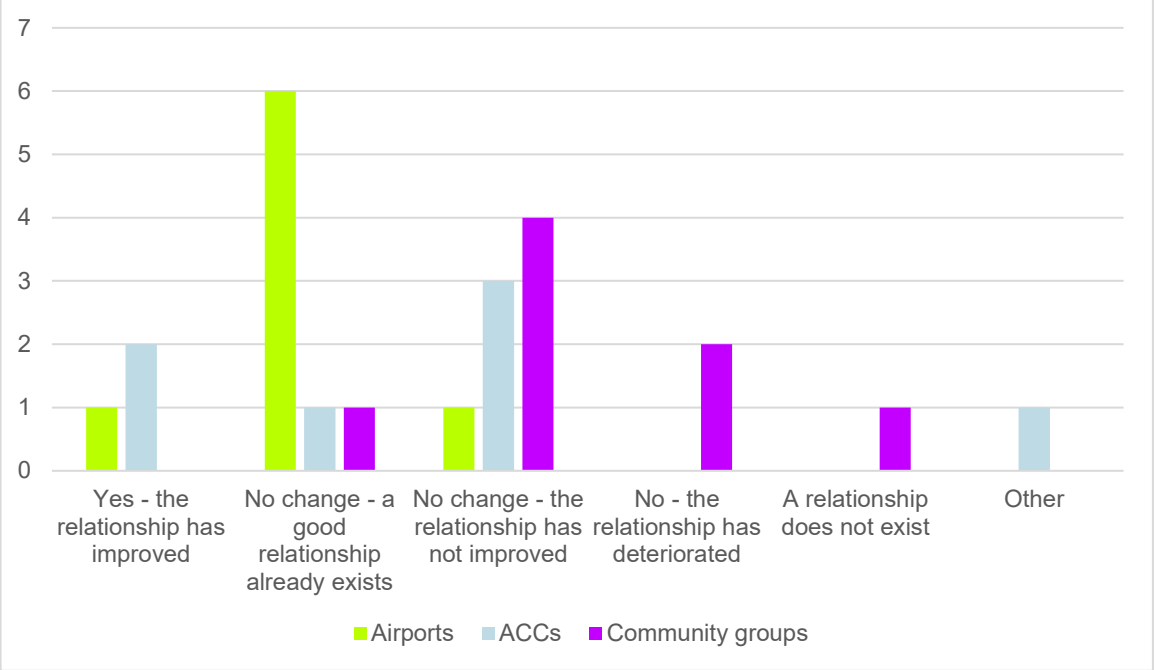

Figure 10-3: Questionnaire responses to the statement “Has the Noise Action Plan, the plan process, or specific measures led to better relationships with local communities?”

Community stakeholder responses showed a variety of opinions on whether the relationship between the airport and local communities had improved. Seven out of the sixteen responses stated there was no change in their relationship with the airport since the implementation of the Noise Action Plan. Two community groups stated their relationship had worsened as they perceived that their concerns were not being acted on. One community group stated they had no existing relationship with the airport (Leeds Bradford) as they had “consistently refused to communicate with local communities and requests to join the ACC”. The ACC for Manchester Airport indicated that

until recently the basis of their relationship with the airport was formed by their section 106 agreement rather than the Noise Action Plans or the process for developing them.

Community stakeholders provided additional comments on their relationship with the airport - where relationships had improved this was due to the implementation of open constructive discussion and public forums. Some community stakeholders perceived that their feedback was not being incorporated in the final Noise Action Plan, leading to perceptions that their suggestions regarding suitable measures were dismissed. A key stakeholder for George Best Belfast City stated their relationship with the airport had not improved and suggested the lack of timely and progressive Noise Action Plans for George Best Belfast City airport is impacting the relationship with local communities.

Q66: What are the limitations of the Noise Action Plans?

Table 10-3 summarises the perceptions received from community stakeholders and airport operators on the limitations of Noise Action Plans.

Table 10-3: Limitations of Noise Action Plans

Community Stakeholders	Airport Operators
• Lack of a non-technical summary • Dependence on technological upgrades to achieve noise benefits • Vague success criteria • Lack of enforcement • Lack of transparency in the approval process • Perception that the Noise Action Plans are focussing on reporting requirements rather than reducing noise • Local community views are not taken into consideration • Lack of assessment on health effects • Lack of independent monitoring	• Noise penalties act as a deterrent but do not reduce the number of people affected by aviation noise • Weak planning policy, leading to population encroachment or growth around the airport • Reduction in the size of the affected population takes precedence over the reduction of the noise contour area • Difficulty in assigning the reduction of the affected population to individual measures • More time is required to implement actions between Rounds • Limited flexibility for continuous changes • Difficulty in achieving the full 12 week consultation period • Impacts of COVID-19 during Round 4 • Information within the Noise Action Plans is not understandable to the general public

Both community stakeholders and airport operators recognise that the technical nature of Noise Action Plans is a limitation, and that further work is required to provide this information in a more accessible way. The remaining limitations raised by community stakeholders tend to focus on ability of the Noise Action Plans to achieve their stated aims in a transparent way that considers community views. In particular, enforcement is important to ensure compliance with the Noise Action Plan. These views contrast with those provided by the airport operators, which focus more on the development of the Noise Action Plan and the influence of external factors.

Q67: What are the successes of the Noise Action Plans?

Figure 10-4 summarises the perceptions received by community stakeholders and airport operators on the successes of Noise Action Plans.

The responses demonstrate that airport operators find Noise Action Plans a useful noise management tool that brings relevant information together that can be shared with the public and broaden discussions beyond planning

requirements. The response received from community stakeholders recognise the Noise Action Plans as management tools, but focus on tangible benefits.

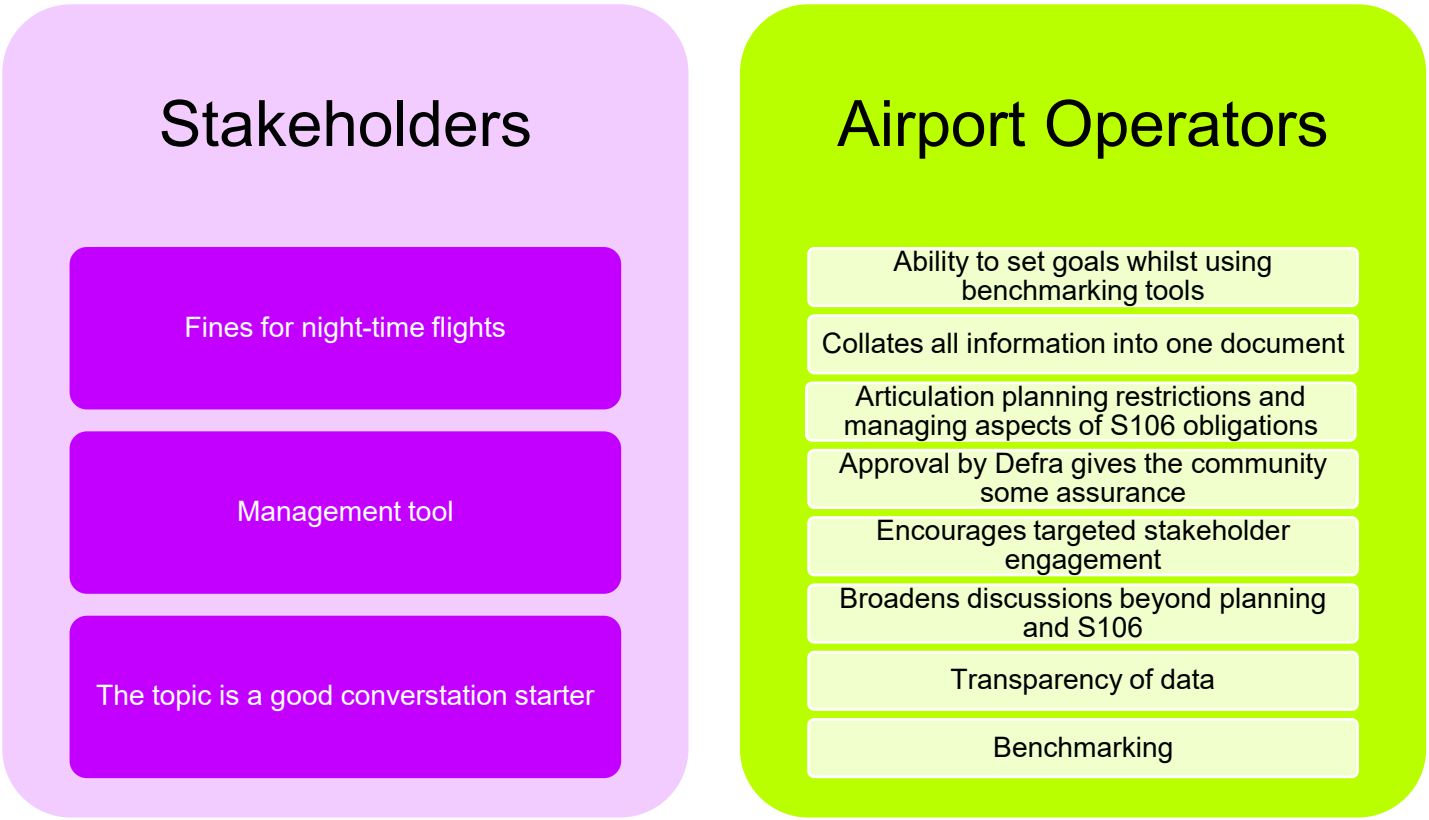

Figure 10-4: Questionnaire responses to 'What do you think are the benefits of the Noise Action Plan at your airport?'

Q68: Is there any extra support that airports need to develop and adopt the Noise Action Plan?

Airport operators have provided the following feedback on additional support they would like related to the development and adoption of Noise Action Plans:

- Guidance on positioning the Noise Action Plan within the context of the ICAO Balanced Approach
- More information on the current guidance and regulations that should be met, including Annex V of the END
- Clarification of the language used in the legislation and how it relates to the language of the Balanced Approach Regulations
- Additional guidance on acceptable means of compliance
- Further context on the END and Environmental Noise Regulations to better understand the underpinning aims and objectives behind the requirements
- Case studies demonstrating best practice or examples of achieving requirements
- A standardised Noise Action Template that could be used
- Guidance on how to identify noise problems and situations that need to be improved
- Guidance on estimates of the reduction of the number of people affected by aviation noise (annoyed, sleep-disturbed, other), including case studies or examples
- Thought leadership from Defra or the CAA on “the reduction of the number of people affected”
- Guidance on the development of a noise abatement objective

Defra has also indicated that many of the Round 4 Noise Action Plans initially submitted to them were not approved due to non-compliances found relating to estimates of the reduction in affected populations (annoyed, sleep disturbed or other). This is seen as an area for improvement in future noise action planning rounds.

10.5 Non-airport Noise Action Plans

Q69: Are airport Noise Action Plans substantially different from the road/rail/industry ones?

Noise Action Plans for airports, roads, railways, and industry share the common goal of reducing noise exposure and its impact on communities, but they differ significantly in their sources of noise, mitigation measures, and levels of stakeholder engagement. Airports primarily deal with noise from aircraft operations, including take-offs, landings, and ground movements, and employ measures such as controlling Auxiliary Power Units and Ground Power Units, engine testing restrictions, and community noise monitoring schemes. Roads focus on vehicle noise, implementing low noise road surfaces, vehicle noise emission standards, and noise barriers. Railways address noise from train operations through railhead grinding, brake replacements, and electrification of trains, while industry noise control varies widely depending on the specific processes and machinery involved. The airport Noise Action Plans are focussed on aviation noise sources in a relatively localised area. This contrasts with the Noise Action Plans for roads and railways, which focus on the national strategic network and are more generic.

Despite these differences, all sectors follow regulatory requirements to avoid, prevent, and reduce the harmful effects of noise exposure, and they prioritise community impact and continuous improvement. Airports tend to have the highest level of community engagement, including noise forums and public consultations, while roads and railways engage with local authorities and communities to a lesser extent. Monitoring and enforcement also vary, with airports using noise monitoring systems and specific performance indicators, while roads and railways rely more on data collection and community feedback.

Some trends similar to those observed in the airport Noise Action Plans were present in the non-airport Noise Action Plans. For example, assessments of the current national policy frameworks were not present.

Structural similarities exist between the airport and non-airport Noise Action Plan. This is to be expected given the common ancestor they share in the END. For example, both types of document contain:

- An overview of the transport noise at hand;
- The current approach to managing that noise source and reference to the policy frameworks that enable this;
- A summary of the noise mapping results;
- Action plan measures;
- Plans for future development;
- Details of a consultation process.

Structural differences exist between the airport Noise Action Plans and non-airport Noise Action Plans too. A non-airport Noise Action Plan clearly has a remit that is on a national scale and the identification of localised health effects, the impact on schools and hospitals, etc. is not possible. It is also true that whilst classed as a public body, the airport operators act as a commercial enterprise and are not government funded in the manner of Network Rail and National Highways. This means that, from an oversight perspective, one can expect a greater level of detail in a regional airport Noise Action Plan.

Q70: Do the differences affect the quality and effectiveness of the Noise Action Plan?

The differences in Noise Action Plans for airports, roads, railways, and industry significantly impact their quality and effectiveness. Airports generally have the most comprehensive and effective Noise Action Plans due to their high level of community engagement, including noise forums and public consultations. They employ a wide range of measures to address ground operation and maintenance noise, noise at source and noise pollution within local communities. Airports also use noise monitoring systems and community feedback to ensure effective implementation and continuous improvement.

Road Noise Action Plans rely heavily on data collection and analysis for monitoring purposes. This approach supports effective implementation but often lacks the extensive community feedback mechanisms that are integral to airport Noise Action Plans. While Rail Noise Action Plans implement specific measures, they do not cover all aspects of noise management comprehensively. Both road and rail sectors face challenges in monitoring noise as effectively as airports do. Consequently, although their plans are effective, they tend to be more narrowly focused compared to the comprehensive strategies employed by airports. This narrower focus can limit their ability to address the full spectrum of noise-related issues and incorporate community feedback to the same extent.

Industry Noise Action Plans vary significantly in quality and effectiveness depending on local regulations and specific industry practices. Engagement varies widely, which can affect the consistency and effectiveness of Noise Action Plans. Noise control measures are often specific to the type of industry and include noise control at the source, planning controls, and insulation. Monitoring and enforcement depend on local regulations and industry standards.

Overall, the differences in sources of noise, mitigation measures, and levels of stakeholder engagement impact the quality and effectiveness of Noise Action Plans. Airports tend to have the most comprehensive and effective plans due to their high level of engagement, detailed monitoring, and wide range of measures. Roads and railways have effective but more narrowly focused plans, while industry Noise Action Plans vary significantly in quality and effectiveness depending on local regulations and specific industry practices.

11. Defra Guidance

This section collates the results to the research questions related to the Defra guidance for airport operators on Noise Action Plans and equivalent documents used outside of England. The results are based on information obtained by desktop and questionnaire responses from the airport operators.

11.1 Clarity of the Defra Guidance

Q71: Is the language in the Defra guidance clear and unambiguous?

The language used in the Defra guidance has been consistent in its level of clarity and unambiguity between the iterations released in 2009, 2013, and 2022. The guidance issued in 2009 and subsequent revisions is generally written clearly. When surveyed, the airport operators provided a mixed response regarding the clarity of the guidance, albeit more positive than negative.

The breakdown of responses to the questionnaire shows that of the seven UK-based airports who responded to the questionnaire, four airport operators consider the language to be clear. These airports were generally those classified as ‘major airports’ as defined in the END. One airport operator did not consider the language to be clear, and two provided a neutral response.

Feedback received from the four airport operators suggests that the majority opinion is that the language can be ambiguous in place, even though the same proportion of UK airport operators stated that the guidance is clearly written. Based on the responses to Q68 (is there any extra support that airport operators need to develop and adopt the Noise Action Plan), it can be inferred that the language is ambiguous where the legal requirements are mirrored in the Defra guidance without additional clarification. No specific examples of ambiguous language were provided by the survey respondents.

It is considered that a level of technical knowledge on the subject matter is required to fully understand the content of the guidance. This is in-keeping with the intended audience of the documents, namely the airport operators. However, it is clear following feedback from some community stakeholders that they are also interested in the Defra guidance and would like access to it.

Q72: Does the Defra guidance clarify how the legislative requirements should be interpreted?

Each of the iterations of the Defra guidance provides information on how the legislative requirements should be interpreted. The ambiguous nature of some of the language used as identified by the airport survey respondents has introduced a small amount of uncertainty as to the obligations that arise under the legislation. Flexibility exists for the airport operators to interpret the legislative requirements. This is best evidenced by the requests of London Southend and Gatwick for the provision of examples of acceptable means of compliance. London Southend expressed a desire for more guidance on the methodology to report the number of people affected. Manchester and East Midlands requested that the guidance offer a breakdown of all requirements, including Annex V.

Q73: Is the Defra guidance interpreted differently by different airports?

Generally, it appears that the Defra guidance is interpreted in a consistent manner by the different domestic airports. Where occasional differences occur, it tends to be a result of using differing approaches to achieve the same objective. For example, the Round 3 and 4 guidance refers to the Aviation Policy Framework, which includes some information on noise insulation schemes. Manchester offers a compensatory grant scheme instead of capital expenditure on sound insulation, which provides a subtle difference. Another example is that airports take differing

views on the level of detail required to report on health-related metrics, the costs of measures, assessments of local and national frameworks, and the consultation process.

11.2 Content of the Defra Guidance

Q74: Is the Defra guidance appropriate for all airport types requiring a Noise Action Plan?

The Defra guidance is not tiered in its requirements for airports of different type. Whether or not an airport submits a Noise Action Plan is determined by the Environmental Noise Regulations (2006) Regulation 18, namely:

i) the number of aircraft movements per year, or

ii) whether an L_{den} value of at least 55 dB(A) or an L_{night} value of at least 50 dB(A) occurs anywhere in an agglomeration.

This lack of nuance, grouping Heathrow with East Midlands for example, is countered somewhat by the requirement for a balanced approach called for by the Aviation Policy Framework [8], which in turn drew on material from the International Civil Aviation Organization [9]. The 'number of flights' criterion does not distinguish between the different types of aircraft making use of the airport (for example, between Chapter 3, 4 and 14 aircraft, or if the aircraft is used for freight), or their departure/arrival times.

One regional airport operator in England stated that they would like more clarity on what is expected of the airports in light of the differences in their scale of operations.

Q75: The original guidance focuses on noise preferential routes - did this put other measures at a lower priority?

Out of the 23 Noise Action Plans reviewed for UK airports, it was determined that the use of noise preferential routes did not put any other measures at a lower priority in all but one of the Noise Action Plans. The use of noise preferential routes was the central strategy for noise management in the Round 2 Noise Action Plan for London Southend airport, which may have encouraged the de-prioritisation of other measures at Round 2 although there is no evidence to confirm this.

The view that noise preferential routes did not put other measures at a lower priority is also reflected in the survey responses provided by the airport operators. All UK airport operators provided a neutral response or indicated that noise preferential routes did not put other measures at a lower priority.

Q76: Does the guidance's emphasis on Directive Annex V more than Directive Article 1(c) lead to inconsistency or non-compliance?

Directive Article 1(c) aims to prevent and reduce noise and to preserve environmental noise quality where it is good. This is undertaken by means of developing and adopting Noise Action Plans based on noise mapping to alleviate health problems. These aims are not in opposition to Annex V. For example, the preservation of quiet areas is one objective that satisfies the requirements of Article 1(c) and Annex V, yet the Noise Action Plans considered for this project do not provide this information (even if this simply takes the form of acknowledging no quiet areas are present). The same trend occurred relating to the reporting of health effects in the Noise Action Plans.

The airport survey responses show that further guidance on the acceptable means of compliance would be beneficial to airport operators. A request for annual contours to be generated was made by London Southend. The MAG group of airports requested that all current regulations and requirements should be included in the Defra guidance "such as the requirements of Annex V". Given the subtle variation in the level of adherence to Annex V observed in the Noise Action Plans considered for this research, it is clear that a uniform understanding of the

Annex is not guaranteed. If the requirements of Annex V, and thus Article 1(c) are to be met in a uniform manner, then more structured guidance would certainly facilitate this.

Q77: Should the guidance be explicit about the 57 dB onset of significant effects from the Aviation Policy Framework?

Only 13 of the 23 Noise Action Plans for UK airports refer to 57 dB as the noise level representing the onset of significant effects. Six Noise Action Plans suggesting the following alternatives values:

- 54 dB (Round 3 of East Midlands, Leeds Bradford, Manchester and George Best Belfast); or
- 55 dB (Round 2 at Gatwick and East Midlands).

As the alternative values are lower than 57 dB, they offer a more conservative approach to the estimation of significant effects. Some of the airports justified this decision on the basis that recent research indicates that annoyance occurs below 57 dB. An example of this is the UK Government's 2014 Survey of Noise Attitudes, which indicated that sensitivity to aircraft noise has increased. The same percentage of people report being highly annoyed at 54 dB $L_{Aeq\ 16\text{-}hour}$ as previously reported at 57 dB $L_{Aeq\ 16\text{-}hour}$. The updates made align with the UK Government's response to the consultation on UK Airspace Policy and the Air Navigation Guidance 2017, and the new threshold reflects more recent research discussed in the Round 4 Noise Action Plans.

Q78: Should the guidance give clarity on the level of cost benefit analysis required for actions?

It is noted that a clear trend exists in the Round 4 Noise Action Plans whereby the costs and benefits for every measure contained within the Noise Action Plan are not present. The authors of all the available Round 4 Noise Action Plans do make reference to the costs and benefits of some of the measures present, but not all. The degree of subjectivity afforded here, regarding what to include or exclude, does not lend itself to transparency. Improving transparency here is a strong argument for the Defra guidance to advise on the level of detail required, or simply adopt a formulaic approach. Feedback during a Stakeholder Engagement Group meeting held during February 2025 indicated that further guidance on this would be welcomed by airports, as providing a full cost benefit analysis for all measures could take several years.

The Noise Action Plans and questionnaire responses were reviewed to identify examples of a cost benefit analysis based on health effects informing Noise Action Plan measures. The only airport found to actively use monetised health impact data was Amsterdam Schiphol.

Q79: What are the limitations of the Defra guidance in supporting the production and implementation of Noise Action Plans?

Several limitations to the Defra guidance have been identified following analysis of the airport and ACC survey responses, and a review of the Noise Action Plans. The Defra guidance does not offer recommendations in the following areas, that would be considered advantageous to the production and implementation of the Noise Action Plans:

Table 11-1: Limitations

Airport Operator feedback	Community stakeholder feedback	Noise Action Plan review
Guidance on the level of detail required for reporting	A requirement for a non-technical summary document to be prepared alongside the Noise Action Plan that is designed to help members of the public understand the Plan. This	A uniform framework of fines for noise threshold breaches that financially benefit the communities affected

Airport Operator feedback	Community stakeholder feedback	Noise Action Plan review
	would help them participate in a way that allows an informed debate.	
Case study examples of best practice in the development of Noise Action Plans	An insistence that objectives and actions to reduce noise should be 'SMART' goals that can be measured empirically	The inclusion of any active section 106 agreements as an appendix

11.3 Equivalent Guidance for Airports Outside of England

Q80: Is there consistency between the Defra guidance and the approach of the devolved administration airports considered in this study?

There is a high level of consistency between the guidance issued by the devolved administration airports with the Defra guidance. Differences that arise are attributable to the publication date and the political situation at the time of issue. For example, the 2022 Defra guidance for England and Wales makes no mention of the Environmental Noise Directive or Annex V following Brexit, yet the parent legislature still retains reference to both. The most recent guidance issued in Northern Ireland was published in 2013 and reflects the political realities of the day, albeit with a strong correlation in content.

Q81: What is working well / not so well in comparison?

In England, the identification of quiet areas is a duty imposed on Defra rather than the airport operators. The observation that the airport operators have omitted discussion of quiet areas in the Round 4 Noise Action Plans could be due to lack of information with the Defra guidance.

Similarly, the latest guidance for each of the domestic territories does not expressly mandate the reporting of health effects or TAG outcomes. This does not aid transparency or the establishment of measurable goals.

Q82: How have non-England devolved authorities developed Noise Action Plans if there is no guidance equivalent to that produced by Defra?

The Noise Action Plans produced by Edinburgh and George Best Belfast City airports take into account equivalent guidance made available by the Scottish Government and Department of the Environment in Northern Ireland respectively. As this guidance is very similar to that produced by Defra, there are no further insights available on how the guidance for airports in England could be improved based on the guidance used by devolved administrations.

Contrastingly, no equivalent guidance appears to be available for the two EU airports studied for this project. The Noise Action Plan for Amsterdam Schiphol is authored by the Ministry of Infrastructure and Water (Ministerie van Infrastructuur en Waterstaat), which is a government authority so therefore does not need to produce external guidance. Instead, the requirements of the END are directly referred to. This seems to be consistent with the approach taken in England for noise action planning for other transportation sources, such as roads and railways, noting that since Brexit, local regulations are referenced instead. The Noise Action Plans for Frankfurt airport are authored by the Darmstadt Government District (Regierungpräsidum Darmstadt) of Hesse. As a governmental body, it is thought that equivalent guidance also does not exist, however, no questionnaire responses were received from Frankfurt airport to confirm that this is the case.

12. Discussion

This section brings together the findings from the previous sections to evaluate the process for developing Noise Action Plans, their effectiveness, and the clarity of the Defra guidance for airport operators.

12.1 Process for Developing Noise Action Plans

12.1.1 Preparation

The process for developing Noise Actions Plans is consistent between airports and over time in that the same common elements are considered – the prevailing legal context, strategic noise mapping outcomes, actions and measures to reduce noise, and a consultation phase prior to submitting the Plan for adoption. This reflects the requirements of the Environmental Noise Regulations and the END. There is evidence from some of the Noise Action Plans, such as those from Manchester and Southend, that the section 106 agreements are a key element in their noise management practices and accordingly contribute to the content of the Noise Action Plans.

Most of the airport operators surveyed state they collaborate on sharing best practices, lessons learnt, and the interpretation of the Noise Action Plan guidance. This collaboration supports the development of consistent Noise Action Plans. Some airport operators are not currently involved in Noise Action Plan knowledge-sharing. The practice of Noise Action Plan knowledge sharing could be undertaken more widely among airport operators, to their benefit.

When surveyed on whether the timeframe of rounds was realistic, the airport operators provided a mixed response. This is in-keeping with the theme of time constraints affecting the outcome of Noise Action Plan development. It was also suggested by the airport operators that a self-styled ‘lack of dynamism’ within the Plans can be attributed to external factors such as difficulties navigating the planning process.

12.1.2 Selection of Measures

The selection and prioritisation of actions and measures is an important part of the Noise Action Plan development process, with all Noise Action Plans providing a rationale behind the selection of each action and measure. The set of actions and measures published in the Noise Action Plan may change over time to reflect the changing circumstances at the airport. However, some Noise Action Plans are better at indicating where measures are changing than others, which can help provide transparency. For example, the Round 3 Manchester and East Midlands Plans use colour-coded labels to do this whereas the Southend Noise Action Plans provide a simple table of measures. The justifications for not selecting or including measures are also important for providing a transparent process, and these are included in most of the reviewed Noise Action Plans.

All UK airports that responded valued the role of community acceptance in shaping Noise Action Plans prior to adoption. The same airports also confirmed that this feedback does result in changes to the draft Noise Action Plan, which demonstrates that the local communities have an influence on the airport operators’ noise reduction measures. However, it is clear from community stakeholder feedback received for this project that there can be more transparency in how the measures and actions are finalised prior to submitting the Noise Action Plans to Defra (Scottish Government or DAERA for Scotland and Northern Ireland respectively).

There are examples where measures and actions can be linked to the regulatory framework, for instance, the ICAO Balanced Approach or the Aviation Policy Framework, but this is not always clear in the Plans. In limited circumstances, such as at Heathrow, some responsibilities lie with the Department for Transport or National Air Traffic Services, for example. This can inhibit the airport operator from taking action. The airport operators noted that the strict adherence to the regulatory requirements can sometimes limit the airports’ ability to adopt innovative

or more flexible noise management solutions. Airspace modernisation is a potential example of this. Many airports refer to the benefits of modernising airspace to reduce congestion, which would lead to noise improvements. The DfT and CAA are consulting on proposals for airspace modernisation. Until their strategy is finalised, aircraft operators are planning for airspace modernisation, but are unable to start using the 'new' airspace.

A further observation of the regulatory framework shared by airport operators is that it can hinder and constrain their ability to implement measures and reduce noise, as any new measures are required to go through a multiple stage approval process, which slows down the implementation process. Some ACC feedback criticised airport operators' tendency to rely on over-arching noise reduction initiatives that are not expressly defined within the relevant Noise Action Plan.

It would be beneficial for airport operators to include 'in the pipeline' measures within their Noise Action Plan submission as SMART goals. The desired use of SMART goals was a common request from ACCs. The benefits of these include the capacity for empirical review, greater levels of transparency, and enhanced community involvement.

In terms of ambition, the reviewed Noise Actions Plans include examples of going beyond best practice or current standards for some measures as well as examples of seeking to meet regulatory requirements and planning conditions only. The Amsterdam Schiphol Round 4 Noise Action Plan provides an example of a drastic but innovative proposal to reduce the number of flights to better meet environmental standards. The pushback on this from industry stakeholders demonstrates that economic growth is important, but a greater understanding is required on how best to ensure the full benefits of aviation can be realised while simultaneously meeting environmental obligations. Where the 'tipping point' lies for curtailing growth to secure environmental compliance in the UK needs to be more clearly defined.

A further consideration for the Round 5 Noise Action Plans is the role of future aviation technologies, such as electric planes and electric vertical take-off and landing aircraft (eVTOL), which may eventually provide airport shuttle or air taxi services. Although these services may not be commercially available before 2030, airports expecting to use these technologies will need to collaborate with NATS for test flights. The potential impacts of the test flights will need to be managed and accounted for in the airport operator's Noise Action Plan. Some guidance from the CAA, Defra or DfT on this would help to ensure that airports approach this consistently while simultaneously reflecting local circumstances.

12.1.3 Consultation

The consultation process is an area whereby a degree of flexibility exists within the Defra guidance. This flexibility is manifested in the various approaches used by the airport operators in consultation. In turn, this has resulted in varying degrees of satisfaction from the ACCs and community groups.

Differing Perspectives

It is clear that the perception of transparency within the consultation process is important to meaningful consultation taking place. One of the surveyed ACCs was dissatisfied with an airport operator, responding that in their opinion, the consultation process had been wholly inadequate and in breach of the airport operator's obligations.

Each Noise Action Plan reviewed for this project noted that the public was consulted about proposals for the relevant Noise Action Plan, that community feedback was considered, and specified a timeframe of each consultation stage. These points demonstrate compliance with Annex V in this area.

Survey responses from the airport operators showed that they regularly update and review their lists of potential stakeholders and that they have the following perceptions about their performance in the consultation process:

- Stakeholders feel the consultations are well promoted;

- Stakeholders feel the Noise Action Plan material is easily accessible;
- Stakeholders have confidence their feedback is considered;
- The consultation responses resulted in changes to draft proposals;

This suggests that the consultation process is befitting of a healthy collaboration between the operators and the community stakeholders. This is in contrast to the experience of the ACC and community stakeholder respondents whom, when asked the same survey questions offered a mixed response on the ease of consultations and the accessibility of the material, and had mostly negative perceptions on whether their voices were heard. The responses included some experiences of feeling intentionally excluded from the process or that the airport was not communicating with them at all. Similarly, the airport operators considered that their relationships with stakeholders had either not changed or had improved through the Noise Action Plan process, which contrasts with perceptions from community groups that the relationship in some cases had deteriorated. East Midlands is an example of where having an ACC with an independent chair proved beneficial. In this instance community groups near East Midlands have offered praise for the set-up in their questionnaire responses. Community groups that have recently joined an ACC have noticed tangible benefits to membership and feel more able to participate in the process.

The Submission Process

The community stakeholder feedback received for this project has also consistently raised the point that after the consultation has taken place, the finalised Noise Action Plan is often not shared with community stakeholders before it is formally adopted by Defra or equivalent bodies in the devolved administrations. This means that community stakeholders find out after the Plan is adopted that either the consultation aspect of the document does not reflect the full community views or that their suggestions were not included. It can lead to feelings of distrust towards the airport operators and perceptions that the adopting authorities are colluding against them.

Quality of Feedback

A further consideration is the quality of feedback received by airport operators from consultation, with some airport operators stating that some very different views were expressed by stakeholders on the same issue or that low feedback response rates occurred despite high levels of engagement at consultation events. Taken in combination with the differing perceptions of the consultation process outlined above and that the finalised Plans tend not to be shared until they are adopted, it is clear that more or better-quality engagement is needed between the airport operators and community stakeholders on noise issues and to improve transparency.

The Clarity of Draft Noise Action Plan Documents

The ACCs/community stakeholders also raised concerns with the clarity of the Noise Action Plan drafts discussed (with the notable exceptions of Gatwick and George Best Belfast City). The length of the Noise Action Plan documents and technical language were cited by many as barriers to participation. In the context of the Aviation Policy Framework, it could be argued that this prevents “an informed debate” from being fully realised. A separate non-technical summary document of the Noise Action Plan was widely requested from community stakeholders as a means of improving their ability to understand the draft proposals. One community group suggested that use of a red-amber-green scale against each of the measures to track progress could help to improve clarity in a non-technical summary.

Defra’s Input

The latest Defra guidance advises airport operators to make sure that “reasonable time frames are provided allowing sufficient time for each stage of public participation”. This statement is vague and does not provide airport operators with direction on how to manage the consultation process. One airport operator located in England stated that they would like more advice on consultation and how to fit it into the Noise Action Plan production timetable. A standardised or recommended chronology for the consultation process would allow for greater transparency and help to ensure that community stakeholders are consulted early enough in the noise action planning process.

12.1.4 Adoption of the Noise Action Plan

The Noise Action Plans submitted to Defra are not recommended to ministers for adoption until they meet the legal requirements set out in Annex V. It is common for airport operators to need to revise their submissions following feedback from Defra, which correlates with questionnaire responses stating that the adoption process can take a long time.

As Annex V does not set out the level of detailed needed to meet the minimum requirements for Noise Action Plans, the audit process therefore focusses on whether the correct information is included. This explains why the approved Noise Action Plans are consistent in the type of information they provide but not the level of detail.

12.2 Clarity of Defra Guidance

12.2.1 Airport Feedback

Feedback from the airports surveyed shows a mixed response regarding the clarity of the guidance documents issued, with a slight tendency towards acknowledging the guidance documents are clearly written. However, the majority of airports surveyed consider the language within the guidance used to be ambiguous. When reviewing the Defra guidance as part of this study, we observed some ambiguous language that might benefit from tighter requirements for example:

- Vague terms such as “reasonable time frame” that are left open to interpretation by the airport operator
- Direct use of wording from the Environmental Noise Regulations, END or other relevant policies that is unclear and repeated in the guidance.

It is notable that the airports make several requests for further detail in the Defra guidance, to encourage a more standardised approach for submissions. This includes a standardised Noise Action Plan template, further information on the underpinning requirements of the Environmental Noise Regulations, case study examples, and guidance/examples on the acceptable means of compliance. As discussed above, more information on how to programme the activities required to develop the Noise Action Plan within the five-year timescales was also requested to ensure that local communities have enough time to comment on the draft proposals and for the airport to use these to finalise the document. These would improve the clarity of the guidance while also sharing best practice and encouraging more consistency between airports.

12.2.2 Lessons Learned from the Scotland and Northern Ireland Guidance

The latest iteration of the guidance issued for England and Scotland is effectively identical. The current guidance for Northern Ireland was issued in 2013, and is similar in structure to the Round 2 guidance issued for England in July 2013. A more prescriptive approach is observed in the Northern Ireland guidance, which mirrors the more technical approach set out in the corresponding Defra guidance produced at the same time.

With the greater word count of the Northern Ireland guidance comes some useful passages no longer represented in the England guidance. For example, of interest are the minimum time frames set out for the consultation period, and the structured advice on when a cost benefit analysis should take place, etc. These two points are thematically linked to several of the survey responses received that would like the inclusion of such guidance.

It is noted that in Northern Ireland, airport operators are empowered to identify Noise Management Areas in agglomerations using a combination of noise contours, stakeholder input, and bespoke software. The validation process for the quality assurance of the Noise Management Areas, and thus the noise contours, is also specified in

the Northern Ireland guidance. A defined monitoring regime for this process is absent from the Round 4 Defra guidance.

12.3 Effectiveness of Noise Action Plans in Managing Noise and its Effects Around Airports

12.3.1 Quality, Detail and Content of the Adopted Noise Action Plans

Overall, the Noise Action Plans appeared to be consistent across airports through Round 2 to Round 4. The quality of the Noise Action Plans was consistent with the plans either maintaining the same levels of quality or with improvements over time. The level of detail within the Noise Action Plans varied, with the least detail most commonly seen at Round 2, progressing to the highest level of detail during Round 4. Several of the Noise Action Plans were deemed understandable to the general public, with improvements made in successive noise action planning rounds. These improvements include non-technical summaries, more understandable graphics, less jargon and more simplistic explanations.

The Noise Action Plans, with two exceptions, consistently demonstrated the most important areas exposed to aviation noise using noise contour maps and population exposure data. Most Noise Action Plans had a variety of important area identification techniques, such as identification through noise contour maps, community feedback and by identifying the specific type of noise (e.g. night flights, ground operations) causing the impact.

Each of the Noise Action Plans included how noise has changed from the previous plan and the causes of any changes in impacted population. Varying levels of detail were seen when evaluating changes in noise levels and determining whether changes were caused by implemented measures. All Noise Action Plans suggest that any reductions in noise levels are reliant on changed behaviours which are seen through the implementation of noise reduction measures. All airports include noise contours for L_{den} and L_{night} demonstrating the noise impact on the surrounding area.

12.3.2 Compliance with Annex V

Each of the airport Noise Action Plans reviewed provides the majority of the minimum requirements for noise action planning set out in Annex V of the Environmental Noise Directive. Compliance with the Annex V requirements has generally improved from Round 2 to Round 4 although the improvement is small in some cases.

Several of the trends discussed in Section 7 and 8 (including Q5) are centred upon the failure to supply information on the benefits, a monitoring regime, and costs of every measure proposed within each Noise Action Plan (noting that Annex V acknowledges that financial information may not be available). However, some Noise Action Plans do include cost information for a selection of measures, such as the Round 4 Noise Action Plans for Gatwick and Edinburgh, and where this is provided it demonstrates to community stakeholders that the airport operators are taking noise management seriously. No guidance is currently available to airport operators on cost benefit analyses for Noise Action Plan measures.

The reporting of health effects is a key area where more detail should be provided in Noise Action Plans. The default approach within the Round 4 submissions is to provide a discussion of the LOAEL/SOAEL with reference to the Government Airspace Policy threshold noise values that have been issued since Round 3. The reader is typically invited to draw conclusions on health effects by combining noise contour population data with noise metrics established elsewhere in the document. Explicit estimates of those suffering from attributable health conditions are typically absent from the Round 4 Noise Action Plans. There is no evidence to suggest that the absence of this information from the Noise Action Plans has an impact on the measures being selected. However, it is also the case

that issuing these figures in a clearer and more direct manner would improve transparency in this area, and potentially generate a cycle of public interest leading to airport operators taking further targeted action.

12.3.3 Influence of the Wider Regulatory Context

As mentioned, the balanced approach strategy for reduction of noise at source from ICAO had great influence across all airport Noise Action Plans in all countries. The balanced approach led to the implementation of measures to ensure the ICAO guidance was followed.

The Aircraft Policy Framework also had considerable impact on the airports based within the UK, with all Noise Action Plans ensuring measures were included to ensure this guidance was met. When gaining opinions from aircraft operators on the usefulness of the regulatory frameworks they stated the framework empowers their airports to take action to reduce noise and does not hinder their capabilities.

Alongside ensuring the ICAO balanced approach and Aircraft Policy Framework guidance aims were successfully achieved when selecting measures for implementation, some Noise Action Plans included the impact of local planning and overarching planning requirements which caused the removal of some initially proposed measures due to the complexity and long timeframe.

12.3.4 Implementation and Enforcement

The implementation of the Noise Action Plans has led to better or sustained outcomes on noise at most airports, notwithstanding an increase in demand. However, this does not necessarily mean the noise impact has been reduced. Where the noise impact has remained stable or has increased, a positive impact can be seen from the implementation of measures. Furthermore, there are examples where the implementation of the Noise Action Plan has led to better outcomes on community engagement, economic benefits, environmental sustainability, air quality and improvement of health and wellbeing.

However, there are also examples where noise reductions or positive changes to the affected population sizes are not achieved despite implementing an array of effective measures. Sometimes this is influenced by external factors such new housing developments being built near the airport, but other times it is linked to air traffic growth or airport expansion (such as night-time flights at Leeds Bradford airport). Modernisation of the fleet is gradually reducing source noise emissions. However, these gains can only be fully realised if air traffic growth is managed so that the noise from additional planes does not exacerbate aviation noise emissions overall.

The review found that all airports enforce their measures, most commonly through the inclusion of specific noise reduction measures within contracts with airlines and other stakeholders. Airports utilise noise monitoring systems, data collection and community feedback to track progress and enforce necessary measures. To ensure enforcement, larger airports utilise regulatory bodies and independent auditors to track the progress of implemented measures. Measures are enforced through regulatory requirements, operational controls, financial incentives, and community engagement. Penalties for non-compliance include fines and other sanctions.

However, financial penalties require regular review to ensure that they remain effective and provide a suitable deterrent. The airport operators are dependent on airlines and other industry stakeholders to ensure that their measures are implemented, such as investment in quieter planes, using quieter procedures and NPR, and abiding by restrictions in place to avoid generating excess noise or disturbance. If they are unwilling or unable to meet the airport operator’s requirements, this threatens the success of the Noise Action Plan.

The review uncovered limited evidence of enforcement action against airport operators specifically related to their Noise Action Plan. Local authorities have issued Breach of Condition Notices where planning conditions are contravened, and airport operators are aware that the CAA and DfT can take action but no examples of this were evident in the Noise Action Plans. However, the Noise Action Plans for Amsterdam Schiphol have been used to

demonstrate failure to adequately improve noise impacts in court, with worsening impacts partially attributable to weak enforcement from governmental bodies. It is notable that Heathrow airport has a similar scale of operations and surroundings, yet has managed to achieve noise decreases in each successive noise action planning round.

12.3.5 Evidence of Noise Improvement

All Noise Action Plans demonstrated that their implementation has resulted in improved noise outcomes in various ways. The introduction of Noise Action Plan prompted the adoption of noise reduction measures, such as influencing fleet modernisation and inflicting night flight restrictions. Additionally, each Noise Action Plan suggests that the implementation process has also led to positive outcomes in other areas, including community engagement, economic benefits, and environmental sustainability.

Significant noise reductions were observed at several airports from Rounds 2 to 4, including Heathrow, Edinburgh, George Best Belfast City, Gatwick, Manchester, and Frankfurt. However, it was challenging to determine if these reductions were due to COVID-19 or noise reduction measures. Exact details on the level of impacts can be seen in Q48 and Q49. When considering the increase in air traffic volumes since 2011, most airports showed an increase or no change in noise impact whilst Heathrow saw a reduction in impact.

The Noise Action Plans reviewed included good examples of monitoring compliance and progress, this was seen through noise contour maps, population details and implementation of preventive mitigation. Some Noise Action Plans included additional specialist monitoring compliance and progress such as KPIs, however, the inclusion of details regarding the success of measures were variable across different airports and regions. Some airports included success criteria and KPIs but did not state the details on how successful the measures were, it was only possible to infer the success of a measure by cross-referencing the different Rounds.

Furthermore, longitudinal effectiveness of measures was detailed within all UK airport Noise Action Plans, with limited evidence provided in both EU airport plans.

12.3.6 Stakeholder Engagement and Perceptions

The majority of Noise Action Plans indicate that they had good quality consultations and detailed inputs from community stakeholders, which is reflected in the questionnaire responses from airport operators. However, there are examples where community stakeholders reported that the airport operators were not engaging with them and the quality of the consultation from their perspective is low, in part because the technical Noise Action Plan documentation is not intended for a general audience.

All airport operators stated community stakeholders had influence over the selection of measures, although only 44% of the community stakeholders felt they had influence. When reviewing the Noise Action Plans, the extent to which community perceptions influence the selection and prioritisation of measures appears proportionate to the size and scale of airport operations. The larger airports appear to have more extensive community engagement processes, which provide more frequent opportunities for consultation. Smaller airports have measures that are proportionate for the scale of their operations.

Good consistent stakeholder engagement was seen within the Noise Action Plans of 6 of the UK airports. Key methods of stakeholder engagement included annual reporting, community noise forums, and noise advisory groups.

The perceptions of noise from the local community are detailed in all Noise Action Plans, mainly shown by the utilisation of complaints data and consultation reviews. Responses to the questionnaire indicated that sometimes the full range of community views are not represented in their Noise Action Plans, with one airport operator attributing this to low volumes of written responses to the draft proposals. Only one third of surveyed stakeholders stated they found the consultation process easy and the majority of stakeholders would like more frequent

involvement. This suggests that improvements to the accessibility of consultations is required. Surveys of noise attitudes are rarely utilised so the full range of stakeholder views and perceptions is not available.

12.3.7 Role of Contextual Factors

Airport size / air traffic volume, and the proportionality aspect

The larger airports, such as Heathrow or Gatwick, have more detailed Noise Action Plans than smaller airports. The larger airports use substantially more noise reduction measures to respond to their greater scale of aircraft movements.

Whilst the effectiveness of measures was seen across the airports, increased demand for aircraft movements meant that reductions of noise were not always achieved.

The balance between passenger and freight / cargo flights

The review of Noise Action Plans did not show any specific mention of freight/cargo flight measures and impacts at any airports.

Day and night flights

Most airports fined operators of night flights to incentivise airlines to fly during daytime hours. Daytime flights also saw incentives for airlines to use quieter/smaller aircraft.

Growth ambitions e.g. third runway at Heathrow, using the northern runway at Gatwick, reaching the current permitted flight caps stated in planning conditions

Large airports have ambitious expansion plans (for example, Heathrow's desire for a third runway) to accommodate the growing demand for flights. An increase in community engagement and transparency is required to address stakeholder concerns throughout any development plans. Any implemented measures need to be flexible and adaptable to ensure noise impact is sustained or reduced during any developments.

Proximity to population centres

The proximity of population did not directly affect the level of measures implemented by an airport. When determining the noise impact of the airport, noise contour maps were utilised showing the population impacted within specific noise bands. Noise measures were implemented to reduce impact on impacted population centres.

Population growth in the local area (new housing estates etc)

Where new developments occur near airports, an increase in the population affected by aircraft noise is likely. This leads to challenges with land-use planning and close working with local authorities to ensure new developments are appropriate for the expected noise impacts. Enhancement of noise insulation schemes has been seen for new developments near some airports, ensuring the control of noise impacts.

Perceptions of the airport and its attitude to noise abatement

The perceptions of the airports and their attitudes towards noise abatement have had a significant impact on their relationship with the local community and the effectiveness of their noise management strategies. Broadly, the airports' noise management efforts were perceived badly by community stakeholders.

12.3.8 Lessons Learned from Airports Located in Devolved Administrations or the EU

As discussed in Section 12.1.2, Amsterdam Schiphol airport is proposing to reduce its annual number of flights by between 6 - 8% as one key measure to reduce noise impacts, as the previous Noise Action Plans had not resulted in meaningful noise reductions alongside air traffic growth. The flight reduction encompasses a reduction in night-time operations to 27,000, which could be implemented alongside a partial night-time ban.

The self-imposed flight reduction is a novel measure as it is contrary to growth aspirations many airports have, but has been justified as the increased uptake of quieter aircraft ultimately led to more flights so that there were no noise improvements to local residents overall. This raises some interesting questions about whether flight reductions could be achieved at airports with a similar scale of operations in the UK, and the long term benefits of fleet modernisation to achieve noise pollution goals where air traffic growth is expected or being pursued.

A further lesson learned from Amsterdam Schiphol is its approach to presenting health effect information. The UK airports tend to quote relevant policy information and sometimes research (notably larger airports), and then present information on the affected populations for various noise contours. It can be inferred that population sizes experiencing health effects (annoyance and sleep disturbance) are the totality of the affected population, but does not clearly distinguish between the number of people exposed to a noise level exceeding the LOAEL and the SOAEL. The Gatwick Round 4 Noise Action Plan includes additional tables to allow direct comparison with the stated LOAEL values. However, the Amsterdam Round 4 Noise Action Plan goes one step further and assigns highly annoyed/sleep disturbed population sizes to each noise band as shown below:

Class	Number of properties	Number of occupants	Number of residents with a high degree of nuisance
55 – 59	24.600	52.300	19.200
60 – 64	4.600	9.800	4.900
65 – 69	300	700	500
70 – 74	0	0	0
75 and up	0	0	0
Total	29.500	62.800	24.600

Table 3.5: Numbers of noise-affected homes and residents in 2021 over the entire day, as well as the number of residents with a high degree of nuisance around Schiphol (including agglomerations) per noise exposure class in dB Lden

Figure 12-1: Example of health effect reporting in the Amsterdam Schiphol Round 4 Noise Action Plan (translated)

A similar approach to health effects could be explored for UK airports. Additionally, Noise Action Plans for Amsterdam Schiphol and Frankfurt provide detailed information about noise impacts to non-residential sensitive receptors, such as schools and hospitals. This information is not provided in the UK Noise Action Plans, which focus on impacts to dwellings, although it is noted that several airports include measures such as noise insulation that are available to schools and hospitals. Inclusion of reporting about noise impacts to non-residential sensitive receptors can allow progress to be tracked at locations for vulnerable population groups and may lead to some additional targeted measures and actions.

George Best Belfast City airport uses community attitude surveys to gain other local community perceptions. This was the only airport to use attitude surveys and they appeared successful in gaining the opinions of stakeholders. By contrast , Noise Action Plans for airports in England referred to national aviation noise perception studies. However, stakeholder feedback suggests that they perceive that their ability to influence the choice of measures

within the Noise Action Plan did not improve despite the attitude survey data. A local attitude study could be a useful tool for other airports to better understand the range of perceptions on aviation noise and the airport's approach to noise management, and the outcomes of such studies could be shared with community stakeholders and form a basis for improving relationships or specific measures in the Noise Action Plan.

12.3.9 Effectiveness of Noise Action Plans

There is some positive evidence that Noise Action Plans can be effective:

- Some airports have shown steady decreases in noise over time (Heathrow);
- Monitoring air traffic and noise levels allows for new measures to be added that could lead to improvements (Manchester/East Midlands); and
- Where typical measures are failing to deliver, more innovative or drastic solutions are devised (Amsterdam).

However, as the circumstances vary from airport to airport and the influence of COVID-19 distorts some of the noise contours/affected populations in the Round 4 Plans, there is not enough evidence to conclude that they are effective or ineffective overall.

However, it is clear from the review and the feedback from airport operators and community stakeholders that Noise Action Plans could be more effective than they currently are. The key areas identified for improvement are:

- **Improving transparency in the process at all levels**. Airport operators should share with community stakeholders the (first) submission to Defra. This would be carried out in order to obtain approval and explain the rationale behind the selection / prioritisation of measures, and how community feedback has changed their proposals. Additionally, there needs to be more transparency in the Defra approval process.
- **The measures and actions within the Noise Action Plan need to be SMART** to improve accountability and to more transparently measure its success and ambition. The use of cost-benefit analyses for the measures and actions could further improve the effectiveness of the Noise Action Plan in terms of implementation and stakeholder engagement.
- **Providing stronger links between the noise predictions / affected populations / health effects**. This could be undertaken by including some explanatory text alongside the affected populations by noise band tables (and linking them to LOAEL and SOAEL) or providing separate estimates of highly sleep disturbed and highly annoyed populations like the Amsterdam Schiphol Noise Action Plan.
- **Improving communications to local stakeholders** so that they are better able to engage in the process and in an accessible way so that the aspiration of an "informed debate" stated in the Aviation Policy Framework can be better achieved. This includes promoting Noise Action Plan consultation periods, using non-technical summaries as part of the consultation process, and providing similar non-technical updates on a regular basis.
- **Better or stronger enforcement**. Fines / penalties are imposed on airlines in breach of various operating conditions, such as exceeding certain noise levels or not using Noise Preferential Routes. Compliance and implementation of several measures is dependent on the behaviours of third parties (pilots and airlines) and their willingness to cooperate. The airport operators are left to police this while simultaneously trying to run a viable business. But in terms of enforcing the Noise Action Plans themselves and holding the airport operators accountable, there seems to be limited enforcement against airport operators in the UK unless some of the requirements are linked to planning conditions, section 106 agreements or the airports are designated for noise reasons under the Civil Aviation Act 1982.

12.4 Limitations

This study is subject to some limitations that apply to the reported findings.

A key aspiration of the study was to be able to compare findings for airports located in England with those located in devolved administrations and the EU. The study has been able to achieve this in the review of the 28 Noise Action Plans obtained for this project. No responses from airport operators to the questionnaire were provided from George Best Belfast City Airport and Frankfurt Airport. Similarly, no equivalent guidance to the Defra Guidance for airport operators was available for Amsterdam Schiphol and Frankfurt am Main. Together, this limited the ability of the study to draw wider comparisons between airports in England and those located in either devolved administrations or the EU.

A further limitation to the study is related to the questionnaires issued to ten airport operators and their ACCs and community groups. A short response window of six weeks for the questionnaires is considered to have affected the response rate, especially as the Christmas period occurred during the response window. This may have led to a reduced response rate and therefore all opinions were not obtained.

Additionally, as described in Section 2, an ACC and a local community group were contacted for each of the UK airports to provide feedback for this study. This was undertaken to enable a wider range of community views to be considered. However, it is recognised that there are often multiple community groups that are active for each airport. Inclusion of additional community groups and a longer response period for the questionnaires would have enabled a larger, broader range of perspectives to be gathered. This is evident in the responses from community groups near Gatwick and East Midlands airports. Conflicting opinions were frequently seen between different community stakeholders at these airports, which provided a more diverse set of perspectives.

The sample size of ten airports for this study comprises 6 airports located in England, two in devolved administrations and two in the EU. As fewer airports in devolved administrations and the EU form part of the sample, it makes it difficult to draw robust comparisons between them and airports in England. Furthermore, the scale of operations at Amsterdam Schiphol and Frankfurt am Main are similar to those at Heathrow. Expanding the study to consider additional airports in the devolved administrations and smaller airports in the EU would have enabled more comparisons between similar airports in different geopolitical areas.

13. Recommendations

This section sets out the recommendations and future actions based on the outcomes of this review.

13.1 Noise Action Plan Development

The review has identified a need to improve transparency throughout the Noise Action Plan development process. This would improve the ability of community stakeholders to engage in an "informed debate" as required in the Aviation Policy Framework. It would also provide more confidence that noise concerns are being fully addressed. We recommend that action is taken to improve transparency in the following areas:

1. **Provision of a non-technical summary that is prepared alongside the Noise Action Plan, that is written for a general audience and avoids using jargon**. This best practice action is already undertaken at some airports, but can be further improved to make sure that information provided to stakeholders is easier to understand and respond to. This was the strongest theme observed in the community stakeholder responses to the questionnaire.
2. **Airport operators share their Noise Action Plan submission with community stakeholders prior to the adoption of the Plan and explain how their feedback was used to shape the actions and measures**. This would improve transparency in the development and adoption process. Any further change to the actions and measures during the adoption process (if any) should also be explained.
3. **The Noise Action Plans include a list of the community stakeholders (including the ACC) that were involved in the consultation process**. The Noise Action Plans for Heathrow and Gatwick provide best practice examples of this.
4. **The Noise Action Plans include more information on any relevant planning conditions or section 106 obligations, and other similar legal requirements relating to noise that are enforceable**. This is recommended as the review has found that in some cases, these documents have a greater influence on the operational noise management of the airport than the Noise Action Plan. Some airports provide section 106 information with their Noise Action Plan, but not all. Section 106 agreements are usually available on the local authority planning portal. However, housing a Noise Action Plan and a section 106 agreement on separate websites is considered an unnecessary barrier for community stakeholders. Where such documents inform the content of the Noise Action Plan, this should be made clear and a copy of the section 106 agreement be included as an appendix to the Noise Action Plan.
5. **Feedback from airport operators and community stakeholders alike has shown that they find the process for approving Noise Action Plans to be opaque, with both groups unclear on the process and how Defra determines compliance with the requirements**. Although in this project Defra has explained that approval is based on the presence of the required material, transparency is required to build trust into the process. This could also lead to improved efficiency in the approval process if fewer airport operators need to revise their submissions to achieve compliance.

The Noise Action Plans were found to include most of the information required in Annex V of the END. The key areas that tended to be omitted or where compliance could be demonstrated more strongly in the Noise Action Plans were:

- A statement explaining why the airport has prepared the Noise Action Plan, linked to Regulation 18 of the Environmental Noise Regulations (whether it is a major airport or within an agglomeration)
- Discussion of 'quiet areas' and specific measures intended to protect them
- Cost benefit analyses (noting that Annex V states to provide this 'where available')

- Linking health effects (annoyance, sleep disturbance, other) to the affected populations reported

It is recommended that future Noise Action Plans strive to improve compliance in these areas, with further information provided to airport operators on these points included in the Defra guidance. It is noted that quiet areas are not defined in England, which can present some difficulties. However, this does not necessarily prevent airport operators from defining their own in collaboration with community stakeholders, following the example set in Northern Ireland. This could be informed by guidance, a standard, or simply duplicate the methodology used in Northern Ireland.

13.2 Noise Action Plan Effectiveness

To improve transparency and accountability on delivering the measures and actions within the Noise Action Plans, it is strongly recommended that the measures and actions are specific, measurable, achievable, relevant and time-bound (SMART). Provision of quantifiable targets means that progress can be clearly demonstrated towards achieving goals. In particular, the inclusion of a 'time-bound' element for each measure would help airport operators transparently manage the expectations of community stakeholders as well as budgeting.

As discussed in Section 13.1, it is important for airport operators to communicate clearly with community stakeholders and that information shared with them is easily accessible and understandable. It is recommended that regular progress updates are provided to community stakeholders on delivering the measures and actions in the Noise Action Plans. A non-technical progress statement was widely requested by community stakeholders, with one suggesting that a red-amber-green scale or similar could be used as a means of showing progress against each measure. This would be particularly effective for measures and actions that are SMART, improve transparency and help community stakeholders participate in an "informed debate" in line with the Aviation Policy Framework.

Alongside the implementation of actions and measures, enforcement is an important aspect for the Noise Action Plan to achieve its stated goals. It is recommended that further information on enforcement practices is included in the Noise Action Plan or other material shared regularly with the community stakeholders to improve transparency in this area. Some of the Noise Action Plans indicate that this is already being undertaken, for example, by reporting income from fines on a quarterly or annual basis, then donating the proceeds to a community fund.

The review has identified that the airport operator's ability to achieve several actions and measures within the Noise Action Plan is dependent on the behaviours of third parties, notably airlines. It is recommended that airport operators continue to review their monitoring and enforcement systems on a regular basis to ensure that these are effective enforcement tools. Similarly, fines and penalties should be reviewed regularly to ensure that they are a suitable deterrent, and that airport operators are empowered to escalate their enforcement action where continued non-compliant behaviour occurs.

13.3 Defra Guidance

The review has found that guidance produced by Defra for airport Noise Action Plans is considered by airport operators to be beneficial. However, there are some aspects of the guidance where further clarity is needed or the quality of the guidance could be improved. It is recommended that future issues of the Defra guidance for airport operators include more information on the following:

- Contextual information on what the END and Environmental Noise Regulation requirements are aiming to achieve

- Linking the tables of affected populations more strongly to health effects (annoyance, sleep disturbance, other) and guidance on noise levels to use to represent health effects

- Aspects of Annex V where compliance is less explicitly demonstrated
- Case studies and examples of best practice
- Acceptable means of compliance

In addition to the above, it is also recommended that the guidance includes advice on the consultation process and timetabling within the noise action planning timescales. This could lead to greater consistency on the process between airports and help to ensure that consultation takes place early enough in the process. Examples of best practice would be useful to ensure that enough consultation inputs are received from community stakeholders and that the information provided is of sufficient quality to the airport operator.

As mentioned in Section 13.1, the review has found that both airport operators and community stakeholders would like there to be more transparency in the process for adopting Noise Action Plans. It is suggested that further information is included on the approval and adoption process within the Defra guidance.

In the near future, some aircraft operators may start to operate test flights linked to future aviation technologies. These include eVTOL aircraft and air taxis. As the Round 5 Noise Action Plans will need to look ahead to managing aviation noise in 2030 and beyond, the noise impacts from future aviation technologies will need to be considered. It is recommended that the guidance is provided to airport operators on how to assess noise impacts from these within their Noise Action Plans, ideally within the Defra guidance. The CAA, Defra and DfT may need to collaborate to develop this guidance.

Finally, some airport operators requested that further information is provided related to population growth or encroachment increasing the size of affected populations despite noise contour areas decreasing. It is suggested that Defra consider including some advice on this within their guidance for airport operators.

13.4 Next Steps

Alongside the review and implementation of the recommendations above, the review has found that airport operators and community stakeholders have misaligned views on how well the airport operator is managing noise. Further work is required by the airport operators to improve their relationships with community stakeholders, which involves being more transparent and accountable on noise-related matters.

As the scope of the project was focussed on reviewing the Noise Action Plans, limited information was found on how airport operators in the UK are held to account by local or national government bodies on noise-related issues. There is potential for this to be examined more closely to further understand enforcement mechanisms used on airport operators, and how this corresponds to enforcement practices used by airport operators.

A varied range of topics has been considered in this review and further work is required to explore some of them more deeply. This includes the use of additional noise indicators or contours, the assessment of health effects, the role of socioeconomics in noise management, sustainability, future aviation technologies, cost benefit analyses and the role of section 106 agreements (and other similar legal obligations) in shaping the Noise Action Plan submissions. The proportionality aspect that takes into account the differing contexts of each airport could also be examined further. Additionally, the outcomes of the project could be reviewed alongside the recent research paper “Study on Airport Noise Reduction” commissioned by the European Commission [86], which reviewed some similar themes for European airports.

As the work undertaken for this project considered eight airports based in the UK, aspects of the work could be extended out to additional airports. For example, further information could be gathered at additional airports using the questionnaires issued to airport operators and community groups. This could enable more distinct trends between England and the devolved administrations to be identified. Similarly, the study could be extended to

consider some additional European airports that are perhaps smaller and more comparable to most already considered in this study.

Finally, the project has found that airports seem to be reliant on consultation inputs and passive means to measure community perceptions, such as complaint rates. Few Noise Action Plans refer to local perception studies being undertaken as a means of monitoring performance or influencing the selection of Noise Action Plan measures. The potential benefits of local perception studies could be studied further to see if they could be beneficial to the process.

14. Conclusions

Noise Action Plans are a useful tool for identifying noise impacts in areas surrounding airports and creating a set of actions to managing noise. The review of Noise Action Plans has shown that there is some positive evidence that Noise Action Plans are effective. This is demonstrated most clearly in the Noise Action Plans that showed steady decreases in noise over time, and where measures are added or revised based on data from monitoring regimes to bring about more improvements. These revisions include setting 'stretch' goals once the original requirement is achieved. Where typical or planned measures are failing to deliver the required results, more innovative or drastic solutions are devised. The most effective Noise Action Plans were detailed, with clearly stated achievable measures and success criteria.

However, the optimism presented in the Noise Action Plans on delivering improvements can contrast with the perspectives from community stakeholders, who might not be experiencing the expected noise improvements. This could be due to a number of factors, including air traffic growth, airport expansion or airlines not complying with the airport operator's requirements. The ability of the airport operator to enforce their measures and actions is an important aspect of ensuring compliance, and their mechanisms to do so require regular review to ensure that they are effective.

As the circumstances vary from airport to airport and the influence of COVID-19 distorts some of the noise contours/affected populations in the Round 4 Plans, there is not enough evidence to conclude that Noise Action Plans are effective or ineffective overall.

The review has shown that Noise Action Plans can be more effective than they currently are. Building more transparency and accountability into the process at all levels is key – from using SMART measures and actions in the Noise Action Plans, to explaining changes resulting from consultation to local communities, to Defra making the process for approving Noise Action Plans clearer.

The Noise Action Plans contain technical information and can be lengthy documents, which can create barriers for community stakeholders wishing to participate in the process. The production of a non-technical summary document alongside the Noise Action Plan that draws out the aspects the community stakeholders are most interested in would help to ensure that they can participate in an "informed debate". A similar non-technical document can be shared regularly to provide progress updates.

To support the airport operators with the preparation of their Noise Action Plans, the Defra guidance should be updated to include additional information and improve clarity. The inclusion of case studies and best practice examples within the guidance, or suitable references that contain this information, would lead to improvements to Noise Action Plans and measures within them. Further information on how to demonstrate compliance with Annex V would also lead to improvements in the quality of the Noise Action Plans, including health effect assessments, that could potentially lead to a quicker approval and adoption process.

In the near future, some aircraft operators may start to operate test flights linked to future aviation technologies. These include eVTOL aircraft and air taxis. As the Round 5 Noise Action Plans will need to look ahead to managing aviation noise in 2030 and beyond, the noise impacts from future aviation technologies will need to be considered. The CAA, Defra and DfT may need to work together to agree a suitable approach for appraising impacts from future aviation technologies in a Noise Action Plan context so that airport operators are consistent in how this is managed.

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- Members of the Steering Group
- Members of the Stakeholder Engagement Group
- Representatives from the ten selected airports or appointed third parties
- ACCs and community stakeholders for the ten selected airports.

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APPENDICES

Appendix A. Glossary

A.1 Acronyms and Abbreviations

ACC	Airport Consultative Committee
CAA	Civil Aviation Authority
DAERA	Department of Agriculture, Environment and Rural Affairs (Northern Ireland)
Defra	Department for the Environment, Food and Rural Affairs (England)
DfT	Department for Transport
END	Environmental Noise Directive
EU	European Union
eVTOL	Electric vertical take off and landing aircraft
FLK	Aircraft Noise Commission (in Frankfurt)
HSNAG	Heathrow Strategic Noise Advisory Group
ICAO	International Civil Aviation Organization
KPI	Key Performance Indicator
NaTMAG	Noise and Track Monitoring Advisory Group (at Gatwick)
NATS	National Air Traffic Services
NPPF	National Planning Policy Framework
NPR	Noise Preferential Routes
NPSE	Noise Policy Statement for England
SEL	Sound Exposure Level
SMART	Specific, Measurable, Achievable, Realistic, Time
TAG	Transport Appraisal Guidance
UK	United Kingdom

A.2 Terminology

A-weighting	Frequency adjustments made to a soundwave to reflect how humans perceive sound
Agglomeration	An area having a population in excess of 100,000 people and a population density such that it considered to be an urbanised area
Article 1c (of the END)	A requirement that Noise Action Plans are “based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good”
Annex V	Section of the Environmental Noise Directive that sets out the minimum requirements for Noise Action Plans
COVID-19	Coronavirus pandemic
Designated airport	An airport that has operational restrictions for noise purposes under the Civil Aviation Act 1982.
Devolved administration	Region of the UK with devolved powers – Wales, Scotland and Northern Ireland
$L_{Amax,T}$	The maximum A-weighted sound level measured during time period T
$L_{Aeq,T}$	The equivalent continuous sound pressure level during time period T.
L_{den}	The day-evening-night noise indicator representing overall annoyance, calculated by adding together L_{day}, L_{eve} and L_{night} sound levels that are weighted according to the methodology in the Environmental Noise Directive.
L_{day}	The A-weighted long term average sound level determined over all day periods of a year, typically representing the 12 hour time period between 07:00 and 19:00. This noise indicator represents annoyance during the day period.
L_{eve}	The A-weighted long term average sound level determined over all evening periods of a year, typically representing the 4 hour time period between 19:00 and 23:00. This noise indicator represents annoyance during the evening period.
L_{night}	The A-weighted long term average sound level determined over all evening periods of a year, typically representing the 8 hour time period between 23:00 and 07:00. This noise indicator represents sleep disturbance during the night period.
Major airport	A civil airport that has more than 50,000 movements per year (a movement being a take-off or a landing), excluding those purely for training purposes on light aircraft.
N above	The number of noise events that exceed a certain level. For example, an N60 contour level represents the number of noise events above 60 dB(A).
Noise Action Plan	Plans designed to manage noise issues and effects, including noise reduction if necessary.
Noise contours	A graphical representation used to show equal noise levels over a defined area.
Noise indicator, noise metric	A physical scale for the description of environmental noise, which has a relationship with a harmful effect.
Round [number]	Iteration of strategic noise mapping and action planning, linked to a specific five-year period
Sound Exposure Level	The acoustic energy of an event (such as an aircraft flyover or train passby) that is condensed into a one second period

Stakeholder Engagement Group	A group of diverse stakeholders assembled to engage with the project including those who possess executive authority for noise improvement actions as well as community stakeholders.
Steering Group	A government bodies who provided strategic oversight and direction for the project.
Strategic Noise Map	A map designed for the global assessment of noise exposure in a given area due to different noise sources or for overall predictions for such an area.

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Appendix C. Survey to Airport Operators

Noise Action Plan Survey: Airports

Civil Aviation Authority - AtkinsRéalis - Issued 02/12/2024

* Required

Noise Action Plans are a legal requirement for eligible airports under the EU Environmental Noise Directive and legal instruments that transpose these requirements into national law.

The Civil Aviation Authority is undertaking a critical review of the process for developing and implementing Noise Action Plans, their effectiveness as a noise management tool, and the clarity of guidance prepared to support airport operators with the development of their Noise Action Plans.

AtkinsRéalis has been commissioned to support with the Civil Aviation Authority review and is requesting feedback from airports and their stakeholders on Noise Action Plans. If you have any questions about the survey, or would like to learn more about the research being undertaken, please contact [redacted].

Please answer the following questions and submit your responses.

Respondent Data

1. Please provide your name. *

2. Please provide your email address. *

3. On behalf of which airport are you responding? *

4. Do you consent to your responses being shown in a report? Any responses used would be attributed to the airport, and not the author by name. *

- ◯ Yes
- ◯ No

Noise Action Plan Development, Enforcement, and Effectiveness

5. Consider the regulatory framework of airport Noise Action Plans. Please indicate on the scale below your responses to the following statements: *

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
The regulatory framework empowers our airport to take action to reduce noise	○	○	○	○	○
The regulatory framework hinders our airport from taking action to reduce noise	○	○	○	○	○

6. Please explain what informed your responses to the previous question. *

7. How are the Noise Action Plan measures actioned at your airport? *

- ☐ Contractual arrangements with airlines
- ☐ Voluntary agreements
- ☐ Working with manufacturers to bring about quieter technologies
- ☐ Regular training for airport and airline personnel
- ☐ Other

Noise Action Plan Development, Enforcement, and Effectiveness

Continued...

8. Do you produce noise contours annually? *

- ◯ Yes
- ◯ No

9. If you produce noise contours annually, how do you use these to track progress and inform measures in the Noise Action Plan? *

10. What obstacles or constraints, if any, prevent Noise Action Plan measures and actions from being fully implemented, or from realising their full benefits? *

11. Consider the most recent timeframe of the strategic noise mapping Rounds. Please indicate on the scale below your response to the following statements: *

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
The timeframe of Rounds is realistic	◯	◯	◯	◯	◯
The timeframe of Rounds is useful	◯	◯	◯	◯	◯

12. Do you work with other airports on Noise Action Plan development or share measures / lessons learned? *

- ◯ Always
- ◯ Sometimes
- ◯ Rarely
- ◯ Never
- ◯ Don't know

13. What type(s) of work do you undertake with other airports? *

- [ ] Lessons learned
- [ ] Best practice
- [ ] Interpretation of Noise Action Plan guidance, or other relevant sources
- [ ] Training
- [ ] Not applicable
- [ ] Other

Noise Action Plan Development, Enforcement, and Effectiveness

Continued...

14. Regarding Noise Action Plan measures; what action(s) have you taken previously to address any measures that proved to be less effective? *

- [ ] Consulted with stakeholders
- [ ] Reviewed the efficacy of measures
- [ ] Removed constraints that affect the performance of the measure
- [ ] Pursued 'enforcement' measures
- [ ] Replaced with alternate measures
- [ ] Did nothing - our airport was unable to make changes
- [ ] Not applicable
- [ ] Other

15. What consequences have arisen at your airport from measures that weren't implemented or weren't effective?

16. How are Noise Action Plan measures enforced at your airport, including any noise limits or restrictions? *

17. Are there any penalties for not meeting the objectives of the Noise Action Plan at your airport? If so, who incurs the penalties? *

Noise Action Plan Development, Enforcement, and Effectiveness

Continued...

18. What do you think are the limitations of the Noise Action Plan at your airport? *

19. What do you think are the benefits of the Noise Action Plan at your airport? *

Supporting Local / National Guidance

This section focuses on local / national guidance that supports airports to develop Noise Action Plans. For airports located in England, this is 'Guidance for Airport Operators to produce Noise Action Plans under the terms of the Environmental Noise (England) Regulations 2006 (as amended)', published by Defra. If your airport is outside of England, there may be equivalent guidance for airports that you use that should inform your responses.

20. What, if any, local or national guidance for airports do you use to develop your Noise Action Plans in accordance with the Environmental Noise Directive (and its transposition into national law)? *

21. Please indicate on the scale below your responses to the following statements about local or national guidance for airports: *

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
The guidance is helpful to prepare Noise Action Plans	◯	◯	◯	◯	◯	◯
The language in the guidance is clear	◯	◯	◯	◯	◯	◯
The language in the guidance is unambiguous	◯	◯	◯	◯	◯	◯
The guidance has provided additional clarity on the Noise Action Plan requirements	◯	◯	◯	◯	◯	◯
The subsequent revisions of the guidance have become more helpful over time	◯	◯	◯	◯	◯	◯
The use of preferential routes has meant other measures are considered less of a priority	◯	◯	◯	◯	◯	◯

22. If you think noise preferential routes were given a higher priority than other measures, please explain why.

23. What additional guidance, clarifications or support would be useful to you for the development and adoption of your Noise Action Plans? *

Stakeholders Including Local Communities

24. Consider the feedback you have received from stakeholders (community, airlines, local authorities, etc.) and the resulting actions you have taken. Please indicate on the scale below your response to the following statements: *

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Stakeholders feel the consultations are easy to respond to	◯	◯	◯	◯	◯
The quality of the stakeholder responses is high	◯	◯	◯	◯	◯
Stakeholders feel the consultations are well promoted	◯	◯	◯	◯	◯
Stakeholders feel the Noise Action Plan material is easily accessible	◯	◯	◯	◯	◯
The list of potential stakeholders is regularly reviewed and updated	◯	◯	◯	◯	◯
Stakeholders have confidence their feedback is considered	◯	◯	◯	◯	◯
The consultation responses resulted in changes to draft proposals	◯	◯	◯	◯	◯

25. Please outline any areas where feedback from different groups of stakeholders varies. *

26. What actions do you take to keep stakeholders informed of progress in implementing Noise Action Plan measures? *

- [ ] Contact through community groups
- [ ] In person meetings
- [ ] Online meetings
- [ ] By post
- [ ] Email
- [ ] We don't keep stakeholders informed
- [ ] Other

27. How often do you reach out to stakeholders to keep them informed? *

- ◯ Weekly
- ◯ Monthly
- ◯ Quarterly
- ◯ Annually
- ◯ Less regularly than once a year
- ◯ Never

Stakeholders Including Local Communities

Continued...

28. Consider the influence that community acceptance has on the selection and prioritisation of measures. Please indicate on the scale below your response to the following statements: *

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Community acceptance is a consideration when selecting measures	◯	◯	◯	◯	◯
Community acceptance is prioritised when selecting measures	◯	◯	◯	◯	◯

29. Has your plan, the plan process, or specific measures led to better relationships with local communities? Please choose the option that most closely aligns with your opinion. *

- ◯ Yes - an already good relationship has improved
- ◯ Yes - the relationship has improved
- ◯ No change - a good relationship already exists
- ◯ No change - the relationship has not improved
- ◯ No - the relationship has deteriorated
- ◯ A relationship does not exist

30. What informed your response to the above question? Please provide details. *

Additional Factors

31. Please indicate on the scale below your response to the following statements, with respect to practices at your airport: *

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
All socio-economic groups are treated equally in the development of our Noise Action Plan	○	○	○	○	○
Health effects in the most important areas (as identified in strategic noise mapping) are monitored	○	○	○	○	○
Cost benefit analyses based on health effects inform Noise Action Plan measures	○	○	○	○	○
Reducing noise emissions conflicts with sustainability goals	○	○	○	○	○
Metrics other than dB Leq,16hr, Lnight and Lden are used to inform the Noise Action Plan process and track improvements	○	○	○	○	○
The Noise Action Plan is an effective noise management tool at my airport	○	○	○	○	○

General Comments

32. Is there anything further that you wish to add regarding Noise Action Plans? *

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Appendix D. Survey to Community Stakeholders

Noise Action Plan Survey: Stakeholders Including Local Communities

Civil Aviation Authority - AtkinsRéalis - Issued 02/12/2024

* Required

Noise Action Plans are a legal requirement for eligible airports under the EU Environmental Noise Directive and legal instruments that transpose these requirements into national law.

The Civil Aviation Authority is undertaking a critical review of the process for developing and implementing Noise Action Plans, their effectiveness as a noise management tool, and the clarity of guidance prepared to support airport operators with the development of their Noise Action Plans.

AtkinsRéalis has been commissioned to support with the Civil Aviation Authority review and is requesting feedback from airports and their stakeholders on Noise Action Plans. If you have any questions about the survey, or would like to learn more about the research being undertaken, please contact [redacted].

Please answer the following questions and submit your responses.

Respondent Data

1. Please provide your name. *

2. Please provide your email address. *

3. On behalf of which organisation are you responding? *

4. Which airport are your comments related to? *

5. Do you consent to your responses being shown in a report? Any responses used would be attributed to the organisation you represent, and not your name. *

- ◯ Yes
- ◯ No

Stakeholders Including Local Communities

6. Please indicate on the scale below your responses to the following statements that consider airport Noise Action Plans: *

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
It is easy to respond to consultations about Noise Action Plans	○	○	○	○	○
You feel able to influence the selection of measures in the Noise Action Plan for your airport	○	○	○	○	○
You feel able to influence the prioritisation of measures in the Noise Action Plan for your airport	○	○	○	○	○
You feel the Noise Action Plan material is easy to access	○	○	○	○	○
You feel the Noise Action Plan and consultation material is easy to understand	○	○	○	○	○

7. What informed your responses to the above statements? *

Stakeholders Including Local Communities

Continued...

8. How are you informed of progress in implementing and achieving the Noise Action Plan measures? *

- ◯ You or your organisation are directly contacted
- ◯ In person meetings
- ◯ Online meetings
- ◯ By post
- ◯ Email
- ◯ I am / we are not kept informed
- ◯ Other

9. What are your views on the frequency of communications and updates provided on implementing and achieving the Noise Action Plan measures? *

10. How often are you informed of progress in implementing and achieving the Noise Action Plan measures? *

- ◯ Weekly
- ◯ Monthly
- ◯ Quarterly
- ◯ Annually
- ◯ Less frequently than once a year
- ◯ Never

11. How often would you like to be informed of progress in implementing and achieving the Noise Action Plan measures? *

- ◯ More frequently
- ◯ Less frequently
- ◯ The current frequency of communications / updates is about right

12. Has the Noise Action Plan, the Plan process, or specific measures led to better relationships between local communities and the airport? Choose the option that most closely aligns with your opinion. *

- ◯ Yes - an already good relationship has improved
- ◯ Yes - the relationship has improved
- ◯ No change - a good relationship already exists
- ◯ No change - the relationship has not improved
- ◯ No - the relationship has deteriorated
- ◯ A relationship does not exist
- ◯ Don't know

13. What informed your response to the above question? Please provide details. *

Limitations & Successes

14. What do you think are the limitations of the Noise Action Plan at your airport? *

15. What do you think are the benefits of the Noise Action Plan at your airport? *

Additional Factors

16. Please indicate on the scale below your response to the following statements: *

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Don't know
All socio-economic groups are treated equally in the development of the Noise Action Plan	◯	◯	◯	◯	◯	◯
Health effects in the most important areas (as identified by the strategic noise mapping) are monitored	◯	◯	◯	◯	◯	◯
Cost benefit analyses based on health effects inform the Noise Action Plan measures	◯	◯	◯	◯	◯	◯
Reducing noise emissions conflicts with sustainability goals	◯	◯	◯	◯	◯	◯
Metrics other than dB Leq,16hr, Lnight and Lden are used to inform the Noise Action Plan process and track improvements	◯	◯	◯	◯	◯	◯
The Noise Action Plan is an effective noise management tool at my airport	◯	◯	◯	◯	◯	◯

Have Your Say...

17. Is there anything further that you wish to add regarding Noise Action Plans for airports? *

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