Logika Noise Air Quality CONSULTANTS

Study on Airport Noise Reduction

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Glossary

Action plans: plans designed to manage noise issues and effects, including noise reduction if necessary[1].

Agglomeration: part of a territory, delimited by the Member State, having a population in excess of 100,000 persons and a population density such that the Member State considers it to be an urbanised area[2].

Airport / Major Airport: an airport which has more than 50,000 civil aircraft movements per calendar year (a movement being a take-off or landing), on the basis of the average number of movements in the last three calendar years before the noise assessment[3] or a civil airport designated by the Member State, which has more than 50,000 movements per year (a movement being a take-off or landing) excluding those purely for training purposes on light aircraft[4].

Assessment: any method used to calculate, predict, estimate or measure the value of a noise indicator or the related harmful effect[5].

ICAO Balanced Approach: the process developed by the International Civil Aviation Organization under which the range of available measures, namely the reduction of aircraft noise at source, land-use planning and management, noise abatement operational procedures and operating restrictions, is considered in a consistent way with a view to addressing the noise problem in the most cost-effective way on an airport-by-airport basis[6].

Limit value: where determined by the Member State, the exceeding of which causes Competent Authorities to consider or enforce mitigation measures as a consequence of national legislation;.

Noise indicator: a physical scale for the description of environmental noise, which has a relationship with a harmful effect[7].

Noise mapping: the presentation of data on an existing or predicted noise situation in terms of a noise indicator, indicating breaches of any relevant limit value in force, the number of people affected in a certain area, or the number of dwellings exposed to certain values of a noise indicator in a certain area[8].

Noise-related action: any measure that affects the noise climate around airports, for which the principles of the ICAO Balanced Approach apply, including other non-operational actions that can affect the number of people exposed to aircraft noise[9].

Operating restriction: a noise-related action that limits access to or reduces the operational capacity of an airport, including operating restrictions aimed at the withdrawal from operations of marginally compliant aircraft at specific airports as well as operating restrictions of a partial nature, which for example apply for an identified period of time during the day or only for certain runways at the airport[10].

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[1] Article 3 (t) of END.
[2] Article 3 (k) of END
[3] Article 2(2) of BAR.
[4] Article 3(p) of END
[5] Article 3 (e) of END.
[6] Article 2 of BAR.
[7] Article 3 (d) of END.
[8] Article 3 (q) of END.
[9] Article 2 of BAR.
[10] Article 2 of BAR.

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[11].

[11] Article 3 (r) of END.

Abstract

The European Environment Agency's Environmental noise in Europe - 2020 report stated that "*Environmental noise* (which includes road, rail, aircraft, and industry sources), […] *remains a major environmental problem affecting the health and well-being of millions of people in Europe*".

The European Commission, through this study, is assessing how European legislation on the management of aircraft noise around airports is implemented.

The study aims to assess how both Directive 2002/49/EC (END) and Regulation 598/2014 (BAR) have been implemented by Competent Authorities at airports within the European Union, how these may have helped achieve noise reduction objectives, and whether there is a need to revise the existing legislation to improve their effectiveness.

Through an online questionnaire and ad-hoc interviews, quantitative and qualitative data were collected from the Competent Authorities of 63 European major airports on how the provisions of both END and BAR have been implemented and on any associated practices and approaches undertaken in the execution of their noise management framework.

The aggregated data have been used to provide an overview of the different approaches and rationales taken by Competent Authorities during implementation of the two legislations as well as their thoughts on how these and their application could be improved.

Executive summary

Introduction

Aircraft noise has been a sensitive issue for residents in areas near airports since jet aircraft became widely used in the 1960s and 1970s. It has resulted in a proliferation of local and national legislations and policies to manage aircraft noise over the intervening decades. Governments and industry have sought improvement in the level of noise generated by individual aircraft, notably by reaching agreement at global level (ICAO) on the introduction of increasingly stringent standards – a process that has led to the definition of so-called Chapter 2, 3, 4 and 14 standards for aircraft. As a result, today's passenger jets are considerably quieter than their predecessors.

Even with these technological improvements, the European Environment Agency (EEA) report on Environmental noise in Europe 2020, found that *"environmental noise* […] *remains a major environmental problem affecting the health and well-being of millions of people in Europe"* and considers aircraft noise as *"the most significant cause of adverse community reaction related to the operation and expansion of airports."* (https://www.icao.int/environmental-protection/Pages/noise.aspx).

Directive 2002/49/EC (END) which was published in July 2002, sets out a framework for a common approach intended to avoid, prevent or reduce the harmful effects of environmental noise (from road, rail, air and industrial sources) in Europe.

Within a five-year rolling programme of activities, the Competent Authorities designated within each Member State are to undertake strategic noise mapping, assess the extent of environmental noise, draw up noise action plans, manage noise issues and effects, and consult with the public on the extent of the noise exposure and the action proposed.

The Balanced Approach Regulation (EU) 598/2014 (BAR) which was published in June 2014 and entered into force in June 2016, establishes rules and procedures on the introduction of noise-related operating restrictions at Union airports through a balanced approach, replacing Directive 2002/30/EC. Its Article 5, by providing general rules for the noise management, effectively set out the wider concept of the ICAO Balanced Approach.

This report collects information on how the Environmental Noise Directive (END) and Balanced Approach Regulation (BAR) have been implemented in the European Union based on the results of an extensive questionnaire and selected ad-hoc interviews. It reflects the collective views of the airports' Competent Authorities regarding where and how legislation could be improved.

Objectives of the study

The study had the following objectives:

- To understand how the END and BAR provisions on airport noise management are implemented across the European Union;
- To understand what practices and approaches have been used in the execution of the noise management framework;

- To identify evidence of how/if these have helped reach the noise abatement objectives and/or priorities; and
- To gather views on whether there is a need to revise the existing legislation to improve its effectiveness.

The study collected information from airport Competent Authorities through an in-depth review of the legal framework, a questionnaire to collect information on the implementation of END and BAR provisions, and ad-hoc interviews to understand in more depth the different approaches used and collect inputs for improvements of such legislation.

A total of 63 major airports of the European Union (i.e., those ones with at least 50,000 air traffic movements per year) were included in the study scope. Competent Authorities from 55 of them completed the questionnaire, and 20 were selected for the ad-hoc interviews (including one airport that did not complete the questionnaire).

The information collected

Noise problem: most Competent Authorities define the noise problem in relation to non-compliance with the national legislation criteria, often linked to a specific Environmental Permit or Planning Condition. These are the result of separate activities to the END and BAR process and were often established in Member States prior the European legislation. The noise problem is commonly identified when there is an exceedance of national noise limits and policies, or contour area limits. There were few examples where the calculation of harmful effects is used for the identification of a noise problem.

Noise abatement objective and measurable outcomes: there is no evidence of SMART (specific, measurable, achievable, realistic and timebound) noise abatement objective statements which include a quantifiable outcome or defined goal, to be achieved as a result of the action implementation or within a set timeframe. In general, objectives and priorities range from those aspiring to a "reduction in population exposure", without indicating a timeframe or quantum, to a list of key actions for delivery over the course of an action plan.

Noise related actions and operating restrictions: the determination of the noise related actions or operating restrictions is generally not undertaken through Cost Benefit or Cost Effectiveness Analysis. There are examples of actions being identified through working groups / airport commissions, with the engagement of the airport operator, Competent Authorities, local and industry stakeholders.

Monitoring and measurements of progress, outcomes and achievement: monitoring the progress of actions is commonplace. However, the value or effectiveness of specific interventions is rarely quantified within the process. In some cases, the noise action plan progress is measured through stakeholder dialogue to reach a consensus view.

Engagement and consultation: engagement is frequently undertaken through an Airport Commission or Technical Stakeholder/Working Groups. The public consultations often follow the timing of the national framework rather than the END, and noise action plan consultations with the public are mainly held online through virtual events or via remote feedback. Promotion activities are mostly through Competent Authority and airport operator Websites.

Identified practices and approaches

European and national/local legislation: where there is pre-existing national/local legislation END and BAR have not been adopted by Member States as the main driving process for developing airport noise management approaches**.** In these instances, Environmental Permits and/or Development Planning conditions often form the basis of the noise action plans and are considered outside of the END or BAR process. However, where the END and BAR are the main legislations for airport noise, these offer an effective noise management planning process.

Identified delivery models: two main models have been identified in the delivery of the END and BAR provisions. These are based on: the designation of Competent Authorities; the role of the airport operator; the process used in defining noise related actions or operating restrictions; stakeholder engagement arrangements; cost benefit and cost effectiveness analysis tools; progress monitoring activities; and feedback received on the END/BAR role in the noise management process. The report draws the following distinction:

- National/Local institutions as Competent Authorities and airport operator as stakeholder;
- Airport operator among Competent Authorities in the noise management framework.

Within these two models, it was found that a wide fragmentation of the roles can make the process to deliver the noise management framework more complex, while having the airport operator as one of the Competent Authority, or as the main stakeholder, can have a positive influence on the process of delivering the END/BAR provisions.

Observations and advice for policy improvements

Observations

The following tables summarise the observations in relation to the specific articles within the legislation and are based on the information collected from the Competent Authorities through the online questionnaire and ad-hoc interviews.

END's Articles	Content	Main Observation
Article 1	Objectives	Inconsistency with BAR objectives
Article 3	Definitions	Inconsistency of language used in BAR
Article 4	Implementation and responsibilities	Mixed interpretation and some uncertainties in roles and responsibilities
Article 5	Noise indicator and their application	National indicators comparability with L_{den}/L_{night} and in assessing harmful effects
Article 6	Assessment methods	Harmful effects not usually assessed
Article 7	Strategic noise mapping	Access to noise performance data, comparability of models, assumptions with/for aggregated data
Article 8	Action plans (and public consultation)	Noise action plan reports actions identified within a pre-existing national framework which may have objectives that differ from END.
		Priorities have not always been identified and are rarely quantifiable where they have been.
		Reviews not undertaken when major development has occurred.

END's Articles	Content	Main Observation
		Development Planning and/or Environmental Permit consultation and engagement outside of END process used to inform noise action plan for submission
		Stakeholders are generally consulted but, in some instances, these are only accredited organisations excluding single or groups of citizens from the engagement activities.
		Stakeholders are generally consulted but, in some instances, these are only accredited organisations excluding single or groups of citizens from the engagement activities.
Article 9	Information to the public	Wide use of website to disseminate information and promote engagement
Article 10	Collection and publication of data by Member States	Not all major airports' Competent Authorities have reported data across the three END rounds
Article 11	Review and reporting	Interest on how reported data have been used by the Commission to determine long term and medium-term Union's goals
Annex I	Noise Indicators	Comparability of night noise data with different approaches used by Member States
Annex II	Assessment Methods for the noise indicators	Variations in modelling software, assumptions, or inputs such as population databases make amalgamation to an EU wide trend or comparison between airports of limited value
Annex III	Assessment method for Harmful Effects	Harmful effects expected to be more widely calculated following the 2022 revision of Annex III
Annex IV	Minimum Requirement for strategic noise mapping	Inconsistency on how agglomeration data is presented.
Annex V	Minimum requirements for action plans	No noise abatement objective
		No clear alignment in definition of long-term strategies, priorities and noise abatement objectives or description of the noise problem
		Limited use of CBA/CEA assessment and challenge feasibility of estimating the number of people affected by each action.
		Lack of evidence to enable the quantification of the effectiveness and value of the interventions described in noise action plans
Annex VI	Data to be sent to the commissions	Inconsistent approaches in reporting agglomeration data for airports within or very close to an agglomeration
		Agglomeration data excluded for night-time data

BAR's Articles	Content	Main Observation
Article 1	Subject matter, objectives and scope	The noise problem and noise abatement objective are rarely set, and guidance is welcomed
		Objectives are inconsistent with END
Article 2	Definitions	Inconsistency of language used in the BAR and END
Article 3	Competent Authorities	Not all member states have designated a Competent Authority
		Complexity created by fragmentation of Competent Authority roles for END and BAR
Article 4	Right of Appeal	Examples where this has not yet been established
Article 5	General rules on aircraft noise management	There is some confusion surrounding the application of the general rules on aircraft noise management since they are set out in BAR and reflect the ICAO Balanced Approach but are omitted from the END
		Actions have been identified without a Cost Effectiveness Analysis evaluation or consideration of the public interest as regard the development prospects of airports

BAR's Articles	Content	Main Observation
Article 6	Rules on noise assessment	There are many examples of Airport Commission / Technical Groups being established but they are not universally found
Article 7	Noise performance information	Forecasting and performance data concerns due to lack of availability to latest noise performance data expected following the introduction of the BAR
Article 8	Rules on the introduction of operating restrictions	Except for one Member State - no new operating restrictions have been implemented under BAR
Article 14	Existing operating restrictions	Only one example identified where pre-existing restrictions were being revised, but many airports already had operating restrictions prior to BAR
Annex I	Assessment of the noise situation at an airport	Access to data on future fleet technology and in particular deployment is very limited which makes forecasting the impacts of noise at source challenging
		Accountability for the monitoring of encroachment (and wider Land Use Planning aspects of the ICAO Balanced Approach) is unclear
Annex II	Assessment of the cost effectiveness of noise-related operating restrictions	Except for one member state - no new operating restriction have been implemented under BAR

Advice for policy improvements

The questionnaire and the ad-hoc interviews sought Competent Authority views on how the existing END and BAR legislation could be improved.

Potential amendments to the legislation

The respective aims of the BAR and END are not fully aligned and this can mean that Competent Authorities do not consider the two pieces of legislation together. There are language inconsistencies between the two legislations. These include the use and understanding of terms such as 'noise problem', 'noise abatement objective', 'noise related action', 'actions', 'priorities', and 'long-term strategy', which appear to be interchangeable in the legislation and therefore open to different interpretations by Competent Authorities. The same is true of other frequently used terms such as 'airport', 'aircraft', or 'noise measure'. Competent Authorities and wider stakeholders would benefit from greater clarity and guidance in relation to the definition of key terms within the legislation and best practice in the application of the END and BAR. The language inconsistencies between the two pieces of legislation need to be addressed to help reduce the likelihood of confusion or misinterpretation.

The legislation could be improved by making the "general rules on aircraft noise management" clear in both or at least offering guidance specifying that they relate to both the END and the BAR. In fact, there are some different interpretations of how the wider concept of the ICAO Balanced Approach interacts with the END and application of the BAR, which could helpfully be clarified. Competent Authorities emphasised that any potential amendments to the legislation should not hinder or undermine the location specific longstanding and pre-existing approaches to noise management, which are well understood and considered effective by many stakeholder groups.

Areas needing additional guidance

The assumption that the noise problem has been clearly identified, and a quantifiable noise abatement objective or priority set, hinders the application of the legislation. Guidance is sought for the determination of actions for selection in the noise action plans, and the development and application of a Cost Benefit or Cost Effectiveness analysis in the process. This would include reviewing the feasibility of some elements within the legislation, for instance the calculation of the reduction in harmful effects resulting from each

specific action, with further guidance welcomed on the assessment of harmful effects, how these should relate to defining noise problems and assisting Competent Authorities in setting SMART noise abatement objectives.

The view that the BAR and END are part of a co-ordinated wider noise management framework is not universally held. Where there is pre-existing national/local legislation, END and BAR have not always been adopted by Member States as the main regulatory framework for airport noise management. Guidance on how the END and BAR processes are expected to interact with pre-existing national legislation, strategic development plans, noise management frameworks, and broader policy objectives is therefore necessary.

Moreover, accountability for the land use planning pillar of the ICAO Balanced Approach should be given greater emphasis. Competent Authorities would welcome if this was highlighted clearly in the legislation or related guidance.

Competent Authorities also suggested a need for a best-practice platform on noise management, that includes details of measures implemented across EU airports, to help share experience and knowledge and support both airports and Competent Authorities.

Areas needing further clarification

The aims of the respective legislation could be interpreted as not aligned and would benefit from greater clarity by enabling the measures of success around a noise abatement objective / priority to be more broadly interpreted, and include other environmental, economic, or social indicators.

Clarification of the roles and responsibilities of the Competent Authorities under the END and BAR is also sought. The roles for developing, collecting, implementing, approving, and reporting noise action plans and strategic noise maps, should be clearly defined within END, as well as the roles and responsibility of the Competent Authorities under the BAR for the implementation of the Balance Approach. This would also help communities and wider stakeholders to identify clear accountability for actions and in seeking information.

Some Competent Authorities sought clarification from the Commission as to when data provisions required under BAR are to be actioned. The central database of noise certification data by registration has yet to be completed, and this creates challenges for airports seeking to track their fleet improvement/implement charges or improve noise modelling. Additionally, the Commission should consider how it could ensure that noise profile data for all common aircraft types are included in a centralised noise model database.

Concluding Remarks

Although the study is limited by the fact that it has only considered the views and input from the relevant Competent Authorities and not the wider stakeholders involved in and impacted by their decisions in general, there appears to be a wide range of engagement and consultation activity undertaken by the Competent Authorities in relation to noise management and the application of the END and BAR.

Amongst several concluding remarks, the study considers that the legislation is broadly in good shape, with clear processes and accountabilities which seek to ensure that all stakeholders are engaged and consulted. At the heart of the study findings is a need to clarify the link between the two pieces of legislation and the key to their successful implementation is the defining of key terms as 'noise problem', 'noise abatement objective', 'noise related action', 'actions', 'priorities' and 'long-term strategy', and setting SMART objectives.

Abstract

Le rapport 2020 de l'Agence européenne pour l'environnement sur le bruit dans l'environnement en Europe indique que « *le bruit dans l'environnement* (qui comprend le trafic routier, ferroviaire, aérien, ainsi que le bruit industriel), […] *reste un problème environnemental majeur qui affecte la santé et le bien-être de millions de personnes en Europe* ».

La Commission européenne, à travers cette étude, évalue comment la législation européenne sur la gestion du bruit des avions aux abords des aéroports est mise en œuvre.

L'étude vise à évaluer comment la directive 2002/49/CE (END) et le règlement 598/2014 (BAR) ont été mis en œuvre par les autorités compétentes dans les aéroports de l'Union européenne, comment ils ont pu contribuer à atteindre les objectifs de réduction du bruit, et s'il est nécessaire de réviser la législation existante pour améliorer leur efficacité.

Au moyen d'un questionnaire en ligne et d'entretiens ad hoc, des données quantitatives et qualitatives ont été recueillies auprès des autorités compétentes de 63 grands aéroports européens sur la manière dont les dispositions établies aussi bien la directive END que dans le règlement BAR ont été mises en œuvre et sur toutes les pratiques et approches associées entreprises dans l'exécution de leur stratégie de gestion du bruit.

Les données agrégées ont été utilisées pour fournir une vue d'ensemble des différentes approches et logiques adoptées par les autorités compétentes lors de la mise en œuvre des deux législations, ainsi que leurs réflexions sur la manière dont celles-ci et leur application pourraient être améliorées.

Résumé

Introduction

Le bruit des avions est un sujet sensible pour les résidents des zones riveraines des aéroports depuis que l'utilisation des avions à réaction s'est généralisée dans les années 1960 et 1970. Cette problématique a donné lieu à une prolifération de législations et de politiques locales et nationales visant à gérer le bruit des avions au cours des décennies écoulées. Les gouvernements et le secteur aéronautique ont cherché à réduire le niveau de bruit produit par chaque aéronef, en parvenant notamment à un consensus à l'échelon international (OACI) sur l'introduction de normes de plus en plus strictes – un processus qui a conduit à définir les normes dites Chapitre 2, 3 et 4 pour les aéronefs. Il en résulte que les avions à réaction de transport de passagers actuellement en service sont nettement moins bruyants que leurs prédécesseurs.

En dépit de ces améliorations technologiques, le rapport 2020 de l'Agence européenne pour l'environnement (AEE) sur le bruit dans l'environnement en Europe a établi que *« le bruit dans l'environnement* […] *reste un problème environnemental majeur affectant la santé et le bien-être de millions de personnes en Europe »* et considère le bruit des avions comme *« la cause la plus importante de réaction négative de la communauté liée à l'exploitation et à l'expansion des aéroports »* (https://www.icao.int/environmental-protection/Pages/noise.aspx).

La directive 2002/49/CE (END), publiée en juillet 2002, définit le cadre d'une approche commune visant à prévenir ou atténuer les effets nocifs du bruit ambiant (généré par le trafic routier, ferroviaire, aérien et le bruit industriel) en Europe.

Dans le cadre d'un programme d'activités quinquennal glissant, les autorités compétentes désignées dans chaque État membre doivent entreprendre une cartographie stratégique du bruit, évaluer l'ampleur du bruit dans l'environnement, élaborer des plans d'action contre le bruit, gérer les problèmes et les effets du bruit et consulter le public sur l'ampleur de l'exposition au bruit et les mesures proposées.

Le règlement (UE) 598/2014 (BAR) relatif à l'approche équilibrée qui a été publié en juin 2014 et est entré en vigueur en juin 2016, établit les règles et procédures relatives à l'introduction de restrictions d'exploitation liées au bruit dans les aéroports de l'Union par le biais d'une approche équilibrée, en se substituant à la directive 2002/30/CE. Son article 5, en fournissant des règles générales pour la gestion du bruit, définit effectivement le concept plus large de l'approche équilibrée de l'OACI.

Ce rapport rassemble des informations sur la manière dont la directive sur le bruit ambiant (END) et le règlement sur l'approche équilibrée (BAR) ont été mis en œuvre dans l'Union européenne, sur la base des résultats d'un questionnaire détaillé et d'entretiens ad hoc sélectionnés. Il reflète les points de vue collectifs des autorités compétentes des aéroports concernant les domaines dans lesquels la législation pourrait être améliorée et la manière de le faire.

Objectifs de l'étude

Cette étude visait les objectifs suivants :

- Comprendre comment les dispositions de l'END et du BAR relatives à la gestion du bruit dans les aéroports sont mises en œuvre dans toute l'Union européenne ;

- Comprendre quelles pratiques et approches ont été utilisées dans l'exécution de la stratégie de gestion du bruit;
- Identifier les preuves de la manière dont elles ont contribué à atteindre les objectifs et/ou les priorités relatives à la réduction du bruit ;
- Recueillir des avis sur l'opportunité de réviser la législation existante pour en améliorer l'efficacité.

L'étude a recueilli des informations auprès des autorités compétentes des aéroports par le biais d'un examen approfondi du cadre juridique, d'un questionnaire visant à collecter des informations sur la mise en œuvre des dispositions de l'END et du BAR, et d'entretiens ad hoc afin de comprendre plus en profondeur les différentes approches utilisées et de recueillir des contributions pour améliorer cette législation.

Au total, 63 grands aéroports de l'Union européenne (c'est-à-dire ceux qui comptabilise au moins 50 000 mouvements de trafic aérien par an) ont été inclus dans la portée de l'étude. Les autorités compétentes de 55 d'entre eux ont rempli le questionnaire, et 20 ont été sélectionnées pour les entretiens ad hoc (dont un aéroport qui n'a pas rempli le questionnaire).

Les informations recueillies

Problème de bruit : la plupart des autorités compétentes définissent le problème de bruit en relation avec le non-respect des critères de la législation nationale, souvent lié à un permis environnemental ou à une condition de planification spécifique. Il résulte d'activités distinctes liées au processus introduit par l'END et le BAR et ont souvent été établis dans les États membres avant la législation européenne. Le problème du bruit est généralement identifié lorsqu'il y a un dépassement des limites et des politiques nationales en matière de bruit, ou des limites de zone de contour. Il y a eu quelques exemples où le calcul des effets nuisibles est utilisé pour l'identification d'un problème de bruit.

Objectif de réduction du bruit et résultats mesurables : il n'y a aucune preuve d'énoncés d'objectifs SMART (spécifiques, mesurables, réalisables, réalistes et limités dans le temps) relatifs à la réduction du bruit, qui comprennent un résultat quantifiable ou un but défini à atteindre à la suite de la mise en œuvre de l'action ou dans un délai fixé. En général, les objectifs et les priorités vont de ceux qui aspirent à une « réduction de l'exposition de la population », sans indiquer de calendrier ou de quantum, à une liste d'actions clés à réaliser au cours d'un plan d'action.

Actions liées au bruit et restrictions d'exploitation : la détermination des actions liées au bruit ou des restrictions d'exploitation n'est généralement pas entreprise par le biais d'une analyse coûts-bénéfices ou coûts-efficacité. Il existe des exemples d'actions identifiées par le biais de groupes de travail/commissions aéroportuaires, avec la participation de l'exploitant de l'aéroport, des autorités compétentes, des parties prenantes locales et de l'industrie.

Suivi et mesure des progrès, des résultats et des réalisations : le suivi des progrès des actions est une pratique couramment appliquée. Cependant, la valeur ou l'efficacité d'interventions spécifiques est rarement quantifiée dans le cadre du processus. Dans certains cas, l'avancement du plan d'action contre le bruit est évalué dans le cadre d'un dialogue avec les parties prenantes afin de parvenir à un consensus.

Engagement et consultation : l'engagement est souvent entrepris par le biais d'une commission aéroportuaire ou de groupes d'intervenants techniques/de travail. Les consultations publiques suivent souvent le calendrier du cadre national plutôt que celui de l'END, et les consultations du plan d'action contre

le bruit avec le public se déroulent principalement en ligne, par le biais d'événements virtuels ou de retours d'informations à distance. Les activités de promotion se font principalement par le biais des sites Web des autorités compétentes et des exploitants d'aéroports.

Pratiques et approches identifiées

Législation européenne et nationale/locale : lorsque la législation nationale/locale préexistante n'a pas été adoptée par les États membres comme principal processus de développement des approches de gestion du bruit dans les aéroports. Dans ce genre de cas, les permis environnementaux et/ou les conditions de planification du développement constituent souvent la base des plans d'action contre le bruit et sont considérés en dehors du processus induit par l'END ou le BAR. Cependant, là où l'END et le BAR constituent les principales législations en matière de bruit des aéroports, celles-ci offrent un processus de planification de la gestion du bruit efficace.

Modèles de mise en application identifiés : deux modèles principaux ont été identifiés dans la mise en application des dispositions de l'END et du BAR. Ceux-ci sont basés sur : la désignation des autorités compétentes ; le rôle de l'exploitant de l'aéroport ; le processus utilisé pour définir les actions liées au bruit ou les restrictions d'exploitation ; les accords d'engagement des parties prenantes ; les outils d'analyse coûts-avantages et coûts-efficacité ; les activités de suivi des progrès ; et les commentaires reçus concernant le rôle de l'END/du BAR dans le processus de gestion du bruit. Le rapport établit la distinction suivante :

- Les institutions nationales/locales en tant qu'autorités compétentes et l'exploitant d'aéroport en tant que partie prenante ;
- L'exploitant de l'aéroport parmi les autorités compétentes dans le cadre de la gestion du bruit.

Dans ces deux modèles, il a été constaté qu'une large fragmentation des rôles peut rendre plus complexe le processus de mise en œuvre du cadre de gestion du bruit, tandis que le fait que l'exploitant de l'aéroport soit l'une des autorités compétentes ou la principale partie prenante peut avoir une influence positive sur le processus de mise en œuvre des dispositions établies dans l'END/le BAR.

Observations et conseils pour l'amélioration des politiques

Observations

Les tableaux suivants résument les observations relatives aux articles spécifiques de la législation et sont basés sur les informations recueillies auprès des autorités compétentes par le biais du questionnaire en ligne et des entretiens ad hoc.

Articles de l'END	Contenu	Observation principale
Article 1	Objectifs	Incohérence avec les objectifs du BAR
Article 3	Définitions	Incohérence du langage utilisé dans le BAR
Article 4	Mise en œuvre et responsabilités	Une interprétation mitigée et certaines incertitudes vis-à-vis des rôles et des responsabilités
Article 5	Indicateur de bruit et leur application	Comparabilité des indicateurs nationaux avec les indicateurs L_{den}/L_{night} et évaluation des effets nuisibles
Article 6	Méthodes d'évaluation	Effets nuisibles qui ne sont généralement pas évalués

Articles de l'END	Contenu	Observation principale
Article 7	Cartographie stratégique du bruit	Accès aux données sur les performances en matière de bruit, comparabilité des modèles, hypothèses avec/pour les données agrégées.
Article 8	Plans d'action (et consultation publique)	Le plan d'action contre le bruit rend compte des actions identifiées dans un cadre national préexistant qui peut avoir des objectifs différents de ceux de l'END.
		Les priorités n'ont pas toujours été identifiées et sont rarement quantifiables lorsqu'elles l'ont été.
		Aucune évaluation n'est entreprise lorsque des développements majeurs ont eu lieu.
		Consultation et engagement en matière de planification du développement et/ou de permis environnemental en dehors du processus de l'END, utilisés pour élaborer le plan d'action contre le bruit à soumettre
		Les parties prenantes sont généralement consultées mais, dans certains cas, il s'agit uniquement d'organisations accréditées, ce qui exclut des citoyens ou des groupes de citoyens des activités d'engagement.
		Les parties prenantes sont généralement consultées mais, dans certains cas, il s'agit uniquement d'organisations accréditées, ce qui exclut des citoyens ou des groupes de citoyens des activités d'engagement.
Article 9	Information du public	Large utilisation du site Web pour diffuser des informations et promouvoir l'engagement
Article 10	Collecte et publication des données par les États membres	Les autorités compétentes de tous les grands aéroports n'ont pas toutes communiqué des données pour les trois cycles prévus par l'END
Article 11	Évaluation et rapports	Intérêt pour la façon dont les données rapportées ont été utilisées par la Commission pour déterminer les objectifs à long et moyen terme de l'Union
Annexe I	Indicateurs de bruit	Comparabilité des données sur le bruit nocturne avec les différentes approches utilisées par les États membres
Annexe II	Méthodes d'évaluation pour les indicateurs de bruit	Les variations dans les logiciels de modélisation, les hypothèses ou les données d'entrée telles que les bases de données démographiques font que l'amalgame à une tendance à l'échelle de l'UE ou la comparaison entre les aéroports ont une valeur limitée
Annexe III	Méthode d'évaluation des effets nuisibles	Les effets nuisibles devraient être estimés plus largement à la suite de la révision de l'annexe III de 2022
Annexe IV	Prescription minimales pour la cartographie du bruit stratégique	Incohérence dans la présentation des données d'agglomération.
Annexe V	Prescriptions minimales pour les plans d'action	Aucun objectif de réduction du bruit
		Pas d'harmonisation claire dans la définition des stratégies à long terme, des priorités et des objectifs de réduction du bruit ou dans la description du problème du bruit
		Utilisation limitée de l'évaluation CBA/CEA et défi relatif à la faisabilité de l'estimation du nombre de personnes affectées par chaque action.
		Manque de preuves permettant de quantifier l'efficacité et la valeur des interventions décrites dans les plans d'action contre le bruit
Annexe VI	Données à transmettre à la commission	Approches incohérentes dans la communication des données sur les agglomérations pour les aéroports situés à l'intérieur ou très près d'une agglomération
		Données sur les agglomérations exclues pour les données de nuit

Articles du BAR	Contenu	Observation principale
Article 1	Objet, objectifs et champ d'application	Le problème du bruit et l'objectif de réduction du bruit sont rarement définis, et les conseils sont les bienvenus
		Les objectifs sont incompatibles avec l'END
Article 2	Définitions	Incohérence du langage utilisé dans le BAR et dans l'END
Article 3	Autorités compétentes	Tous les États membres n'ont pas désigné d'autorité compétente
		Complexité créée par la fragmentation des rôles de l'autorité compétente pour l'END et le BAR
Article 4	Droit de recours	Exemples où cela n'a pas encore été établi
Article 5	Règles générales relatives à la gestion des nuisances sonores liées au trafic aérien	Une certaine confusion entoure l'application des règles générales sur la gestion du bruit des aéronefs, étant donné qu'elles sont énoncées dans le BAR et reflètent l'approche équilibrée de l'OACI, mais qu'elles sont omises dans l'END
		Des actions ont été identifiées sans évaluation de l'analyse coût-efficacité ni prise en compte de l'intérêt public en ce qui concerne les perspectives de développement des aéroports
Article 6	Règles relatives à l'évaluation du bruit	Il existe de nombreux exemples de création de commissions aéroportuaires ou de groupes techniques, mais ils ne sont pas universellement répandus
Article 7	Informations relatives aux caractéristiques acoustiques	Préoccupations concernant les prévisions et les données sur les performances en raison du manque de disponibilité des dernières données sur les performances en matière de bruit attendues à la suite de l'introduction du BAR.
Article 8	Règles relatives à l'introduction de restrictions d'exploitation	À l'exception d'un État membre, aucune nouvelle restriction d'exploitation n'a été mise en œuvre dans le cadre du BAR
Article 14	Restrictions d'exploitation déjà en vigueur	Un seul exemple a été identifié où des restrictions préexistantes étaient en cours de révision, mais de nombreux aéroports disposaient déjà de restrictions d'exploitation avant le BAR
Annexe I	Évaluation des nuisances sonores dans un aéroport	L'accès aux données sur la technologie future de la flotte et en particulier sur le déploiement est très limité, ce qui rend difficile la prévision des impacts du bruit à la source
		La responsabilité de la surveillance de l'empiètement (et des aspects plus larges de l'aménagement du territoire de l'approche équilibrée de l'OACI) n'est pas claire.
Annexe II	Évaluation du rapport coût-efficacité des restrictions d'exploitation liées au bruit	À l'exception d'un État membre, aucune nouvelle restriction d'exploitation n'a été mise en œuvre dans le cadre de BAR

Conseils pour l'amélioration des politiques

Le questionnaire et les entretiens ad hoc ont permis de recueillir l'avis des autorités compétentes sur la manière dont la législation existante établie dans l'END et le BAR pourrait être améliorée.

Modifications éventuelles de la législation

Les objectifs respectifs fixés dans le BAR et l'END ne sont pas parfaitement alignés, ce qui peut signifier que les autorités compétentes ne considèrent pas les deux textes législatifs en concordance. Il existe des incohérences linguistiques entre les deux législations. Notamment dans l'utilisation et la compréhension de termes tels que « problème de bruit », « objectif de réduction du bruit », « action liée au bruit », « actions », « priorités » et « stratégie à long terme », qui semblent interchangeables dans la législation et peuvent donc faire l'objet d'interprétations différentes de la part des autorités compétentes. Il en va de même pour

d'autres termes fréquemment utilisés tels que « aéroport », « aéronef » ou « mesure du bruit ». Les autorités compétentes et les parties prenantes au sens large bénéficieraient d'une plus grande clarté et de conseils concernant la définition des termes clés de la législation et les bonnes pratiques relatives à l'application de l'END et du BAR. Les incohérences linguistiques entre les deux textes législatifs doivent être corrigées afin de réduire le risque de confusion ou de mauvaise interprétation.

La législation pourrait être améliorée en clarifiant les « règles générales sur la gestion du bruit des aéronefs » dans les deux cas, ou du moins en fournissant des orientations précisant qu'elles se rapportent à la fois à l'END et au BAR. En fait, la façon dont le concept plus large de l'approche équilibrée de l'OACI interagit avec l'END et l'application du BAR fait l'objet de différentes interprétations, ce point gagnerait donc à être éclairci. Les autorités compétentes ont insisté sur le fait que tout amendement potentiel à la législation ne devrait pas entraver ou compromettre les approches de longue date et préexistantes de la gestion du bruit, qui sont bien comprises et considérées comme efficaces par de nombreux groupes de parties prenantes.

Domaines nécessitant une orientation supplémentaire

Le fait de supposer que le problème du bruit a été clairement identifié, et qu'un objectif ou une priorité quantifiable de réduction du bruit a été fixé, entrave l'application de la législation. Des conseils sont demandés pour la détermination des actions à sélectionner dans les plans d'action contre le bruit, ainsi que pour le développement et l'application d'une analyse coût-bénéfice ou coût-efficacité dans le processus. Il s'agirait notamment de réexaminer la faisabilité de certains éléments de la législation, par exemple le calcul de la réduction des effets nocifs résultant de chaque action spécifique, et d'obtenir des conseils supplémentaires sur l'évaluation des effets nocifs, sur la manière dont ceux-ci devraient être liés à la définition des problèmes de bruit et sur l'aide à apporter aux autorités compétentes pour fixer des objectifs SMART de réduction du bruit.

L'opinion selon laquelle le BAR et l'END font partie d'un cadre plus global et coordonné de gestion du bruit ne fait pas l'unanimité. Là où il y a préexistence d'une législation nationale/locale, l'END et le BAR n'ont pas toujours été adoptés par les États membres en tant que cadre réglementaire principal pour la gestion du bruit aéroportuaire. Il est donc nécessaire de fournir une orientation sur la manière dont les processus établis par l'END et le BAR sont censés interagir avec la législation nationale préexistante, les plans de développement stratégique, les stratégies de gestion du bruit et les objectifs politiques plus larges.

En outre, il convient de mettre davantage l'accent sur la responsabilisation à l'égard du pilier « aménagement du territoire » de l'approche équilibrée de l'OACI. Les autorités compétentes apprécieraient que cela soit clairement souligné dans la législation ou dans les orientations connexes.

Les autorités compétentes ont également suggéré la nécessité d'une plateforme de bonnes pratiques en matière de gestion du bruit, comprenant les détails des mesures mises en œuvre dans les aéroports de l'UE, afin d'aider à partager l'expérience et les connaissances et de soutenir à la fois les aéroports et les autorités compétentes.

Domaines devant être mieux définis

Les objectifs des législations respectives pourraient être interprétés comme n'étant pas alignés et bénéficieraient d'une plus grande clarté en permettant aux mesures de succès autour d'un objectif /priorité de réduction du bruit d'être interprétées plus largement et d'inclure d'autres indicateurs environnementaux, économiques ou sociaux.

Une clarification des rôles et des responsabilités des autorités compétentes dans le cadre de l'END et du BAR est également sollicitée. Les rôles pour le développement, la collecte, la mise en œuvre, l'approbation et le rapport des plans d'action contre le bruit et des cartes de bruit stratégiques, doivent être clairement définis au sein de l'END, ainsi que les rôles et la responsabilité des autorités compétentes sous le BAR pour la mise en œuvre de l'approche équilibrée. Cela aiderait également les communautés et les parties prenantes au sens large à identifier clairement les responsabilités en matière d'actions et de recherche d'informations.

Certaines autorités compétentes ont demandé à la Commission des éclaircissements sur le moment où les dispositions relatives aux données requises par le BAR doivent être mises en œuvre. La base de données centrale des données de certification acoustique par enregistrement n'est pas encore terminée, ce qui crée des difficultés pour les aéroports qui cherchent à suivre l'amélioration de leur flotte/la mise en œuvre des redevances ou à améliorer la modélisation du bruit. En outre, la Commission devrait examiner comment elle pourrait faire en sorte que les données relatives au profil de bruit de tous les types d'aéronefs courants soient incluses dans une base de données centralisée de modèles de bruit.

Remarques de conclusion

Bien que l'étude soit limitée par le fait qu'elle n'a pris en compte que les points de vue et les contributions des autorités compétentes concernées et non pas les parties prenantes plus larges impliquées dans leurs décisions et impactées par celles-ci en général, il semble qu'il existe un large éventail d'activités d'engagement et de consultation entreprises par les autorités compétentes en ce qui concerne la gestion du bruit et l'application de l'END et du BAR.

Parmi plusieurs remarques finales, l'étude considère que la législation est globalement bien établie, appuyée par des processus et des responsabilités clairs qui visent à garantir que toutes les parties prenantes sont engagées et consultées. Au cœur des conclusions de l'étude se trouve la nécessité de clarifier le lien entre les deux textes législatifs et la clé de leur mise en œuvre réussie est la définition de termes clés tels que « problème de bruit », « objectif de réduction du bruit », « action liée au bruit », « actions », « priorités » et « stratégie à long terme », et la définition d'objectifs SMART.

1. Introduction

1.1 This report

This is the final report for Specific Contract No 09.0202/2021/849771/ENV.A3. It is based on the results of questionnaire analysis regarding the implementation of the Environmental Noise Directive (END) and Balanced Approach Regulation (BAR) and reflects the collected views of the airports' Competent Authorities of where and how legislation could be improved.

1.2 Study context

The ICAO website describes aircraft noise as *"the most significant cause of adverse community reaction related to the operation and expansion of airports"*[12]. It is unlikely that this situation will change in the near future and so one of ICAO's key environmental goals is *"Limiting or reducing the number of people affected by significant aircraft noise"*[12]. The main overarching ICAO policy on aircraft noise is the Balanced Approach to Aircraft Noise Management, adopted by the ICAO Assembly in its 33rd Session (2001) and reaffirmed in all the subsequent Assembly Sessions. This provides an important global context to the study.

Given the international nature of aviation and ICAO's position, noise policy is clearly a shared responsibility of both the European Union and its Member States. The local nature of noise problems does not mean that all actions are always best taken at local level, as sources of noise are not always of local origin. However, effective actions are very dependent on strong local and national policies and these need to be more closely related to measures decided at Community level. The 2002 Environmental Noise Directive (END) and 2016 Balanced Approach Regulation (BAR) set out common frameworks for the assessment and management of noise, and a consistent process for the introduction and revision of noise-related operating restrictions, at major airports in the European Union.

This Community level framework requires Member States to designate and empower relevant Competent Authorities, who are to implement the management of airport noise within the context of the END and the BAR. To date, the depth, consistency, and outcomes associated with this noise management framework have not yet been fully investigated. This study provides a detailed insight into the current extent of value added by this legislation and provides evidence in support of proposals to enhance their future impact and help further reduce the negative health impacts due to exposure to aircraft noise in Europe, whilst ensuring a sustainable transport network.

The European Environment Agency (EEA) report on Environmental noise in Europe 2020, found that environmental noise remains a major environmental problem affecting the health and well-being of millions of people in Europe. According to reported data, it was estimated that aircraft noise exposes approximately 3 million people to levels of 55 dBA or higher during the day-evening-night period inside and outside urban areas, and approximately 1.2 million people to levels above 50 dBA during the night-time, which are levels of noise exposure 10 dBA higher than the WHO 2018 guidelines indicated as the threshold for adverse effects on human health.

[12] https://www.icao.int/environmental-protection/Pages/noise.aspx

The Green Paper on Future Noise Policy, published in November 1996, reviewed the characteristics and impacts of the existing Community and Member State approaches to noise policy and concluded that these were unsatisfactory. Community policy had focused on product standards, whereas some Member States had set allowable noise levels for the domestic environment. The Green Paper recommended that a proposal for a Directive be brought forward, which would provide for noise mapping, the provision of information to the public and action to reduce noise exposure towards established target values.

Directive 2002/49/EC (END) relating to the assessment and management of environmental noise was subsequently published in July 2002, setting out a framework for a common approach intended to avoid, prevent or reduce the harmful effects of noise in Europe. Within a five-year rolling programme of activities, the Competent Authorities designated within each Member State are to undertake strategic noise mapping, assess the extent of environmental noise, draw up noise action plans, manage noise issues and effects, and consult with the public on the extent of the noise exposure and the action proposed.

The END has been transposed into national legislations in each of the Member States, within which the relevant competent authorities are identified for the implementation of the relevant stages of the process. This implementation may be assigned at national, regional or local level, as considered appropriate within each Member State. The authorities or organisations responsible for strategic noise mapping, action planning, national or regional administration, and reporting may differ. Any of the designated authorities may have one of these identified roles, or several.

Under Article 11 of the END the Commission is to report to the European Parliament and the Council on the implementation of the Directive. To date, there have been two reports, the first in June 2011 supported by the EEA and by a specific study to review the implementation of the END, and the second in March 2017, with a review on implementation under the REFIT programme. This current study is to support the Commission towards the third implementation report by providing an up-to-date review of the implementation of the END with respect to major airports in Europe.

Following the previous reviews of the END, there has been significant progress in establishing common noise assessment methods (Annex II), through Directive 2015/996 (as amended by Directive 2021/1226), in establishing assessment methods for harmful effects (Annex III), through Directive 2020/367, and through establishing a common data repository with the European Environment Agency (EEA) and a mandatory digital information exchange mechanism, through Regulation 2019/1010 (EIONET Reportnet 3 ENDRM). However, the Commission have not issued guidelines on the noise action plans (Annex V (4)), nor updated the 2007 EC WG-AEN Good Practice Guide v2 in light of revisions to Annex II and Annex III (Annex IV (9)).

Aircraft noise has been a sensitive issue for residents in areas near airports since jet aircraft became widely used in the 1960s and 1970s. It resulted in a proliferation of local and national legislation to manage aircraft noise over the intervening decades. This has also led governments and industry to seek constant improvement in the level of noise generated by individual aircraft, notably by reaching agreement at global level (ICAO) on the introduction of increasingly stringent standards – a process that has led to the definition of so-called Chapter 2, 3, 4 and 14 standards for aircraft. As a result, today's passenger jets are considerably quieter than their predecessors.

The direct consequence of this is that many Member States have developed national management frameworks to address noise around busy airports, or in proximity of densely populated areas, which precede the introduction of the European legislation in question.

On 26 March 2002, the European Union adopted Directive 2002/30/EC on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at EU airports. The Directive allowed Member States to introduce at individual airports new operating restrictions, in particular on aircraft that were marginally compliant with Chapter 3, provided that they did so in accordance with the ICAO "Balanced Approach". This sets out industry best practice for the introduction of noise abatement procedures, including restrictions where necessary, following the identification of a noise problem at the airport. Since its introduction in 2001 it has continued to evolve, and is envisioned as providing:

> *"An internationally agreed approach to address aircraft noise problems where they occur – at individual airports - in an environmentally responsive and economically responsible way."*[13]

Alongside the Assembly Resolutions, ICAO have published a number of guidance documents relevant to best practice implementation of the Balanced Approach, including guidance on the Balanced Approach (Doc 9829), land use and environmental control (Doc 9184), recommended method for computing noise contours around airports (Doc 9911), policies for charges for airports (Doc 9082), airport economics (Doc 9562) and manual for airport and air navigation tariffs (Doc 7100), amongst others.

In the 2008 report from the European Commission on implementation of Directive 2002/30/EC it was clear that it had only been used at a limited number of airports and had only a limited impact on marginally compliant aircraft, whilst the number of people affected by noise, particularly at night, had continued to grow. The Commission determined to examine ways to clarify the provisions and consider whether changes were needed. This led in turn to the Commission proposal for a Regulation on rules and procedures with regard to the introduction of noise-related operating restrictions at EU airports, presented by DG MOVE in December 2011.

The Balanced Approach Regulation (EU) 598/2014 (BAR) on the establishment of rules and procedures about the introduction of noise-related operating restrictions at Union airports through a balanced approach was published in June 2014, and repealed Directive 2002/30/EC. Its Article 5, by providing general rules for the noise management, effectively set out the wider concept of the ICAO Balanced Approach. The regulation entered into force in June 2016. Under Article 13 of the BAR the Commission is to report to the European Parliament and the Council on the implementation of the Regulation.

The Regulation sets out certain responsibilities on Member States, including the designation of Competent Authorities, and for this reason many Member States have established a national regulation which gives further effect to the Regulation, including designation of the Competent Authorities and any legal provisions relevant to the implementation of noise-related actions, noise abatement procedures and operating restrictions. Competent Authorities designated under the BAR may not have a role under the END, and therefore may have little relationship with the strategic noise mapping or noise action planning.

1.3 Study aims and objectives

END and BAR set obligations to assess noise emitted by aircraft operations around the airport, and their effects on human health, communicate this to the citizens, discuss measures to reduce or prevent the

[13] ICAO Doc 9829 Guidance on the Balanced Approach to Aircraft Noise Management, Second Edition 2008.

harmful effects, assess the costs and benefits of possible measures, implement such measures and based on an established noise reduction objective, ensure that these objectives are reached.

The key objectives of the study are:

- Understanding how the END and BAR provisions on airport noise management are implemented across the European Union, including:
    - the process followed when preparing strategic noise maps and noise action plans and whether the legislation has been applied and how;
    - the process followed in the identification of noise-related actions (most cost-effective measures) or when operating restrictions are identified or revised and whether the legislation has been applied and how;
- Understanding what practices and approaches have been used in the execution of the noise management framework;
- Identifying evidence / examples of how these have helped reach the noise abatement objectives and/or priorities;
- Gathering views on whether there is a need to revise the existing legislation in order to improve the effectiveness of the legislation.

The study findings aim to support the European Commission in assessing how European legislation on the management of noise around the airport is implemented by collecting up to date information on the implementation of both END and BAR. To date, there have been two reports on implementation of the END, whilst there has not yet been a report from the Commission on implementation of the BAR.

Under Article 11 of the END the Commission is to report to the European Parliament and the Council on the implementation of the Directive. This study is to support the Commission towards the third implementation report by providing an up-to-date review of the implementation of the END with respect to major airports in Europe. Under Article 13 of the BAR the Commission is to report to the European Parliament and the Council on the implementation of the Regulation. This study therefore aims to provide to the Commission essential information for the END and BAR implementation reports. Such essential information includes:

- How the Competent Authorities are established according to the END and the BAR;
- Whether there is a control mechanism set up to ensure implementation of decided measures and how the right of appeal is ensured;
- How general rules on aircraft noise management are followed (Art. 5 of the BAR) when preparing action plans (Art 8 of the END), and specifically how costs and benefits are thoroughly assessed for all possible options, without prejudice;
- Whether the definition of operating restrictions is clear, updated and uniformly applied in accordance with the BAR;
- Whether airports already had operating restrictions in place before the 2016 date of entry into force of the BAR or have applied after it;

- How the harmful effects assessment has been used in determining objectives and identifying noise reduction measures.

1.4 Scope of the study

The scope of the study covers the 63 airports of the European Union that have a traffic of more than 50,000 movements per year (**Table 1**), according to the definition of "major airport" of Article 3 (p) of the END.

Table 1 - Airports included in the study

Country	Airport Name	Country	Airport Name	Country	Airport Name
Austria	Vienna International Airport	**Germany**	Dusseldorf International Airport	**Latvia**	Riga International Airport
Belgium	Brussels Airport	**Germany**	Frankfurt am Main Airport	**Luxembourg**	Luxembourg Findel Airport
Bulgaria	Sofia Airport	**Germany**	Hamburg Airport	**Netherlands**	Amsterdam Airport Schiphol
Czech Republic	Prague Vaclav Havel Airport	**Germany**	Hanover Langenhagen Airport	**Poland**	Warsaw Chopin Airport
Denmark	Billund Airport	**Germany**	Leipzig/Halle Airport	**Portugal**	Francisco Sa Carneiro Airport
Denmark	Copenhagen Airport	**Germany**	Munich Airport	**Portugal**	Lisbon Portela Airport
Denmark	Roskilde Airport	**Germany**	Nuremberg Airport	**Romania**	Bucharest Henri Coandă International Airport
Finland	Helsinki Vantaa Airport	**Germany**	Stuttgart Airport	**Spain**	Alicante-Elche Airport
Finland	Helsinki-Malmi Airport*	**Greece**	Athens International Airport "Eleftherios Venizelos"	**Spain**	Barcelona El Prat Airport
France	Bordeaux-Merignac Airport	**Hungary**	Budapest Ferihegy International Airport	**Spain**	Gran Canaria Airport
France	EuroAirport Basel–Mulhouse–Freiburg	**Ireland**	Dublin Airport	**Spain**	Ibiza Airport
France	Lyon-Saint Exupery Airport	**Italy**	Bologna Guglielmo Marconi Airport	**Spain**	Lanzarote Airport
France	Marseille Provence Airport	**Italy**	Catania Fontanarossa Airport	**Spain**	Madrid Barajas Airport
France	Nice Cote d'Azur Airport	**Italy**	Ciampino - G. B. Pastine International Airport	**Spain**	Malaga Airport
France	Paris Charles de Gaulle Airport	**Italy**	Fiumicino - Leonardo da Vinci International Airport	**Spain**	Palma de Mallorca Airport
France	Paris Le Bourget Airport	**Italy**	Il Caravaggio International Airport	**Spain**	Tenerife North Airport
France	Paris Orly Airport	**Italy**	Milan Malpensa Airport	**Spain**	Tenerife South Airport
France	Toulouse Blagnac Airport	**Italy**	Milano Linate Airport	**Spain**	Valencia Airport
Germany	Berlin Schonefeld Airport	**Italy**	Naples International Airport	**Sweden**	Göteborg-Landvetter Airport
Germany	Berlin Tegel Airport	**Italy**	Turin Airport	**Sweden**	Stockholm-Arlanda Airport
Germany	Cologne Bonn Airport	**Italy**	Venice Marco Polo Airport	**Sweden**	Stockholm-Bromma Airport

* Subsequently excluded from the study as not a major airport as per END Article 3(p)

2. Understanding the legal framework

2.1 Introduction to the chapter

Environmental noise around airports is regulated both by the Environmental Noise Directive (END) and the Balanced Approach Regulation (BAR). These two pieces of legislation share the objective of protecting the environment and human health from the effects of airport noise. In addition, the BAR makes reference to the key objective of a sustainable and effective functioning transport system. They both apply to environmental noise generated by civil aviation around airports that have a traffic of more than 50,000 movements per year.

The BAR widely refers to the provisions and procedures described in the END, as such the two pieces of legislation are closely linked.

A thorough analysis of these two pieces of legislation has been carried out. This consists of a review of legislative overview of the provisions and obligations derived from the combined reading of the END and the BAR. This in-depth review of the END and BAR provisions is crucial in ensuring that the subsequent analyses carried out as part of this study are based on sound understanding of their legal implications.

2.2 Review of the legal framework

Environmental noise from aircraft at major EU airports is regulated both by the Environmental Noise Directive (END)[14] and the Balanced Approach Regulation (BAR)[15]. END provides rules that apply to a wide range of activities that cause environmental noise to which humans are exposed, including noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft around airports and in agglomerations, outdoor and industrial equipment, and mobile machinery[16]. On the other hand, BAR has a limited scope applying only to noise emitted by aircraft around airports[17].

Under the END, the Competent Authorities are responsible for developing, approving and collecting strategic noise maps and action plans; and to report information to the Commission[18]. Under the BAR, the Competent Authorities are responsible for the process to be followed when adopting operating restrictions[19]. Several authorities, or one, can be in charge of the various actions required when implementing the noise assessment process[20].

[14] Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise - Declaration by the Commission in the Conciliation Committee on the Directive relating to the assessment and management of environmental noise, OJ L 189, 18.7.2002, p. 12–25. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32002L0049.

[15] Regulation (EU) 598/2014 of the European Parliament and of the Council of 16 April 2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC, OJ L 173, 12.6.2014, p. 65–78. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014R0598.

[16] Article 1 (2) of END.

[17] Article 1 (1) of BAR.

[18] https://ec.europa.eu/environment/archives/enlarg/handbook/noise.pdf.

[19] Article 3 (1) of BAR.

[20] Article 6 of BAR

They both apply to environmental noise generated by civil aviation at airports that have traffic of more than 50,000 movements per year[21]. However, under the END the number of movements are calculated in the year before the mapping, whereas under the BAR the number of movements are calculated on the basis of the average number of movements in the last three calendar years before the noise assessment. Also, the END includes all aircraft in the accounting, such as helicopters, small touristic aircrafts, drones, while the BAR includes only larger aircrafts of a certain mass or with a minimum number of passenger seats. END defines that environmental noise as the unwanted or harmful outdoor sound created by human activities, including noise emitted by means of air traffic[22].

There are close links between the two pieces of legislation since the BAR contains several cross-references to the provisions and procedures described in END. Both END and BAR include obligations that fall under the responsibility of the Competent Authorities, which have been designated by the Member States under END and BAR.

BAR specifies that the Competent Authorities must be independent of any organisation which could be affected by noise-related action in order to ensure transparency and impartiality[23]. In its recital 13 it, however, mentions that such obligation of independence does not necessarily entail the modification of Member State administrative structures or decision-making procedures[24]. Furthermore, both BAR and END provide that Member States must notify to the European Commission, in a timely manner, details of the Competent Authorities and bodies responsible for the implementation of the respective rules[25]. According to the END, Member States shall then make the respective information available to the public, whereas, according to the BAR, the Commission is responsible to publish this information[26].

Both END and BAR set responsibilities addressed to the Competent Authorities designated by the Member States under END and BAR, as indicated in the following tables and described further below.

Table 2 – END responsibilities addressed to Competent Authorities

END's Articles	Mention of Competent Authorities? Y/N	Category of responsibility
Article 1 of END	N	N/A
Article 2 of END	N	N/A
Article 3 of END	Y	Definitions
Article 4 of END	Y	Implementation and responsibilities
Article 5 of END	N	N/A
Article 6 of END	N	N/A
Article 7 of END	Y	Noise mapping
Article 8 of END	Y	Action plans and public consultation
Article 9 of END	N	N/A

[21] According to the definition of 'major airport' of Article 3 (p) of END and Article 2 (2) of BAR.
[22] Article 3 (a) of END.
[23] Article 3 (2) of BAR.
[24] Recital 13 of the BAR.
[25] Article 3 (3) of BAR and Article 4 (1) of END.
[26] Article 4 (2) of END and Article 3 (3) of BAR.

END's Articles	Mention of Competent Authorities? Y/N	Category of responsibility
Article 10 of END	N	N/A
Article 11 of END	N	N/A
Article 12 of END	N	N/A
Article 12a of END	N	N/A
Article 13 of END	N	N/A
Article 14 of END	N	N/A
Article 15 of END	N	N/A
Article 16 of END	N	N/A

Table 3 - BAR responsibilities addressed to Competent Authorities

BAR's Articles	Mention of Competent Authorities? Y/N	Category of responsibility
Article 1 of BAR	N	N/A
Article 2 of BAR	N	N/A
Article 3 of BAR	Y	Designation of the Competent Authorities by the Member States
Article 4 of BAR	N	N/A
Article 5 of BAR	N	N/A
Article 6 of BAR	Y	Noise assessment
Article 7 of BAR	Y	Noise performance information
Article 8 of BAR	Y	Introduction of operating restrictions
Article 9 of BAR	Y	Developing countries
Article 10 of BAR	Y	Exemption for aircraft operations
Article 11 of BAR	N	N/A
Article 12 of BAR	N	N/A
Article 13 of BAR	N	N/A
Article 14 of BAR	Y	Existing operating restrictions
Article 15 of BAR	N	N/A
Article 16 of BAR	N	N/A
Article 17 of BAR	N	N/A

2.2.1 Strategic noise mapping

Competent Authorities' obligations:

- **Develop the strategic noise maps describing the situation in the preceding calendar year for major airports within their territories;**
- **Approve the strategic noise maps;**
- **Submit the strategic noise maps to the Commission.**

Noise mapping is the tool through which the exposure to environmental noise is determined[27]. It entails the presentation of data on an existing or predicted noise situation in terms of a noise indicator, indicating breaches of any relevant national limit value in force, the area exposed above certain thresholds for major sources, the number of people affected in a certain area, or the number of dwellings exposed to certain values of a noise indicator in a certain area[28].

Under the END, Competent Authorities must be designated to develop and, where relevant, approve the strategic noise maps describing the situation in the preceding calendar year for major airports within their territories. These are usually two different designated authorities. END defines certain noise indicators to be used by Member States for the preparation and the revision of strategic noise mapping (the 'L_{den}': day-evening-night noise indicator and the 'L_{night}': night-time noise indicator) [29]. Member States may also use supplementary noise indicators for special cases[30]. In 2015, Directive (EU) 2015/996 amending END, introduced common noise assessment methods to be used by the Member States from the 1st of January 2019[31]. Neighbouring Member States shall cooperate with each other on strategic noise mapping near borders[32].

Strategic noise maps must be sent to the Commission, must serve as a source of information to citizens and as a basis to develop action plans as explained further below[33].

Topic 1: Strategic noise mapping key questions

- *How often do Member States have to notify major airports within their territories to the Commission?*

Member States are obliged to notify the major airports within their territories to the Commission every five years[34].

- *What are the minimum elements that should be included in a strategic noise map for a major airport?*

[27] Article 1 (1) (a) END.
[28] Article 3 (q) of END; Annex IV 1. of END.
[29] Article 5 (1) of END.
[30] Article 5 (2) and Annex I 3. of END.
[31] Commission Directive (EU) 2015/996 of 19 May 2015 establishing common noise assessment methods according to Directive 2002/49/EC of the European Parliament and of the Council, OJ L 168, 1.7.2015, p. 1–823. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015L0996.
[32] Article 7 (4) of END.
[33] Annex IV 4. of END.
[34] Article 7 (1) of END.

A strategic noise map for a major airport is the presentation of data on one (or more) of the following aspects taking also in consideration the elements specified in Article 3 (q) of END[35]:

- an existing, a previous or a predicted noise situation in terms of a noise indicator,
- the exceeding of a limit value,
- the estimated number of dwellings, schools and hospitals in a certain area that are exposed to specific values of a noise indicator,
- Information about the estimated total number of people (in hundreds) and the total area (in km2) exposed to the values provided.

- *Do strategic maps need to be reviewed?*

Yes. The strategic noise maps must be reviewed, and revised, if necessary, at least every five years after the date of their preparation.

- *Are noise maps available to the public?*[36]

Strategic noise maps must be made available to the public, including by electronic means therefore on Internet in the respect of the freedom of access to information on the environment. In addition, END provides that strategic noise maps may be represented to the public in the form of graphical plots, numerical data in tables, or numerical data in electronic form[37].

2.2.2 Action plans

Competent Authorities' obligations:

- **Develop action plans designed to manage, within their territories, noise issues and effects, including noise reduction, if necessary, for major airports;**
- **Adopt measures within the plans to address the priorities which may be identified by the exceeding of any relevant national limit value or by other criteria chosen by the Member States;**
- **Consult with the public about proposals for action plans;**
- **Inform the Commission on the other relevant criteria.**

According to Article 8 of END, the Competent Authorities designated by the Member States are responsible to draw up action plans[38] designed to manage, within their territories, noise issues and effects, including noise reduction, if necessary, for major airports. Action plans are provided solely under END. Competent Authorities adopt action plans "*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*

[35] Annex IV 5. in conjunction with VI 2. of END.
[36] Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment, OJ L 158, 23.6.1990, p. 56–58. Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex:31990L0313.
[37] Annex IV 2. of END.
[38] Article 8 of END.

preserving environmental noise quality where it is good"[39]. The exact content of the measures within the plans is at the discretion of the Competent Authorities. However, these measures shall in particular address priorities which may be identified by the exceeding of any relevant national limit value or by other criteria chosen by the Member States, that shall be clearly stated. Measures shall apply in particular to the most important areas as established by strategic noise mapping[40]. Member States shall ensure that the public is consulted about proposals for action plans, and that the results of that participation are taken into account and that the public is informed on the decisions taken.[41] [42]

Actions to be adopted by Competent Authorities may include for example traffic planning, land-use planning, technical measures at noise sources, selection of quieter sources, reduction of sound transmission, regulatory or economic measures or incentives[43]. Each action plan shall also contain estimates in terms of the reduction of the number of people affected[44]. More recently, in 2020, Directive (EU) 2020/367 amending Annex III to the END, introduced assessment methods for harmful (health) effects of environmental noise on the population to be used by the Member States from 1st January 2022[45]. The harmful effects are: High Annoyance (HA), High Sleep Disturbance (HSD) or Ischemic Heart Disease (IHD).

Topic 2: Action plans key questions

- *Are public consultations required for action plans?*

Yes, always and suggestions shall be considered. Indeed, public consultation about proposals for action plans is also required, according to END. The public has the right to participate in the procedure of the preparations and review of the action plans. The results of this participation must be taken into account and the public has to be informed of the decisions taken. More specifically, Member States shall ensure 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. Public participation shall be accompanied by reasonable timeframes and in the case a public participation procedure arises simultaneously from this Directive and any other Community legislation, joint procedures may be provided by the Member States to avoid duplication[46].

- *What is the minimum content of action plans?*

An action plan for major airports shall at least include the following elements[47]:

  - A description of the major airport,
  - The Competent Authority(ies) responsible,
  - The legal context,
  - Any limit values in place,
  - 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,

[39] Article 1(1)(c) of END.
[40] Article 8 (7) of END.
[41] Article 8 (3) of END.
[42] Article 8 (6) of END.
[43] Annex V 2. of END.
[44] Annex V 3. of END.
[45] Commission Directive (EU) 2020/367 of 4 March 2020 amending Annex III to Directive 2002/49/EC of the European Parliament and of the Council as regards the establishment of assessment methods for harmful effects of environmental noise, OJ L 67, 5.3.2020, p. 132–136. Available at: https://eur-lex.europa.eu/legal-content/GA/TXT/?uri=CELEX:32020L0367.
[46] Article 8 (7) of END.
[47] Annex V of END, Minimum requirements for action plans.

- A record of the public consultations organised,
- 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,
- 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.

The actions which the Competent Authorities intend to take in the fields within their competence may for example include:

- traffic planning,
- land-use planning,
- technical measures at noise sources,
- selection of quieter sources,
- reduction of sound transmission,
- regulatory or economic measures or incentives

These are described in Annex V of END, 'minimum requirements for action plans'. Each action plan shall contain estimates in terms of the reduction of the number of people affected (annoyed, sleep disturbed, or other). There are no more specific guidelines available at EU level.

- *Do action plans need to be reviewed or revised?*

Yes. The action plans must be reviewed, and revised, if necessary, when a major development occurs affecting the existing noise situation, and at least every five years after the date of their approval. It is also noted that for the reviews and revisions that would be due to take place in 2023, these shall be postponed taking place no later than 18 July 2024[48].

- *Are action plans available to the public?*

Action plans that have been drawn up must be available to the public in the respect of the freedom of access to information on the environment[49].

2.2.3 Noise management

Summary of noise management provisions:

- **BAR applies when noise problems are identified as a result of the review, or the revision of the noise action plans under END;**
- **BAR sets procedural rules for the introduction or revision of noise-related operating restrictions;**
- **The most cost-effective measure or combination of measures must be applied.**

The general rules on aircraft noise management should be followed when preparing action plans. The ICAO Balanced Approach is to be adopted where a noise problem has been identified e.g. within the END noise assessment. In addition, if new noise-related operating restrictions are foreseen, or the modification of old

[48] Article 8 (5) of END.
[49] Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment, OJ L 158, 23.6.1990, p. 56–58. Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex:31990L0313.

ones, then BAR sets procedural rules for their introduction[50]. More specifically, BAR shall be applied when noise problems are identified as a result of the review, or the revision of the noise action plans under END.

When noise-related actions are taken as a result of adopting the ICAO Balanced Approach in line with the BAR Article 5, the combination of measures must reflect the most cost-effective measure or combination of measures[51]. In particular, these measures shall not be more restrictive than necessary to achieve the environmental noise abatement objectives set for that airport[52]. The noise abatement objectives can include health aspects, at the level of individual airports, while respecting relevant EU rules, in particular those laid down in END, and the legislation within each Member State. One of the two objectives of the BAR is to facilitate the achievement of such noise abatement objectives[53].

Topic 3: Noise management key questions

- *What does the Balanced Approach in the BAR entail?*

The END is used to assess the noise situation. If a noise problem is identified, then the BAR shall be used, and this represents the correct implementation of the ICAO Balanced Approach.

For this purpose:

  - the noise abatement objective for that airport is defined taking into account, as appropriate, the action plans regulated in END,
  - measures available to reduce the noise impact are identified,
  - the likely cost-effectiveness of the noise mitigation measures is thoroughly evaluated,
  - the measures, taking into account public interest in the field of air transport as regards the development prospects of their airports, are selected without detriment to safety,
  - the stakeholders are consulted in a transparent way on the intended actions,
  - the measures are adopted and sufficient notification is provided for,
  - the measures are implemented and
  - dispute resolution is provided for.

- *Does a new action plan need to be prepared under the BAR?*

No, the action plan is regulated by the END and consulted in the context of the BAR.

2.2.4 Noise assessment

Competent Authorities' obligation:

- **To ensure that the noise situation is regularly assessed in accordance with the noise indicators under END.**

[50] Article 1 of BAR; Article 5 (2) of BAR; Article 14 of BAR.
[51] Article 5(3) of BAR.
[52] Article 5(6) of BAR.
[53] Article 1 (2) (a) of BAR.

According to BAR, Competent Authorities shall ensure that the noise situation is regularly assessed[54]. In particular, the indicators used in the assessment shall be in accordance with the noise indicators provided in END[55]. Additional noise indicators which have an objective basis may also be used[56]. Therefore when, as a result of the assessment conducted under END and under a first draft of the action plan, a new noise-related operating restriction may be required to address a noise problem, the BAR is triggered[57].

Topic 4: Noise assessment key questions

- *What is the content of noise management information?*

According to BAR, the noise management information includes[58]:

- The current inventory.
- A description of the airport, including information about its size, location, surroundings, air traffic volume and mix.
- A description of any environmental objectives for the airport and the national context. This will include a description of the aircraft noise abatement objectives for the airport.
- Details of noise contours for the relevant previous years — including an assessment of the number of people affected by aircraft noise, carried out in accordance with END.
- Description of the existing and planned measures to manage aircraft noise already implemented in the framework of the ICAO Balanced Approach and their impact on and contribution to the noise situation, by reference to:
  - Reduction at source
  - Noise abatement operational measures, to the extent that those measures do not restrict the capacity of an airport
  - Operating restrictions
  - Financial instruments in place, such as noise-related airport charges
- A forecast without new measures.
- An assessment of additional measures.
- Outline of the additional measures available and an indication of the main reasons for their selection.
- An overview of the possible environmental and competitive effects of the proposed measures on other airports, operators and other interested parties.
- Reasons for selection of the preferred option.
- A non-technical summary.

2.2.5 Operating restriction measures

Competent Authorities' obligations:

- **To ensure that the process to be followed when adopting operating restrictions is applied and action is taken as appropriate.**

One of the BAR objectives is to enable the adoption or amendment of operating restrictions in accordance with the ICAO Balanced Approach so as to achieve the sustainable development of the airport and air traffic

[54] Article 6(1) of BAR.
[55] Annex II of END.
[56] Annex I of BAR
[57] Article 6 (1) and (2) of BAR.
[58] Annex I of BAR.

management network capacity[59]. To that end, Competent Authorities under the BAR must follow up and monitor the implementation of the operating restrictions and take action as appropriate. All the relevant information must be available to local residents living in the vicinity of the airports and to the relevant local authorities.

The relevant information may include: (a) information on alleged infringements due to changes in flight procedures, in terms of their impact and the reasons why such changes were made; (b) the general criteria applied when distributing and managing traffic in each airport, to the extent that those criteria may have an environmental or noise impact; and (c) data collected by noise measuring systems, if available [60].

Topic 5: Operating restriction measures key questions

- *What should the Competent Authorities do if the noise assessment indicates that new operating restriction measures may be required to address a noise problem at an airport?*

According to Article 6(2) of BAR, if the noise assessment indicates that new operating restriction measures may be required to address a noise problem at an airport, the Competent Authorities shall ensure that:

- before operating restrictions are introduced, the method, indicators and information provided are applied in such a way as to take due account of the contribution of each type of measure under the ICAO Balanced Approach,
- at the appropriate level, technical cooperation is established between the airport operators, aircraft operators and air navigation service providers to examine measures to mitigate noise. The Competent Authorities are responsible for the public consultation with the local residents, or their representatives, and relevant local authorities, and that technical information on noise mitigation measures is provided to them,
- the cost-effectiveness of any new operating restriction is assessed,
- the process of consultation with interested parties, which may take the form of a mediation process, is organised in a timely and substantive manner, ensuring openness and transparency as regards data and computation methodologies. Interested parties shall have at least three months prior to the adoption of the new operating restrictions to submit comments. The interested parties shall include at least:
  - local residents living in the vicinity of the airport and affected by air traffic noise, or their representatives, and the relevant local authorities;
  - representatives of local businesses based in the vicinity of the airport, whose activities are affected by air traffic and the operation of the airport;
  - relevant airport operators;
  - representatives of those aircraft operators which may be affected by noise-related actions;
  - the relevant air navigation service providers;
  - the Network Manager, as defined in Commission Regulation (EU) No 677/2011 (2);
  - where applicable, the designated slots coordinator.

2.2.6 Introduction of operating restrictions

Before the introduction of an operating restriction, the Competent Authorities shall give to the Member States, the Commission and the relevant interested parties six months' notice ending at least two months prior to the determination of the slot coordination parameters for the airport concerned for the relevant scheduling period[61].

[59] Article 1 (2) (b) of BAR.
[60] Article 6 (4) of BAR.
[61] Article 8 (1) of BAR.

Following the noise assessment carried out based on the provisions of Article 6 of BAR, the notification shall be accompanied by a written report explaining the reasons for introducing the operating restriction, the noise abatement objective established for the airport, the measures that were considered to meet that objective, and the evaluation of the likely cost-effectiveness of the various measures considered, including, where relevant, their cross-border impact. The written report mentioned above shall fulfil the requirements on aircraft noise management as explained in Article 5 of BAR.

Specific rules regarding the cases where the operating restriction concerns the withdrawal of marginally compliant aircraft from an airport are provided under the BAR[62].

Topic 6: Introduction of operating measures key questions

- *What is the role of the Commission in the process for the introduction of operating restrictions?*

The Commission, at the request of the Member State or at its own initiative, may review the process for the introduction of an operating restriction. In case that the new operating restriction does not follow the process of the BAR, the Commission may notify the relevant Competent Authority accordingly. The relevant Competent Authority must examine the Commission notification and inform the Commission of its intentions before introducing the operating restriction[63].

[62] Article 8 (4) of BAR.
[63] Article 8 (3), 9 (1) and (2) and 10 of BAR.

3. Collection of information

3.1 Introduction

A questionnaire was developed aiming to collect up-to-date information relating to the fulfilment of the different provisions of the END and BAR for each airport. Specifically, the questionnaire aimed to identify:

- Information on noise action plans and strategic noise maps in accordance the END, and on the implementation of the BAR;
- How Competent Authorities have been designated according to the END and the BAR, and their roles;
- How END and BAR have been implemented into the national/local legislation;
- How noise problems have been identified and how priorities and objectives have been set;
- The decision-making process for selecting noise mitigation measures and noise-related operating restrictions;
- The methods of consultation and engagement used in developing the noise action plan or implementing an operating restriction;
- Opinions on the END and BAR effectiveness in dealing with Airport Noise Reduction and how they could be improved.

The responses to the questionnaire were used to select 20 out of the 63 airports for an ad-hoc interview between the Competent Authority(ies) and the study team.

The objective of the ad-hoc interviews was to obtain a more detailed understanding of the different approaches and interpretations of the established European legislation as well as gather thoughts on potential improvement opportunities. More specifically, the ad-hoc interviews with the representative set of Competent Authorities aimed:

- To have further discussion on how the END and BAR provisions for the management of noise around airports are implemented;
- To clarify data and comments within the submitted questionnaire, particularly where questions were not answered or a “n/a” response was provided;
- To understand the process followed when preparing strategic noise maps and noise action plans, whether it has been applied and how this relates to the legislation;
- To understand the process to be followed when adopting operating restrictions, whether it has been applied and how this relates to the legislation;
- To understand what practices and approaches that have been used in the execution of the noise management framework;

- To Identify evidence / examples of how these have helped reach the noise abatement objectives and/or priorities; and
- To seek views on whether there is a need to revise the existing legislation to improve its effectiveness and understand the rationale for those views.

Amongst the selected airports, interviews also aimed to collect the specific technical details of how the quantification of costs and benefits was performed and how measures were selected.

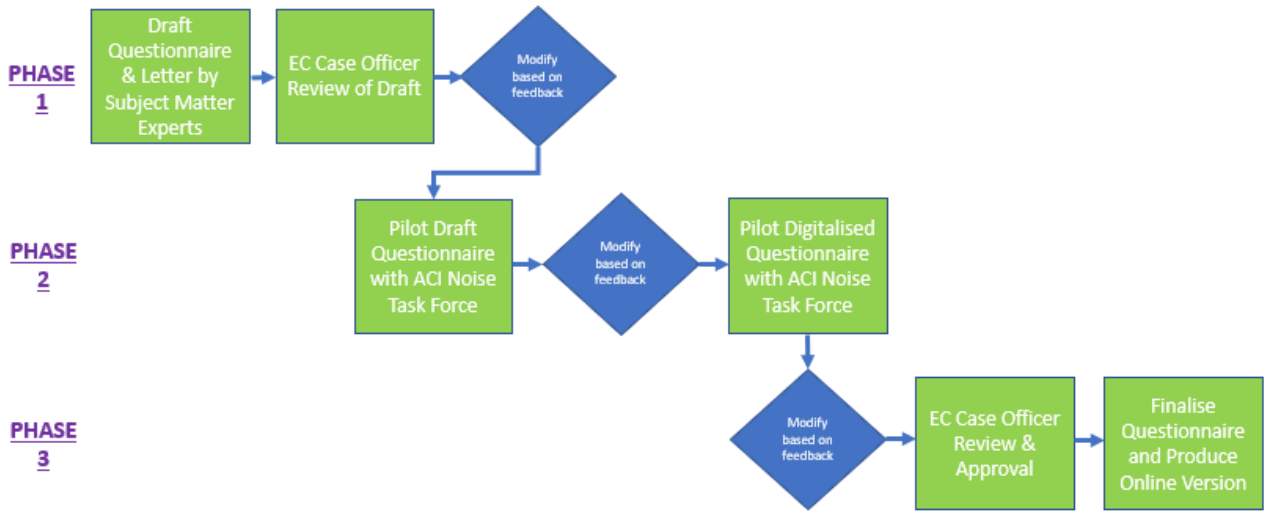
3.2 3.The questionnaire

3.2.1 How the questionnaire has been developed

In line with the project scope the aim of the questionnaire was to understand how the administrative arrangements, technical and economic evaluation as well as the process and implementation aspects of both the BAR and END had been undertaken in the different Member States. The structure of the questionnaire was developed by subject matter experts (SMEs) with direct experience of delivering strategic noise maps, noise action plans and the provisions of the BAR. There were three broad phases of development for the questionnaire, which were:

- Phase 1 - Initial draft design and review
- Phase 2 - Pilot testing; and
- Phase 3 - Final drafting, digitalisation, and approval.

Figure 1 - Questionnaire Development Process



Phase 1 - Initial draft design and review

Using the outputs described in Chapter 2 and the experience of the subject matter experts, a draft structure was determined for the questionnaire. It was considered important that the questionnaire provided clear instructions, was user friendly and avoided where possible the use of technical or legal jargon. To help with the coding of responses it was also key that a series of introductory questions were included. Each article of both the BAR and END was reviewed, and questions identified which were then categorised into broader sections as detailed in **Table 4** below.

Table 4 – Questionnaire initial structure

Questionnaire initial sections
Description of the airport
Designation of roles
Defining the noise problem
Setting the noise abatement objective
Cost Effectiveness Methodology
Legacy Noise Measures and Restrictions
Identification of noise measures
Consultation and engagement
Monitoring and Enforcement
Appeal Process

As a result of the systematic review of the legislation a series of more than 170 closed, open, and multi-option questions were identified. A key concern at this stage was the volume of questions and the prospect of "respondent fatigue" potentially resulting in partially completed and/or poorer quality responses.

Phase 2 – Pilot testing

Although the first draft of the questionnaire was likely to be too onerous for Competent Authorities to be reasonably expected to complete it in the time allowed, it was decided that it was useful to undertake a two stage "pilot" to help shorten the questionnaire and refine the structure. Feedback was sought from the wider project team, the EC Case Officers and the Airports Council International (Europe) Noise Task Force (NTF). The first stage involved circulation of the draft questionnaire in spreadsheet format ahead of planned feedback meetings.

During these sessions several consistent themes emerged. There was broad consensus that the questionnaire should be no more than 100 questions, and that the section on cost effectiveness and cost benefit analysis needed to be simplified. Finding a balance between the number of open, closed, and multi-option questions was also a common theme, as was the need to simplify the questions' language which could help with translation. There was a desire for both a digital and paper version of the questionnaire to be made available.

The insights of the NTF proved particularly valuable as the group had extensive experience of both the development and delivery of noise management strategies and policy across a range of Member States. From their feedback it was clear that there were likely to be multiple agencies responsible for different aspects of the END and BAR, and consequently the different questionnaire' sections, so access to the questionnaire needed to recognise that. This was also linked to a concern that, if only one body or individual attempted to complete the questionnaire, it was possible that a lot of legacy knowledge would be missed which could be useful in framing a Members State specific approach.

The original draft also planned to pre-complete several data related questions and seek confirmation that the range selected was correct, but feedback from the NTF advised that the preference would be to provide the specific figures for the airport. As well as identifying how some questions would be better considered as simple "yes" or "no" responses, the group also pointed out where this was not suitable for some already drafted in this way.

The NTF had identified the fact that often aviation noise has been the subject of national legislation for many years prior to the introduction of both the BAR and the END, they felt that this could influence how these are perceived. The EC were also keen to include questions relating to the interaction with national legislation, particularly where it preceded the END and BAR. All groups felt it would be helpful to identify areas that the Competent Authorities were interested in exploring, if identified for a follow up interview.

Following the dialogue with the different groups, the draft questionnaire was modified, and the number of questions reduced to a total of 77. A key alteration was to focus the questionnaire more on capturing the "what" was in place with respect to the different provisions of the END and BAR, rather than also seeking to understand "how" this had occurred. It was considered that this could more usefully be explored through the interviews.

The updated draft was converted into a digital format using Survey Monkey, and the members of the NTF were invited to test the technology and provide feedback on their individual experiences. This enabled the removal of technical "glitches" and a coding matrix to be developed and tested. This data has not been used in any analysis.

The feedback from the NTF identified the need for some explanatory text to be added to the questionnaire to assist respondents and help frame the questions. It also identified the need to enable multiple users to input different parts of the questionnaire at the same time. To ensure that, the project team made the questionnaire accessible online through a web link, unique for each airport and password protected. The advantages of this approach were:

- The questionnaire for the same airport could be completed by multiple respondents having access to that link;
- Answers inserted by multiple users could be reviewed by the Competent Authority before the final submission;
- The link could be included in the official letter from the European Commission to the Competent Authorities;
- The project team had full control of each questionnaire to provide technical assistance if required.

Phase 3 – Final drafting, digitalisation and approval

During Phase 3 the questionnaire accompanying letters were drafted by the project team and edited after feedback from the European Commission Case Officer. The final version of the questionnaire was approved and converted into online and word document formats.

The final questionnaire was designed to gather as much insight as possible regarding the interpretation and application of the provisions in both the BAR and END. After the Phases 1 and 2 feedback and review this was further refined into the final structure detailed in **Figure 2** below.

Figure 2 - Questionnaire Structure Development

Initial Structure
Description of the airport
Designation of roles
Defining the noise problem
Setting the noise abatement objective
Cost Effectiveness Methodology
Legacy Noise Measures and Restrictions
Identification of noise measures
Consultation and engagement
Monitoring and Enforcement
Appeal Process

Final Structure
Description of the airport
Designation of roles
END and BAR implementation into national/local legislation
Defining the noise problem
Setting the priorities and objectives
Assessment methodology of noise measures
Identification of noise measures
Consultation and engagement
Resolution and review
Overview
Interview

Competent Authorities were then given a period of circa 7 weeks from 20th September 2021 to 4th November 2021 to complete and return the questionnaire.

3.3 Ad-hoc interviews

3.3.1 Proforma development

For this phase of the study, 20 out of the 63 airports included in the study scope were selected for the ad-hoc interviews between the Competent Authorities and project team.

The selection was informed by the *interview sampling framework* described in Section 3.3.2, which categorises the airports by the scale of their operations and population exposure using the data from the END Round 3 – and the information collected through the questionnaires on the different strategies used by the airport authorities to tackle noise, their different levels of ambition, and the results achieved.

An interview proforma was developed to help seek clarifications on the answers provided in the submitted questionnaires, and to ensure that the approaches used in the noise management, and the rationale behind their implementation, was captured and understood for each airport. The following areas were identified

for discussion at the interviews, to either clarify or ask further questions on specific answers provided by the airport's Competent Authorities.

- **Airport ownership**: to understand how the various ownership models are perceived by the different stakeholder groups and seek views on whether the Competent Authorities believe this helps or hinders stakeholder relationships.
- **Data clarification**: to clarify any data queries identified following the detail review of the questionnaire responses, particularly where data was absent or inconsistent.
- **Role of Competent Authorities / Designation of roles**: to identify the range of models used for the designation of the Competent Authority for the various aspects of the END and BAR, and to explore the rationale for these designations and any perceived advantages and disadvantages of each approach.
- **END and BAR implementation into/relationship with national/local legislation**: to understand the constraints and conflicts the legal relationship between national and European legislation raises for the Competent Authorities.
- **Identification of the Noise Problem/Priorities and objectives**: to understand how Competent Authorities have interpreted the definitions of noise problem, priorities and objectives, and their inter-relationships. To understand how they identify the noise problems and establish noise abatement objective(s) and determine the level of consistency in the identified approach.
- **Cost effectiveness/benefit assessment**: to explore these key aspects of the process for both the development of the noise action plans and introduction of potential operating restrictions. To gather the details on how the effectiveness of individual measures or interventions is assessed.
- **Identification of noise measures**: the types of noise measure implemented are addressed in the PHENOMENA study. Through this study the aim is to understand whether the implementation of the END/BAR has helped the identification and implementation of these measures, and the process by which the appropriate package of measures was determined for each airport.
- **Consultation/Engagement**: to understand how Competent Authorities have interpreted the requirements to engage and consult, and the approaches they have taken.
- **Overview of legislation**: to understand the reasons of the score given by exploring the respondents understanding between the processes set out in the BAR/END, and the presumption/existence of a noise abatement objective.

3.3.2 Interview sampling framework

A sampling framework was developed to determine the airports selected for the ad-hoc interviews. The framework consisted of a two-step process.

Step 1 - Airport category identification: a quantitative approach through a scoring system based on the 2017 END, and any of the missing data collected through the questionnaire, on:

- Annual air traffic movements;
- Population exposure within the L_{den} contours.

Step 2 - Interview selection: qualitative assessment that considered:

- Representation of the identified airport categories;
- Member State representation;
- Noise-related factors;
- Contextual factors; and
- Airport collaborative approach and quality of questionnaire responses.

Step 1 – Airport category identification

The third round of the END data gathered through EIONET or provided by the EEA were used to identify airport categories based on ATMs, Contour Areas and population exposed to noise. For airports that did not provide such information through the third END round, the data collected through the questionnaire were used instead. A score from 0 to 4 for each of these indicators was given to each airport as shown in **Table 5**.

Table 5 – Scoring system for airport categorisation

Score	*Activity*	*Relative exposure*		
	Movements as 2017 END	Exposed population		
		>55 dB L_{den}	>65 dB L_{den}	>75 dB L_{den}
4	≥300,000	≥130,000	≥20,000	≥100
3	150,000 – 300,000	45,000 - 130,000	5,000 – 20,000	-
2	75,000 - 150,000	13,000 – 45,000	1,200 – 5,000	-
1	50,000 - 75,000	1 – 13,000	1 – 1,200	-

The ranges used for the air transport movements (ATM) scoring were determined by considering the available data on ATM of all the airports in the scope, as reported for the 2017 END round. The 300,000 ATM value set as the threshold for the highest score, corresponds approximately to the 90th percentile of the movements across all the airports in the scope. The ranges for the other ATM scores have been determined by merely halving of the ATM for each sub score, which would correspond to a hypothetical 3dB difference of the noise contours between ranges.

The ranges of exposed population, follow the ones used by the EEA in "The NOISE Observation & Information Service for Europe" website (https://noise.eea.europa.eu/) for *the number of people exposed to noise from major airports*. The EEA explained that the ranges chosen were through "Natural Breaks" classification of numerical variables using ArcGIS software. The number of classes chosen was four. This is a widely used method in the analysis of geospatial data, that helps in minimising variance in the classification. Breaks are selected to separate values where major changes occur. This classification is made within each noise band.

While other approaches to define the population exposure ranges were explored, based on the 2017 END reported data, they resulted in very similar ranges to those used by EEA. It was subsequently agreed with the Commission to use the same EEA data range for consistency across European Commission projects.

The scores for the population exposures were averaged across the three noise bands, with a penalty used for higher noise ranges based on High Annoyance ratios, to provide a single score for the impact on population to be used for the airport categorisation.

Based on this scoring system, 10 different categories were identified. Airports were categories based on their *activity* score in terms of ATM, and the *relative exposure* (*RelExp*) score on population.

Table 6 shows the identified categories and the airports under each category using the scoring system.

Table 6 - Airports' categorisation

1_Activity 1_RelExp	1_Activity 2_RelExp	1-2_Activity 3_RelExp	2_Activity 1_RelExp	2_Activity 2_RelExp	3-4_Activity 1_RelExp	3_Activity 2_RelExp	3_Activity 3_RelExp	3_Activity 4_RelExp	4_Activity 2_RelExp
Bologna Guglielmo Marconi Airport	Berlin Schonefeld Airport	Francisco Sa Carneiro Airport	Alicante-Elche Airport	Bucharest Henri Coandă International Airport	Athens International Airport "Eleftherios Venizelos"	Dublin Airport	Brussels Airport	Barcelona El Prat Airport	Amsterdam Airport Schiphol
Catania Fontanarossa Airport	Ciampino–G. B. Pastine International Airport	Il Caravaggio International Airport	Bordeaux-Merignac Airport	Budapest Ferihegy International Airport	Copenhagen Airport	Helsinki Vantaa Airport	Dusseldorf International Airport	Berlin Tegel Airport	Frankfurt am Main Airport
Göteborg-Landvetter Airport	Naples International Airport	Luxembourg Findel Airport	EuroAirport Basel–Mulhouse–Freiburg	Cologne Bonn Airport	Nice Cote d'Azur Airport	Milan Malpensa Airport	Hamburg Airport	Lisbon Portela Airport	Madrid Barajas Airport
Ibiza Airport	Paris Le Bourget Airport		Gran Canaria Airport	Hanover Langenhagen Airport	Prague Vaclav Havel Airport	Palma de Mallorca Airport		Paris Orly Airport	Munich Airport
Lanzarote Airport	Tenerife South Airport		Lyon-Saint Exupery Airport	Marseille Provence Airport	Stockholm-Arlanda Airport				Paris Charles de Gaulle Airport
Leipzig/Halle Airport	Valencia Airport		Malaga Airport	Milano Linate Airport	Vienna International Airport				
Nuremberg Airport			Stuttgart Airport	Toulouse Blagnac Airport	Fiumicino – Leonardo da Vinci International Airport				
Riga International Airport			Venice Marco Polo Airport	Warsaw Chopin Airport					
Sofia Airport									
Stockholm-Bromma Airport									
Tenerife North Airport									
Turin Airport									

Step 2 – Interview selection

Following the categorisation of the airports, the identification of the 20 airports[64] selected for the ad-hoc interviews went through a qualitative evaluation of the information gathered through the questionnaire, which included:

- **Noise-related factors**
  - Change in noise across the three END rounds;
  - Range of noise abatement procedure and operating restrictions in place;
- **Methodologies used**
  - Cost benefit / Cost effectiveness analysis
  - Consultation and engagement activities
- **Contextual factors**
  - Airport size;
  - Influence on agglomerations;
  - Ownership;
  - Implementation into national local legislation
- **Airport collaborative approach and quality of questionnaire responses**;
- **Positive or negative feedback on the two legislations**.

By using the sampling framework, it was ensured that at least one airport from each of the identified categories was selected for the ad-hoc interviews, providing a fair representation of the different conditions around airports and range of approaches to noise management.

As different approaches are driven by Member States, the project team ensured that the candidate selection of airports covered the widest geographical distribution and considered older and newer Member States entries to understand the specific challenges in each country in the application of a noise management framework.

Based on this sampling framework, the candidate selection was reported to the Commission, based on the initial airport categorisation, the noise management approaches, and contextual factors extrapolated from the questionnaires. The Commission confirmed the selection of the twenty airports shown in **Table 7**.

[64] Vienna –Schwechat; Prague – Havel airport; Copenhagen – Kastrup; Helsinki – Vantaa; Paris – Charles de Gaulle; Berlin – Tegel; Cologne; Frankfurt; Dublin; Milan – Malpensa; Amsterdam – Schiphol; Madrid – Adolfo Suarez Madrid-Barajas; Stockholm – Arlanda were analysed within the European Commission study PHENOMENA and as per the ToR could not be considered amongst the 20 selected for this study, to avoid duplications.

Table 7 - Airport final selection for ad-hoc interviews

#	Airport	MS	Category score
1	Munich Airport	DE	4_Activity - 2_RelExp
2	Paris Orly Airport	FR	3_Activity - 4_RelExp
3	Barcelona El Prat Airport	ES	3_Activity - 4_RelExp
4	Lisbon Portela Airport	PT	3_Activity - 4_RelExp
5	Brussels Airport[65]	BE	3_Activity - 3_RelExp
6	Palma de Mallorca Airport	ES	3_Activity - 2_RelExp
7	Athens International Airport	GR	3-4_Activity - 1_RelExp
8	Budapest Ferihegy International Airport	HU	2_Activity - 2_RelExp
9	Milano Linate Airport	IT	2_Activity - 2_RelExp
10	Warsaw Chopin Airport	PL	2_Activity - 2_RelExp
11	Bucharest Henri Coandă International Airport	RO	2_Activity - 2_RelExp
12	EuroAirport Basel–Mulhouse–Freiburg	FR	2_Activity - 1_RelExp
13	Luxembourg Findel Airport	LU	1-2_Activity - 3_RelExp
14	Berlin Schonefeld Airport	DE	1_Activity - 2_RelExp
15	Ciampino–G. B. Pastine International Airport	IT	1_Activity - 2_RelExp
16	Leipzig/Halle Airport	DE	1_Activity - 1_RelExp
17	Riga International Airport	LV	1_Activity - 1_RelExp
18	Sofia Airport	BG	1_Activity - 1_RelExp
19	Bologna Guglielmo Marconi Airport	IT	1_Activity - 1_RelExp
20	Göteborg-Landvetter Airport	SE	1_ Activity - 1_RelExp

3.3.3 How the interview was conducted

Arrangements were made between the project team and the Competent Authorities of the selected airports to carry out the ad-hoc interviews. The Competent Authorities were asked to extend the invitation to any other relevant authorities and organisations, including the airport operator, responsible for the noise management tasks and the implementation of the END and BAR provisions.

In preparation for the interview, a document was sent to the Competent Authorities containing a guideline of the interview framework, the planned discussion, and associated questions. An example document is provided in **Appendix B**.

All the ad-hoc interviews were carried out between the 8th December 2021 and the 14th January 2022.

Interviews were generally conducted in English, except for those with the French, German, Italian, Polish and Spanish Competent Authorities which were requested to be undertaken in their native languages.

[65] Brussel Airport Competent Authority did not complete and submit the questionnaire

Interviews were hosted via Microsoft Teams and recorded for the sole purpose of aiding the transcription of accurate notes. It was agreed with the individuals present that the recordings were not for wider circulation or inclusion in the final report. Following each interview, minutes were produced and sent to the attending parties for validation to confirm the contents for use in the study.

In some instances, follow up interviews were arranged in agreement with the Competent Authorities, where the interview discussions went outside the remit of the attendees, and it was felt that the input of another representative, authority or organisation was required.

The information gathered during the interviews and validated by the Competent Authorities, was then aggregated with that from other interviews to provide an overview on the END and BAR legislations.

3.4 Summary of the information collected

The information and data used and/or processed within this section were provided directly by the Competent Authorities through the questionnaire or the ad-hoc interviews.

Out of the 63 airports included in the scope, 55 returned the questionnaire completed[66]. It should be noted that not all the questions were completed by all 55 airport Competent Authorities.

The responses received through the questionnaire, and the information gathered from the ad-hoc interviews[67], have been aggregated to provide a general picture of the status of END and BAR implementation with respect to major airports in the European Union. The data and information collected with reference to the END are up to the third round of strategic noise maps and noise action plans. The data provided might differ from that formally reported by the Competent Authorities to the Commission as per Article 10 (2), and responses provided do not take into account the implementation of EU 2020/367 which took effect from 1st January 2022 i.e. after the questionnaire and ad-hoc interviews.

The aim of this section is to provide a summary of the main information collected both from the questionnaires and the ad-hoc interviews. Full questionnaire results are presented in **Appendix C** and information collected from the ad-hoc interviews in **Appendix D**.

This information will support the Commission in the preparation of the END and BAR implementation reports providing an up-to-date overview of the implementation of these two legislations in the European Union.

A detailed review, analysis and discussion is set out in Section 4.

[66] Vienna International Airport, Brussels Airport, Prague Vaclav Havel Airport, Billund Airport, Roskilde Airport, Berlin Tegel Airport, Stuttgart Airport did not complete and return the questionnaire.

[67] The selection of airports for the ad-hoc interviews included Brussel Airport, which did not complete and submit the questionnaire.

Topic	Summary of information collected
Overview of the average trend of airport noise in the European Union	According to the data provided through the questionnaire, the number of air traffic movements (ATM) across the EU major airports has remained relatively stable since the first round of the END, with a reduction in movements of circa 3% in 2017 compared to 2007. However, while only 2% of major airports had a reduction in traffic to less than 50,000 movements per year since the END was implemented, 6% of airports newly qualified as major airports, between the second and third round of the END according to the data provided (49 airports in 2007, 47 in 2012 and 51 in 2017). Between 2007 and 2014, airports with an annual traffic between 50,000 and 75,000 ATM were the most common in the EU27. This changed in 2017, with major airports operating between 75,000 to 150,000 ATM (**Q17**) being the most common. With the assumption that from 2007 there was no overall increase in the total number of ATMs, this shift can be attributed to the redistributions of the air movements across Europe, in particular from the busiest and more capacity constrained airports to airports with fewer annual movements and capacity for growth. Without the Covid-19 impact, an increase was expected in annual ATMs in more than 80% of the airports in 2021 compared to 2017 (**Q3**). Subsequently only 60% of the airports are expecting to return to the pre pandemic levels over the course of the next round of action planning (**Q5**) This expectation of increase in movements and passengers (**Q4**, **Q6**) is confirmed by the fact that pre and post 2017, major developments were either ongoing or planned at around 50% of the airports in order to accommodate this forecast growth (**Q8**, **Q9**).The data collected on noise contour areas (**Q19**) (39 airports in 2007, 38 in 2012, 50 in 2017) and population exposed to aircraft noise (**Q18**) (43 in 2007, 43 in 2012, 52 in 2012), showed a general trend of reduction in both area and population exposure around the European airports included in the study. The same trend is also confirmed in the night period (**Q20**), although data collected on L_{night} noise contours is more limited with less than 35% of the airports in the study scope providing this information. As per the END provision, the noise situation at the European Union's major airports is generally assessed every 5 years. Just over 10% of the airports produce strategic noise maps every year, while 21% commented that they have failed to produce strategic noise maps at least every 5-years as required

Topic	Summary of information collected
	by the legislation but commented that a process is now in place to respect the future deadlines (**Q22**). In addition to the required L_{den} and L_{night} indicators, the noise situation is also expressed through other metrics, mainly L_{Aeq} with alternative average time periods(**Q23**), which were established prior the END implementation (**Q12**). In more than 80% of the cases, noise reduction measures to limit or reduce the effects of aircraft noise were already in place prior to the END implementation. (**Q10**). The fleet composition at the studied airports varies significantly, but on average is composed of more than 50% Chapter 4 compliant aircraft, based on the responses received. Chapter 3 aircraft formed approximately 14% of the fleet, (with less than 1% being marginally compliant Chapter 3). Almost a quarter of the fleet mix comprises the quieter Chapter 14 aircraft (**Q7**). 94% of the airports which responded have not granted exceptions for marginally compliant aircraft registered in developing countries (**Q13**) However, some airports do not hold records of aircraft by ICAO Chapters, hence the data reported through the questionnaire can only be considered indicative. This aligns with the fact that more than half of the airports included in the study do not have regular access to information from their major aircraft operators on how their fleet mix will change in the forthcoming years (**Q15**), and therefore are not able to confidently produce forecasts of future strategic noise maps (**Q24**). Nevertheless, based on data provided by the airports which do have such information (40%), it can be estimated that from 2022 there will be a 4% reduction in Chapter 3 aircraft, in favour of the quieter Chapter 14 aircraft, in the EU major airports' fleet mix (**Q16**).
Designation of the roles	Full details on how Competent Authorities have been designated with respect to the different roles associated with noise action plans, strategic noise maps and the BAR are shown in responses to **Q25** to **Q35** set out in **Appendix C**. Member States have taken different approaches to designated Competent Authority roles under the END and BAR. These range from all tasks being covered by a single Competent Authority, to a fragmentation of roles across multiple bodies or organisations.

Topic	Summary of information collected
	Under the END, the most common approach delegates the roles across two authorities, with one of the two being the airport operator under the oversight of a Government Agency or a Ministry (**Q25** and **Q26**). Under the BAR, the process for applying the Balanced Approach and developing noise management measures, or identifying operating restrictions, is mainly carried out by a single Competent Authority and/or organisation. However, it is interesting to highlight that from interview discussions some examples of single bodies, such as an Airport Commission or Stakeholder Group which includes different bodies, were also in place. These formal bodies could include airport, industry, and local stakeholder representation. (**Q27**). Where the designation of roles under the BAR is fragmentated, there are cases where each pillar of the Balanced Approach is under the competence of a different Competent Authorities. When a single Competent Authority is responsible for multiple roles under the END and BAR, independence is ensured under a functional separation of the roles (**Q30**).
END and BAR implementation into national / local legislation	As discussed in Section 1.2 aviation noise management has been an issue for Member States since well before the introduction of the END and BAR. For many there has been national legislation in place prior to the formal introduction of the ICAO Balanced Approach at the start of the century. In the 93% of the cases reported, noise limits were already established before the END implementation (**Q12**), and in more than 80% there were noise reduction measures in place (**Q10**). Consequently, although, as per Article 14 of the END and Article 17 of the BAR, these two legislations must have been transposed into the Member States' national legislation, they will often be alongside pre-existing legislation(**Q36**). In the majority of the cases the national legislation simply implements the END and BAR provisions, but where there is a noise management process established through national frameworks, the national legislation complements, and in some cases can exceed, the END and BAR provisions (**Q35**) - for example by providing clear noise limits – or by providing processes to identify priorities and objectives, as circa 23% of airports have confirmed (**Q41**).

Topic	Summary of information collected
Defining the noise problem	A noise problem has been identified in almost three quarters of the major airports in the EU (**Q38**). However, the interviews clarified that this is not a direct consequence of the END and BAR application, but rather as the result of compliance with the national legislation. The noise problem is identified mainly by means of noise contours and population exposure (**Q40**). Where harmful effects have been indicated to be used when identifying the noise problem (by circa 30% of airports), annoyance or sleep disturbance are mainly related to a quantification of relevant complaints rather than quantifiable effects as considered in the updated END Annex III Considering that transposition of the revised Annex III into national legislation (**Q37**) was due by 1st January 2022, it was the general response that harmful effects will be assessed from round four of the END. However, it was not clarified how Competent Authorities intend to use the harmful effects assessment in their approach to noise management. In more than 75% of the cases, the process of identification of the noise problem is carried out by a National or a Local authority (**Q31**). Where a noise problem is not identified, in the majority of cases it is because noise limits – which can be established by the national legislation or an Environmental Permit/Planning Conditions – have not been exceeded, even if an increase in the population exposed to noise, or noise contour areas, has been identified. In almost half the cases the noise problem is not described within the noise action plan (**Q39**), either when the national noise limits were exceeded or because a noise problem has not been identified. In Member States where there is a well-established noise management framework (e.g., under Environmental Permits, Planning Conditions or established Strategic Development Plans, all of which required an environmental impact assessment), any exceedance of the national limits and identification of noise problem is dealt via such a management framework. In these cases, the noise action plans mainly report the results of the strategic noise maps, and the noise-related actions already defined as a result of the environmental impact assessments, precluding the need for the noise action plan to undergo further public consultations other than those already carried out for the environmental impact assessments.

Topic	Summary of information collected
Noise abatement objectives and priorities	Establishing a noise abatement objective (NAO), and defining the priorities, are fundamental to the process of developing noise action plans and ensuring compliance with the BAR. The questionnaire included several questions exploring this theme. From the subsequent responses it was clear that Member States had approached this in several different ways. It was also noted that the response rates on this topic were often relatively low (e.g., 38 of 55 airports in one instance). The most frequent body responsible for establishing the NAO is a government office, however examples of an independent or stakeholder body (e.g., Airport Noise Commission / Stakeholder Groups) were almost as frequent (**Q32**). There were also instances of local authorities and airport operators holding accountability for this. However, a quarter of the airports in the study did not provide a response on who establishes the NAO at the airport. When asked how the balance between the need for an effective functioning transport system and protection of the environment had been considered in determining priorities and/or objectives (**Q42**) most described the provision of noise reduction or management plans (37%) with national law compliance (24%) and socio-economic analysis being the next most common answers (18%). These were not mutually exclusive with some responses indicating more than one method. Where an NAO or priority had been specified, they are commonly linked to population noise exposure and/or area. There were very few examples of objectives or priorities being directly linked to health impacts or desired outcomes. Of interest was the fact that more than 50% of the responses referenced "other" indicators, including land use planning and delegation to an Airport Commission / Stakeholder group to identify the current priorities and NAO (**Q45**). Given the emphasis in the END on priorities, and the BAR on establishing the NAO, it was interesting to note that 63% of responses (of 41) in relation to the END and 52% (of 50) for the BAR indicated that there were no specific time bound targets set. From the data gathered it appears that by 2028 only around 20% of locations will have specific time bound targets (**Q46**). Regardless of whether the priority or objective had a specific target date for completion, responses also indicated that 46% (of 39) and 57% (of 40) did not know when they would be achieved (**Q47**). Between 26% (for the BAR) and 36% (for the END) expected to have achieved the current NAO or priority by 2028. As might be expected, given the 5-year cycle of strategic noise mapping required under the END, over 80% of respondents stated that their priorities are reviewed every 5 years. Of the remainder, 12% suggested there was an

Topic	Summary of information collected
	annual review, and 5% indicted another unspecified period. For the NAO the responses were slightly different, with more responses (42 vs 51) showing that 47% review it every 5 years, and 45% at an unspecified interval. An annual review of the NAO was recorded in 8% of cases (**Q48**).
Assessment methodology of noise measures / operating restrictions	Most responses indicated that a Cost Benefit Analysis (CBA) had not been used in determining the best actions to take in relation to the END (circ. 90%) or the BAR (circ. 60%) (**Q49**). Similary, the Cost Effectiveness Analysis (CEA) had not been used at more than 80% of the airports in relation to the END. However, some principles of a CEA are used in the indentification of noise-related measures, but this appears to be more on a case-by-case basis rather then being an established systematic approach. It is understood that Competent Authorities interpret the BAR to only be applicable when operating restrictions are to be established or amended, and only in those circumstances should a CEA/CBA be undertaken[68]. Hence, the scarse utilisation of a CBA/CEA may be explained in part by the fact that there are very few instances of operating restrictions being established after the introduction of the BAR. Of equal note is the fact that around 30% of respondents left these questions blank (**Q49**, **Q50**). Where a CBA/CEA has been used, the methodologies described by respondents indicated that the factors set out in Annex II of the BAR had been considered by between 2% and 25% of respondents. Most commonly the changes in population noise exposure, changes in harmful effects and economic effects were considered (**Q52**). In relation to determining actions for the END noise action plans, the factors identified in BAR Annex II are rarely considered, with less than 10% of respondents (of only 38 that answered) considering any of the factors other than the total cost of implementing the measure, which was used in 13% of the locations (**Q50**). There were no examples of the network or economic impacts being considered in relation to the END. The limited application of a CBA/CEA may in part be because only 12% of 52 respondents said that any national guidance had been developed in relation to undertaking this type of assessment (**Q53**). Although more likely to not be considered (51%), where harmful effects are assessed, annoyance and sleep disturbance feature most (**Q51**). This question

[68] Annex II of BAR

Topic	Summary of information collected
	attracted only 35 responses. The data shows that the most common factors used to consider the health, social and economic effects are noise metrics (41%) and population exposure (37%). Social and economic indicators were considered at 22% of the response sample (of 41). It was noted that 27% of the sample that responded to the wider questionnaire skipped this question, and 12% of those that did answer stated that it was not applicable (**Q52**).
Identification of noise related action and operating restrictions	The questionnaire set out a wide range (circ. 50) of potential measures (**Q54** to **Q57**) that could be adopted under the different pillars of the ICAO Balanced Approach, and sought responses on which had been implemented, or were being considered, as well as whether they had been excluded from future implementation. The responses showed that there are examples across the study airports of every example measure presented in the questionnaire and equally, apart from Continuous Descent Operations (CDO), instances where they had been excluded from future implementation. Regarding managing noise at source (**Q54**), it would appear from the responses that some form of differential noise charging is either in place or potentially could be in the future, with the most common approaches based on ICAO noise certification values. Between 15-25% of responses indicated that voluntary agreements were in place or due to be implemented. Very few respondents have excluded some form of noise charging in the future. In terms of operating procedures (**Q55**), it was notable that very few respondents had ruled out the use of continuous climb operations (CCO) or PBN based departure routes. Interventions such as preferential departure routes and runway use were very common, and around 40% and 20% respectively had mandated the use of NAPD1 or NAPD2. For arrivals (**Q56**), as mentioned above, there was universal consideration of CDO and almost all indicated the use or potential use of PBN based approaches. Steeper approaches, scheduled respite, noise limits and fines were the most likely measures to have been excluded from future consideration. Turning to land use planning interventions (**Q57**), approximately 85% of respondents stated that there were building codes or planning guidance in place to avoid or reduce noise sensitive development close to airports, and a similar number confirmed that stakeholders are consulted in regard of new developments in noise sensitive areas. Almost all respondents stated that there were noise insulation schemes in place or planned (circ. 80%), and only one location that excluded the future

Topic	Summary of information collected
	consideration of a scheme. In contrast nearly 40% of responses indicated that the prospect of relocation assistance in the future would not be considered, and less than 20% have such schemes in place currently. The questionnaire detailed a range of operating restriction examples (**Q58**), and by far the most common was the presence of night restrictions, with around 70% of locations already having some form of restriction, the majority of which were in place prior to 2007. There were instances of all the examples included in the questionnaire. Interestingly between around 20% and 50% of respondents excluded the prospect of any the specific restrictions detailed in the questionnaire. Given the specific reference in the BAR to marginally compliant aircraft it was perhaps surprising that nearly 20% of respondents excluded the future prospect of this measure. Other intervention measures (**Q57**) mentioned, such as the relocation of the airport, some of its traffic to other airports, or its passengers to other transport modes, were generally excluded from consideration. It was also noted that very few locations had designated Quiet Areas, which may reflect challenges in defining or identifying such sites and the fact that the END also applies to other sources of environmental noise. The questionnaire also explored (**Q60**) what the Competent Authorities understood by the statement "*the measures, taking into account public interest in the field of air transport as regards the development prospects of their airports, are selected without detriment to safety*;"[69]. It was noted that only 57% of the respondents answered this question, indicating that any selected measures are always considered with regard to safety first, and then to their noise/environmental benefit. During the interviews, it was a consistent finding that an assessment of the effectiveness of any of the interventions in reducing the health effects was largely absent, and that selection primarily rested on stakeholder discussion, existing practices elsewhere, or studies into the feasibility of the action.
Consultation and engagement	There was only one example where the noise action plans, and strategic noise maps had not been made available to the public (**Q61**) with weblinks provided (**Q62**). Although 10% of respondents did not provide an answer, it appears that in the vast majority (82%) of instances there is technical engagement of some description with airport operators, aircraft operators and air navigation service providers (**Q63**).

[69] Article 5 of BAR

Topic	Summary of information collected
	Caveated by the fact that only 34 responded, it appears that a wide range of consultation and engagement techniques are used for each of the different stakeholder groups identified (**Q64**). Of note is that no response identified a technical forum which included aircraft or engine manufacturers, but there were examples of such forums for both residents and community groups. As expected, online publications and consultations featured highly with resident, community groups and business engagement. With a similarly low response rate, in promoting stakeholder engagement (**Q65**) and interest in noise action plans, or implementing operating restrictions, a wide range of communication tools appeared to be utilised. In one case radio and television advertisements had been used for residents. Both the Competent Authority and airport operator websites were key sources used to engage all stakeholders. Perhaps unsurprisingly examples of the use of postal communication were very limited. It appears that the use of websites is fundamental to informing the public about decisions taken following the consultation process (**Q66**). Public noticeboards, and media or press releases, were also cited by two and three locations respectively.
Resolution and review	By far the most common methods of reviewing the noise action plan was through either ongoing or annual monitoring of the actions (circa 75%) (**Q67**). Around 25% indicated that an annual report was used. Third party review or evaluation through an Airport Noise Commission or technical forum only accounted for around 11% of responses. A similar number indicated a not applicable response (10%). In regard to measuring the success of the action plan, over 80% of responses indicated that this was done by comparison to previous Action Plans and/or strategic noise maps, or the level of action implementation over the course of the action plan, and not against a set noise abatement objective (**Q68**). Evaluation by an Airport Commission or stakeholder group is unusual, with only 2% of responses suggesting this was done. Most notable was the fact that 94% of respondents (of 47) indicated that there was no independent audit of progress reports (**Q69**). When considering the appeals and disputes, 65% of respondents indicated that this was resolved through an Administrative Court (47%) or by Council of State (18%), with other examples including the Civil Aviation Authority and an Aircraft Noise Commission. Not all respondents answered this question (9% skipped), and 24% or those that did respond selected a non-applicable response (**Q70**).

Topic	Summary of information collected
	With respect to the review of noise action plans, as might be expected around 80% indicated that this was done every 5 years in line with the cycle of the END, with one response undertaking an annual review (**Q71**). In relation to the monitoring of operating restrictions 88% responded to this question (**Q72**) noting that periodical reviews of violations are undertaken and communicated to the Civil Aviation authorities, or Airport Commission / Stakeholder Groups, and made public through reporting or online publications.
Overview	The final section of the questionnaire sought to understand how successful the END and BAR had been to date, from the Competent Authority perspective, and any wider feedback. It also aimed to identify potential areas for discussion at interview if selected (**Q73** to **Q77**). When asked about their views on the success of the END and BAR, it was interesting to note that almost 90% respondents described the END (**Q73**) as fair or better, with fewer (76%) feeling similarly about the BAR (**Q75**). However, twice as many respondents felt that the END was more unsuccessful than the BAR. Almost 80% of respondents offered comments on how the END could be improved (**Q74**) whilst around 60% had thoughts on the BAR (**Q76**). This may reflect the fact that experience of the END is more widespread. The written comments gathered through **Q73** to **Q77**, together with the information gathered during the interviews, have been used to assist the analysis reported in Section 4.1 on how the END and BAR provisions have been implemented, and to outline any specific comments and advice for improvements on the two legislations as reported in Section 4.3. Although only 31 responses were recorded, there were a few strong themes that emerged. The assessment methodology relating to selecting noise measures was raised by nearly three quarters of the respondents, with over 40% also interested in discussing how to define the noise problem, set priorities and objectives, and how to consult and engage with stakeholders (**Q77**).

4. Analysis of information collected and observations

4.1 Understanding the followed process

4.1.1 Results of the strategic noise maps

What did the collected data show?

- **There are some inconsistencies between the ATM and population exposure data collected in the questionnaire and data reported for the three END rounds;**
- **Different approaches to reporting are taken by Member States;**
- **It is not possible to draw a precise picture of the overall aviation noise trends in the European Union due to missing data and different reporting approaches.**

Results of the strategic noise maps are reported to the European Commission. The END defines reporting obligations for assessing and managing environmental noise. For the forthcoming Round 4 END reporting, Member States will have to make data available in accordance with the INSPIRE Directive and Regulation (EU) 2019/1010, on the alignment of reporting obligations in the field of legislation related to the environment. ATMs, population exposed to noise, and noise contour areas, are among the information that have to be reported.

In the questionnaire, we asked the Competent Authorities to report such data for the last three rounds of the END through question **Q17**, **Q18** and **Q19**.

Differences were identified between the data collected through the questionnaire and the formally reported ones which the EEA had provided. Both sets of data are respectively reported in **Appendix E** and **Appendix F**.

In relation to ATM, differences were found between the data gathered through the questionnaire and that reported to the EEA. Only 23% of the airport's ATMs for the 2007 and 2012 END rounds, and 37% for the 2017 round were consistent[70]. Differences of up to +/- 35% were observed in the data.

The general trend of the ATM data collected through the questionnaire, when only considering the 37 airports, out of 55, which provided information for all three rounds of the END, shows an overall reduction in movements since 2007. However, this is not the case for all the airports, considering that from 2007, ATM increased in 46% of the major airports in the study.

[70] Within a difference of +/- 1,000 ATM for <75,000 movements per year and +/- 2,500 ATM for ≥75,000 movements per year between the EEA data and those ones provided by the Competent Authorities through the questionnaire.

For population noise exposure, an overall and consistent reduction in the number of people exposed was observed across the three END rounds when considering an average of the population exposure across all the gathered data. However, not all the major airports have been reporting this information across the different rounds (43 in 2007, 43 in 2012, 52 in 2017). By considering only the airports which provided information for all the END rounds since 2007 (37 out of 55), the data shows an average increase in population exposed to noise between round two and round three of the END in all the noise ranges.

Looking at each individual case, circa 60% of the airports have reported an increase in population exposed to L_{den} >55 dB from 2007 of at least 3%.

Table 8 – Relation between ATM and population exposure from 2007[71]

ATM from 2007	Population exposure from 2007	% of major airports
Increment	Increment	35%
Increment	No Change	9%
Increment	Reduction	18%
No Change	Increment	6%
No Change	No Change	0%
No Change	Reduction	0%
Reduction	Increment	6%
Reduction	No Change	3%
Reduction	Reduction	24%

With the exclusion of the airports that increased to ATM greater than 50,000 during the previous Round 3 of END, 23% of the major airports did not provide information on the data reported across the END rounds through the questionnaire. Similarly, more than 25% of major airports do not have a complete reporting history across the three END rounds, according to the data provided by the EEA. While the questionnaire gathered data for some of these airports, others that had reported this information through EIONET, did not answer the question.

As per the ATM data, differences were found in the data provided through the questionnaire on population exposure compared to the data reported to the EEA. In fact, the figures gathered on the population exposure for 2017 match those from the EEA for circa 70% of airports. The other 30% had significant differences. One reason could be the exclusion of agglomerations from the population count. This aspect was discussed at interviews, and in some cases it became apparent that data on population count might not be accurate, as the reporting of such information was the responsibility of the agglomeration Competent Authority rather than the one for airport strategic noise maps, and in other instances because of outdated census data.

[71] Based on the response of 37 airports which provide through the questionnaire data on ATM and L_{den} population exposure for all the three END rounds.

The missing data across almost a quarter of the major airports, and the difference in the data provided for almost a third of them, makes it difficult to draw a precise picture of the overall population exposure trends in Europe.

Instead, it highlights the inconsistency on the data reporting across the different Member States. While it is possible to see trends for single airports, different approaches (as well as noise models, assumptions and population databases) may have been taken on how the data has been calculated, and how it has been reported.

However, the difference in reporting ATMs and population exposure is not found in the reporting of the noise contour areas, as the EEA data are consistent with the data collected through the questionnaire, which suggests a more consistent assessment and reporting process across Europe for the airport strategic noise maps.

The questionnaire data collected on noise contours shows, on average, a reduction of 2% of the L_{den} > 55dB contour area from 2007, which suggests an overall reduction in noise exposure. Looking again at those airports that reported the data for all the three END rounds (30 out of 55), an average increase of 8% in the L_{den} >55 dB contour area is observed. Looking at these 30 airports, more than 60% experienced an increase in the L_{den} >55 dB contour areas. The reported increases range from 4% up to over 100%.

Table 9 - Relation between L_{den} >55 contour area and population exposure from 2007[72]

Contour Area from 2007	Population exposure from 2007	% of major airports
Increment	Increment	47%
Increment	No Change	0%
Increment	Reduction	17%
No Change	Increment	3%
No Change	No Change	0%
No Change	Reduction	0%
Reduction	Increment	20%
Reduction	No Change	3%
Reduction	Reduction	10%

From the above table, the case where there is a reduction, or no change, of the >55 dB L_{den} contour area and an increment in population exposed to noise is of particular interest. This occurs in 23% of the cases, and would suggest population encroachment as the cause, which the interviewed Competent Authorities indicated was out of their direct control. However, it is not possible to exclude population encroachment where no change or reductions in population exposure were recorded.

Data on population exposure at night provided by EEA for airports excluded agglomerations. The questionnaire asked whether the population in the agglomerations was included in the data provided. In 40% of the cases, it was stated that the population from agglomeration was excluded, or that the noise

[72] Based on the response of 30 airports which provide through the questionnaire data on L_{den} contour area and population exposure for all the three END rounds.

contours occur outside the agglomeration, despite the fact those airports are located within agglomerations or in close proximity, as confirmed from information available at https://noise.eea.europa.eu/. This illustrates how the different approaches taken to data reporting across the different Member State, and how this constrains any potential comparison of the data across airports.

The reporting of noise contours, and exposure statistics, for major airports which affect areas inside and outside agglomerations, is currently one of the most complex parts of the END reporting, which may be related to the inconsistency in results which has been identified during this study.

4.1.2 Noise problems

How have Noise Problem been identified?

- **There were no examples where a systematic methodology was used to define a noise problem under the END noise management framework;**
- **Most Competent Authorities defined the noise problem in relation to non-compliance with a national limit value, created outside of the BAR or END process, or with a specific environmental permit or planning condition;**
- **The indicators used are mainly related to population exposure and /or noise contour areas.**
- **There are examples where the calculation of harmful effects has been used but these are rare, and in even fewer cases the location of complaints has been used.**

As a result of the questionnaire and the following ad-hoc interviews, it was found that the *noise problem* is mainly identified when there is an exceedance of a noise limit. This follows the approach to priorities within END Article 8: "*priorities identified by the exceeding of any relevant limit value or by other criteria chosen by the Member States*".

Where the noise problem identification follows this approach, limit values or acoustic zoning/noise contour area limits defined in the national/local legislation are used. In a few instances, L_{den} 55dB and L_{night} 50dB, which are the EU thresholds for exposure defined in the Environmental Noise Directive, are used as values to identify a noise problem. However, national limits may use different thresholds, and also be expressed in metrics other than the L_{den} and L_{night} indicators provisioned by END.

There are cases where even if national limits for aviation noise are established, their utilization for the noise problem identification is open to interpretation by the designated Competent Authorities within the noise management framework, suggesting that there is not an established systematic process to identify the noise problem.

In the instances where the assessment of the noise situation at the airport recorded an increase of population exposed to noise and a noise problem was not identified, it was explained during the interviews that in those circumstances any increment in noise which was within the national limits, or acoustic zoning/noise contour area limits, was not considered to be a noise problem.

In a few cases, the noise problem has been identified through complaints, identifying the main areas where these arose as the focus for noise actions.

Even though the legislation currently leaves Member States to determine how to establish a noise problem and what parameters to consider, it was the opinion of almost all the interviewed Competent Authorities that clearer guidance regarding the definition of the noise problem, and the potential parameters to define it, would be we welcomed.

The vast majority of the interviewees expressed concern about a single definition of what constitutes a Noise Problem being added to the legislation at European level. They emphasized that any clarification of the term should take consideration of the local context and not be mandatory.

4.1.3 Harmful effects

Have harmful effects been considered in the identification of Noise Problems?

- **In most cases, harmful effects have not been assessed and therefore not used to define noise problems, quantify noise objectives and priorities, or assess the cost effectiveness of potential noise management actions.**

Whether harmful effects are assessed to evaluate the noise situation at the airport was asked across five questions. The responses gathered indicate that harmful effects have generally not been assessed or used to define noise problems, nor identify the most effective noise related measures in cost benefit analysis.

In some instances, where annoyance and sleep disturbance data had been used, they were considered as non-acoustic factors and interpreted as the cause of complaints received, rather than quantifiable direct effects of the airport noise.

The interviews clarified that to date, the main reason harmful effects have not been routinely assessed was due to the lack of outlined dose-response functions within END Annex III.

Many of the interviews confirmed the intention to assess harmful effects from END R4, following the publication of 2020/367 and its transposition into national legislation from 1 January 2022.

However, as many Member States identify a noise problem when national limit values or contour areas limits are exceeded, it was not clarified by Competent Authorities how the assessment of harmful effects will be used in their noise management approach.

4.1.4 Noise abatement objective and measurable outcomes

Is there a single noise abatement objective (NAO) statement or expected outcomes defined?

- **Examples of a specific desired outcome were found in less than 10% of the airports.**
- **The majority, but not all, interpreted the NAO and the priorities as the same thing.**

- **Currently NAO, strategy and priority statements range from those aspiring to a "reduction in population exposure" generally without a timeframe or quantum, to a list of key actions for delivery over the course of an action plan.**
- **There is a desire for guidance in establishing an NAO and providing clarity and consistency of language between the END and BAR.**

The END and the BAR both place an emphasis on the achievement of a desired outcome, as a prerequisite to determining the appropriate and proportionate noise management actions for a specific noise situation. Whether they are described as priorities, or long-term strategy (END), or noise abatement objectives (BAR), it is assumed by the legislation that they are in place. This requirement to have a clear goal in mind is fundamental to the application of ICAO Balanced Approach to aircraft noise management, and without it the determination of noise management interventions becomes somewhat subjective.

The questionnaire sought to understand how Competent Authorities had interpreted the terms "priorities" (**Q43**) and "noise abatement objective" used in the legislation and whether these were considered to be the same thing (**Q44**). The vast majority of Competent Authorities considered the priorities and noise abatement objective to be the same thing, which is perhaps an indication that the legislation could be improved by clarifying if this should be considered the case or unifying the language between the documents to reduce the potential for misinterpretation.

Although over a quarter of the respondents did not answer these questions, those that did where also asked to provide details of their existing priorities and objectives. The results from the questionnaire, and the selected interviews, revealed a range of ways in which this has been interpreted. The responses included statements aspiring to a "reduction in population exposure" generally without a timeframe or quantum, to a list of key actions for delivery over the course of an action plan.

Less than 10% of the airports' Competent Authorities included in the study, referred to a strategy, priority or noise abatement objective which included a specific desired outcome. None of these responses included a noise abatement objective that detailed a specific desired outcome, was measurable, and set a clear timeframe or had a stated baseline (e.g., the implementation of actions A-Z is expected to "reduce high sleep disturbance by X%", or the aim is to "reduce the number of people exposed to noise above X dB L_{den} in 20yy compared to 20xx"). This was explored and reaffirmed at the ad-hoc interviews.

The widespread finding that objectives or expected outcomes are not clearly stated or defined, raises the question of how the most cost-effective noise-related actions are identified (more in Section 4.1.5), and their effectiveness monitored or measured (Section 4.1.6). In discussion with the interviewed airports' Competent Authorities, a number suggested that guidance on how to establish the NAO, and what parameters to consider, would be welcomed. That is not to suggest that it is for the Commission to set the objective or desired outcome, as there was also strong feeling that this should remain the responsibility of the Member State based on the local situation and wider policy objectives.

An alignment in the definition of noise problem, long-term strategy, priorities, and noise abatement objectives between END and BAR was also frequently suggested, as was more clarity around the process/framework within which these two legislations operate.

4.1.5 Noise related action and operating restrictions

How are noise-related actions and operating restrictions identified?

- **In most cases, there is no systematic objective approach using CBA or CEA to identify noise related measures or operating restrictions**
- **Often the selection of noise related actions is the consequence of stakeholder dialogue and compromise and/or benchmarking with other airports.**
- **Environmental Permits and/or Development Planning conditions often form the basis of noise action plans and are considered outside of the END or BAR process.**
- **Understanding the value or effectiveness of specific interventions is rarely quantified**
- **CBA/CEA guidance would be welcomed in many locations where this is not available but should not be mandatory.**

The questionnaire and ad hoc interviews explored both the range of actions currently in place, or being considered, at the study airports, and the process by which these had been selected. This included investigating whether a CEA or CBA had been used in the determination of the specific actions in place.

Unsurprisingly the range of measures in place or being considered varied at the different airport locations, at least in the specifics, but consistent themes emerged around noise charging, departure profile and track keeping requirements, continuous climb or descent operations (CCO, CDO), the implementation of Precision Based Navigation (PBN), noise insulation, land use planning regulation and night flight restrictions as well as many others. The basic "template" of the ICAO Balanced Approach is clearly being adopted at the study airports.

Understanding how these measures came into place is perhaps where the more interesting observations were evident. The study found that there were very few examples where a systematic approach using a CEA or CBA had been used to determine the most appropriate and proportionate actions at a specific location. Where instead the cost benefit or cost effectiveness analysis was carried out for the implementation of operating restriction, tools were in some instances provided by the national legislation. The more likely pathway to develop noise management actions, was through stakeholder dialogue and compromise, and/or benchmarking against other locations.

The study found that the content of the noise action plan was frequently a result of a process outside of the END or BAR, often linked to the requirements of a pre-existing environmental permit or planning/development condition(s). An added challenge that identified through the ad-hoc interviews was that the timeframes associated with the environmental permits or planning permissions did not align with the END process. In this respect several respondents felt that the END was more of a "reporting" process, and a reflection of noise management approaches agreed nationally/locally through these separate processes. However, it was noted that often these had been developed as part of an environmental impact assessment, and the interventions identified aligned with the various pillars of the ICAO Balanced Approach. Given the comments in section 5.1.4 regarding the absence of clear noise abatement objectives in the context of the application of the END and BAR, the limits and outcomes required by the environmental

permit and/or planning conditions perhaps provided a clearer sense of what needed to be done to meet those requirements or desired outcomes.

It is understood that it is the interpretation of many Competent Authorities that the BAR is only applicable when operating restrictions are introduced or amended. Hence, the lack of application of a CEA/CBA can possibly be attributed to the fact that, very few operating restrictions have been introduced or revised since the BAR implementation, and so they could be considered as not required by Competent Authorities. However, the ICAO Balanced Approach has been in place since the turn of the century and refers to cost effective solutions. What is clear from the questionnaire responses, and dialogue at the interviews, is that there is a need for guidance in this area, and whether the general rules on aircraft noise management under BAR Article 5 are to be used within the process of defining actions under the END. There were concerns raised about what should be included in an assessment, but also around how its application could potentially rule in or out a particular action which has widespread support across different stakeholder groups. This frequently led to a debate in the interviews about how to quantify the value or effectiveness of a particular intervention. There are clear gaps in knowledge and understanding here that might benefit from further European Commission study and research.

Regarding noise action identification, the overriding finding is that a systematic objective approach to the selection of noise management interventions is not widely apparent. For some of the respondents this kind of approach (essentially the process set out in the BAR) is perceived as burdensome (expensive, too long and involving too many stakeholders).

Although there were a couple of examples where Member States had issued guidance on CBA/CEA, for those Competent Authorities which do not have such tools it appeared that they would welcome guidelines on how to undertake a cost benefit and cost effectiveness analysis. However, they often added that any CBA/CEA guidance, or potential tool, should enable consideration of the local contexts and wider policy needs, and not be mandatory.

4.1.6 Monitoring and measurements of progress, outcomes ad achievements

How is progress monitored or measured?

- **Most commonly, through the monitoring of the implementation of the identified actions**
- **In some cases, by the consensus views of diverse stakeholder forums**
- **Independent auditing of progress or reporting is not commonly undertaken**

A key aim of the study was to understand how progress and success was measured in relation to the noise management actions resulting from the END or BAR. As discussed in Section 4.1.4 in most instances there are no specific, measurable and timebound desired outcomes set prior to the application of the END or BAR process. This intrinsically makes the objective assessment of progress or success complex.

The study reflects the observations and perspectives of the Competent Authorities, and so in some ways is limited in determining whether the existing ways of monitoring are welcomed across all the interested stakeholder groups. The general absence of expected outcomes (which could be social, economic, or environmental in line with the BAR objective of a sustainable development of air transport) across a specified timescale, would seem to both enable stakeholders to argue that on reflection progress had been

good, bad, or indifferent, depending on their perspective, and/or frustrate them by failing to set realistic expectations of the future.

In contrast some Competent Authorities highlighted that noise management success is measured through consensus across multi-stakeholder forums. A more subjective unquantifiable approach potentially, but nonetheless seen as a highly valued indicator of progress, compromise, and collaboration.

The study observed that the most common way of measuring progress or success was through the regular monitoring of the implementation of agreed actions or restrictions and selected noise indicators. These were not necessarily linked to the END and BAR, in fact often they related to actions or limits associated with the airports Environmental Permit or Development Planning Conditions. What was surprising is that this type of progress monitoring was rarely undertaken by an independent auditor or body.

A concern raised by some is that allowing noise action plans to be reviewed and changed without necessarily having delivered a previously agreed action, could lead to frustration amongst stakeholders and give a sense that the actions lacked credibility. There is clearly a need for flexibility, otherwise this could see a much more conservative approach to developing and committing to noise management action delivery. However, it would be potentially useful to encourage a more "formal" process locally in relation to the amendment or cessation of a specific previously agreed action.

As stated previously, the need for a clear NAO, long-term strategy, or priority is key to effective and meaningful monitoring and assessment of progress. Often the Environmental Permit or Development Planning conditions will include time bound targets, measurement indicators, and potentially sanctions and incentives, and it is these that inevitably inform perspectives on the success and progress of noise management strategies.

4.1.7 Engagement and Consultation

How is engagement and consultation undertaken?

- **The respondents generally felt that there was a good level of engagement and consultation using a variety of engagement tools;**
- **Engagement is frequently undertaken through Airport Commission and Technical Stakeholder/Working Groups;**
- **Public consultations often follow the timing of the national framework rather than the END one;**
- **Noise action plan consultations with the public are mainly held online through virtual events or remote feedback;**
- **Promotion activities are mainly through the Competent Authority and airport operator Website;**
- **No examples were found of engagement with non-partisan groups.**

Engagement and consultation are key aspects of both the END and BAR, with some potentially quite onerous requirements set out in the END particularly. The study found that a wide range of techniques

were frequently deployed by Competent Authorities, with websites and face-to-face engagements being commonplace. Although only reflective of the Competent Authority viewpoint, the interviews indicated that generally there was a good level of cross stakeholder engagement around the study airports. During the interviews it was clear that principles such as trust and transparency are found to be highly valued by communities. In this respect, it was noted that in one instance, an independent mediator is employed to facilitate the access and transparency of information.

Understanding different perspectives is an important aspect of good engagement. To facilitate this there is widespread use of multi-stakeholder forums often in the form of Working or Technical Groups, or in some cases Airport Commissions. These will generally include the Competent Authorities, the airport operator, government bodies, ANSPs, airlines, local authorities, and other stakeholder groups. It is less frequent for a specific community group or resident to be represented at these fora. Engagement with these stakeholders tends to be through direct dialogue and/or the formal consultation process.

These consultation periods do not always align with the END process, instead they are likely to be undertaken as part of the Environmental Permit or Strategic Development Planning process. In these instances, the draft noise action plans tend to be made available via online platforms such as the airport operator or Competent Authorities' websites.

An observation drawn out by the study interviews was the differing views taken by the Competent Authorities on the role of the airport operators, where it had not been designated as a Competent Authority for any of the roles in the END or BAR. In one case the Competent Authority recognised the airport operator as a key contributor in helping to identify actions and deliver a successful noise management strategy. In contrast, another Competent Authority responsible for the END perceived the airport as a privileged stakeholder which has more influence in defining the noise related actions, compared to the other stakeholders.

Another interesting observation was that the study did not find examples of proactive engagement with "non-partisan" groups – i.e., those who are not strongly in favour or opposed to aviation interests but that potentially could be impacted either positively or negatively. The study team felt that this could add an interesting perspective to the development of noise management strategies and wider policy.

4.2 Identified practices and approaches

What are the main factors contributing to the different implementations of the END and BAR provisions?

- **The Member States designation of the Competent Authorities' roles under the END and BAR;**
- **The interpretation by Competent Authorities of the END and BAR provisions and the link between the two pieces of legislation;**
- **Whether at national level there is an airport noise legislation or a noise management framework which was in place before the END and BAR implementation.**

The analysis undertaken in Section 4.1 has provided an understanding of how Member States and Competent Authorities have interpreted, approached, and implemented the END and BAR provisions. This

has been used to identify both common trends and areas of difference, and an improved understanding of the causes and reasons behind the different approaches taken.

Prior to the commencement of the Study, it was expected that the implementation of the END and BAR provisions would mainly depend on airport size, airport location with respect to agglomerations, or impact on the nearby population. Using this assumption, the categorisation of the airports (as per **Table 6**), based on the combinations of airport movements and relative population exposed, was used to select the airports for the ad-hoc interviews (as shown in **Table 7**). The intention being to explore the approach taken by each category, with the expectation of similar approaches being adopted among airports within the same category.

In contrast the Study found that the main factors contributing to the different implementations of the END and BAR provisions are:

- The Member States designation of the Competent Authorities' roles under the END and BAR;
- The interpretation, by Competent Authorities and more generally by Member States, of the END and BAR provisions and the links between the two pieces of legislation;
- Whether at national level there was airport noise legislation, or a noise management framework, which was in place before the END and BAR implementation.

The following sections describe the various interpretations and approaches taken by the Competent Authorities in the implementation of the END and BAR provisions.

4.2.1 Identified ownership models

Does the ownership model affect the perception of stakeholders and communities?

- **The ownership model does not influence the perception of the general public or stakeholders.**

Through the questionnaire (**Q2**) information on the ownership of the airports was gathered. The ad-hoc interviews have helped exploring further the ownership of the airport land, infrastructures and operations. While the land at the study airports interviewed was found to be State property, five different models have been identified depending on the ownership of the infrastructure and of the operations:

- Airport infrastructure and operation are owned by a full private company;
- Airport infrastructure is State owned and is operated by a full private company;
- Airport infrastructure is State owned and is operated by a private company where the State is the majority shareholder;
- Airport infrastructure is State owned and is operated by a private company where the State is a minority Shareholder;
- Airport infrastructure is State owned and is operated by a company fully owned by the State.

The study found that the ownership model does not affect how the noise management framework is carried out at the airports. Instead, this is found to be more influenced by the designation of the Competent Authorities' roles as described in more detail in Section 4.2.2.

The interviews discussed whether the ownership model at the airport could alter the perception of the public and wider stakeholders in a positive or negative way. A constant theme in the discussion with all the Competent Authorities was the view that the public is unaware of the existing ownership arrangements, with some giving the example that the nature of complaints received indicated that this was not a determining factor.

Issues arising from the ownership model were linked more to the delegation of roles, and even then, differing views were referenced. For example, one interview cited how concerns had been raised around the delegation of the airport operator for conducting both the strategic noise mapping and the noise action plan, whereas another suggested that this had helped with the engagement process by providing the stakeholders with a single point of contact.

4.2.2 Designation of Competent Authorities

Does the designation of Competent Authorities have influence on the delivery of the END/BAR?

- **Wide fragmentation of the roles can make the process to deliver the noise management framework more complex**
- **Having the airport operator as one of the Competent Authorities, or as the main stakeholder, can have a positive influence in the process of delivering the END/BAR provisions**
- **There is the need for more clarity /emphasis on the role of planning authorities, and guidance in the delivery the land use planning and management aspect of both the END and BAR.**

As discussed in Section 3.4 the designation of Competent Authority for the various roles detailed in the END and BAR has been interpreted in a variety of ways by the Member States. These range from a single organisation responsible, to multiple agencies involved.

The interviews suggested that when there is a fragmentation of the roles across multiple bodies or organisations, there are uncertainties over the scope and jurisdiction, as well as interaction with the other Competent Authorities. This was described by some Competent Authorities in this model as making the process of identifying the noise problem and application of the ICAO Balanced Approach more complex, given that the different authorities may have different priorities. In addition, it can also be difficult for community and wider stakeholders to identify clear accountability when seeking information or enquiring about a change in their situation. This type of model suggests that a clarification of the different roles and responsibilities of Competent Authorities under the END and BAR would help understanding the different roles and responsibilities within the noise management framework.

Similarly, the model of a single Competent Authority can also create issues as stakeholders may feel that the Competent Authority has too wide a remit, and lacks balance or independent scrutiny. The different competencies needed across the END and BAR processes also make this challenging for the Competent Authorities.

The interviews also highlighted that having the airport operator as one of the Competent Authorities, or as a main stakeholder/collaborator, potentially has a positive influence in the process of delivering the END/BAR provisions. In these circumstances it is common to find an established technical group or an airport commission to help develop achievable noise interventions, and facilitate the engagement between Competent Authorities, operators, and other stakeholders.

Some Competent Authorities have also pointed to the difficulties of dealing with the Land Use Planning aspects of the ICAO Balanced Approach. Typically, the responsibility for effective aircraft noise management rests with airport operators, ANSPs, the wider industry and regulators rather than local planners. Several Competent Authorities welcomed the legislation, and in particular the BAR that identified the need for effective land use planning as a key pillar of the ICAO Balanced Approach and suggested that this needed to be better coordinated across the organisations responsible. This had encouraged wider legislation in one instance to incorporate responsibilities for planners in the proximity of airports.

It was suggested that greater involvement and sharing of responsibility with local planners in the delivery of Land Use Management and Planning aspects is required and would be welcomed if specifically highlighted and provisioned through the legislation.

4.2.3 Noise problems/priorities and objectives & CBA/CEA assessment

What is the perception of the END/BAR process for Airport Noise Management?

- **There is wide variation in the application of the BAR and END.**
- **Views on the success and value of the END and BAR often depend on how well they are perceived to assist the respondent**
- **The majority of Competent Authorities described the success of the END and BAR for their airport noise management as fair.**

The aim of the BAR and END legislation is to ensure both a sustainable transport network, critical to economic and social wellbeing, and environmental protection. However, the study has found that there are very few examples where the consideration of the health, economic or network effects has been central to the defining of the noise problem and objectives. Based on the analysis of interview feedback and questionnaire responses, there is considerable variation, or perhaps inconsistency, in the application of the END and BAR processes.

At the heart of this variation appears to be the interpretation of some of the key phrases and assumptions within the existing legislation. The methodology surrounding the identification of a noise problem and subsequent setting of a NAO in a way that provides clarity for all stakeholders is the first point of difference for many Competent Authorities.

A second area of variation is the identification of actions in the development of noise action plans, and determination of operating restrictions. There are two missing aspects which appear to hinder the transparent and objective application of the BAR process. Firstly, there is generally no systematic application of an agreed CBA/CEA process which considers the issues of value for the different stakeholder groups. Secondly, even where these exist, there is a lack of evidence to enable the quantification of the effectiveness and value of many of the interventions described in noise action plans.

Another area impacting the perceived value and success of the legislation, is its interaction with pre-existing legislation and regulatory requirements. Most notably these include Environmental Permits and Strategic Development Planning Conditions. These frequently mean that Competent Authorities perceive the END as a reporting rather than management process.

Finally, the monitoring and measurement of success are often unclear, making it difficult for Competent Authorities to articulate the costs and benefits of a noise related action or Operating Restriction.

For these reasons it is difficult to objectively assess the value or benefit of the respective legislation. The study has shown that the Competent Authorities hold a variety of views on the success and value of the legislation, and these are often shaped by the pre-existing situation at the given airport and/or their ability to achieve particular goals. Nevertheless, the majority of Competent Authorities have described the success of END and BAR for the airport noise management as fair (**Q73**, **Q75**).

4.2.4 Identified delivery models

What are the main models identified in the delivery of the END and BAR provisions?

- **National/Local institutions as Competent Authorities and airport operator as a stakeholder**
- **Airport operator among Competent Authorities in the noise management framework**

The analysis of the information gathered through the questionnaire and the ad-hoc interviews identified two recurring models for the delivery of the END / BAR provisions, and implementation of the noise management framework.

- National/Local institutions as Competent Authorities, and airport operator as stakeholder;
- Airport operator among Competent Authorities in the noise management framework.

The identification of these models took into account:

- The designation of Competent Authorities;
- The role of the airport operator;
- The process used in defining noise related actions or operating restrictions;
- Stakeholder engagement arrangements;
- Cost benefit and cost effectiveness analysis tools;
- Progress monitoring activities;
- Feedback received on the END/BAR role in the noise management process.

Note: it is important to highlight that for each of the two models, we have identified the most common aspects with respect to the END and BAR implementation and the various noise management processes analysed across all the airports in the scope. This does not mean that all airports can be grouped into one or the other categories and share all the aspects described in the following text.

National/Local institutions as Competent Authorities and airport operator as stakeholder

In this model, the airport can be privately owned and operated, or operating through concession.

The Competent Authorities designated under the END and BAR are usually a few national or local government/ministry agencies/departments, which helps make the process of developing noise action plans more efficient.

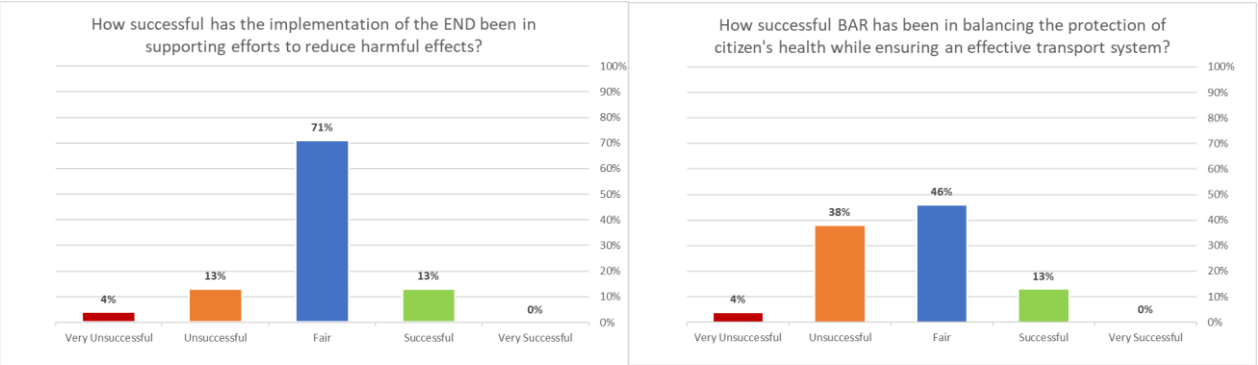
In these contexts, the airport operator is one of the stakeholders engaged by the Competent Authorities along with the other stakeholders. The engagement with the public often occurs through established forums.

The noise problem is identified when there is an exceedance of the national criteria, and as a result noise abatement objectives can be established and if required operating restrictions implemented. There is no single NAO statement or expected outcomes defined. However, monitoring activities is used to verify the progress of the actions outlined in the noise action plans.

Cost benefit or cost effectiveness tools exist in some instances and are used in the definition of the noise operating restrictions.

While most of the airports identified under this model have rated the implementations of the END and BAR as fair to successful, there are examples of Competent Authorities rating them negatively. They highlighted the difficulty of enforcement of the identified actions by the Competent Authorities as a result of only being responsible for the action planning process, or the burdensome process to identify or implement new operating restrictions under the BAR.

Figure 3 - Survey result for the identified model: National/Local institutions as Competent Authorities and airport operator as stakeholder



Airport operator among Competent Authorities in the noise management framework

In this model, generally the State is the owner of the infrastructure while the operator is a private organisation that operates through concession.

The airport operator is the designated Competent Authority responsible of the development of the noise action plans.

The engagement is facilitated by the establishment of an Airport Commission or Technical Group which includes the airport operator, the other Competent Authorities such as government agencies or ministries, local authorities, industrial and local stakeholders.

These airports often have a national legislation that pre-existed the European and a well-defined noise management process. The noise problem is therefore identified when there is an exceedance of the national limits, and the identification of the noise measures mainly follows the national legislation process e.g., Environmental permits, Planning Applications or Strategic Development Plans. It is through these processes that the definition of the actions and the stakeholder engagement are undertaken. The process aligns broadly with the END, which is considered more for reporting.

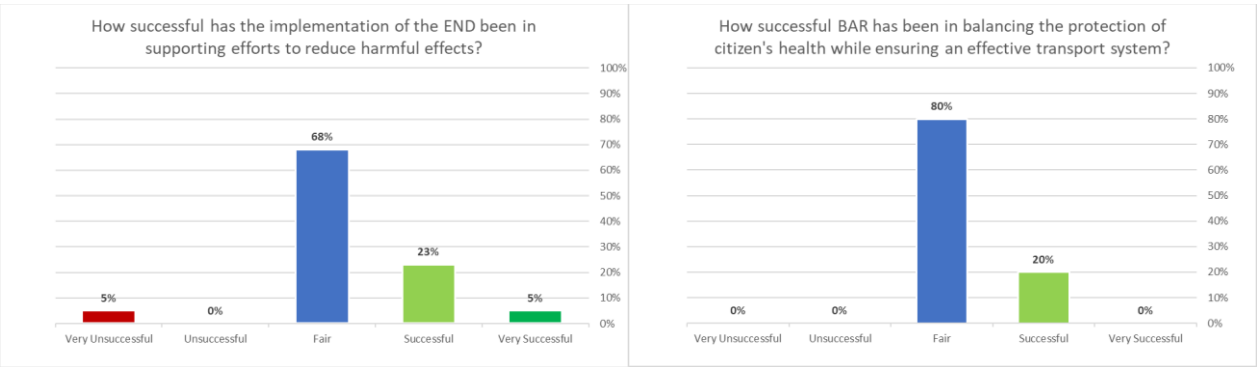
Consequently, the noise action plans mainly report actions already defined through the national noise management framework.

There is no single NAO statement or expected outcomes defined. However, monitoring activities is used to verify the progress of the actions outlined in the noise action plans.

There are no structured cost benefit or cost effectiveness assessment tools to identify noise related actions, which are usually established through the collaboration of the stakeholders of the Airport Commission / Technical Group.

The Competent Authorities of the airports identified within this model have generally rated the implementation of the END and BAR from fair to very successful, suggesting an overall satisfaction of the contribution of the END and BAR in their airport noise management.

Figure 4 - Survey result for the identified model: Airport operator among Competent Authorities in the noise management framework



4.2.4.1 Variants of the identified delivery models

Within the two identified delivery models, two further variants have been highlighted which have some peculiar aspects compared to the main ones described:

- Highly fragmentated role designation of Competent Authorities, and airport operator as stakeholder;
- Airport operator as the main Competent Authority for the implementation of END and BAR.

Highly fragmentated role designation of Competent Authorities, and airport operator as stakeholder.

In this model the airport infrastructure is owned by a private organization, with the State as a minor shareholder, and operated by a different private company. An independent mediator assures the transparency of information.

The Competent Authority designation is fragmentated, with the airport operator as one of the principal stakeholders. The fragmentation of the roles makes coordination for the definition of a noise problem, establishment of objectives, and identification of noise measures, more complex.

However, there are Cost Benefit Analysis tools provided by the national legislation, which have been used to determine the existing noise measures or operating restriction(s).

The Competent Authorities of the airports identified within this model have generally described the implementation of the END and BAR provisions as complex because of the many Competent Authorities involved in the process

Airport operator as the main Competent Authority for the implementation of END and BAR.

This model is relatively rare across the Member States in the study. The Airport is the Competent Authority for most roles detailed in the legislation. Airports with this model are usually state owned, which helps enable this situation.

As the single body responsible for the majority of the roles means it is possible for them to be across all aspects of the process, offering a degree of efficiency and continuity.

Stakeholder engagement and collaboration are key for the implementation of the END provisions and to develop the noise action plan. These airports are trusted by the stakeholder representatives, with less intense or conflicting pressures from multiple stakeholder groups. It is acknowledged that this could change in the future if the noise situation changes or worsens significantly.

In defining a noise problem a set process is not followed, rather it is the product of existing national legislation, and the requirements to produce strategic noise maps.

Like other models, there is no single NAO statement or expected outcomes defined. Progress or success are measured by a consensus of feedback from the key stakeholder group that has confidence in the process. However, there is acknowledgement that an objective/measured outcome-based approach may develop in the future, given the implementation of END Annex III and the assessment of harmful effects.

There is no structured cost benefit or cost effectiveness assessment tool. The identified noise related actions included in the noise action plan are based on specific factors that are considered important by the various stakeholders within the Airport Commission / Technical Group.

The progress of the action implementation is measured by the consensus of the stakeholders, focused more on the implementation of the actions rather than their effectiveness.

The Competent Authorities of the airports identified within this model have generally rated the implementation of the END and BAR from fair to very successful.

4.3 Comments and advice for policy improvements

Feedback from Competent Authorities on aspects of the END and BAR that could be reviewed to improve the legislation effectiveness.

- **Clearer guidance regarding:**
  - **The definition of the noise problem, including how to use harmful effects assessment in the identification of the noise problem, objectives and cost-effective noise measures;**
  - **How to establish the noise abatement objective and measurable outcomes;**
  - **The use of Cost Benefit and Cost Effectiveness analysis in identifying noise-related actions and operating restrictions;**
  - **Reporting data, especially population within agglomerations;**
- **Any review of the legislation should maintain the ability of Member States to shape their noise management strategies and take account of the local context and wider national sustainable development policies.**
- **A need to clarify if "General Rules on Airport Noise Management" apply regardless of whether the process set out in the BAR is triggered by the need to consider Operating Restrictions.**
- **The need for consistency in terminology used in both END and BAR and alignment of aims and objectives;**
- **A need for a best-practice platform on noise management and implementation of measures from other EU airports, to help share experience and knowledge and support other airports and Competent Authorities.**
- **Clarification of the different roles and responsibilities of Competent Authorities under the END and BAR;**
- **Clarification of the role and responsibilities for local land use planning bodies in discharging the Land Use Management and Planning aspects of the ICAO Balanced Approach.**
- **An easily accessible, up-to-date central noise performance database for use among all EU Member States, to allow the identification of noise profile data for all aircraft types.**
- **Clarifications on the interpretation of Article 5 and 6 of the BAR.**

The questionnaire and the ad-hoc interviews sought Competent Authority views on how the existing legislation could improve the effectiveness of the END and BAR. The feedback broadly fell into three areas:

- Potential amendments to the legislation;
- Areas for additional guidance; and
- Areas for further clarification.

There are aspects within END and BAR which were frequently raised where the legislation could be amended to improve their effectiveness.

There are language inconsistencies between END and BAR. This includes the use and understanding of terms such as noise problem, noise abatement objective, noise related action, actions, priorities, and long-term strategy, as well as specific frequently used words such as airport, aircraft, or noise measure.

The respective aims of the BAR and END are felt to not fully align, and several respondents felt this has not helped Competent Authorities link the two pieces of legislation together.

It is considered by some that the legislation could be improved by making the "general rules on aircraft noise management" clear in both the legislations. There are some different interpretations of how the wider concept of the ICAO Balanced Approach (effectively set out in Article 5 of the BAR) interact with the END and application of the BAR, which could helpfully be clarified within the legislation.

However, Competent Authorities emphasised that any potential amendments to the legislation should not hinder or undermine the location specific longstanding and pre-existing approaches to noise management, which are well understood and considered effective by many stakeholder groups. More generally, there was strong consistent feedback that the legislation should continue to enable Member States to determine their approach to noise management at their airports. This was because of the unique local settings and need to set noise management in the context of wider national sustainable development policies and objectives.

Outside of the potential amendments to the legislation, there were also frequent calls for clearer guidance on issues raised by, or requirements of, the legislation. Essentially, the point that the terms noise problem, noise abatement objective, noise related action, actions, priorities, and long-term strategy appear to be interchangeable in the legislation and therefore open to different interpretation by Competent Authorities.

All of these are assumed by the legislations to exist, or at least be reviewed as a consequence of the noise assessment (Strategic Mapping). However, there are no explanatory notes as to how they might be developed, or a framework of expectation. Competent Authorities explained that they would welcome guidance to support their approach in these areas (rather than mandatory processes, limits or indicators).

Guidance is also sought for the determination of actions for selection in the noise action plans, and the development and application of a Cost Benefit or Cost Effectiveness analysis in the process. This would include reviewing the feasibility of application of some elements within the legislation, for instance the calculation of the reduction in harmful effects resulting from each action. With this regard, further guidance would be welcomed on the assessment of harmful effects, and how these should relate to defining noise problems, quantifying noise objectives or long-term strategies, and assessing the cost effectiveness of potential noise management actions.

A few areas were highlighted where further clarification from the Commission would be welcomed.

In relation to the strategic noise maps, different approaches are taken by Member States for the assessment of the population exposed to airport noise levels. Different model assumptions and population databases are used and there are different views on whether the population within the agglomeration is to be considered in the total count, or should be exclusively reported within the agglomeration's strategic noise maps. Section 4.1.1 explained how this was reflected in the data provided by the Competent Authorities through the questionnaire, or via the formal END reporting mechanism. While the reporting parameters are defined within the INSPIRE Directive and Regulation (EU) 2019/1010, the END legislation could provide more clarity on the calculation process, and data to be transmitted within its Annex VI in terms of population exposure, especially for the airports located within or in proximity of an agglomeration, to provide consistency across airports and across the different END rounds.

Clarification of the roles and responsibilities of the Competent Authorities under the END and BAR was also sought. The roles for developing, collecting, implementing, approving, and reporting noise action plans and strategic noise maps, should be clearly defined within END, as well as the roles and responsibility of the Competent Authorities under the BAR for the implementation of the Balance Approach. This would also help communities and wider stakeholders to identify clear accountability for actions and in seeking information.

Moreover, Competent Authorities identified the need for effective land use planning and a requirement for better coordination across the organisations responsible, suggesting that this could be assisted by assigning more responsibilities for planners in the proximity of airports. Involvement and responsibility sharing from local planners for Land Use Management and Planning is deemed to be a key requirement for the airports' Competent Authorities and would be welcomed if highlighted/provisioned clearly in the legislation.

It would be useful for the European Commission to explain what support or consultancy could be, or is being, provided to share what other airports have done, and what results have been achieved, so that other airports in a similar context may learn from other experiences. It was suggested that a best practice database could be put in place, to help sharing how noise is managed in other airports.

Some Competent Authorities sought clarification from the Commission as to when data provisions required under BAR are to be actioned. The central database of noise certification data by registration has yet to be completed, and this creates challenges for airports seeking to track their fleet improvement/implement charges or improve noise modelling. Additionally, the Commission should consider how it could ensure that noise profile data for all common aircraft types are included in a centralised noise model database.

Finally on the specific articles, clarification was sought on the BAR Article 5(3) and, Article 6(3) and (4).

Table 10 and **Table 11** provide a summary of the observations made in relation to the specific articles within the legislation.

Table 10 – Main observations in relation to each END's article

END's Articles	Content	Fully Fulfilled	Main Observation	Advice for improvement
Article 1	Objectives		**Inconsistency with BAR objectives**	Guidance is required to explain how the BAR objective to achieve specific noise abatement objectives and the sustainable development of the airport and network capacity relate to the END objective of defining a common approach intended to avoid, prevent or reduce on a prioritised basis, harmful effects. This could be considered as part of a wider guidance explaining the relationship and interconnectivity of the ICAO Balanced Approach, the END and the BAR. A focus on the interpretation of the terms *noise problem*, *noise abatement objective*, *priorities, long-term strategy, and problems and situations that need to be improved*, is critical if a consistent approach to developing noise management plans is desired. This is not advocating that the objectives, desired outcomes or actions need to be the established at European level as these should be determined by each airport in considerations of the local context.
Article 2	Scope	✓	-	
Article 3	Definitions		**Inconsistency of language used in BAR**	There are language inconsistencies between the END and BAR. This includes the use and understanding of terms such as noise problem, noise abatement objective, noise related action, actions, priorities, long-term strategy, and problems and situations that need to be improved, as well as specific frequently used words such as airport, aircraft, or noise measure. An alignment of the definitions between END and BAR is therefore advised. Alternatively explanatory notes on differences could be provided.
Article 4	Implementation and responsibilities		**Mixed interpretation and some uncertainties in roles and responsibilities**	Guidance is required to explain the roles and responsibilities for developing, collecting, implementing, approving, and reporting Noise Action Plans and Strategic Noise Maps, and where they

END's Articles	Content	Fully Fulfilled	Main Observation	Advice for improvement
				overlap with those detailed in the BAR, to avoid potential conflicting priorities. For example, having one body responsible for BAR (and potentially the noise abatement objectives) and another for the END (and the priorities) potentially makes the process of identifying the noise problem and application of the ICAO Balanced Approach more complex given that the different authorities may have different priorities.
Article 5	Noise indicator and their application		**National indicators comparability with L_{den}/L_{night} and in assessing harmful effects**	Where there are national/local indicators linked to assessing harmful effects, there should be clarity as to which should be used for local action planning and whether these should be different to those submitted as part of the strategic noise mapping process under END. For example, the WHO guidelines, on which ANNEX III is based, advocate, where they exist and are statistically significant, for the use of local studies to inform the assessment of harmful effects.
Article 6	Assessment methods		**Harmful effects not usually assessed**	The use of the word "may" in END Article 6(3) might have created uncertainty around the requirement for the assessment of harmful effects together with the lack of dose-response functions within the annex. However, the amendment of ANNEX III is expected to change this for the next round of Strategic Noise Mapping and Noise Action Planning.
Article 7	Strategic noise mapping		**Access to noise performance data, comparability of models and assumptions with/for aggregated data**	The access to noise performance data envisaged by the inclusion of Article 7 of the BAR has yet to be realised. In addition to variations in access to comprehensive noise performance data, the amalgamation of the data provided by the strategic noise mapping process should be caveated by the fact that different models, input assumptions and population databases are used in the individual

END's Articles	Content	Fully Fulfilled	Main Observation	Advice for improvement
				airport calculations. Other "progress tracking" methods and focus on a consistency of approach at each airport should be considered.
Article 8	Action plans (and public consultation)		**Noise action plan reports actions identified within a pre-existing national framework which may have objectives that differ from END.**	The END objective refers to "avoid, prevent, or reduce" the harmful effects and preservation of good environmental noise quality, however this appears to be at odds with specific expansion projects or growing airports which may be operating to or within limits established as part of a planning condition or environmental permit. Adding the word "limit" to the objectives could be considered to help mitigate this situation.
			Priorities have not always been identified and are rarely quantifiable where they have been.	Guidance explaining the END interpretation of the terms priorities and long-term strategy, and their relationship with the noise abatement objective described in the ICAO Balanced Approach and the BAR would be helpful.
			Reviews not undertaken when major development has occurred.	Further clarification of the definition of major development and the END expectations would be useful.
			Development Planning and/or Environmental Permit consultation and engagement outside of END process used to inform noise action plan for submission	Consideration should be given as to whether the public engagement aspects of the END can be considered redundant if noise management strategies or noise-related actions are developed within the Development Planning and/or Environmental Permit and only reported within the noise action plan. Further clarification of Article 8 (7) could assist competent authorities.
			Stakeholders are generally consulted but, in some instances, these are only accredited organisations excluding single or groups of citizens from the engagement activities.	Further clarification of Article 8(7) and highlighting the Article 3 definition of public would help Competent Authorities in understanding what entities are needed in the consultation process and ensure compliance.
Article 9	Information to the public		**Wide use of website to disseminate information and promote engagement**	Co-ordination of good practice examples could help improve information provision.
Article 10	Collection and publication of data by Member States		**Not all major airports' Competent Authorities have reported data across the three END rounds**	It is noted that any long term amalgamated trend data should be caveated by this fact.

END's Articles	Content	Fully Fulfilled	Main Observation	Advice for improvement
Article 11	Review and reporting		**Interest on how reported data have been used by the Commission to determine the long term and medium-term Union's goals**	It would be helpful for the EC to present the underlying data and analysis undertaken to establish its goals.
Article 12	Adaptation	✓	-	
Article 13	Committee	✓	-	
Article 14	Transposition	✓	-	
Article 15	Entry into force	✓	-	
Article 16	Addresses	✓	-	
Annex I	Noise Indicators		**Comparability of night noise data with different approaches used by Member States**	There are limitations in comparing data between airports or aggregating the data into a single figure given the variance in approaches and modelling techniques. A more generic approach that utilises alternative or supplementary measures for analysing trends could be more informative, e.g., number of airports showing increase vs decrease in harmful effects.
Annex II	Assessment Methods for the noise indicators		**Variations in modelling software, assumptions, or inputs such as population databases, make amalgamation to an EU wide trend or comparison between airports of limited value**	
Annex III	Assessment method for Harmful Effects		**Harmful effects expected to be more widely calculated following the 2022 revision of Annex III**	The use of the word "may" in END Article 6(3) might have created uncertainty around the requirement for the assessment of harmful effects together with the lack of dose-response functions within the annex. However, the amendment of ANNEX III is expected to change this for the next round of Strategic Noise Mapping and Noise Action Planning.
Annex IV	Minimum Requirement for strategic noise mapping		**Inconsistency on how agglomeration data is presented.**	Further clarification is required on how agglomeration data are to be presented and to ensure consistency in methodology across Member States.
Annex V	Minimum requirements for action plans		**No noise abatement objective**	Guidance on the noise management process as set out by the ICAO Balanced Approach and within Article 5 of BAR would be useful. This should include how these two pieces of legislation complement each other.

END's Articles	Content	Fully Fulfilled	Main Observation	Advice for improvement
			No clear alignment in definition of long-term strategies, priorities and noise abatement objectives or description of the noise problem	Guidance setting out European Commission understanding of a noise abatement objective could be helpful. This should focus on how it relates to the other key terms (long term strategy, priorities and noise problem) and the structural requirements. For example, it should be SMART and be compatible with other policy objectives. It could make it clear that this is the starting point for the application of the ICAO Balanced Approach, the BAR and the END.
			Limited use of CBA/CEA assessment and challenge feasibility of estimating the number of people affected by each action.	Guidance on best practice methodologies would benefit the process.
			Lack of evidence to enable the quantification of the effectiveness and value of the interventions described in noise action plans	The European Commission could support wider research into the quantification of the effectiveness of noise management interventions in reducing harmful effects e.g., Noise Insulation or runway alternation/operating patterns
Annex VI	Data to be sent to the commissions		**Inconsistent approaches in reporting agglomeration data for airports within or very close to an agglomeration**	Further clarification is required on how agglomeration data are to be reported, to ensure consistency in methodology across Member States.
			Agglomeration data excluded for night time data	

Table 11 – Main observations in relation to each BAR's article

BAR's Articles	Content	Fully Fulfilled	Main Observation	Advice for improvement
Article 1	Subject matter, objectives and scope		**The noise problem and noise abatement objective are rarely set, and guidance is welcomed.**	Guidance is required setting out the European Commission interpretation of a noise abatement objective. This should focus on how it relates to the other key terms (long term strategy, priorities and noise problem) and the structural requirements. For example, it should be SMART and be compatible with other policy objectives. It could make it clear that this is the starting point for the application of the ICAO Balanced Approach, the BAR and the END. Guidance is also required to highlight that the general rules on aircraft noise management (Article 5) should always apply, even if a noise-related operating restriction is not being introduced (Article 1).
			Objectives are inconsistent with END	Guidance is required to explain how the BAR objective to achieve specific noise abatement objectives and the sustainable development of the airport and network capacity relate to the END objective of defining a common approach intended to avoid, prevent or reduce on a prioritised basis, harmful effects. This could be considered as part of wider guidance explaining the relationship and interconnectivity of the ICAO Balanced Approach, the END and the BAR. A focus on the interpretation of the terms *noise problem*, noise *abatement objective, long term strategy,* and *priorities* is critical if a consistent approach to developing noise management plans is desired. This is not advocating that the objectives, desired outcomes or actions need to be the established at European level as these should be determined by each airport in considerations of the local context.
Article 2	Definitions		**Inconsistency of language used in the BAR and END**	There are language inconsistencies between the END and BAR. This includes the use and understanding of terms such as noise

				problem, noise abatement objective, noise related action, actions, priorities, and long-term strategy, as well as specific frequently used words such as airport, aircraft, or noise measure. An alignment of the definitions is therefore advised. Alternatively explanatory notes on differences could be provided.
Article 3	Competent Authorities		**Not all member states have designated a Competent Authority**	As it is the interpretation of many Competent Authorities that the BAR is only applicable when operating restrictions are introduced, in some instances there is no designated Competent Authority under the BAR because no operating restrictions have been introduced or reviewed. It would be helpful to provide guidance explaining the relationship and interconnectivity of the ICAO Balanced Approach, the END and the BAR. How the requirements set out in Article 5 should be accounted for.
			Complexity created by fragmentation of Competent Authority roles for END and BAR	Guidance is required to explain the roles and responsibilities for developing, collecting, implementing, approving, and reporting Noise Action Plans and Strategic Noise Maps, and where they overlap with those detailed in the BAR, to avoid potential for conflicting priorities. For example, having one body responsible for BAR (and potentially the noise abatement objectives) and another for the END (and the priorities) potentially makes the process of identifying the noise problem and application of the ICAO Balanced Approach more complex given that the different authorities may have different priorities.
Article 4	Right of Appeal		**Examples where this has not yet been established**	To note.
Article 5	General rules on aircraft noise management		**There is some confusion surrounding the application of the general rules on aircraft noise management since they are set out in BAR and reflect the ICAO Balanced Approach but are omitted from the END.**	There is a need to clarify if "General Rules on Airport Noise Management" apply regardless of whether the process set out in the BAR is triggered by the need to consider operating restrictions.

			Actions have been identified without a Cost Effectiveness Analysis evaluation or consideration of the public interest as regard the development prospects of airports	The provision of good practice examples or the minimum expectations of a Cost Effectiveness Assessment would be welcomed by many of the Competent Authorities. This could help the determination of actions/measures in line with Article 5.
Article 6	Rules on noise assessment		**There are many examples of Airport Commission / Technical Groups being established but they are not universally found**	Guidance is required to explain why it is critical that Competent Authorities engage with technical groups when setting objectives and considering actions to ensure they are SMART and sustainable.
Article 7	Noise performance information		**Forecasting and performance data concerns due to lack of availability to latest noise performance data expected following the introduction of the BAR**	The anticipated noise information database is still to be established but would be expected to help partially address these concerns. However, forecasting future fleet compositions is challenging and potentially commercially sensitive. This underlines the importance of collaborative technical forums, not only for consideration of operating restrictions but wider noise management interventions and assumptions. The identification of good practice could assist Competent Authorities.
Article 8	Rules on the introduction of operating restrictions		**Except for one Member State - no new operating restrictions have been implemented under BAR**	To note.
Article 9	Developing countries	✓	-	
Article 10	Exemption for aircraft operations	✓	-	
Article 11	Delegated acts	✓	-	
Article 12	Exercise of the delegation	✓	-	
Article 13	Information and revision	✓	-	
Article 14	Existing operating restrictions		**Only one example identified where pre-existing restrictions were being revised, but many airports already had operating restrictions prior to BAR**	To note.

Article 15	Repeal	✓	-	
Article 16	Transitional provisions	✓	-	
Article 17	Entry into force	✓	-	
Annex I	Assessment of the noise situation at an airport		**Access to data on future fleet technology, and in particular deployment, is very limited which makes forecasting the impacts of noise at source challenging**	The anticipated noise information database is still to be established but would be expected to help partially address these concerns. However, forecasting future fleet compositions is challenging and potentially commercially sensitive. This underlines the importance of collaborative technical forums, not only for consideration of operating restrictions but wider noise management interventions and assumptions. The identification of good practice could assist Competent Authorities
			Accountability for the monitoring of encroachment (and wider Land Use Planning aspects of the ICAO Balanced Approach) is unclear	Guidance in relation to the roles and responsibilities of Competent Authorities could also refer to the areas of accountability set out in the ICAO Balanced Approach and how several different organisations (e.g., airlines, airports, planning authorities and regulators) all have a role to play in its effective application.
Annex II	Content		**Except for one member state - no new operating restriction have been implemented under BAR**	To note.

5. Summary and Conclusions

5.1 Summary

The principal aim of the Environmental Noise Directive (END) and the Balanced Approach Regulation (BAR) is to define a common approach intended to avoid, prevent, or reduce the harmful effects of environmental noise from aircraft, while ensuring a sustainable transport network.

The END and BAR set obligations to assess noise emitted by aircraft operations around the airport, their effects on human health, communicate this to the citizens, discuss measures to reduce or prevent the harmful effects, assess the costs and benefits of possible measures, implement such measures and based on an established noise abatement objective or long-term strategy, ensure that these objectives are reached.

However, such objectives may not be interpreted in the same way across all the Member States.

The study therefore had the following objectives:

- To understand how the END and BAR provisions on airport noise management are implemented across the European Union, including:
    - the process followed when preparing strategic noise maps and noise action plans and whether the legislation has been applied and how; and
    - the process followed in the identification of noise-related actions (most cost-effective measures) or when operating restrictions are identified or revised, whether the legislation has been applied and how.
- To understand what practices and approaches have been used in the execution of the noise management framework;
- To identify evidence / examples of how these have helped reach the noise abatement objectives and/or priorities; and
- To gather views on whether there is a need to revise the existing legislation to improve its effectiveness.

The study collected information from the airports Competent Authorities on what practices and approaches have been used in the execution of the noise management framework through:

- An in-depth review of the legal framework;
- A questionnaire to collect information on the implementation of END and BAR provisions; and
- Ad-hoc interviews to understand in more depth the different approaches used and collect inputs for improvements of such legislation.

A total of 55 out of 63 airports within the study scope completed the questionnaire, and the Competent Authorities of 20 of these airports (which included one airport that did not complete the questionnaire) were selected for the ad-hoc interviews.

The analysis contained in the study has identified the majority / aggregated approaches and views, along with reasons behind these and any recurring themes.

Noise problems

The study has found that most Competent Authorities define the noise problem in relation to non-compliance with the national legislation criteria, which often apply within a specific Environmental Permit or Planning Condition. These are the result of separate activities to the END and BAR process and were often established in these Member States prior the European legislation. The noise problem is commonly identified when there is an exceedance of national noise and policies, or contour area limits. This can result in increases in noise exposure or health effects not being identified as a noise problem because the national limits or criteria have not been exceeded. There are examples where the calculation of harmful effects have been used, but these are rare, and in even fewer cases the location of complaints has been used. There are also cases where a systematic methodology is not used for the identification of noise problems, due to the application of different local legislations and the involvement of multiple authorities. In these cases the noise problem identification might change depending on different circumstances.

Noise abatement objective and measurable outcomes

There is no evidence of established and clear noise abatement objective statements which include a quantifiable outcome or defined goal, to be achieved as a result of the action implementation or within a set timeframe. Priorities are often defined through a series of noise related actions to be implemented at the airports.

Currently the objectives and priorities range from those aspiring to a “reduction in population exposure”, generally, without a timeframe or quantum, to a list of key actions for delivery over the course of an action plan.

Noise related actions and operating restrictions

The determination of the noise related actions or operating restrictions is generally not undertaken through a Cost Benefit or a Cost Effectiveness Analysis.

Actions can be identified through working groups / airport commissions, with the engagement of the airport operator, Competent Authorities, local and industry stakeholders. Where there is a national/local legislation pre-existing the European one, END and BAR have not been adopted by Member States as the main driving process for developing the approach to airport noise management. In these instances, Environmental Permits and/or Development Planning conditions often form the basis of the noise action plans and are considered outside of the END or BAR process. However, where the END and BAR are the main legislations for airport noise, this offers an effective noise management process to follow.

Monitoring and measurements of progress, outcomes and achievement

The progress of the action’s implementation is commonly undertaken through monitoring activities. However, the value or effectiveness of specific interventions is rarely quantified within the process. In some cases, the noise action plan progress is measured by the consensus view of stakeholders.

Engagement and consultation

Engagement is frequently undertaken through an Airport Commission or Technical Stakeholder/Working Groups. The public consultations often follow the timing of the national framework rather than the END, and noise action plan consultations with the public are mainly held online through virtual events or remote feedback. Promotion activities are mostly through the Competent Authority and airport operator Website.

Ownership models

The study identified five ownership models. However, none of them significantly affect how the noise management framework is carried out at the airports. Instead, this is found to be influenced by the designation of the Competent Authorities' roles.

Identified models

Two main models have been identified in the delivery of the END and BAR provisions, based on: the designation of Competent Authorities; the role of the airport operator; the process used in defining noise related actions or operating restrictions; stakeholder engagement arrangements; cost benefit and cost effectiveness analysis tools; progress monitoring activities; and feedback received on the END/BAR role in the noise management process:

- National/Local institutions as Competent Authorities and airport operator as stakeholder;
- Airport operator among Competent Authorities in the noise management framework.

Within these two models, it was found that a wide fragmentation of the roles can make the process to deliver the noise management framework more complex, while having the airport operator as one of the Competent Authority, or as the main stakeholder, can have a positive influence on the process of delivering the END/BAR provisions.

Comments and advice for policy improvements

Finally, recommendations have been provided with a specific focus on which provisions of the END and the BAR concerning the preparation, adoption and implementation of action plans could be improved.

Table 12 - Summary of the observations in relation to END

END's Articles	Content	Main Observation
Article 1	Objectives	Inconsistency with BAR objectives
Article 3	Definitions	Inconsistency of language used in BAR
Article 4	Implementation and responsibilities	Mixed interpretation and some uncertainties in roles and responsibilities
Article 5	Noise indicator and their application	National indicators comparability with L_{den}/L_{night} and in assessing harmful effects
Article 6	Assessment methods	Harmful effects not usually assessed
Article 7	Strategic noise mapping	Access to noise performance data, comparability of models, assumptions with/for aggregated data
Article 8	Action plans (and public consultation)	Noise action plan reports actions identified within a pre-existing national framework which may have objectives that differ from END.

END's Articles	Content	Main Observation
		Priorities have not always been identified and are rarely quantifiable where they have been.
		Reviews not undertaken when major development has occurred.
		Development Planning and/or Environmental Permit consultation and engagement outside of END process used to inform noise action plan for submission
		Stakeholders are generally consulted but, in some instances, these are only accredited organisations excluding single or groups of citizens from the engagement activities.
		Stakeholders are generally consulted but, in some instances, these are only accredited organisations excluding single or groups of citizens from the engagement activities.
Article 9	Information to the public	Wide use of website to disseminate information and promote engagement
Article 10	Collection and publication of data by Member States	Not all major airports' Competent Authorities have reported data across the three END rounds
Article 11	Review and reporting	Interest on how reported data have been used by the Commission to determine long term and medium-term Union's goals
Annex I	Noise Indicators	Comparability of night noise data with different approaches used by Member States
Annex II	Assessment Methods for the noise indicators	Variations in modelling software, assumptions or inputs such as population databases make amalgamation to an EU wide trend or comparison between airports of limited value
Annex III	Assessment method for Harmful Effects	Harmful effects expected to be more widely calculated following the 2022 revision of Annex III
Annex IV	Minimum Requirement for strategic noise mapping	Inconsistency on how agglomeration data is presented.
Annex V	Minimum requirements for action plans	No noise abatement objective
		No clear alignment in definition of long-term strategies, priorities and noise abatement objectives or description of the noise problem
		Limited use of CBA/CEA assessment and challenge feasibility of estimating the number of people affected by each action.
		Lack of evidence to enable the quantification of the effectiveness and value of the interventions described in noise action plans
Annex VI	Data to be sent to the commissions	Inconsistent approaches in reporting agglomeration data for airports within or very close to an agglomeration
		Agglomeration data excluded for night time data

Table 13 - Summary of the observations in relation to BAR

BAR's Articles	Content	Main Observation
Article 1	Subject matter, objectives and scope	The noise problem and noise abatement objective are rarely set, and guidance is welcomed
		Objectives are inconsistent with END
Article 2	Definitions	Inconsistency of language used in the BAR and END
Article 3	Competent Authorities	Not all member states have designated a Competent Authority
		Complexity created by fragmentation of Competent Authority roles for END and BAR
Article 4	Right of Appeal	Examples where this has not yet been established

BAR's Articles	Content	Main Observation
Article 5	General rules on aircraft noise management	There is some confusion surrounding the application of the general rules on aircraft noise management since they are set out in BAR and reflect the ICAO Balanced Approach but are omitted from the END
		Actions have been identified without a Cost Effectiveness Analysis evaluation or consideration of the public interest as regard the development prospects of airports
Article 6	Rules on noise assessment	There are many examples of Airport Commission / Technical Groups being established but they are not universally found
Article 7	Noise performance information	Forecasting and performance data concerns due to lack of availability to latest noise performance data expected following the introduction of the BAR
Article 8	Rules on the introduction of operating restrictions	Except for one Member State - no new operating restrictions have been implemented under BAR
Article 14	Existing operating restrictions	Only one example identified where pre-existing restrictions were being revised, but many airports already had operating restrictions prior to BAR
Annex I	Assessment of the noise situation at an airport	Access to data on future fleet technology and in particular deployment is very limited which makes forecasting the impacts of noise at source challenging
		Accountability for the monitoring of encroachment (and wider Land Use Planning aspects of the ICAO Balanced Approach) is unclear
Annex II	Assessment of the cost effectiveness of noise -related operating restrictions	Except for one member state - no new operating restriction have been implemented under BAR

5.2 Conclusions

Co-ordinating the approach to noise management

The legislation is broadly in good shape with clear processes and accountabilities which seek to ensure that all stakeholders are engaged and consulted. There are good examples of stakeholder engagement and participation in the development and delivery of noise action plans. The study did not find that the responsibilities expected of the Competent Authorities were not being executed. There are, however, opportunities for the European Commission to clarify terms and provide best practice guidance as discussed elsewhere in this section.

The view that the BAR and END are part of a co-ordinated wider noise management framework is not universally held. There is a need to set out more clearly how defining the noise problem, setting the objective, the ICAO Balanced Approach, the END and BAR, and pre-existing local noise management strategies all interact. The study found that some Competent Authorities described the BAR and END as linked by similarities but not part of the same process, whilst others distinguished between locally agreed Environmental Permit or Planning conditions and the legislation. The link between the wider ICAO Resolution (A33-7) in the development of aircraft noise management strategies in general, and the specific requirements of the END and BAR is often interpreted differently. It would be helpful if the European Commission could set out (perhaps in a diagram) how these various aspects should be considered and understood.

The link between the two pieces of legislation is not universally appreciated and requires clarification. The two pieces of legislation are often seen as separate entities, with the BAR only triggered if an Operating Restriction is being proposed. It would be helpful if the process of developing a noise management strategy

was mapped out, indicating how these requirements complement each other. For instance, the ICAO Balanced Approach is prevalent in both (although not so overtly referenced in the END) since in determining prospective actions there will be a need to consider each of the pillars and understand if the proposed measures (not operating restrictions) are effective in achieving the desired outcome, priority, long term strategy or objective. If they are not, then operating restrictions should be considered, and evaluated in line with the BAR.

The aims of the respective legislation could be interpreted as not aligned and would benefit from greater alignment or clarity. The BAR has as its key objective *"…sustainable development. This requires an integrated approach aimed at ensuring both the effective functioning of Union transport systems and protection of the environment"*[73]. On the other hand, the END states "*the aim of this Directive…define a common approach intended to avoid, prevent, or reduce on a prioritised basis the harmful effect, including annoyance, due to exposure to environmental noise*"[74]. Whilst the term "protection of the environment" in the BAR might be considered as a summary of the aim set out in the END, the same is not true the other way. The END's aim does not acknowledge the need for a functioning transport system within the context of sustainable development. In the context of an emerging economy and expanding aviation transport network, the END could therefore be interpreted as a limitation (since it only describes avoid, prevent, or reduce) and therefore create resistance to its application. There is an opportunity to join up the different policy objectives by enabling the measures of success around a noise abatement objective / priority to be more broadly interpreted, and include other environmental, economic, or social indicators.

The language inconsistencies between the two pieces of legislation need to be addressed to help reduce the likelihood of confusion or misinterpretation. There are several instances where the differences in phrasing create confusion where there could be clarity. The most obvious example is in the use of the term's "priority" or "long term strategy" (END) and "noise abatement objective" (BAR). These could be interpreted as the same thing (i.e., the same desired outcomes) and be considered as complimentary or in the case where they are set by different Competent Authorities potentially be in conflict (i.e., conflicting outcomes).

The need for guidance

Competent Authorities and wider stakeholders would benefit from greater clarity and guidance in relation to the definition of key terms within the legislation and best practice in the application of the END and BAR. Specifically, the terms noise problem, noise priority, long term strategy, and noise abatement objective need further clarification. There is a need for Member States to retain the ability to set the approach to noise management within the local context, but the European Commission could helpfully set out a framework within which these key terms could be defined. For instance, a Member State determines the noise abatement objective and indicators of success, by using generic guidance to ensure it contains the attributes considered as best practice, such as being timebound or measurable.

Where there is national/local legislation pre-existing the European one, END and BAR have not always been adopted by Member States as the main regulatory framework for airport noise management. It would be helpful to provide guidance as to how the END and BAR processes are expected to interact with pre-existing national legislation, strategic development plans, noise management frameworks, and

[73] Recital 1 of the BAR
[74] Article 1 of the END

broader policy objectives. Often there are well established noise management strategies in place at airports which have been developed following the existing national / local regulatory frameworks, rather than being driven by the process provided by the END and BAR. However, in determining the content of these strategies the principles of the ICAO Balanced Approach have been followed and there are clear objectives or outcomes that must be delivered or adhered to contained in Environmental Permits and/or Planning Conditions. The consultation, review, and monitoring timeframes do not necessarily align and although END is clear in requiring that these are recorded in the noise action plan, there is no advice on the practicalities of essentially following two systems. For example, making it clear whether, where an existing process aligns with the requirements of the END and considers the ICAO Balanced Approach, it is acceptable for the END to be considered more as a reporting mechanism.

Improving the practical application of the legislation

The assumption that the noise problem has been clearly identified, and a quantifiable noise abatement objective or priority has been set hinders the application of the legislation. This is because the noise abatement objective may not have been established, or priorities do not set measurable desired outcomes. This can significantly hinder identifying a noise problem, and subsequently assessment of which measures to adopt and how much they contribute to the achievement of the objective is not feasible. This also hinders the ability to monitor and assess progress, since there are no realistic expectations set prior to the application of the action plan. This leaves progress open to interpretation by different stakeholder groups based on their respective perspectives.

Competent Authorities should aspire to SMART (Specific, Measurable, Achievable, Realistic, Timebound) noise abatement objectives, but there are significant limitations preventing these becoming widespread. The benefit of a SMART noise abatement objective is that it would provide stakeholders with the clarity of realistic expectations and enable objective assessment of progress. However, there are some significant challenges at present, some of which the European Commission could help unlock. Firstly, forecasting future impacts is inherently challenging particularly over the longer term, but the fact that often Competent Authorities do not have insight into the fleet plans of their major operators adds to the challenge. Secondly the uncertainty, particular now, in the economic conditions of the future can make future predictions more cautious if they are expected to be binding in some way. Aside from forecasting the volume and type of future operation at the airport, quantifying the effectiveness of the interventions is an area of very limited research. For example, most airports have or plan to have noise insulation programmes, however none of them can quantify how much this will reduce sleep disturbance or annoyance. The European Commission could help in this regard by supporting more widespread research and identifying best practice. Finally, even if a full understanding of the effectiveness of interventions were to exist there are limited examples of cross stakeholder accepted CBA or CBE tools or best practice guidance to inform the site-specific selection of potential interventions. The EC could also support and identify best practice in this regard, including acknowledgement that over reliance on the outcomes of a CBA/CEA may lead to not selecting options that have broad stakeholder support (e.g., valuing the non-acoustic interventions).

Accountability for the land use planning pillar of the ICAO Balanced Approach should be given greater emphasis. Accountabilities for the different aspects of the ICAO Balanced Approach are generally focused on industry (more often the airport and CAA or ANSP) and Government bodies. The responsibility for land use planning is typically overlooked, or one step removed from the remaining pillars. It would be helpful for the legislation or associated guidance to clarify the role and responsibilities of the relevant Competent Authorities, and how this pillar of the ICAO Balanced Approach can support the achievement of the noise abatement objectives and/or priorities.

The expectation that the effectiveness of each action considered should be quantified in terms of the number of people affected is unrealistic (END ANNEX V (3)). Many of the actions currently in noise action plans cannot be directly linked to a quantum of benefit in managing the harmful effects, particularly those that will not change L_{eq} based metrics (e.g., rotating runway use during the 12/16 hour day or ceasing operations for a few hours in the 8 hour night will not change the calculation of the harmful effects if the number and type of operations remain constant, but may well be highly valued and effective for the local population). The practical application is that through the engagement and consultation process, particularly with Technical Groups, actions which could reduce noise exposure or measures requested by community stakeholders such as noise insulation schemes are debated and agreed upon. There is currently a research gap in relation to valuing the effectiveness of the various interventions commonly adopted that the EC could help fill but, in the interim, a revised END (or appropriate guidance) might look to recognise this and simplify the requirement in ANNEX V (3) to one that assesses the overall impact of the proposed noise action plan.

Delivering the END and BAR

In general, there appears to be a wide range of engagement and consultation activity undertaken by the Competent Authorities in relation to noise management and the application of the END and BAR. This finding is limited by the fact that for the most part this is the view of the Competent Authorities, rather than the stakeholders with which the engagement and consultation has occurred. Extending the consultation to non-partisan or expert groups could help broaden the perspectives and help in policy development.

A collaborative approach involving the airport operator appears to be an effective approach. This was in part demonstrated during the interview stage where the Competent Authorities responsible for the completion of the questionnaire ensured that several of the technical stakeholders involved in the development and delivery of the noise action plans were present. From these it was possible to get a greater sense of satisfaction with the existing process.

Monitoring progress and success

When considering the success of the END and BAR the EC should consider alternative indicators. The current approach of amalgamating results and macro trends in the number of people exposed to noise levels above 55 dB L_{den} and 50 dB L_{night} does little to explain how the noise situation is being managed across the European Union. This is because the models, assumptions and external inputs are not universally consistent (e.g., a population database may or may not have been updated, night-time period can be set differently). Nor does it recognise the local situation, which may include increasing the noise impacts in the short/medium term, or within an agreed limit, in order to secure other sustainability benefits. There is an opportunity to begin to quantify progress by the quality of the noise abatement objectives set, and the quantity of the number that have been achieved. For example, X number of airports have a SMART objective in place, and over the course of the latest round of action planning Y have been achieved. Another example might be a count or proportion of airports that have seen an increase or decrease in the harmful effects as a consequence of their noise management strategies. This could for example present the data with and without population change to help understand the extent to which permitted development has impacted on exposure levels.

Frustration with the legislation may be because of a perception that it has prevented an outcome of one specific organisation. For example, from a political perspective an organisation may wish to implement or

avoid introducing restrictions, but the "evidence" required by the process is either considered too onerous to gather or unsupportive.

Feedback

The aircraft noise performance information (as determined by the ICAO certification procedure) to which Article 7 of the BAR refers are yet to be made available by aircraft registration in an electronic format from an EASA central database. The provision of, or access to, accurate and up to date noise certification data by aircraft registration was highlighted as an issue for several of the Competent Authorities, particularly at interview. This data informs model forecasting and assessment of the noise situation and has not been as fully developed or made accessible as expected under the provisions of Article 7(3) of the BAR.

The European Commission should consider how it can address concerns raised by several Competent Authorities with respect to the submission of the results of the strategic noise maps. Competent Authorities expressed a view that reporting to EIONET is difficult, complex and time-consuming requiring technical expertise to upload data. There is also concern over the changes expected in the data reporting requirements for END Round 4 leading to additional work and complexity in the data submission process compared to previous rounds.

The Member States should remain responsible for defining the noise problem, establishing the noise objectives, and setting priorities. From the study it is clear that the local circumstances (e.g. proximity to an agglomeration, economic significance of the airport, development prospects, stakeholder relationships, dose-response relationships, etc.) at each airport are unique, and there was no support expressed for the mandating of these aspects centrally. This enables the local context and wider policy objectives (for example growing the aviation sector/international connectivity of the State) to be considered and aligned.

Limitations of the Study

The study is limited by the fact that it has only considered the views and input from the relevant Competent Authorities and not the wider stakeholders involved in and impacted by their decisions. The European Commission might consider seeking views from other key stakeholders in the process to ascertain if the views and observations identified in this study are consistent across the stakeholder groups.

Appendix A – Copy of the questionnaire

European Commission Study on Airport Noise Reduction

1. Introduction

This questionnaire has been prepared by Noise Consultants Limited which is supporting the European Commission with a study on *Airport Noise Reduction*. The focus of this study is to understand how aircraft noise is currently being managed within the European Union Member States by collecting up to date information on the implementation of both Directive 2002/49/EC *(END)* and Regulation 598/2014 *(BAR)*, and any associated practices and approaches in the execution of this noise management framework.

European Commission Study on Airport Noise Reduction

2. Survey Instructions

The questionnaire consists of 77 questions divided into 11 sections:

3. Description of the airport
4. Designation of roles
5. END and BAR implementation into national/local legislation
6. Defining the noise problem
7. Setting the priorities / objectives
8. Assessment methodology of noise measures
9. Identification of noise measures
10. Consultation and engagement
11. Resolution and review
12. Overview
13. Interview

We kindly ask you to complete all the 77 questions included in the questionnaire.

Please contact NCL at aircraftnoisestudy@noiseconsultants.co.uk to receive the Web Link to access and complete the questionnaire online.

Definitions

121 Stakeholder briefings: These are bilateral meetings between the body seeking to engage or consult and individual stakeholder representatives. (e.g., the airport and the home-based airline).

Consultative Committee Groups: These are pre-existing often formally established forums, typically covering a range of issues - including scope to comment on the issue being consulted or engaged on.

Cost-Benefit Analysis: It is an evaluation method that provides a logical and consistent framework for assessing a particular option or options. A Cost-Benefit Analysis gives an indication of the total economic welfare effects of a project by comparing all costs and benefits.

Cost-Effectiveness Analysis: It is an evaluation method focused on achieving a given objective in the most cost-effective way, requiring a comparison of only the costs.

Development: It is taken to mean the inclusion of the entire area of the airport - both aviation (e.g. airspace, infrastructure, passenger cap change, movement cap change, flight routes or procedures) and non-aviation (e.g. retail, food & beverage, parking, advertising, car rental, consumer services and landside real estate) uses. It also includes suggested land use on land adjacent to the airport.

Focus Groups: These are small group discussions aimed at capturing views and experiences on specific issues. The participants typically share similar characteristics (e.g., men under 35 with neutral views on aviation).

Marginally Compliant: Marginally compliant aircraft means aircraft which are certified in accordance with limits laid down in Volume 1, Part II, Chapter 3 of Annex 16 to the Convention on International Civil Aviation signed on 7 December 1944 (the Chicago Convention) by a cumulative margin of less than 8 EPNdB (Effective Perceived Noise in Decibels) during a transitional period ending on 14 June 2020, and by a cumulative margin of less than 10 EPNdB following the end of that transitional period, whereby the cumulative margin is the figure expressed in EPNdB obtained by adding the individual margins (i.e. the differences between the certificated noise level and the maximum permitted noise level) at each of the three reference noise measurement points defined in Volume 1, Part II, Chapter 3 of Annex 16 to the Chicago Convention.

Mediation Meetings: Usually independently chaired these bring together representatives from groups with strongly differing views to develop acceptable solutions.

On-line/virtual consultation events: These allow the public to access the consultation material via a virtual tour remotely. These enable people to participate in the consultation if they are unable to attend an event, have restrictive mobility or are in recent times "lockdown due to pandemic.

On-line publication and feedback: Information made available on a website with a standardised feedback form. These are not staffed.

Public Consultation Events: Staffed events that are held in public places (e.g., Community Halls/Libraries) enabling full public access. Typically featuring display boards and documented materials explaining the issue being consulted on.

Round of Action Planning

First Round - The noise mapping which took place in 2007 and the subsequent adoption of Action Plans in 2008 onwards.
Second Round - The noise mapping which took place in 2012 and the subsequent adoption of Action Plans in 2013 onwards.
Third Round - The noise mapping which took place in 2017 and the subsequent adoption of Action Plans in 2018 onwards.
Fourth Round - The noise mapping that will take place in 2022 and the subsequent action plans that will be prepared in 2024.

Technical Expert Groups: These are specialist groups comprised of experts and focused on finding solutions or options to a specific issue. (e.g., Airspace Design Proposals or Proposed Noise Management operational interventions might involve ANSPs, Airlines, Airports and Regulators).

European Commission Study on Airport Noise Reduction

3. Description of the airport

1. Please, provide the following information about the Airport:

Name of the Airport	
Country	
Email contact of the Competent Authority responsible for the submission of the completed questionnaire for the airport	

2. Is the airport privately owned and operated?

Article 8 2002 END / Annex V

- ○ No
- ○ Yes
- ○ Other, please specify

3. In 2021, were Annual Movements expected to exceed 2017 levels [over the course of the current third round of action planning] without the COVID-19 impact?

Article 8 2002 END/ ANNEX V Article 6 BAR 2014 ANNEX I

- ○ No
- ○ Yes

4. In 2021, were annual passenger figures expected to exceed 2017 levels [over the course of the current third round of action planning] without the COVID 19 impact?

Article 8 2002 END/ ANNEX V Article 6 BAR 2014 ANNEX I

- ○ No
- ○ Yes

5. Are Annual Movements expected to return to the pre COVID-19 levels (2019) from 2022 over the course of the next fourth round of action planning?

Article 8 2002 END/ ANNEX V Article 6 BAR 2014 ANNEX I

- ○ No
- ○ Yes

6. Are annual passenger figures expected to return to the pre COVID-19 levels (2019) from 2022 over the course of the next fourth round of action planning?

Article 8 2002 END/ ANNEX V Article 6 BAR 2014 ANNEX I

- ○ No
- ○ Yes

7. What is the current fleet mix in terms of certificated noise levels (or their equivalent) over the course of 2021? Please insert integer values. Total must be 100.

Article 8 2002 END/ ANNEX V Article 6 BAR 2014 ANNEX I

% of marginally compliant Chapter 3 (or equivalent)

% of Chapter 3 (or equivalent)

% of Chapter 4 (or equivalent)

% of Chapter 14 (or equivalent)

% of other aircraft types (helicopters, small tourist aircraft, drones excluded)

8. Were there any major developments affecting the noise situation planned from 2017? [over the course of the current third round of action planning]? Details can be provided in the comment box.

Article 8 2002 END/ ANNEX V

- ○ No
- ○ Yes

Please, provide details:

9. Were there any major developments affecting the noise situation before 2017? [over the course of the previous first and second round of action planning]? Details can be provided in the comment box.

Article 5 2002 END ANNEX V

- ○ No
- ○ Yes

Please, provide details:

10. Were there any noise reduction measures in place before 2007 [prior to the first round of strategic noise mapping and action planning]?

Article 5 2002 END ANNEX V

- ○ No
- ○ Yes

11. Were any airport developments already approved prior to the introduction of the END in mid-2006?

Article 8 2002 END / ANNEX V

- ○ No
- ○ Yes

12. Were there any noise limit values in place prior to the first round of strategic noise mapping and action planning?

Article 8 &10 2002 END ANNEX V & VI

- ○ No
- ○ Yes

13. Have Competent Authorities granted an exemption from noise operating restrictions for marginally compliant aircraft registered in developing countries?

Article 9 BAR

- ○ No
- ○ Yes, but Competent Authorities of other Member States as and Commission were not informed of such exceptions
- ○ Yes, and Competent Authorities of other Member States as well as Commission were informed of such exceptions

14. Are noise abatement take-off and approach procedures set out in the Airport AIP?

Article 6 BAR 2014 ANNEX I

- No
- Yes

15. Do the major operators advise the airport of any upcoming fleet change from 2022 [over the course of the fourth round of action planning]?

Article 6 BAR 2014 ANNEX I

- No
- Yes

16. How is the fleet mix expected to change from 2022 [over the course of the fourth round of action planning] in terms of certificated noise levels (or their equivalent)? Please insert integer values. Total must be 100.

Article 6 BAR 2014 ANNEX I

% of marginally compliant Chapter 3 (or equivalent)

% of Chapter 3 (or equivalent)

% of Chapter 4 (or equivalent)

% of Chapter 14 (or equivalent)

% of other aircraft types (excluding helicopters, small touristic aircrafts, drones)

17. What is the **number of ATMs** considered in the last three rounds of END?

Article 8 2002 END/ ANNEX V

	ATMs
END R1 (2007)	
END R2 (2012)	
END R3 (2017)	

18. What are the **numbers of people exposed to noise (Lden)** experienced around the airport reported in the last three rounds of END?

Article 8 2002 END/ ANNEX V

	Number of people exposed to noise between **≥ 55 dB < 65 dB Lden**	Number of people exposed to noise between **≥ 65 dB < 75 dB Lden**	Number of people exposed to noise between **≥ 75 dB Lden**	Does the number of people exposed include population in agglomerations?
END R1 (2007)				
END R2 (2012)				
END R3 (2017)				

19. What are the **Lden contour areas** reported in the last three rounds of END?

Article 8 2002 END/ ANNEX V

	Contour Area in Km2 **≥ 55 dB Lden**	Contour Area in Km2 **≥ 65 dB Lden**	Contour Area in Km2 **≥ 75 dB Lden**	Does the contour area include agglomerations?
END R1 (2007)				
END R2 (2012)				
END R3 (2017)				

20. What are the **numbers of people exposed to noise (Lnight)** experienced around the airport reported in the last three rounds of END?

Article 8 2002 END/ ANNEX V

	Number of people exposed to noise between **≥ 50 dB < 60 dB Lnight**	Number of people exposed to noise between **≥ 60 dB < 70 dB Lnight**	Number of people exposed to noise between **≥ 70 dB Lnight**	Does the number of people exposed include population in agglomerations?
END R1 (2007)				
END R2 (2012)				
END R3 (2017)				

21. What are the **Lnight contour areas** reported in the last three rounds of END?

Article 8 2002 END/ ANNEX V

	Contour Area in Km2 **≥ 50 dB Lden**	Contour Area in Km2 **≥ 60 dB Lden**	Contour Area i n Km2 **≥ 70 dB Lden**	Does the contour area include agglomerations?
END R1 (2007)				
END R2 (2012)				
END R3 (2017)				

22. How often are Strategic Noise Mapping Contours (Lden, Lnight, Lday, Levening) produced?

Article 7 2002 END/ANNEX I Article 6 BAR 2014 ANNEX I

- ○ Annually
- ○ Bi-annually
- ○ Every 5 years
- ○ Other, please specify

23. In addition to Lden and Lnight, what supplementary noise metrics are used to describe the noise situation at the airport?

Article 5 2002 END/ANNEX I

- ☐ Leq,T (e.g. Lday, Levening, Leq,16hrs, Leq,8hr etc.)
- ☐ N above
- ☐ Overflights
- ☐ Others, please specify
- ☐ No supplementary noise metrics used

24. Are forecasts of future Strategic Noise Maps being produces?

Article 7 2014 BAR / ANNEX IX

- ○ No
- ○ Yes

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4. Designation of roles

25. With reference to END and **Noise Action Plan** (NAP), who is(are) the Competent Authority(ies) responsible for:

Article 4 2002 END

Developing the NAP

Collecting the NAP

Implementing the NAP

Approving the NAP

Reporting to the European Commission the NAP

26. With reference to END and **Strategic Noise Maps** (SNM), who is(are) the Competent Authority(ies) responsible for:

Article 4 2002 END

Developing the SNM

Collecting the SNM

Approving the SNM

Reporting to the European Commission the SNM

27. With reference to BAR, please specify:

Article 3 2014 BAR / Article 5 2014 BAR

Who is the body/organization responsible for ***developing*** the **noise management measures** as per the ICAO Balanced Approach?

Who is the body/organization responsible for ***approving*** the **noise management measures** as per the ICAO Balanced Approach?

Who is the body/organization responsible for ***applying*** the **ICAO Balanced Approach,** ensuring that operating restrictions are not considered as first measure as per EU598/2014?

Who is(are) the Competent Authority(ies) responsible for ***ensuring*** the ICAO Balanced Approach **process is followed as set out in EU598/2014, if operating restrictions are to be considered?**

28. Have all the Competent Authorities designated under END and BAR in relation to the airport been identified in the questions above? If not, please specify the name of the missing Competent Authorities and their roles.

Article 4 2002 END / Article 5 2014 BAR

- Yes
- No, please specify

29. Has the European Commission been notified of the names and addresses of all the designated Competent Authorities?

Article 3 2014 BAR

- ○ No
- ○ Yes

30. How has the independence of the competent authorities been ensured?

Article 3 2014 BAR

31. Who determines whether a noise problem exists at the airport?

Article 5 2014 BAR

32. Who establishes the noise abatement objective(s) for the airport?

Article 5 2014 BAR

33. Who is the designated appeals body?

Article 4 2014 BAR

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5. END and BAR implementation into national/local legislation

34. Where END and BAR are implemented into the national/local legislation?

Please, state the national legislation and if available provide a web link:

National/local legislation implementing END

National/ local legislation implementing BAR

35. How does the national/local legislation relate to the END and BAR requirements?

	Implements the requirements	Complements the requirements	Exceeds the requirements	Other
END	○	○	○	○
BAR	○	○	○	○

If Other is selected, please specify

36. Are there any further national/local legislations that relate to airport noise management? if yes, please specify

- ○ No
- ○ Yes, please specify

37. How are Competent Authorities intending to implement the new directive 2020/367/EC?

ANNEX III 2002 END amendment

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6. Defining the noise problem

38. Has a noise problem been identified for the airport? If yes, can this be provided?

Article 5 2014 BAR / Article 8 2002 END ANNEX V

- ○ No
- ○ Yes, please specify

39. Has the noise problem been described in the Noise Action Plan?

Article 5 2014 BAR / Article 8 2002 END ANNEX V

- ○ No
- ○ Yes

40. What indicators/metrics are used to determine whether a noise problem exists?

Article 5 2014 BAR / Article 8 2002 END ANNEX V

- ☐ Contour Area
- ☐ Population Exposure to Noise Levels
- ☐ Harmful Effects (e.g. High Annoyance, High Sleep Disturbance or Ischaemic Heart Disease)
- ☐ Other, Please specify

41. How have the priorities/objectives been identified to address the noise problem?

Article 5 2014 BAR / Article 8 2002 END ANNEX V

42. How have both the need for an effective functioning transport system and protection of the environment been taken into account when determining priorities/objectives to address the identified noise problem?

Para 1 2014 BAR

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7. Setting the priorities / objectives

43. Please state the priority(ies) to be addressed by the current Noise Action Plan.

Article 8 2002 END ANNEX V

44. Is(are) the priority(ies) the same as the current Noise Abatement Objective(s)?
If not, please state the current Noise Abatement Objective(s)

- ○ Yes, priorities and Noise Abatement Objective are the same
- ○ No, Please state the current Noise Abatement Objective(s)

45. How have the priority(ies) and the current Noise Abatement Objective(s) been identified/quantified?

Article 8 2002 END ANNEX V

	Contour Area	Population Exposure to Noise Levels	Harmful Effects (e.g. High Annoyance, High Sleep Disturbance or Ischaemic Heart Disease)	Other(s)
Priority(ies)	☐	☐	☐	☐
Noise Abatement Objective(s)	☐	☐	☐	☐

If Other(s) is selected, please specify:

46. Do the priority(ies) and current Noise Abatement Objective(s) include specific time-bound targets? If so, what are they?

Article 8 2002 END ANNEX V

	No specific timeframe specified	By 2022 (within the current NAP round)	By 2028 (within the next NAP round)	Other(s)
Priority(ies)	○	○	○	○
Noise Abatement Objective(s)	○	○	○	○

If Other(s) is selected, please specify:

47. When the priority(ies) and Noise Abatement Objective(s) are expected to be achieved?

Article 8 2002 END ANNEX V

	Not known	By 2022 (within the current NAP round)	By 2028 (within the next NAP round)	Other(s)
Priority(ies)	○	○	○	○
Noise Abatement Objective(s)	○	○	○	○

If Other(s) is selected, please specify:

48. How often are the priority(ies) and Noise Abatement Objective(s) reviewed?

Article 8 2002 END ANNEX V

	Annually	Bi-annually	Every 5 years	Other(s)
Priority(s)	○	○	○	○
Noise Abatement Objective(s)	○	○	○	○

If Other(s) is selected, please specify

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8. Assessment methodology of noise measures and operating Restrictions

49. If a cost-benefit analysis has been used to determine which **actions/noise measures under END and BAR** (which include operating restrictions) are to be proposed or implemented, please specify which of the following have been considered in the methodology:

2002 END ANNEX V

	To determine **Actions/Measures** under END	To determine **Measures**, including **Operating Restrictions** under BAR
Cost-benefit analysis not been used	☐	☐
Total costs of the noise measure(s) (Capital and/or operational costs)	☐	☐
Quantification and/or monetarisation of harmful effects (ie. High Annoyance, High Sleep Disturbance or Ischaemic Heart Disease)	☐	☐
Changes in the costs of real estate and/or land pricing or house/apartment rents (qualitatively, or quantitively)	☐	☐
Valuation approaches i.e. willingness to accept as compensation for noise disturbance or willingness to pay to benefit from noise decrease	☐	☐
Cost of fuel or emissions including to aircraft operators on ground and in air	☐	☐
Costs of air pollution	☐	☐
Costs of climate change	☐	☐
Costs to nature and landscape	☐	☐
Accident/safety costs, including third-parties	☐	☐
Costs related to direct, indirect or catalytic employment and economic effects	☐	☐

Other, please specify

50. If a cost-effectiveness analysis has been used to determine which **actions/noise measures under END and BAR** (which include operating restrictions) are to be proposed or implemented, please specify which of the following have been considered in the methodology:

2002 END ANNEX V

	To determine **Actions/Measures** under END	To determine **Measures**, including **Operating Restrictions** under BAR
Cost-effectiveness analysis not been used	☐	☐
Total costs of the noise measure(s) (Capital and/or operational costs)	☐	☐
Change in the number of people exposed to noise levels at their dwellings with/without the use of the Noise Measure(s)	☐	☐
The safety of aviation operations, including third-party risks	☐	☐
The capacity of the airport	☐	☐
Any effects on the European aviation network	☐	☐
Changes in harmful effects (i.e.. High Annoyance, High Sleep Disturbance and Ischaemic Heart Disease) with/without the noise measure(s)	☐	☐
Environmental sustainability, including Interdependencies between noise and emissions	☐	☐
Any direct, indirect or catalytic employment and economic effects	☐	☐

Other, please specify

51. Which of the following harmful effects are assessed? Please justify your selection

2002 END ANNEX V

- ☐ High Annoyance
- ☐ High Sleep Disturbance
- ☐ Ischemic Heart Disease
- ☐ Other harmful effects
- ☐ Harmful effects not assessed

Please justify your selection

52. What indicators have been used in the methodologies to consider health, social and economics effects?

Article 6 2002 END/ ANNEX III

53. Have Competent Authorities developed/provided any guidance on how to conduct the cost benefit/effectiveness assessment and what factors to consider?

- ○ No
- ○ Yes

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9. Identification of noise measures

Please indicate if the following measures have been implemented (or are planned to be) for this airport and when, or whether they have been considered for future implementations.

Article 8 2002 END ANNEX V / Article 5 BAR 2014 / Article 6 BAR 2014 ANNEX I / BAR Article 5(2)

54.

At Source

	Not implemented (and excluded from future implementation)	**Adopted pre 2007**	**Adopted post 2007** in one of the three END round	**Planned to be implemented**	**Considered** (for future implementation)	**Not yet considered** (but possible consideration in future)
Voluntary agreements for the complete phase out or removal during time sensitive periods of marginally compliant aircraft	○	○	○	○	○	○
Voluntary agreements for the complete phase out or removal in time sensitive periods of specific aircraft (not defined as marginally compliant)	○	○	○	○	○	○
Noise related airport charges based on the noise performance (i.e. operation/mode measured performance as dB expectation)	○	○	○	○	○	○
Noise related charges based on the noise certification (i.e. based on certificated noise levels)	○	○	○	○	○	○
Noise related charges based on other criteria (e.g. blend approach)	○	○	○	○	○	○

If so, please specify the other criteria

55.

Operational procedure (departure)

	Not Implemented (and excluded from future implementation)	**Adopted pre 2007**	**Adopted post 2007** in one of the three END round	**Planned to be implemented**	**Considered** (for future implementation)	**Not yet considered** (but possible consideration in future)
Continuous climb procedures	○	○	○	○	○	○
Minimum climb gradients	○	○	○	○	○	○
Required use of NAPD 1 only	○	○	○	○	○	○
Required use of NAPD 2 only	○	○	○	○	○	○
Noise preferential routes	○	○	○	○	○	○
Alternation of the use of noise preferential routes	○	○	○	○	○	○
PBN departure routes	○	○	○	○	○	○
Predictable and scheduled respite from overflight measures	○	○	○	○	○	○
Preferential runway use for noise purposes	○	○	○	○	○	○
Airspace design restrictions (e.g. not below heights over sensitive receptors)	○	○	○	○	○	○
Noise limits and fines	○	○	○	○	○	○

56.

Operational procedure (arrival)

	Not Implemented (and excluded from future implementation)	**Adopted pre 2007**	**Adopted post 2007** in one of the three END round	**Planned to be implemented**	**Considered** (for future implementation)	**Not yet considered** (but possible consideration in future)
Continuous Descent Approach	○	○	○	○	○	○
Low Power Low drag approaches	○	○	○	○	○	○
Landing gear deployment measures	○	○	○	○	○	○
Steeper Approaches (more than 3 degrees)	○	○	○	○	○	○
PBN arrival routes	○	○	○	○	○	○
Predictable and scheduled respite from overflight measures	○	○	○	○	○	○
Preferential runway use	○	○	○	○	○	○
Noise limits and fines	○	○	○	○	○	○
Airspace design restrictions (e.g. not below specified heights over sensitive receptors)	○	○	○	○	○	○

57.

Land Use Planning

	Not Implemented (and excluded from future implementation)	**Adopted pre 2007**	**Adopted post 2007** in one of the three END round	**Planned to be implemented**	**Considered** (for future implementation)	**Not yet considered** (but possible consideration in future)
Building codes or planning guidance (including prohibiting construction of new buildings) in place to avoid or reduce the noise impact on sensitive land uses	○	○	○	○	○	○
Stakeholders consultation in regard of new developments in noise sensitive areas	○	○	○	○	○	○
Monitoring / reporting of sensitive land use (e.g. residential housing) encroachment within the END contours	○	○	○	○	○	○
Relocation assistance measures for most sensitive areas	○	○	○	○	○	○
Noise Insulation Schemes	○	○	○	○	○	○

If so, please specify details of the noise insulation scheme

58.

Operating Restrictions

	Not Implemented (and excluded from future implementation)	**Adopted pre 2007**	**Adopted post 2007** in one of the three END round	**Planned to be implemented**	**Considered** (for future implementation)	**Not yet considered** (but possible consideration in future)
Night Flight Restrictions	○	○	○	○	○	○
Mandatory Time based restrictions on marginally compliant aircraft	○	○	○	○	○	○
Mandatory Phase out of marginally compliant aircraft	○	○	○	○	○	○
Runway restrictions by aircraft type	○	○	○	○	○	○
Runway restrictions by time of the day	○	○	○	○	○	○
Runway restriction by operating mode	○	○	○	○	○	○
Operating time restrictions by aircraft type	○	○	○	○	○	○

	Not Implemented (and excluded from future implementation)	**Adopted pre 2007**	**Adopted post 2007** in one of the three END round	**Planned to be implemented**	**Considered** (for future implementation)	**Not yet considered** (but possible consideration in future)
Operating time restrictions by runway	○	○	○	○	○	○
Operating time restrictions by routes	○	○	○	○	○	○
Route restriction by aircraft type	○	○	○	○	○	○
Route restrictions by runway	○	○	○	○	○	○
Route restrictions by time of the day	○	○	○	○	○	○
Cap on aircraft movements in place [follow up if just for a specific time period/day/night etc]	○	○	○	○	○	○
Noise quota(budget) limits/cap in place [follow up if just for a specific time period/day/night etc]	○	○	○	○	○	○
Partial restrictions in place that draw a distinction between daytime and night time measures	○	○	○	○	○	○
Noise contour cap	○	○	○	○	○	○
Voluntary restrictions (e.g. agreement not to land before specified time, trials, Charters, joint initiatives)	○	○	○	○	○	○

If selected, please provide details of:
- Noise Contour Caps
- Voluntary Restrictions

59.

Other

	Not implemented (and excluded from future implementation)	**Adopted Pre 2007**	**Adopted post 2007** in one of the three END round	**Planned to be implemented**	**Considered** (for future implementation)	**Not yet considered** (but possible consideration in future)
Relocation of the airport/runways	☐	☐	☐	☐	☐	☐
Relocation of traffic to another airport	☐	☐	☐	☐	☐	☐
Relocation of passengers to other modes of transport	☐	☐	☐	☐	☐	☐
Protection/designation of Quiet Areas	☐	☐	☐	☐	☐	☐

Please specify any other noise measures implemented/planned/considered at the airport

60. When selecting measures, please describe what is understood by "the measures, taking into account public interest in the field of air transport as regards the development prospects of their airports, are selected without detriment to safety".

BAR Article 5(2)

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10. Consultation and engagement

61. **Transparency** - Are the results of the strategic noise maps and noise action plans made available to the public?

Article 8/9 / ANNEX IV 2002 END

- ○ No
- ○ Yes

62. **Transparency** - Where are noise strategic maps and noise action plans available to the public? Please specify where (eg: link to website, etc).

Article 8/9 / ANNEX IV 2002 END

63. **Technical Cooperation** - Has there been technical engagements with airport operator, aircraft operators, air navigator service provider?

Article 6 BAR 2014 2(d)

- ○ No
- ○ Yes

64. **Consultation** - Which of the following methods of consultation and engagement has been used in developing the noise actions plans or implementing an operating restriction? A definition of each method can be found here

Article 6 BAR 2014

	Residents	Community Groups	Business	Airport Operators	Aircraft Operators	Aircraft/engine manufactures	Air Navigation Providers	Network Manager
Public Consultation Events	☐	☐	☐	☐	☐	☐	☐	☐
On-line/virtual Consultation Events	☐	☐	☐	☐	☐	☐	☐	☐
On-line publication and feedback	☐	☐	☐	☐	☐	☐	☐	☐
Focus Groups	☐	☐	☐	☐	☐	☐	☐	☐
Mediation Meetings	☐	☐	☐	☐	☐	☐	☐	☐
Consultative Committee Groups	☐	☐	☐	☐	☐	☐	☐	☐
121 Stakeholder briefings	☐	☐	☐	☐	☐	☐	☐	☐
Technical Expert Groups	☐	☐	☐	☐	☐	☐	☐	☐

Other, please specify

65. **Promotion** - Which of the following methods have been used in promoting stakeholder engagement and interest in the development of noise actions plans or implementing an operating restriction?

Article 6 BAR 2014

	Residents	Community Groups	Business	Airport Operators	Aircraft Operators	Aircraft/Engine manufacturers	Air Navigation Providers	Network Manager
National Published Media	☐	☐	☐	☐	☐	☐	☐	☐
Local Published Media	☐	☐	☐	☐	☐	☐	☐	☐
Competent Authority Responsible Website	☐	☐	☐	☐	☐	☐	☐	☐
Airport Operator Responsible Website	☐	☐	☐	☐	☐	☐	☐	☐
Radio Advertisements	☐	☐	☐	☐	☐	☐	☐	☐
Television Media	☐	☐	☐	☐	☐	☐	☐	☐
Leaflets in community centres (e.g. library's, council offices)	☐	☐	☐	☐	☐	☐	☐	☐
Email communication	☐	☐	☐	☐	☐	☐	☐	☐
Postal communication	☐	☐	☐	☐	☐	☐	☐	☐

Other, please specify

66. How is public informed of decision taken within action plans as result of the consultation process?

Article 6 BAR 2014

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11. Resolution and review

67. How is progress against the Action plan reviewed?

Article 11 END 2002

68. How is the success of the action plan measured?

Article 11 END 2002

69. Is there an independent audit of progress reports?

Article 11 END 2002

- ○ No
- ○ Yes

70. How are disputes resolved?

Article 4 BAR 2014

71. How often is the action plan reviewed?

Article 11 END 2002

- ○ Annually
- ○ Bi-annually
- ○ Every 5 years
- ○ Other, please specify

72. How do Competent Authorities follow up and monitor the implementation of the operating restrictions and take appropriate actions?

BAR 2014

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12. Overview

73. How successful has the implementation of the END been in supporting efforts to reduce harmful effects?

Very Unsuccessful	Unsuccessful	Fair	Successful	Very Successful
☆	☆	☆	☆	☆

Please, motivate your score

74. How could the END be improved?

75. How successful BAR has been in balancing the protection of citizen's health while ensuring an effective transport system?

Very Unsuccessful	Unsuccessful	Fair	Successful	Very Successful
☆	☆	☆	☆	☆

Please, motivate your score

76. How could the BAR be improved?

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13. Interview

77. Which of the topics in this questionnaire would you be interested to further discuss in an interview?

- ☐ Section 4: Designation of the roles
- ☐ Section 5: END and BAR Implementation into nation/local legislation
- ☐ Section 6: Defining the noise problem
- ☐ Section 7: Setting the priorities / objectives
- ☐ Section 8: Assessment methodology of noise measures
- ☐ Section 9: Identification of noise measures
- ☐ Section 10: Consultation / Engagement
- ☐ Section 11: Resolution and Review

Appendix B – Interview contents for Competent Authorities

Contents to be discussed with Competent Authorities during the ad-hoc interviews

The following areas are to be covered during the ad-hoc interview with the Competent Authority(ies), seeking clarifications on specific answers provided in the submitted questionnaire and asking further questions. The questions under each area are indicative of the topics that will need to be discussed.

1. OWNERSHIP

There is an interest in how different ownership models may on stakeholder perceptions of noise action plans and restrictions. For example:

- *How does the ownership model impact on relationships with community and industry stakeholders, if at all?*

2. DATA CLARIFICATION

The interviewer may wish to clarify aspects of the data provided or understand why some data is not available. For example:

- *Why agglomerations have been used excluded/included in the count of population exposure to noise levels?*
- *Why have different approaches in considering the agglomeration been used for different airports within the same member state?*

Additional Metrics used (depending on Member States):

- From questionnaire **Q23**: *What supplementary noise metrics are used to describe the noise situation at the airport?*
- *Why do only some airports within the same member state use supplementary metrics for the various assessments?* (Some only minimum required by END, some additional metrics)

3. ROLE OF COMPETENT AUTHORITIES / DESIGNATION OF ROLES

With such a wide range of approaches the interview is likely to explore the rationale and thoughts on the arrangements at specific airports. For example:

In developing, approving, and submitting the strategic noise maps and noise action plans:

- *What is the rationale for the adopted arrangement?*
- *How do the Competent Authorities (CAs) interact between each other when multiple CAs are appointed?* and
- *What is the relationship with the airport operator, especially in the case where the airport operator is not one of the CAs?*

In the definition of the noise measures / operating restrictions:

- *What is the rationale for the adopted arrangement?*
- *How do Competent Authorities (CAs) interact between each other when multiple CAs are appointed?* and
- *What is the relationship with the airport operator?*

4. END AND BAR IMPLEMETATION INTO/RELATIONSHIP WITH NATIONAL/LOCAL LEGISLATION

There is variation in the relationship between national legislation and the END/BAR which the interview will potentially explore further. For example:

- *What are the benefits/constraints in the noise management caused by the END/BAR in comparison with the national legislation?* (reference to **Q35**: How does the national/local legislation relate to the END and BAR requirements?)

5. IDENTIFICATION OF THE NOISE PROBLEM/PRIORITIES AND OBJECTIVES

The interview will seek to understand in more detail the existing objectives, priorities and noise problems at specific airports. For example:

- *What is the CA interpretation of*
  - *Noise problem*
  - *Priority*
  - *Noise abatement objectives?* and
  - *Long-term strategy (END Annex V)?*
- *How do noise problem, priority, noise abatement objective and long-term strategy relate to each other?*
- *How were the objectives/priorities determined – how were stakeholders involved?*
- *If a noise problem has not been identified, how was the noise abatement objective and priorities established?*
- *How is the progress/success against the noise abatement objective measured?*
- *Is the objective time bound? If not why not?*
- *How can stakeholders determine whether the objective has been achieved?*

- *How does the objective take account of the need to ensure an effective functioning transports system (sustainable aviation sector)?*

Where appropriate:

- *Who is and what is the role of the Airport Noise Commission/Technical Group in setting/verifying the achievability of the objective/priority?*

6. COST EFFECTIVENESS/BENEFIT ASSESSMENT

The interview will seek to more about the approach taken to CEA /CBA. For example:

- *What is the process used when adopting noise measures and/or operating restrictions?* (especially for those airports that answered that a CEA/CBA is not undertaken)

On harmful effects (depending on the questionnaire responses):

- *What is the reason for assessing/not assessing harmful effects?* (reference to Annex III which did not provide response functions and implementation of 2020/367/EC)

Or

- *If assessed, how have harmful effects been assessed?* (eg WHO or other guideline used)
- *How is the effectiveness of individual measures proposed in the drafting of noise action plans undertaken?*
- *What would help you as the CA undertake these assessments?*

7. IDENTIFICATION OF NOISE MEASURES

The interview will seek to understand how CAs have identified and assessed the effectiveness of the interventions detailed in the Noise Action Plans and /or restrictions. For example:

- *How have the noise measures / operating restrictions been established for those ones implemented:*
    - *pre 2007 and*
    - *post 2007 (or since adoption of the END/BAR)*
- *How/why have some noise measures / operating restrictions been excluded from future implementation?*
- *What evidence do they have that the noise measures / operating restrictions have helped reach the noise reduction objectives?* and
- *How was this established/assessed? (e.g. value of Noise Insulation Schemes in reducing sleep disturbance or annoyance or the value of NAPD1 over NAPD2)*

From questionnaire:

- *What is understood by "the measures, taking into account public interest in the field of air transport as regards the development prospects of their airports, are selected without detriment to safety[75]".*

8. CONSULTATION/ENGAGEMENT

Stakeholder engagement and consultation are key aspects of both the END and BAR and the interview will seek to understand the approach taken at specific airports. For example:

- *How as the CA do they ensure that they have heard the views of the different stakeholder groups – especially the harder to reach groups?*
- *Do they think the END and BAR should be improved to help them address the consultation with the public and the engagement with the various stakeholders? If so how?*

As a result of the questionnaires for the relevant airports, it could be asked:

- *How do the Focus Groups work?*
- *How is the feedback from the technical forums considered / why is there no engagement with a technical forum?*
- *What method of promotion are used to make the public and the other stakeholders more aware of noise action plans and measures/OR implementation?*
- *Tell us about the engagement forums you have – the chair, membership, remit/powers?*
- *Why do you not have an independent audit of progress against the noise objective or noise action plan.*

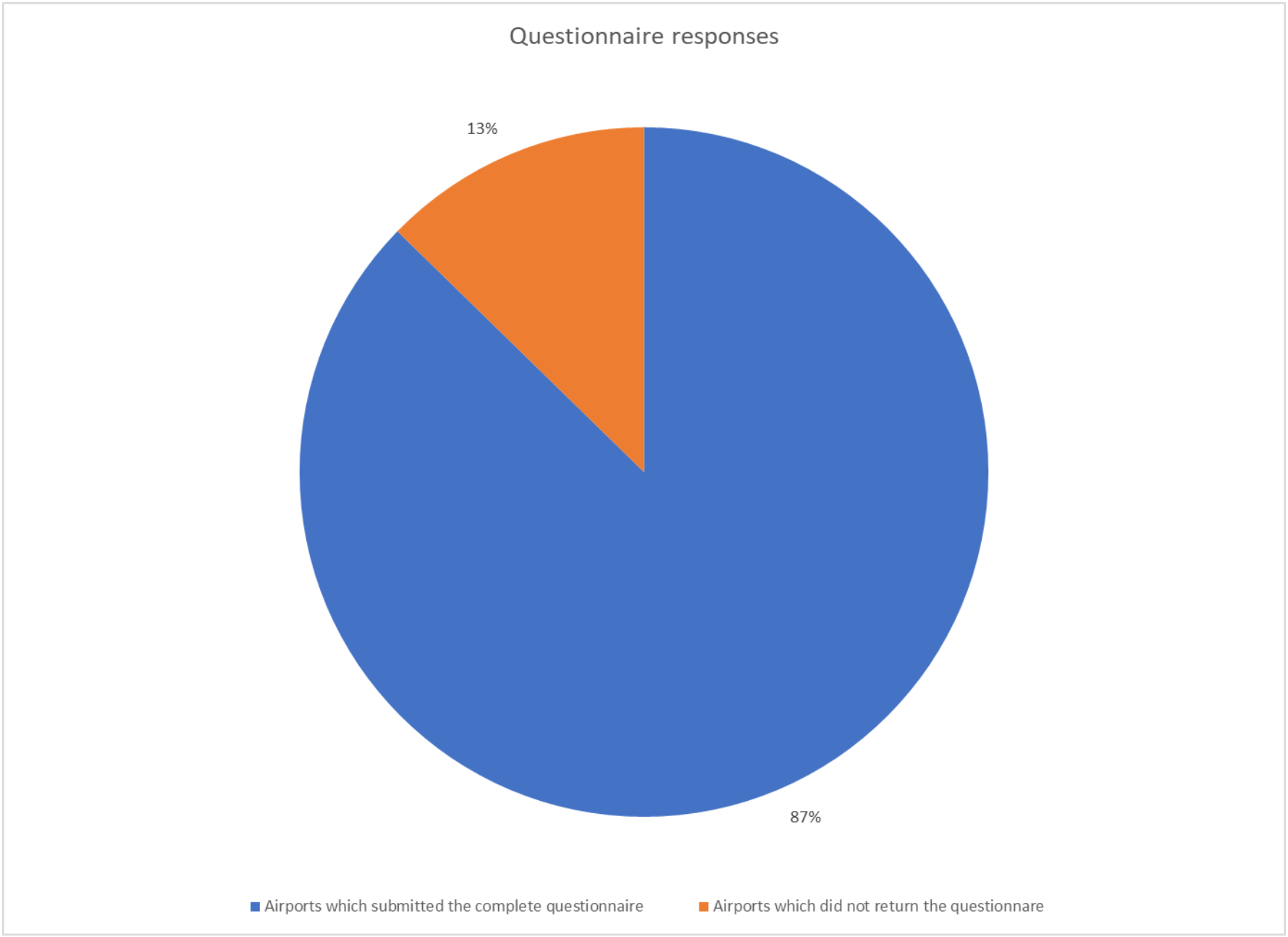
9. OVERVIEW OF LEGISLATION

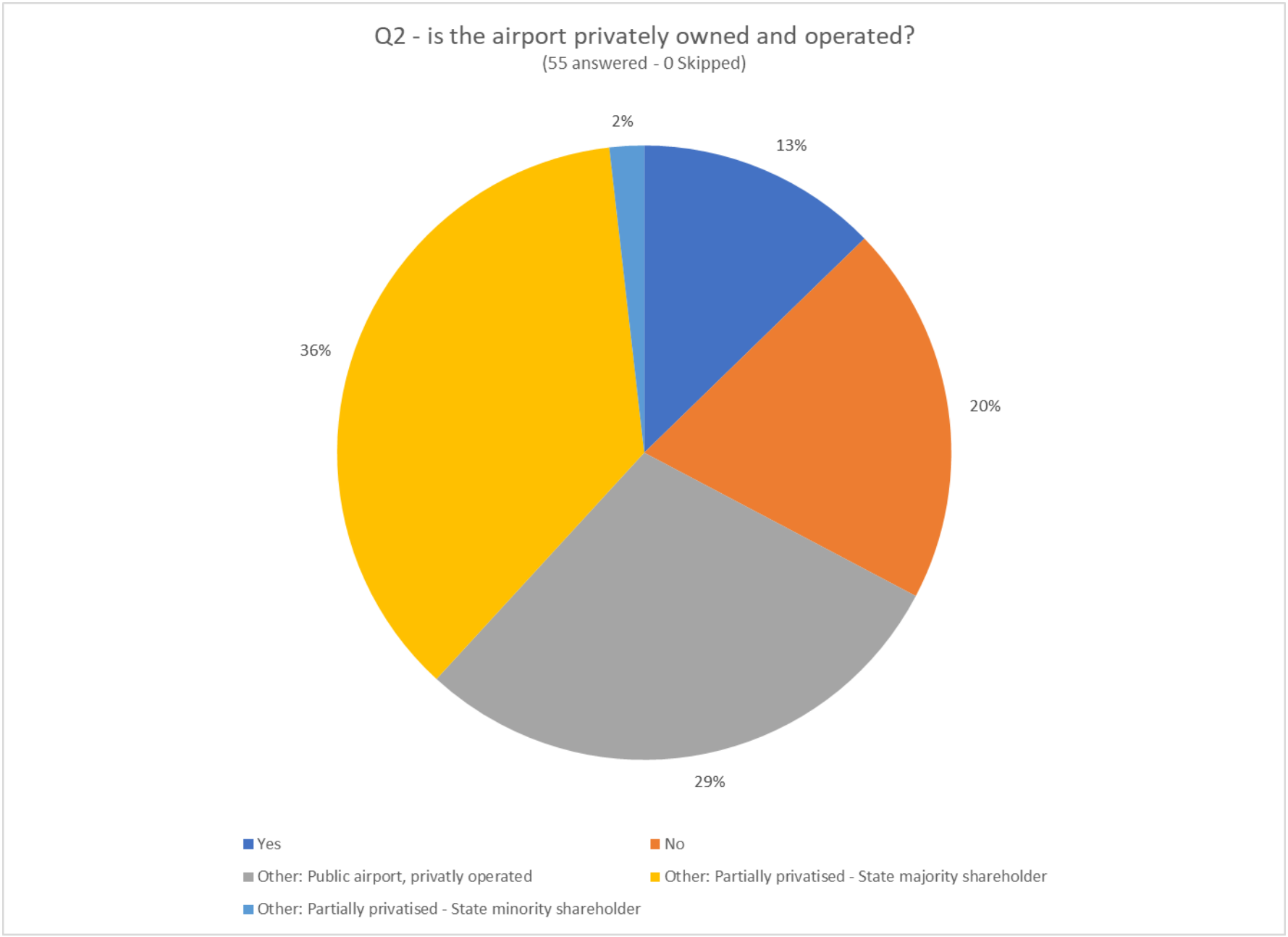
The interview will seek to understand and encourage further feedback on the existing legislation. For example:

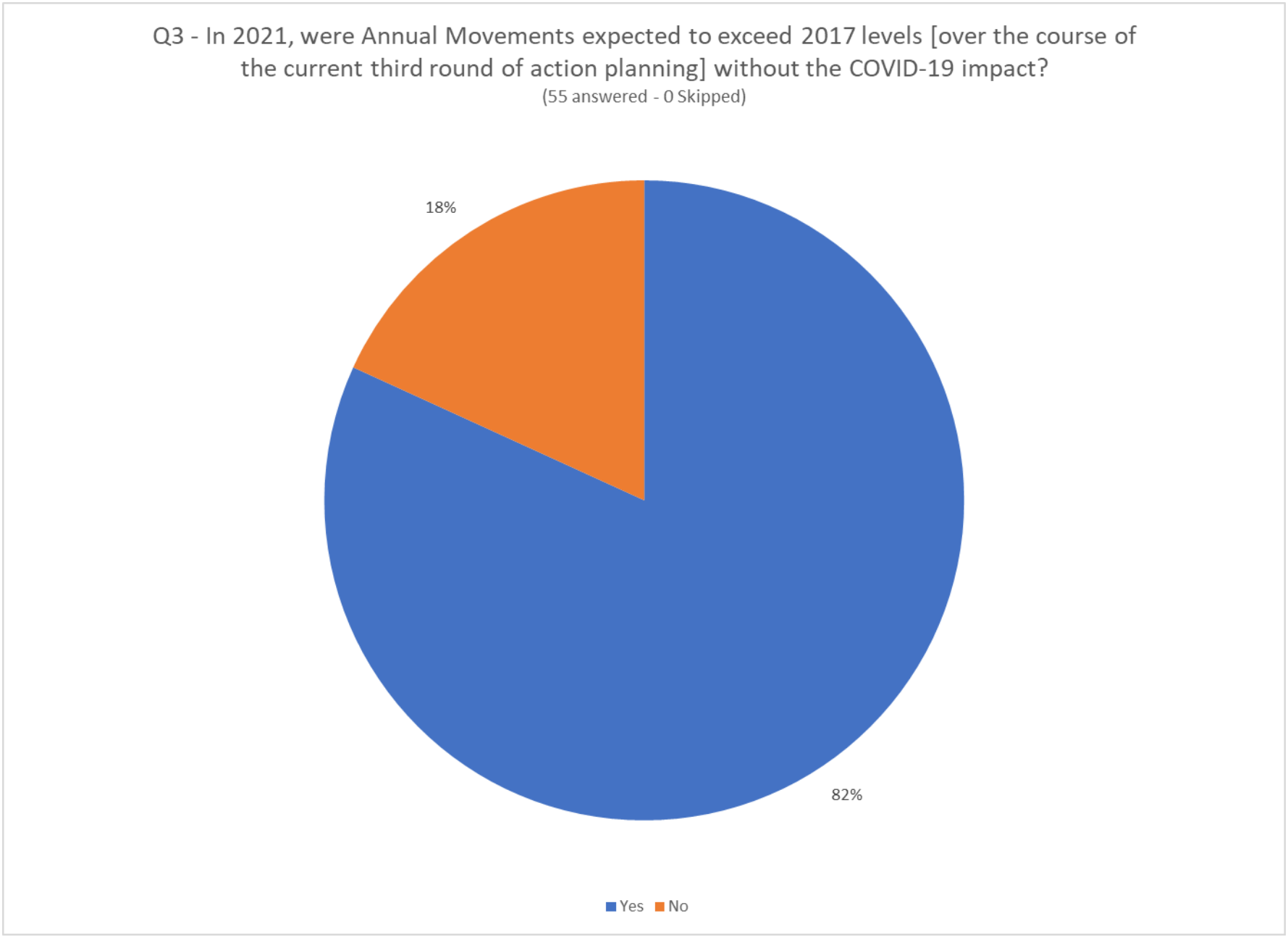
- *How END and BAR have helped the noise management of around the airport? What are the main constrains and benefits?*
- *Tell us a bit more about why you scored the END/BAR like that.*
- *How do you think the END and BAR can be improved to help the noise management around the airport while ensuring its functional operation?*

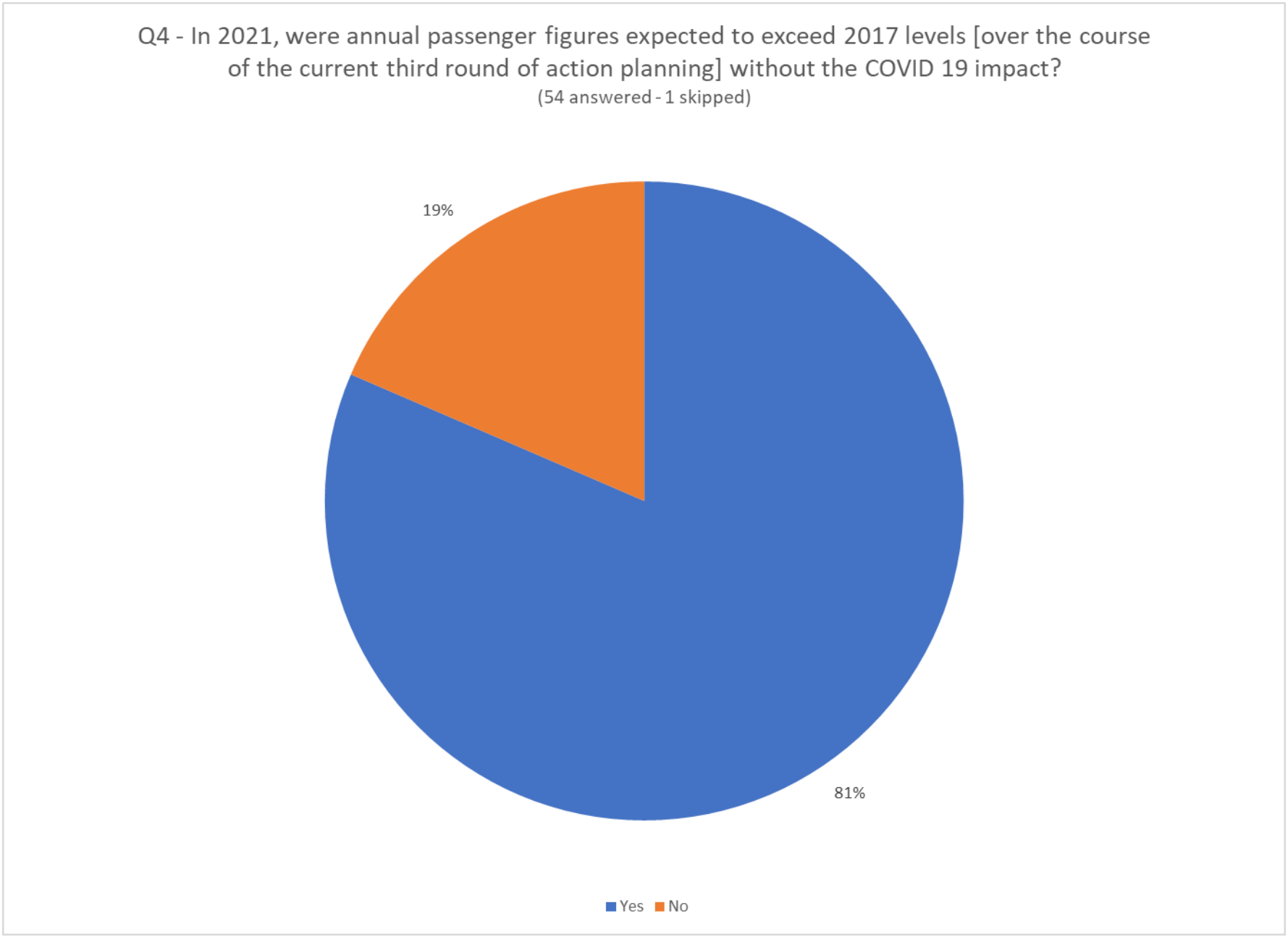
[75] Article 2(d) of BAR

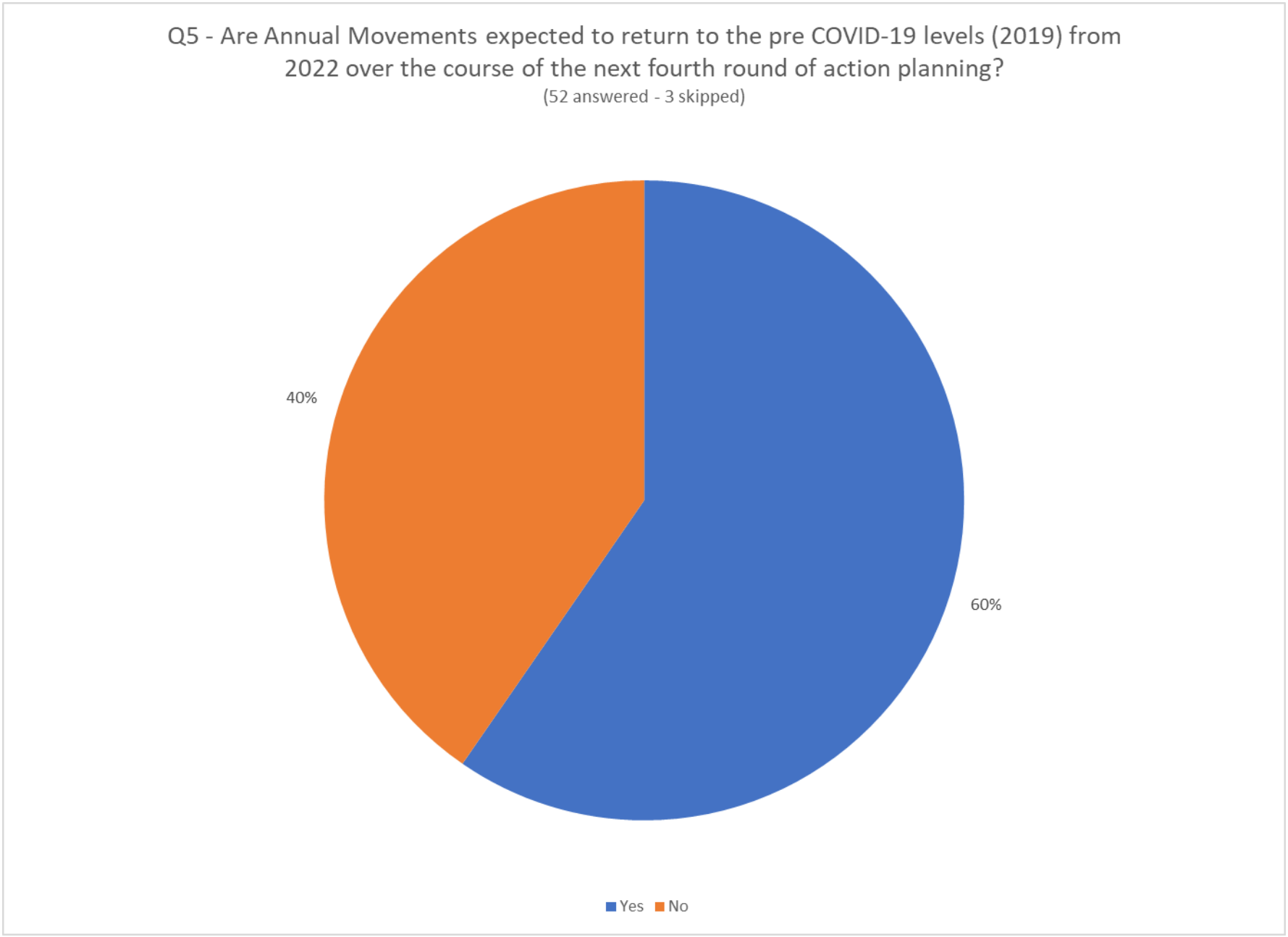
Appendix C – Questionnaire results

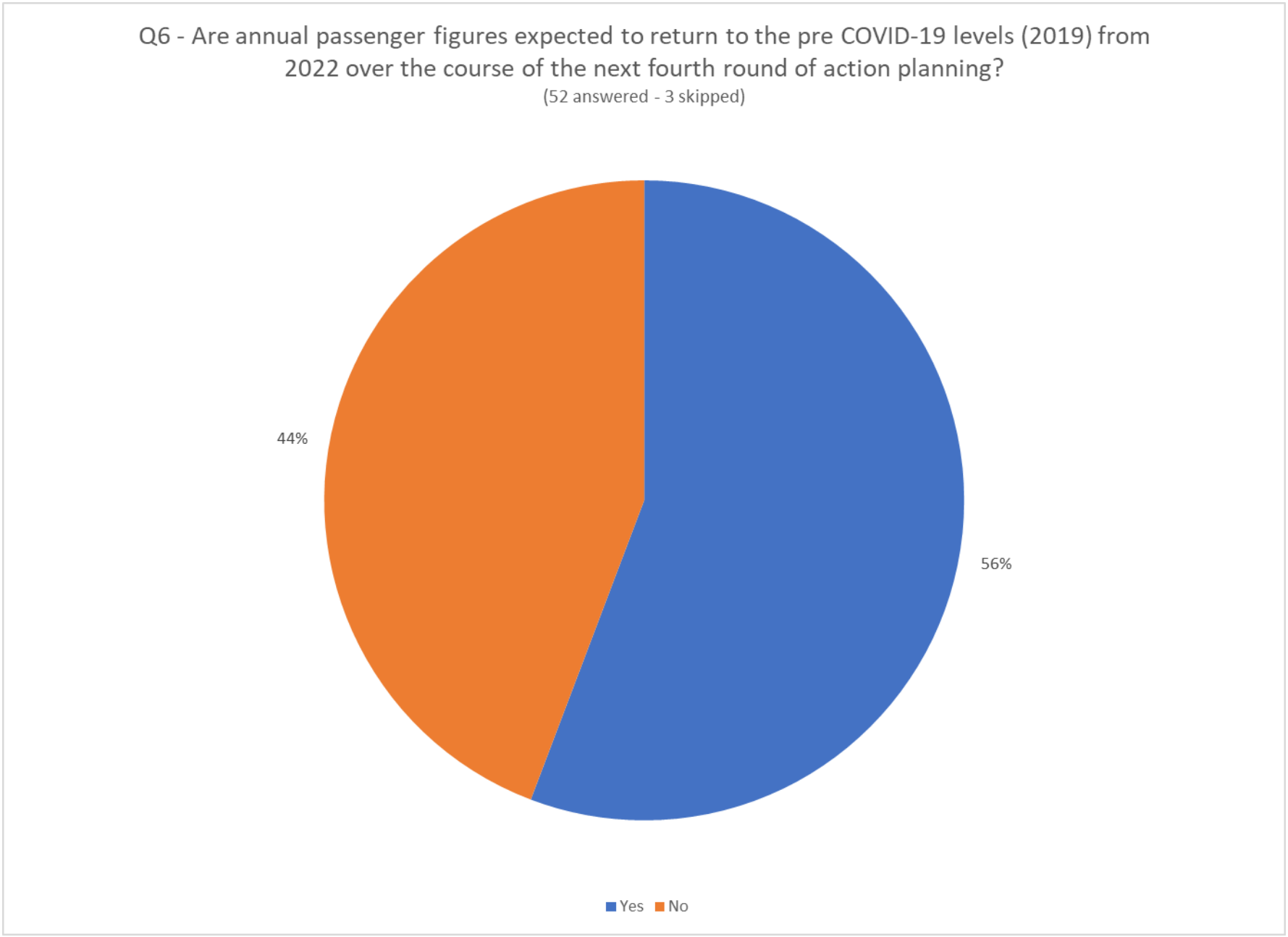

Questionnaire responses
13%
87%
Airports which submitted the complete questionnaire
Airports which did not return the questionnare

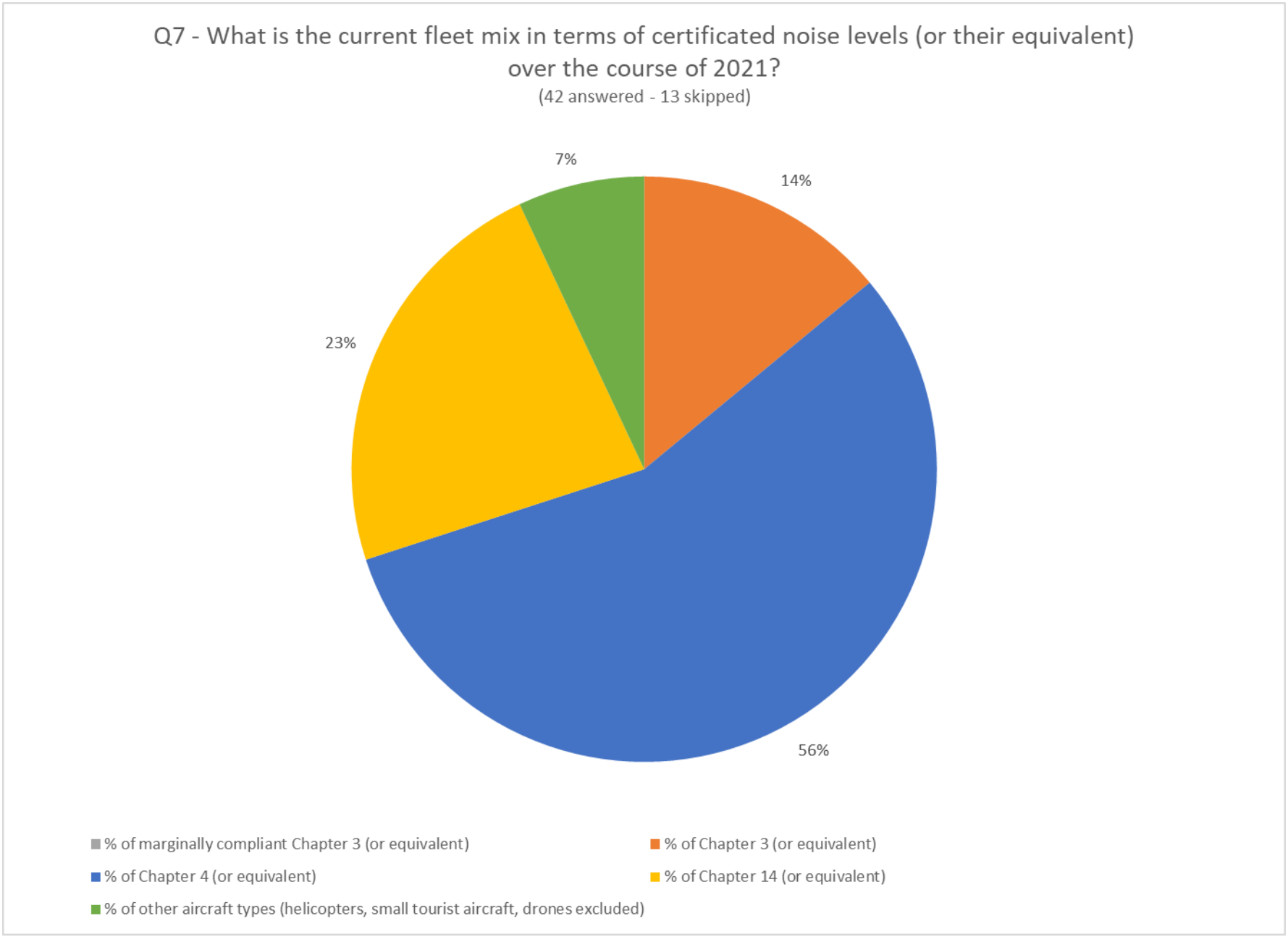

Q2 - is the airport privately owned and operated?
(55 answered - 0 Skipped)
2%
13%
36%
20%
29%
Yes
No
Other: Public airport, privatly operated
Other: Partially privatised - State majority shareholder
Other: Partially privatised - State minority shareholder

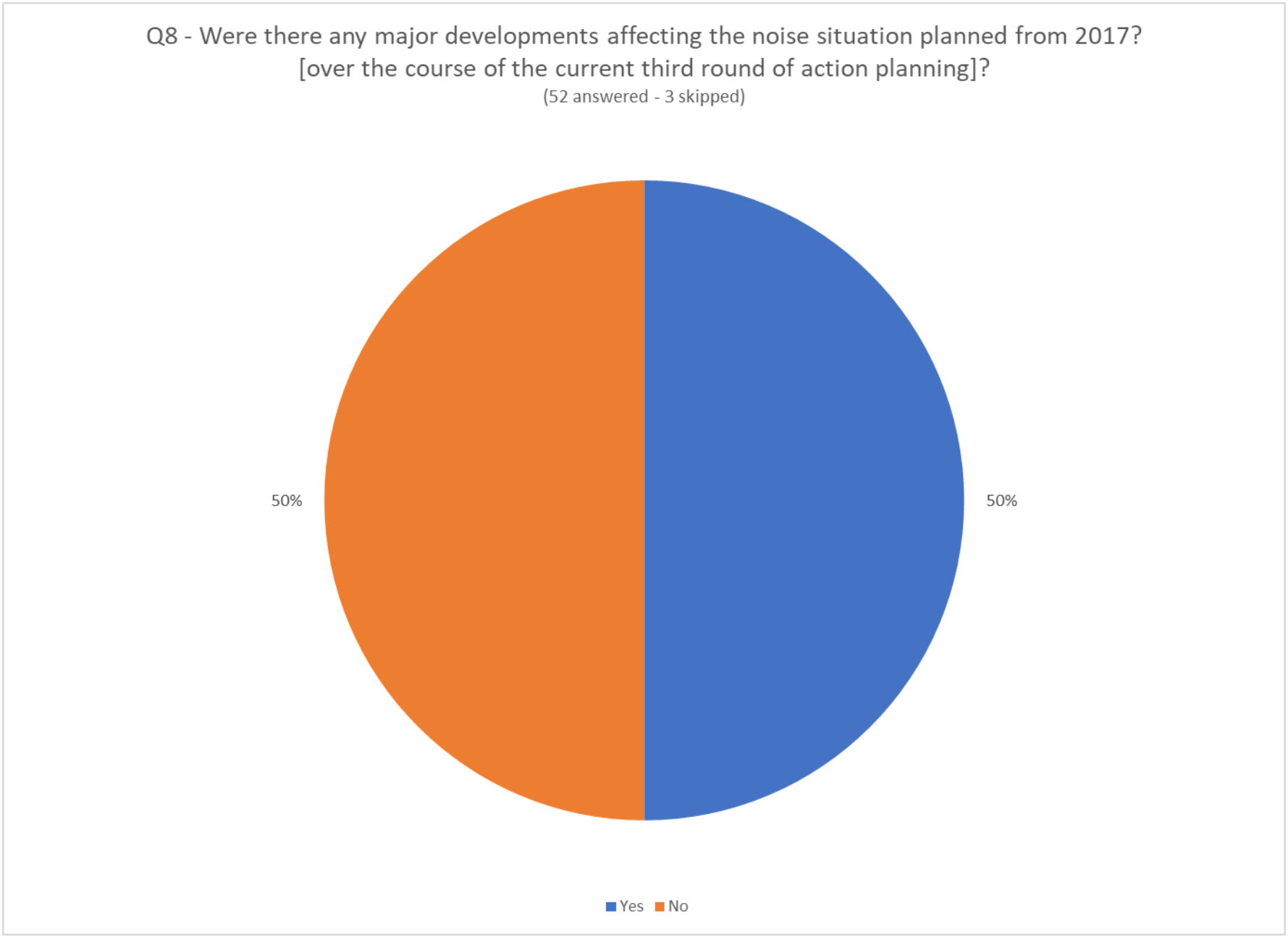

Q3 - In 2021, were Annual Movements expected to exceed 2017 levels [over the course of the current third round of action planning] without the COVID-19 impact?
(55 answered - 0 Skipped)
18%
82%
Yes
No

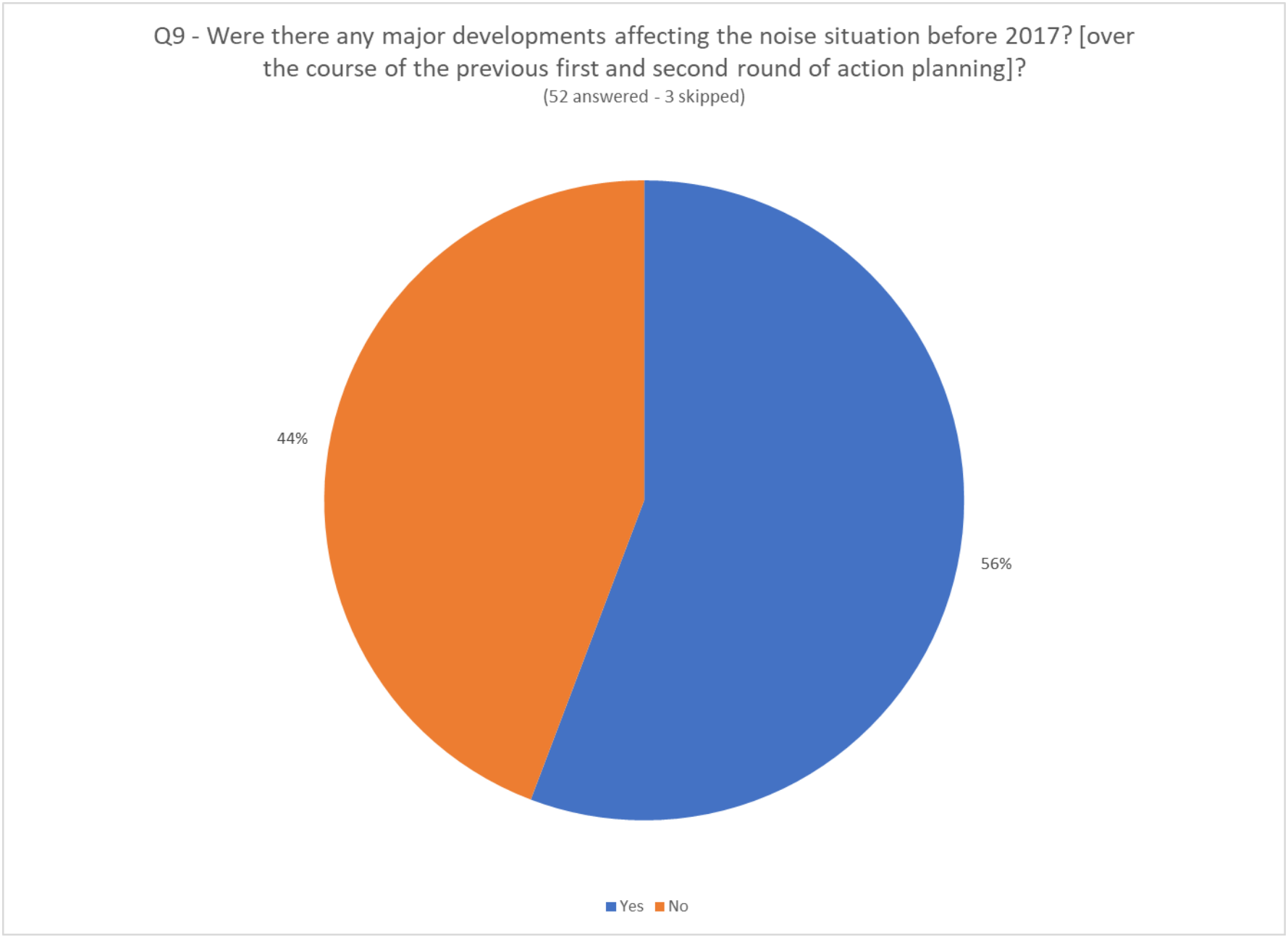

Q4 - In 2021, were annual passenger figures expected to exceed 2017 levels [over the course of the current third round of action planning] without the COVID 19 impact?
(54 answered - 1 skipped)
19%
81%
Yes
No

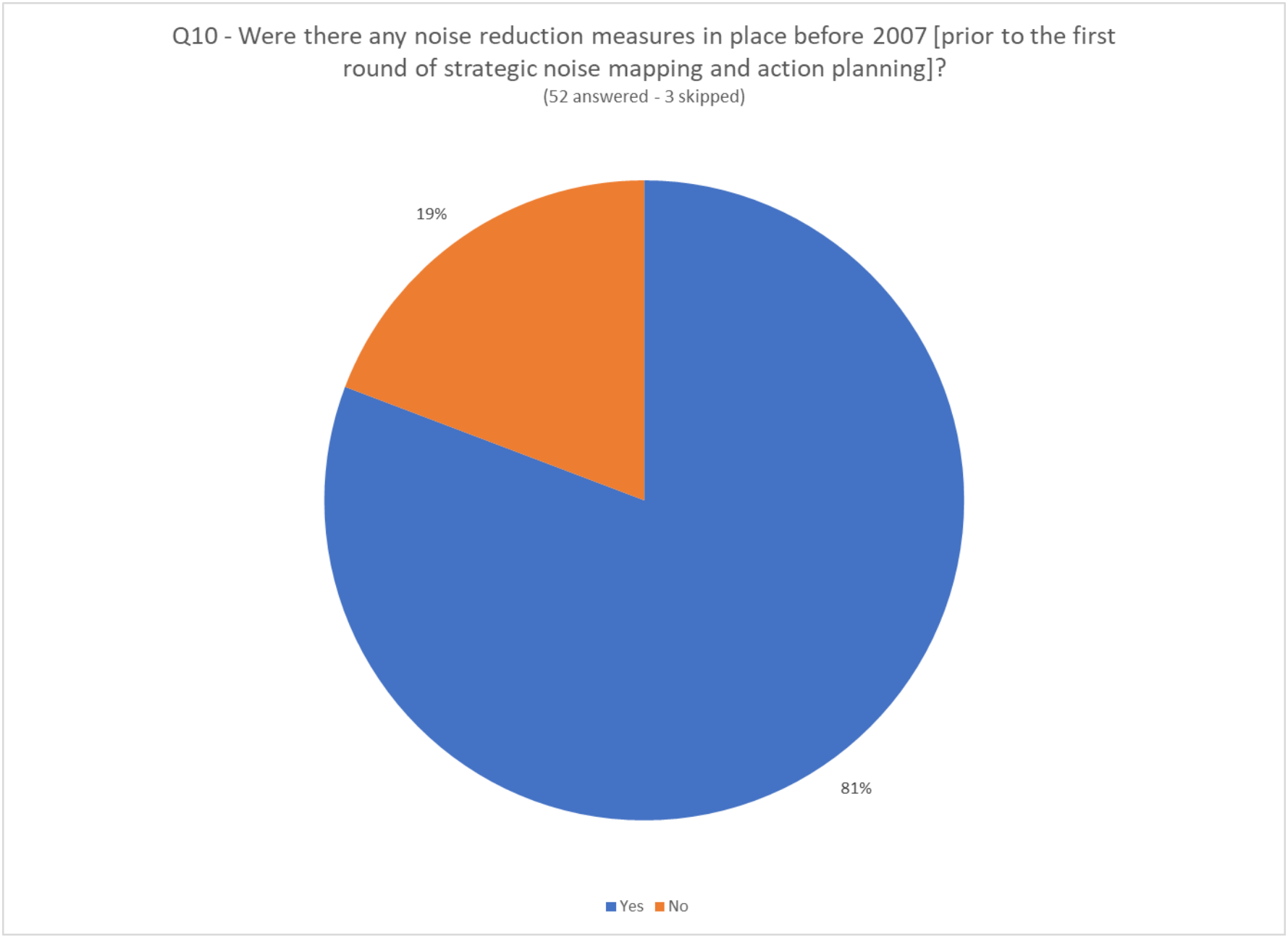

Q5 - Are Annual Movements expected to return to the pre COVID-19 levels (2019) from 2022 over the course of the next fourth round of action planning?
(52 answered - 3 skipped)
40%
60%
Yes
No

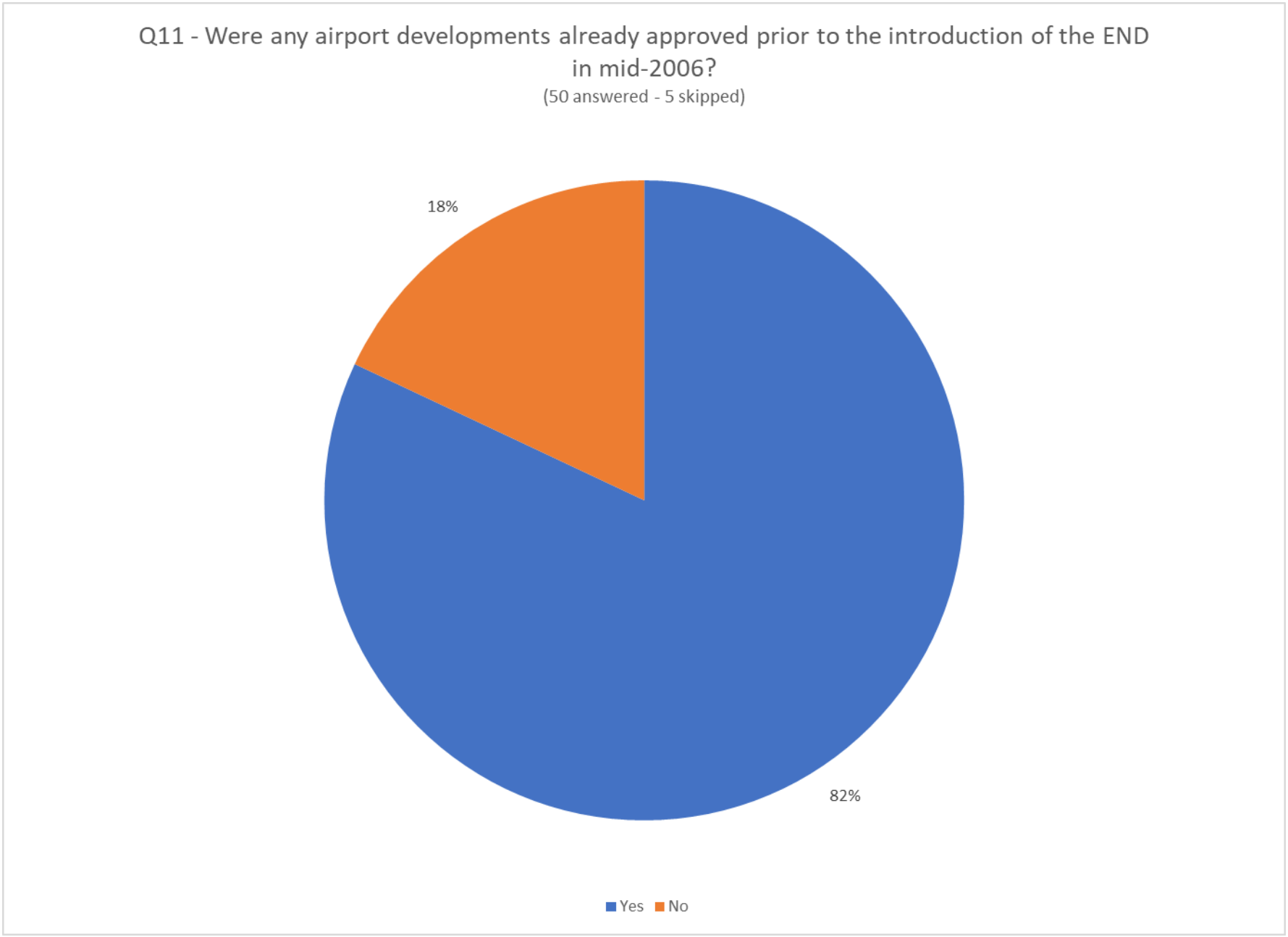

Q6 - Are annual passenger figures expected to return to the pre COVID-19 levels (2019) from 2022 over the course of the next fourth round of action planning?
(52 answered - 3 skipped)
44%
56%
Yes
No

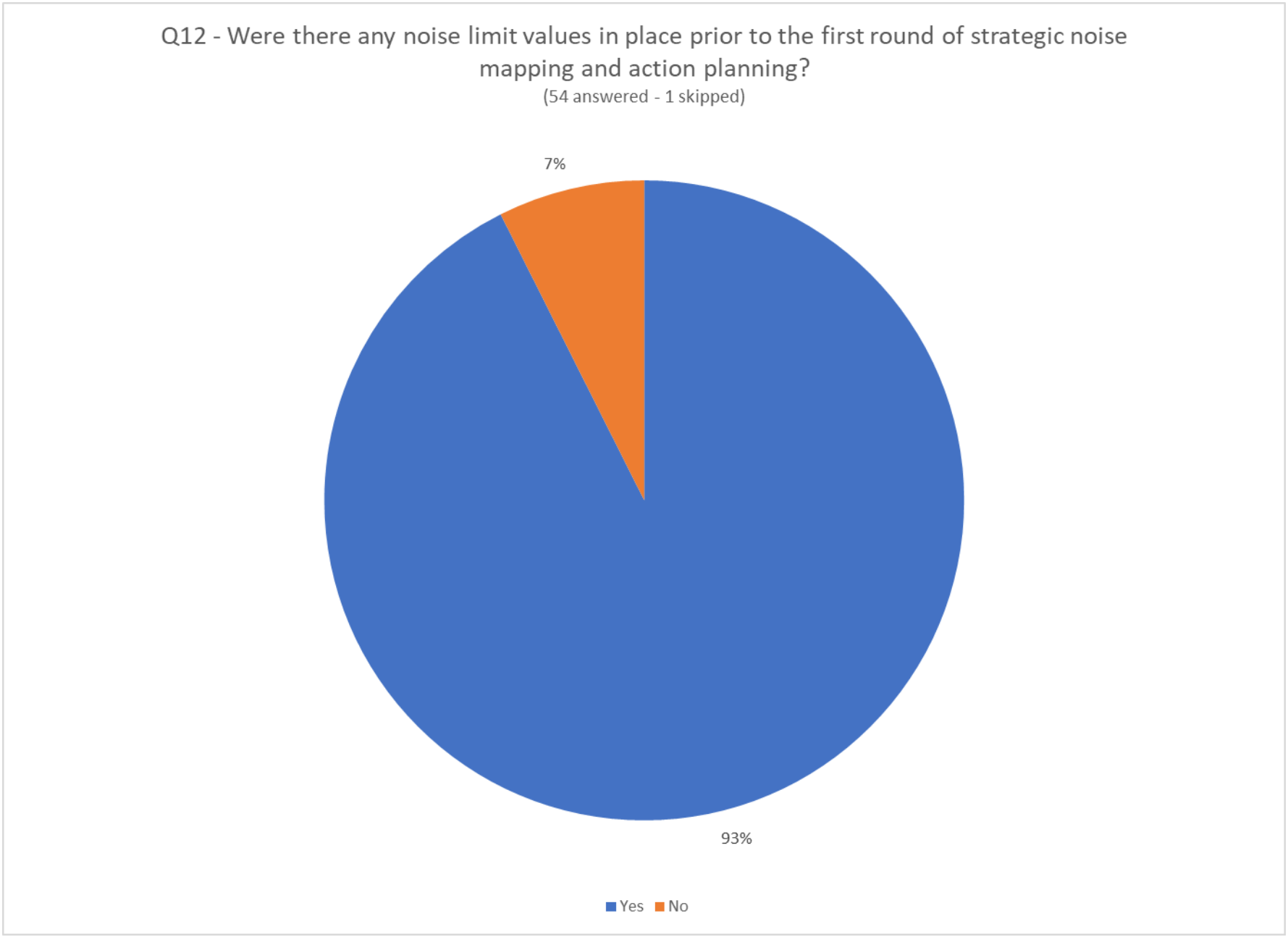

Q7 - What is the current fleet mix in terms of certificated noise levels (or their equivalent) over the course of 2021?
(42 answered - 13 skipped)
7%
14%
23%
56%
% of marginally compliant Chapter 3 (or equivalent)
% of Chapter 3 (or equivalent)
% of Chapter 4 (or equivalent)
% of Chapter 14 (or equivalent)
% of other aircraft types (helicopters, small tourist aircraft, drones excluded)

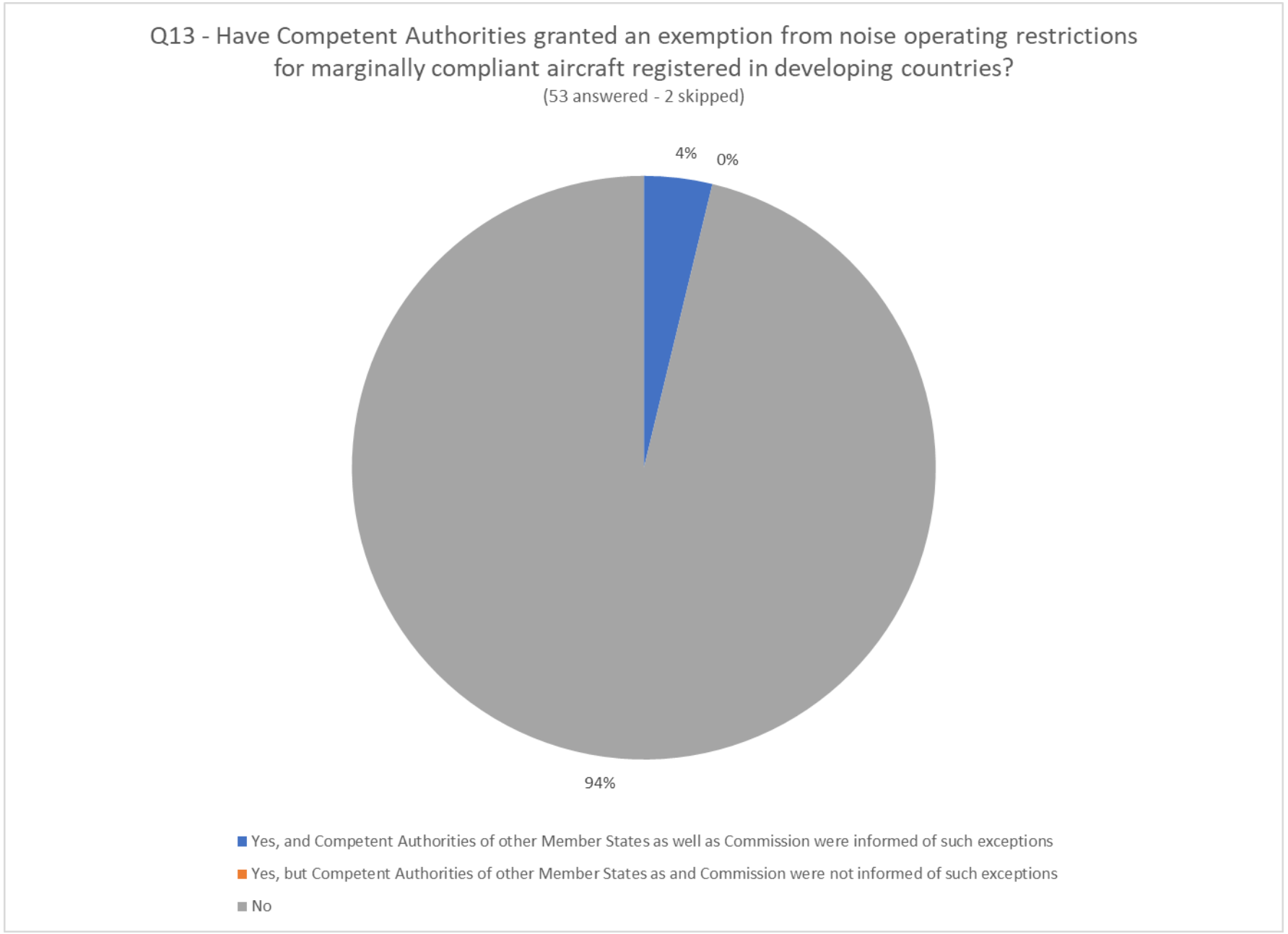

Q8 - Were there any major developments affecting the noise situation planned from 2017? [over the course of the current third round of action planning]?
(52 answered - 3 skipped)
50%
50%
Yes
No

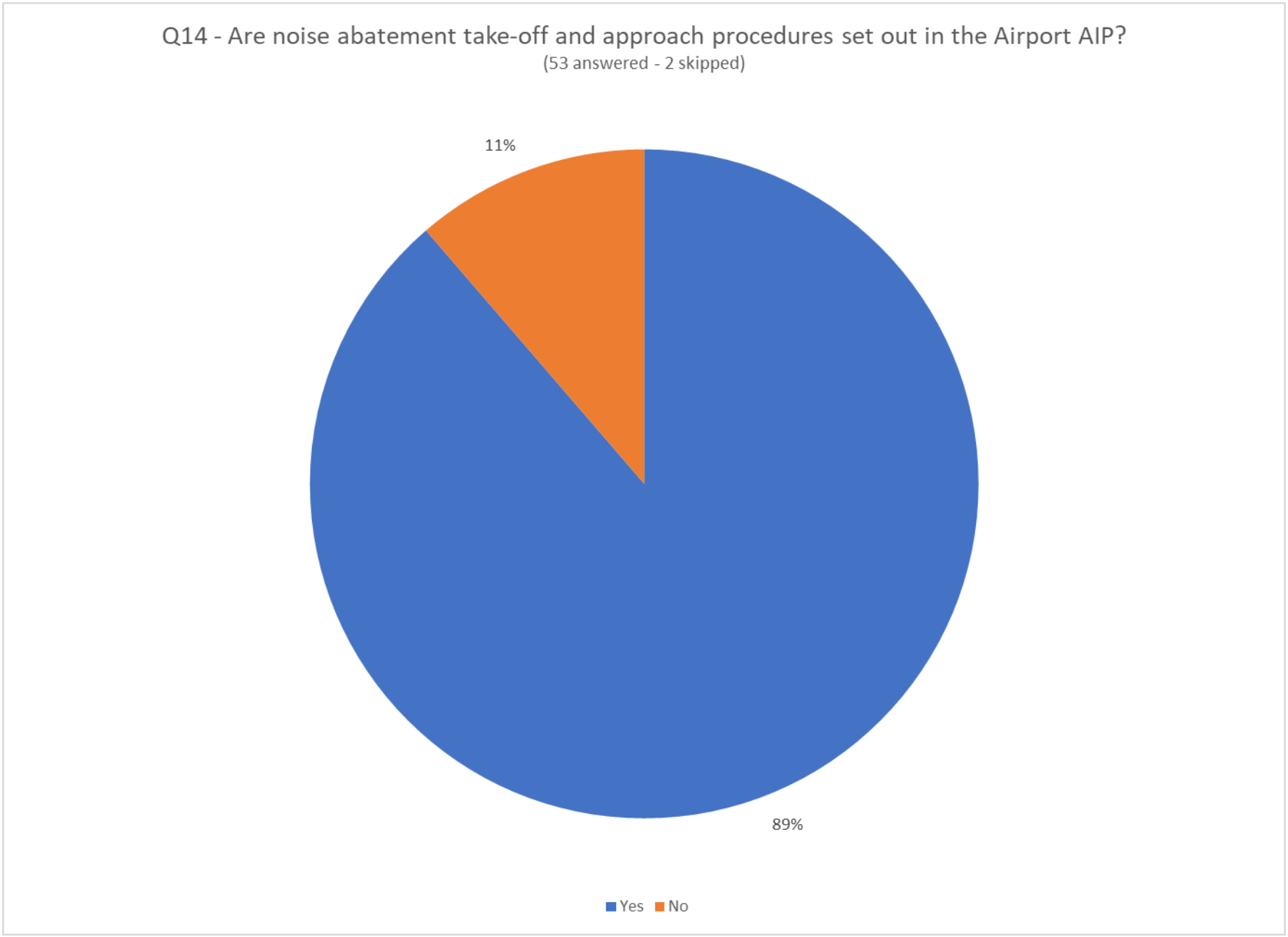

Q9 - Were there any major developments affecting the noise situation before 2017? [over the course of the previous first and second round of action planning]?
(52 answered - 3 skipped)
44%
56%
Yes
No

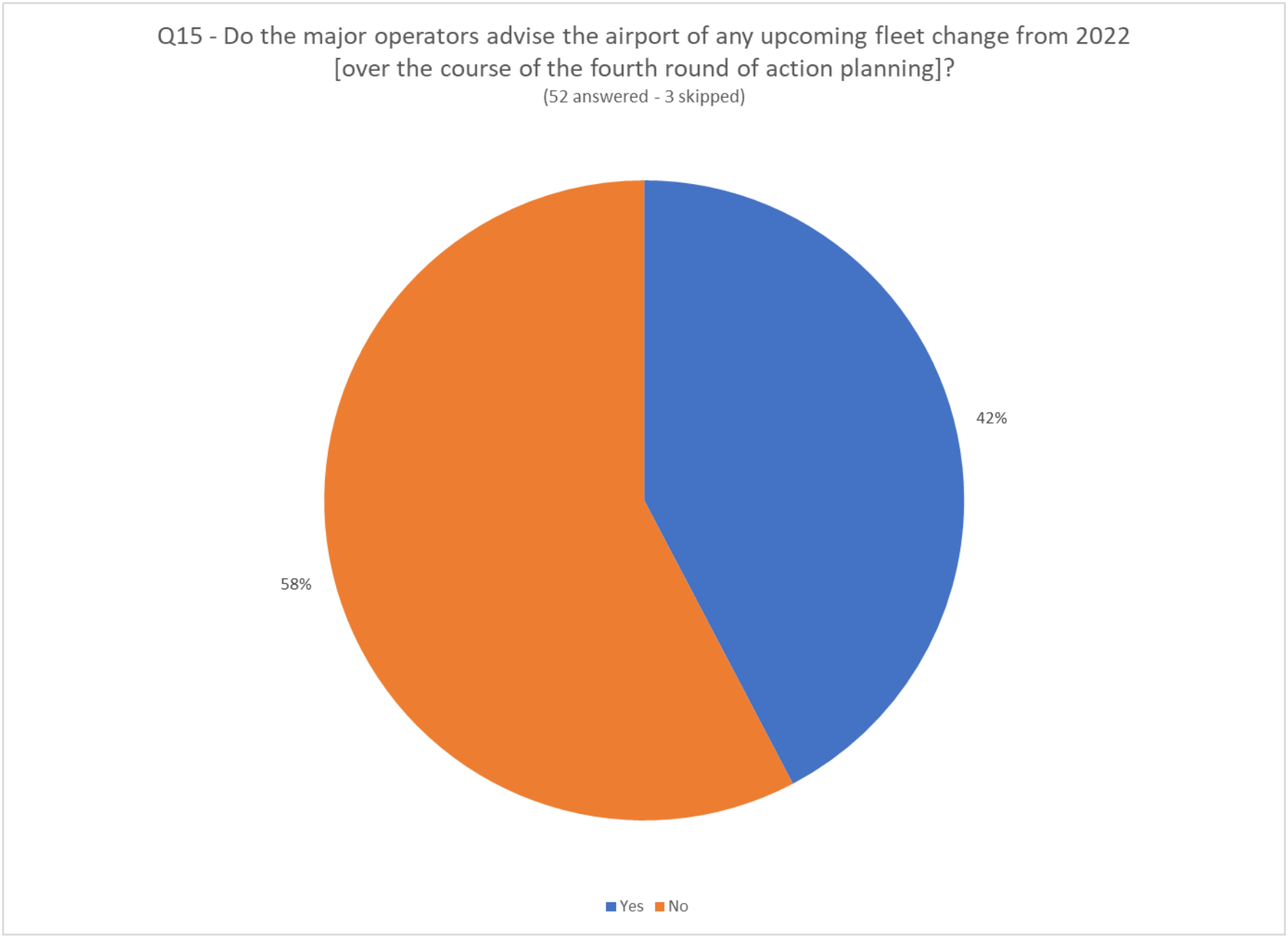

Q10 - Were there any noise reduction measures in place before 2007 [prior to the first round of strategic noise mapping and action planning]?
(52 answered - 3 skipped)
19%
81%
Yes
No

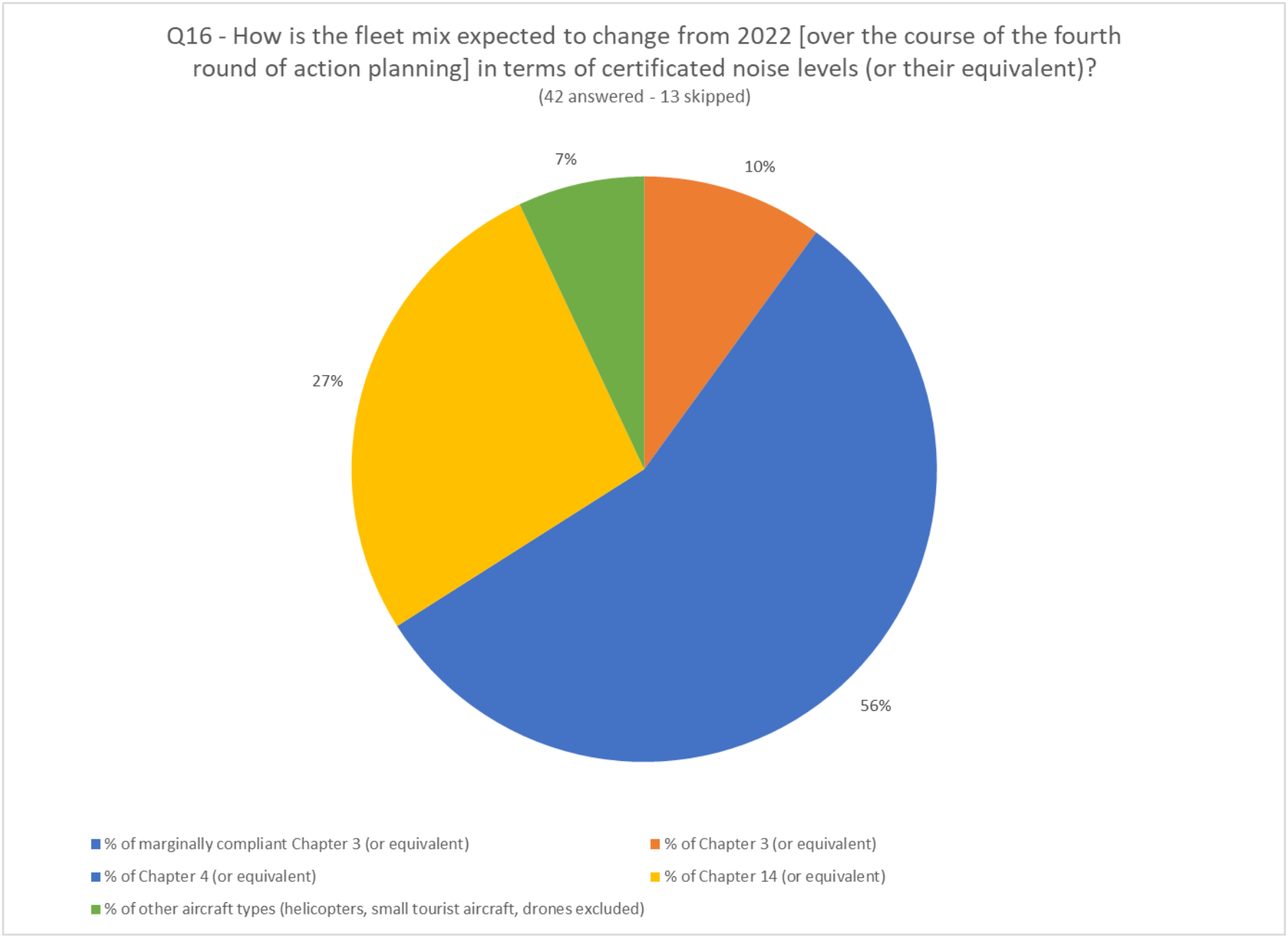

Q11 - Were any airport developments already approved prior to the introduction of the END in mid-2006?
(50 answered - 5 skipped)
18%
82%
Yes
No

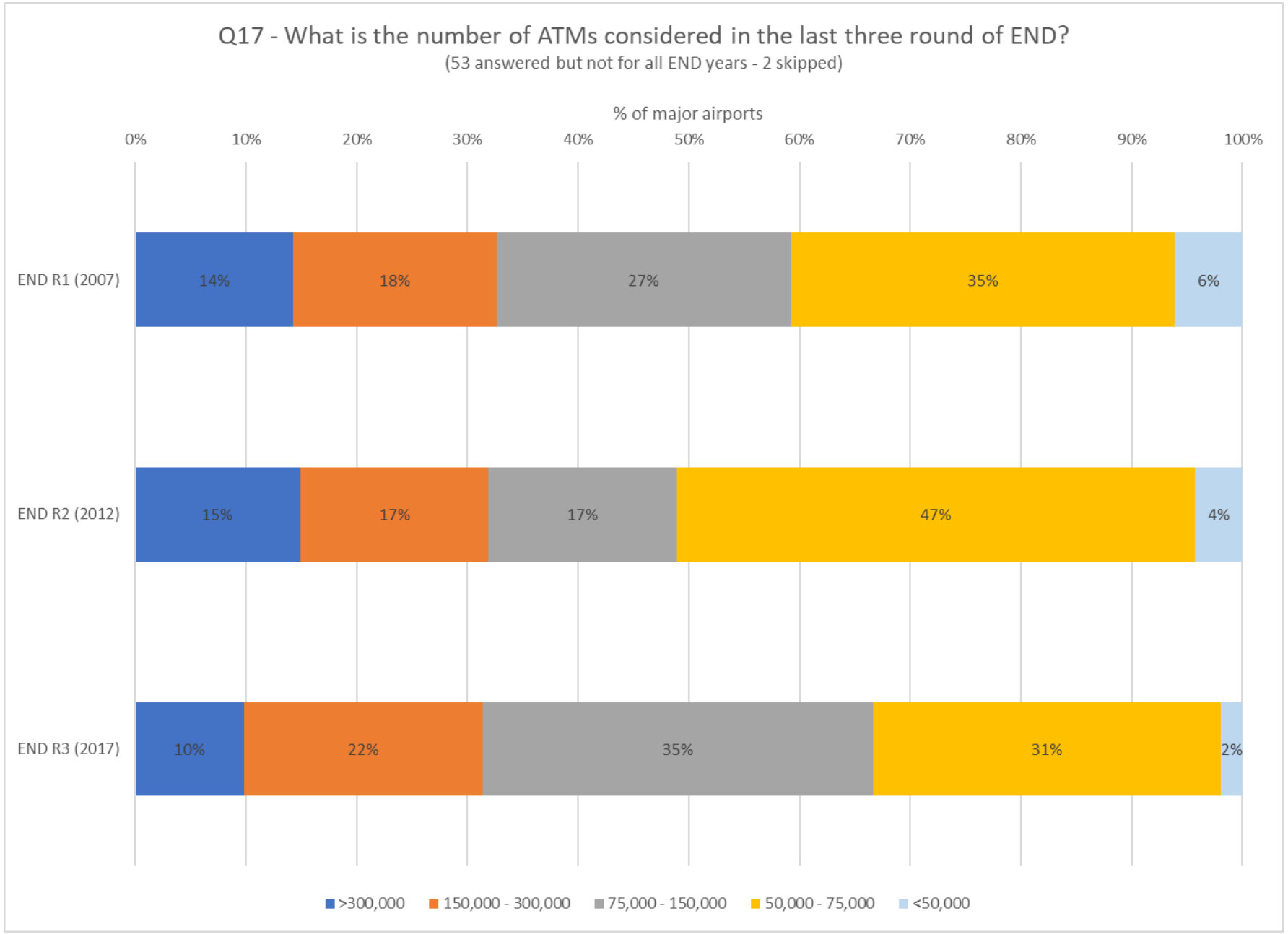

Q12 - Were there any noise limit values in place prior to the first round of strategic noise mapping and action planning?
(54 answered - 1 skipped)
7%
93%
Yes
No

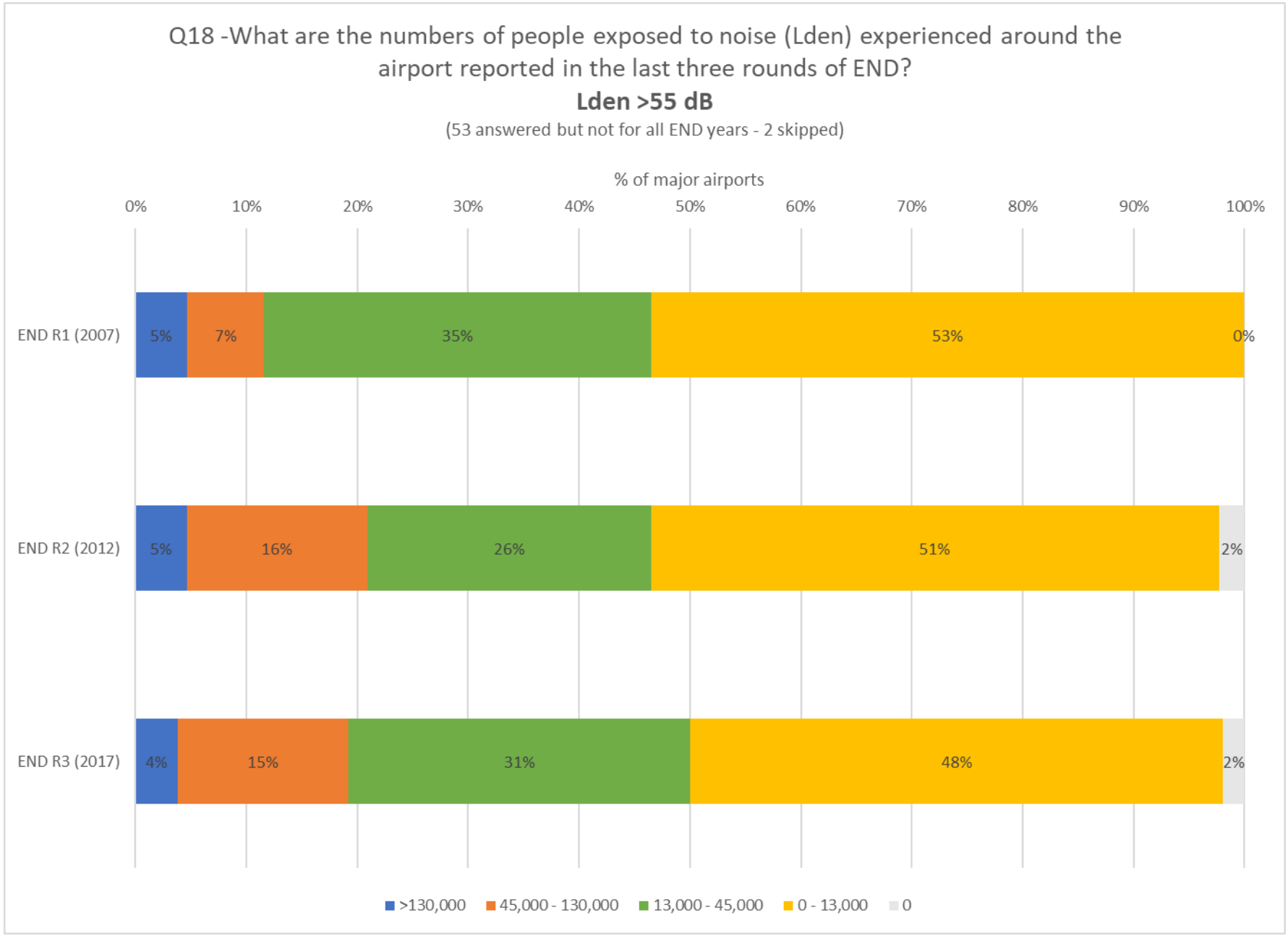

Q13 - Have Competent Authorities granted an exemption from noise operating restrictions for marginally compliant aircraft registered in developing countries?
(53 answered - 2 skipped)
4%
0%
94%
Yes, and Competent Authorities of other Member States as well as Commission were informed of such exceptions
Yes, but Competent Authorities of other Member States as and Commission were not informed of such exceptions
No

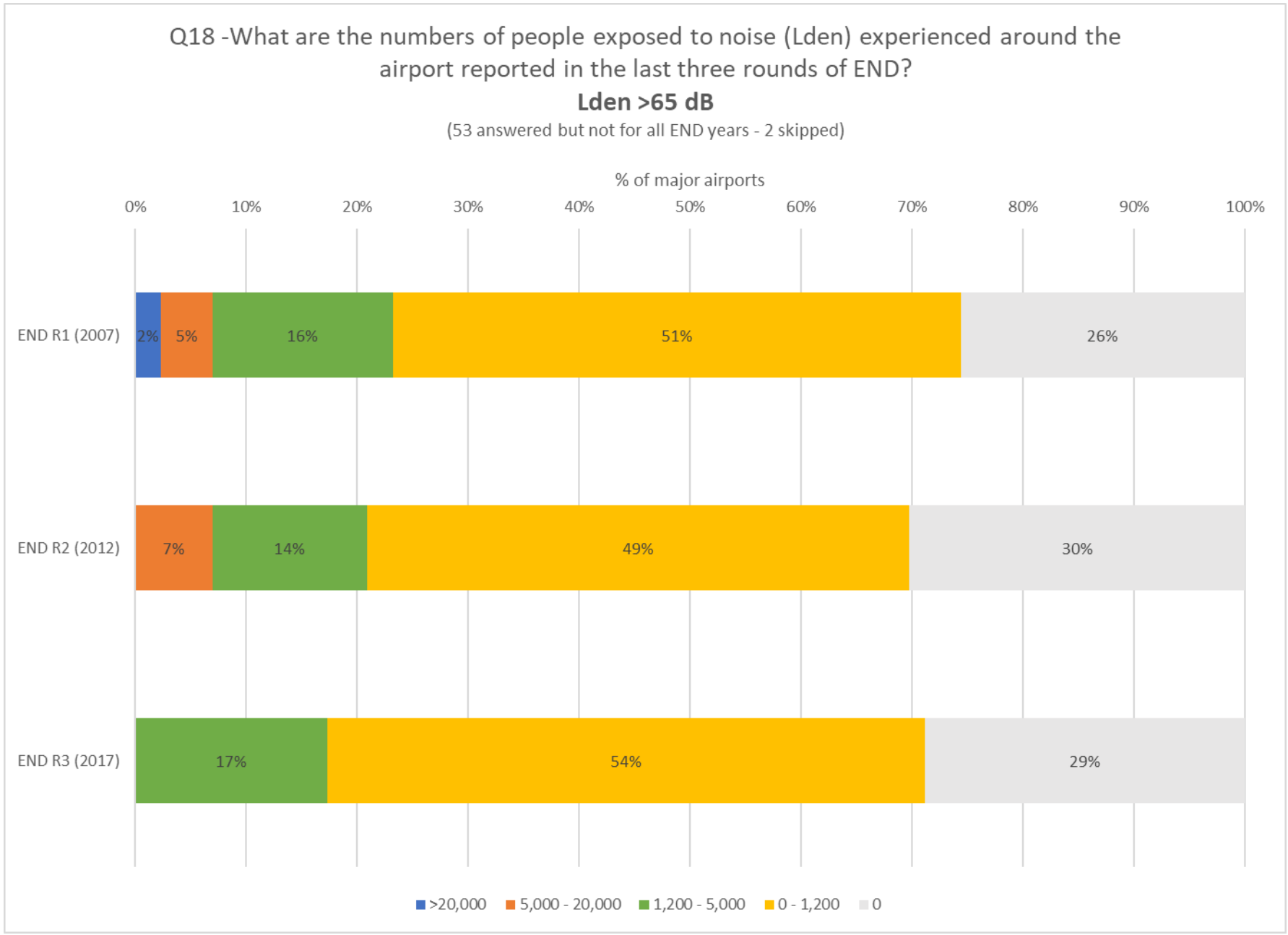

Q14 - Are noise abatement take-off and approach procedures set out in the Airport AIP?
(53 answered - 2 skipped)
11%
89%
Yes
No

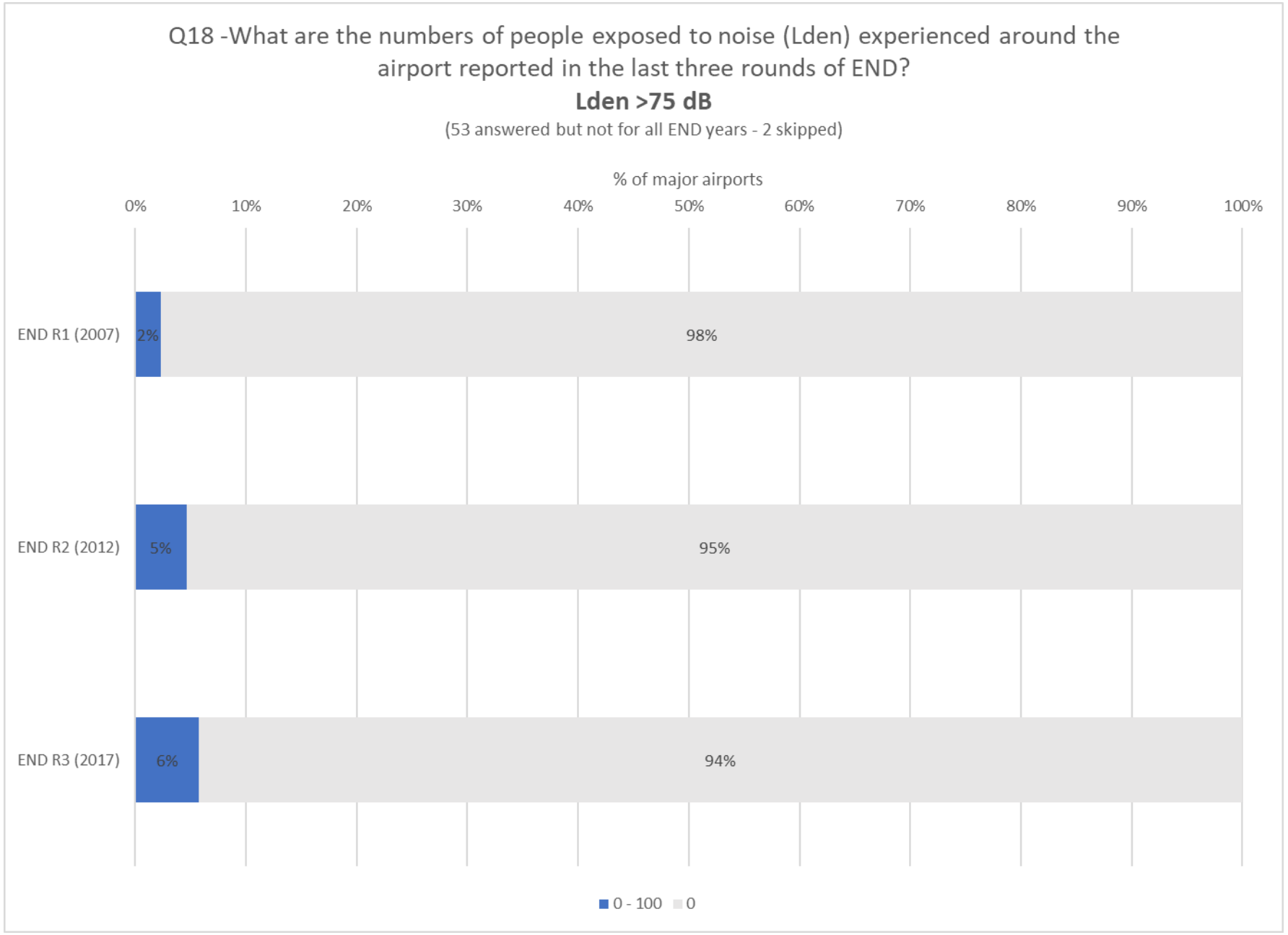

Q15 - Do the major operators advise the airport of any upcoming fleet change from 2022 [over the course of the fourth round of action planning]?
(52 answered - 3 skipped)
42%
58%
Yes
No

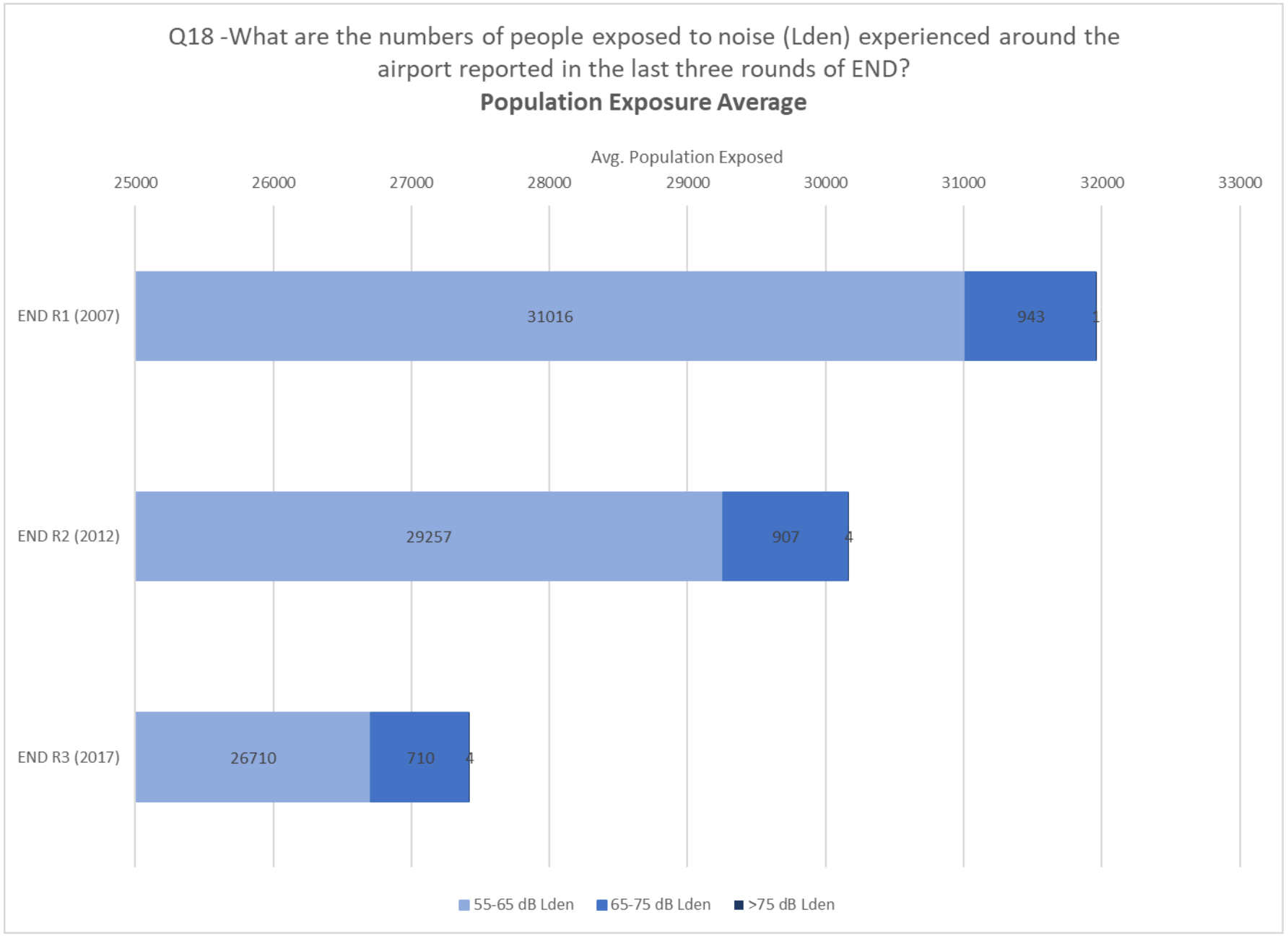

Q16 - How is the fleet mix expected to change from 2022 [over the course of the fourth round of action planning] in terms of certificated noise levels (or their equivalent)?
(42 answered - 13 skipped)
7%
10%
27%
56%
% of marginally compliant Chapter 3 (or equivalent)
% of Chapter 3 (or equivalent)
% of Chapter 4 (or equivalent)
% of Chapter 14 (or equivalent)
% of other aircraft types (helicopters, small tourist aircraft, drones excluded)

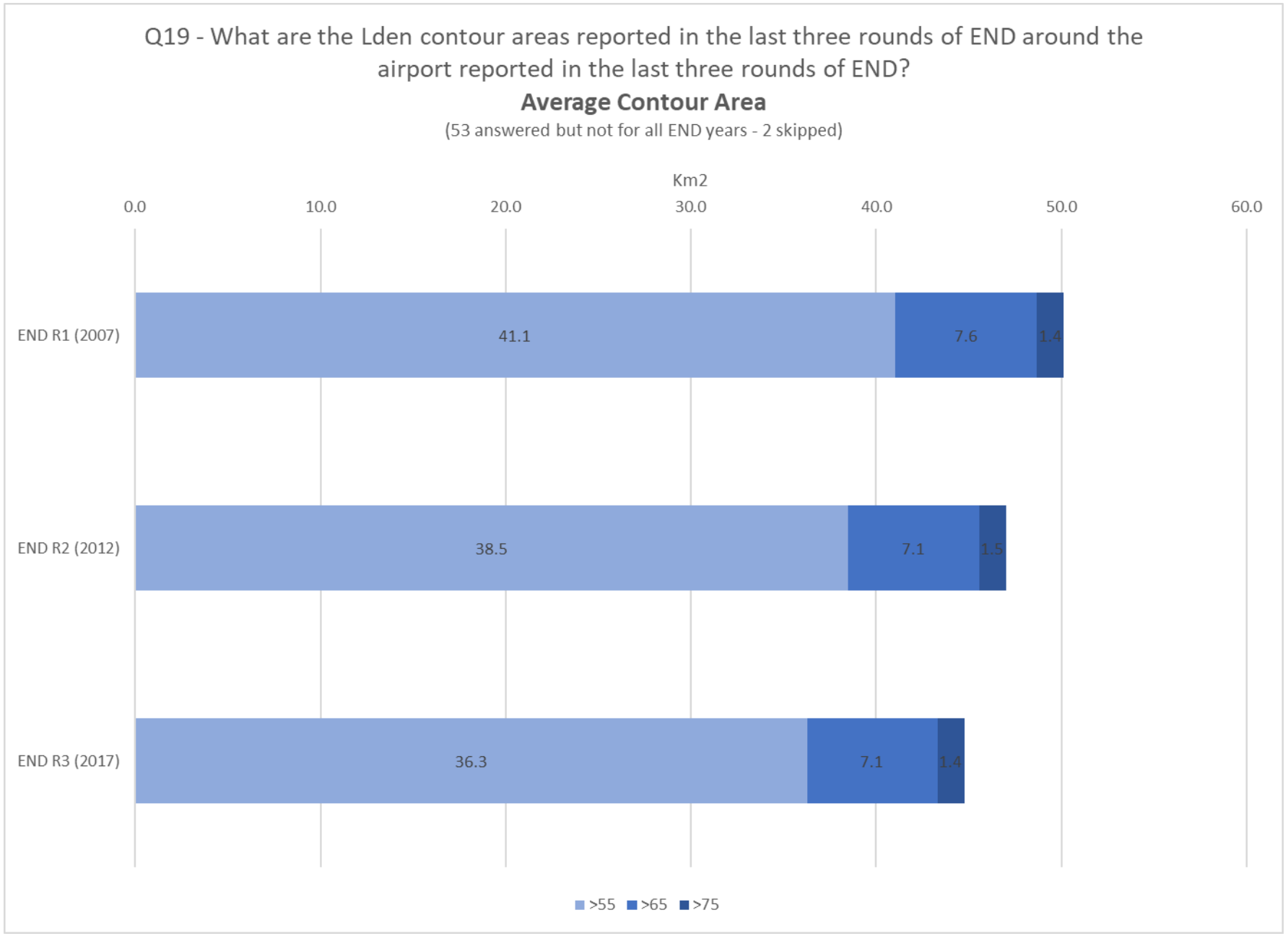

Q17 - What is the number of ATMs considered in the last three round of END?
(53 answered but not for all END years - 2 skipped)
% of major airports
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
END R1 (2007)
14%
18%
27%
35%
6%
END R2 (2012)
15%
17%
17%
47%
4%
END R3 (2017)
10%
22%
35%
31%
2%
>300,000
150,000 - 300,000
75,000 - 150,000
50,000 - 75,000
<50,000

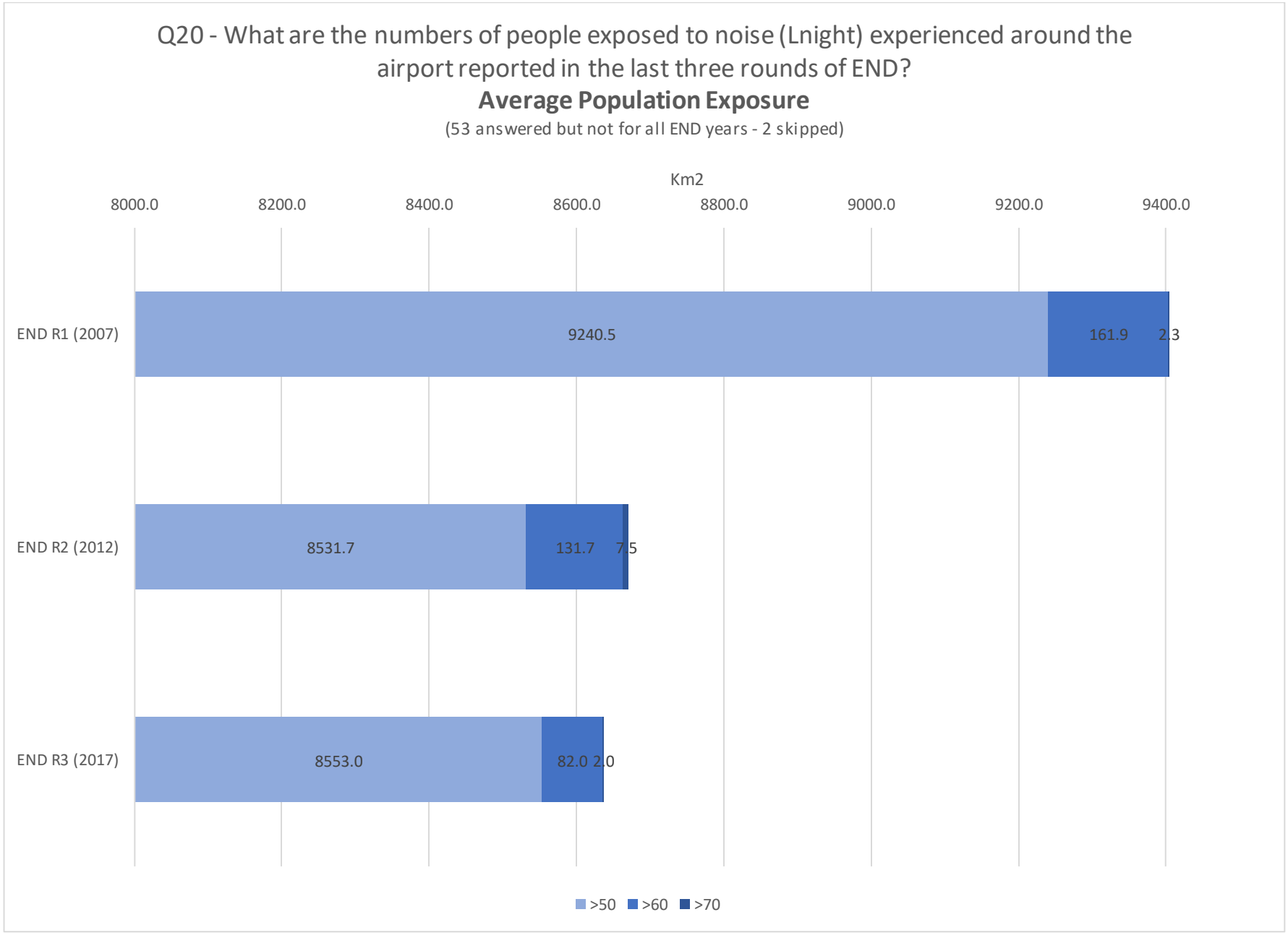

Q18 -What are the numbers of people exposed to noise (Lden) experienced around the airport reported in the last three rounds of END?
Lden >55 dB
(53 answered but not for all END years - 2 skipped)
% of major airports
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
END R1 (2007)
5%
7%
35%
53%
0%
END R2 (2012)
5%
16%
26%
51%
2%
END R3 (2017)
4%
15%
31%
48%
2%
>130,000
45,000 - 130,000
13,000 - 45,000
0 - 13,000
0


Q18 -What are the numbers of people exposed to noise (Lden) experienced around the airport reported in the last three rounds of END?
Lden >65 dB
(53 answered but not for all END years - 2 skipped)
% of major airports
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
END R1 (2007)
2%
5%
16%
51%
26%
END R2 (2012)
7%
14%
49%
30%
END R3 (2017)
17%
54%
29%
>20,000
5,000 - 20,000
1,200 - 5,000
0 - 1,200
0


Q18 -What are the numbers of people exposed to noise (Lden) experienced around the airport reported in the last three rounds of END?
Lden >75 dB
(53 answered but not for all END years - 2 skipped)
% of major airports
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
END R1 (2007)
2%
98%
END R2 (2012)
5%
95%
END R3 (2017)
6%
94%
0 - 100
0


Q18 -What are the numbers of people exposed to noise (Lden) experienced around the airport reported in the last three rounds of END?
Population Exposure Average
Avg. Population Exposed
25000
26000
27000
28000
29000
30000
31000
32000
33000
END R1 (2007)
31016
943
1
END R2 (2012)
29257
907
4
END R3 (2017)
26710
710
4
55-65 dB Lden
65-75 dB Lden
>75 dB Lden


Q19 - What are the Lden contour areas reported in the last three rounds of END around the airport reported in the last three rounds of END?
Average Contour Area
(53 answered but not for all END years - 2 skipped)
Km2
0.0
10.0
20.0
30.0
40.0
50.0
60.0
END R1 (2007)
41.1
7.6
1.4
END R2 (2012)
38.5
7.1
1.5
END R3 (2017)
36.3
7.1
1.4
>55
>65
>75

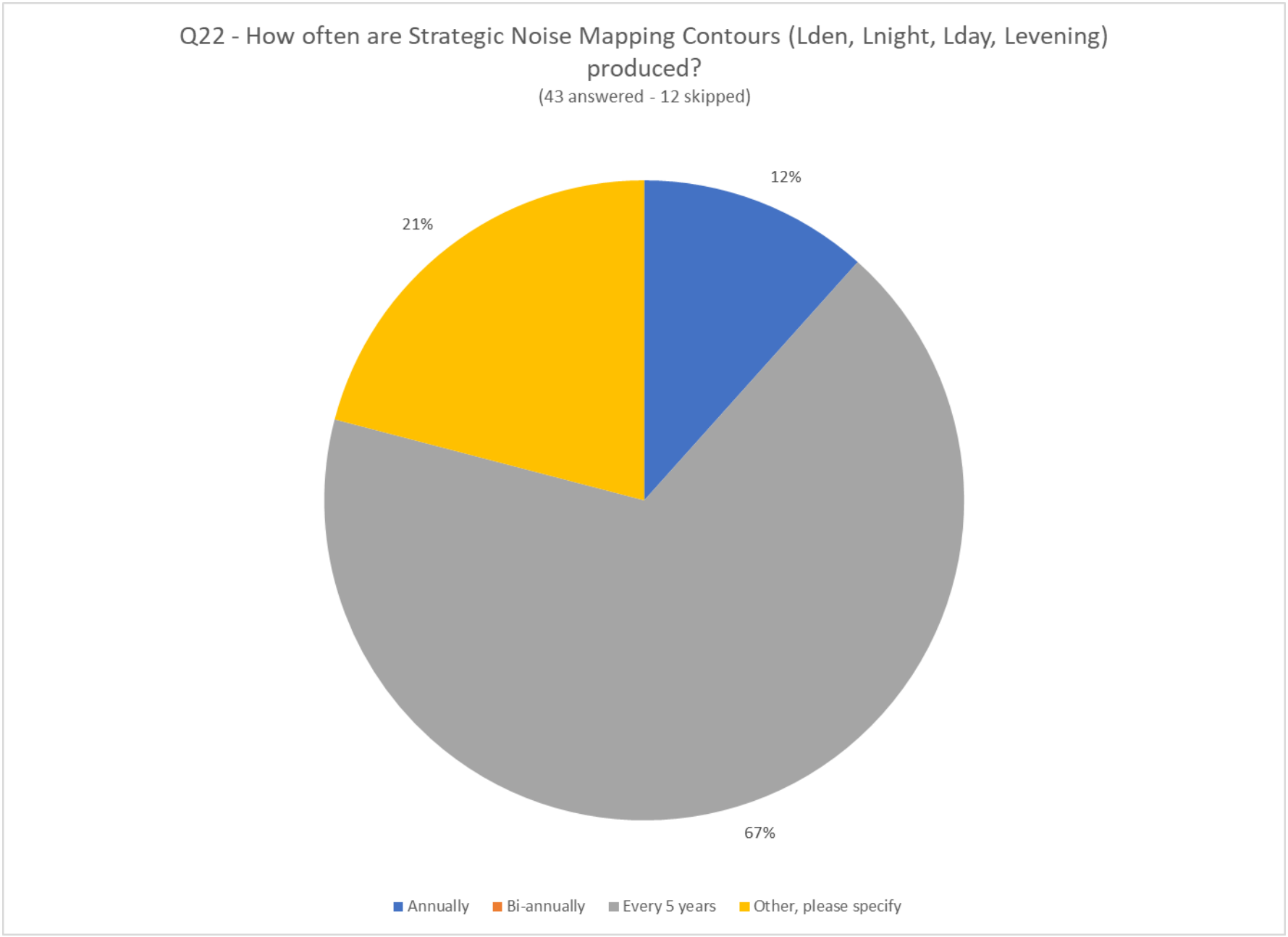

Q20 - What are the numbers of people exposed to noise (Lnight) experienced around the airport reported in the last three rounds of END?
Average Population Exposure
(53 answered but not for all END years - 2 skipped)
Km2
8000.0
8200.0
8400.0
8600.0
8800.0
9000.0
9200.0
9400.0
END R1 (2007)
9240.5
161.9
2.3
END R2 (2012)
8531.7
131.7
7.5
END R3 (2017)
8553.0
82.0
2.0
>50
>60
>70

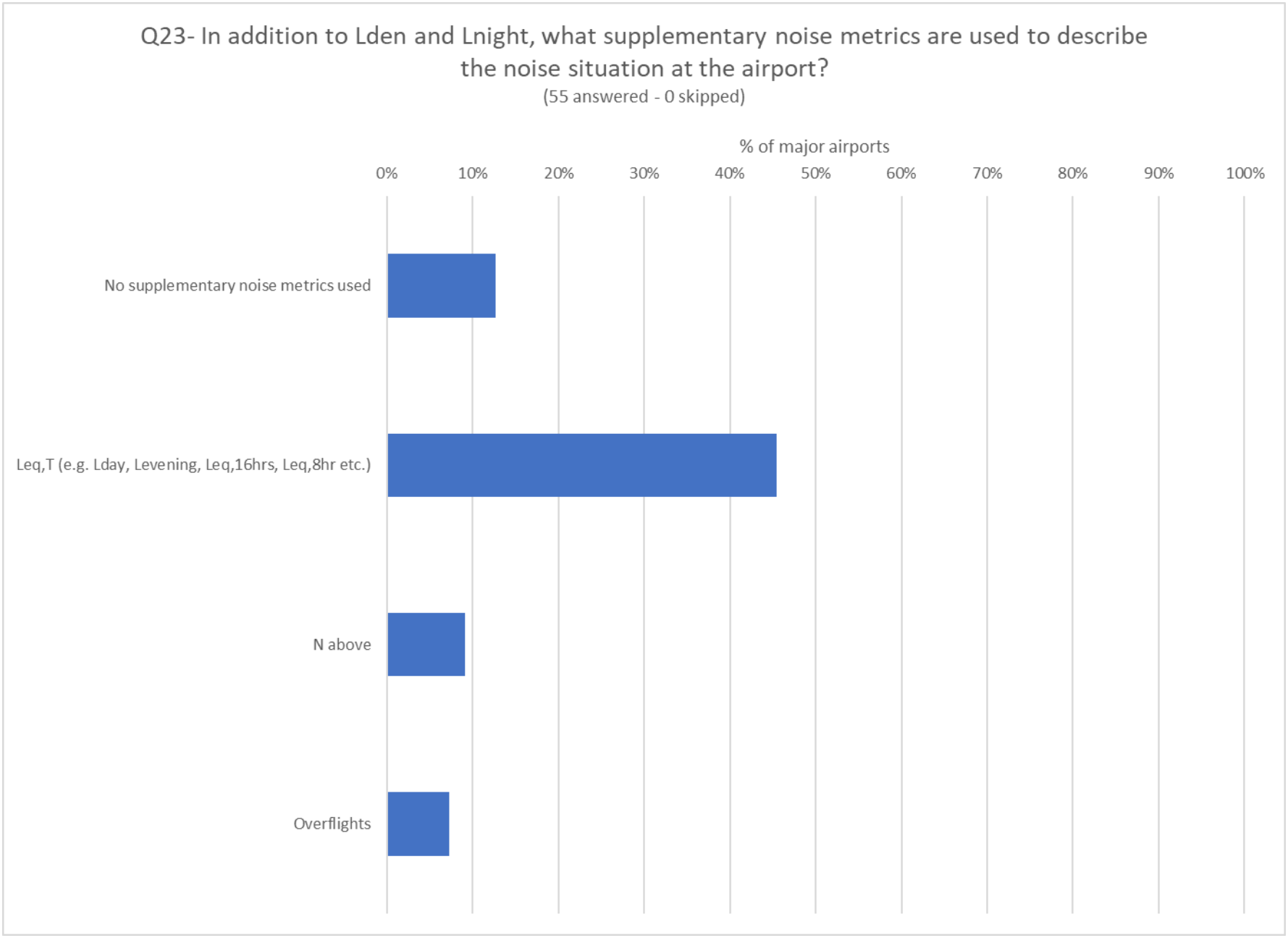
Q21 - What are the contour areas reported in the last three rounds of END around the airport reported in the last three rounds of END?

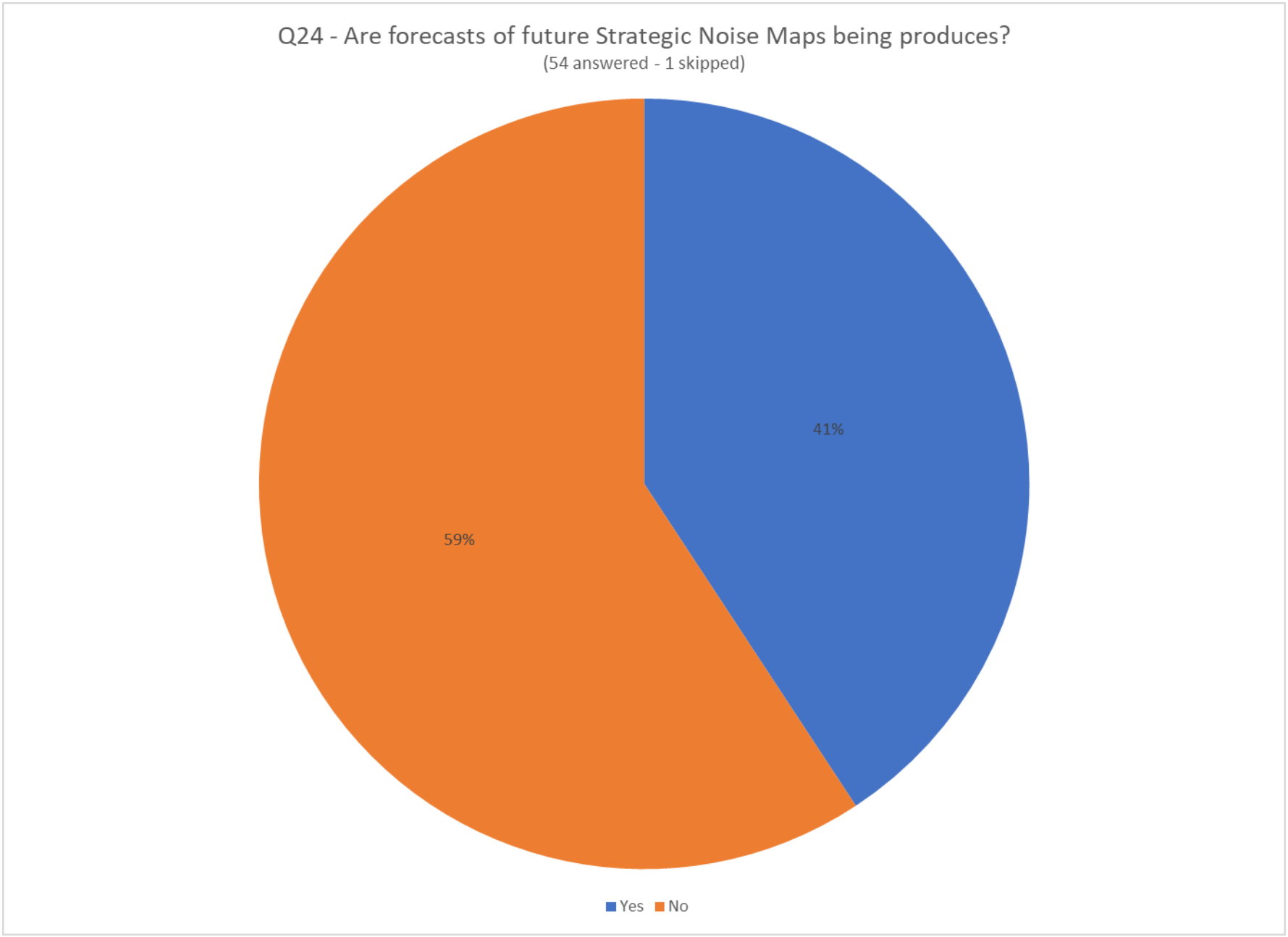
Average Contour Area

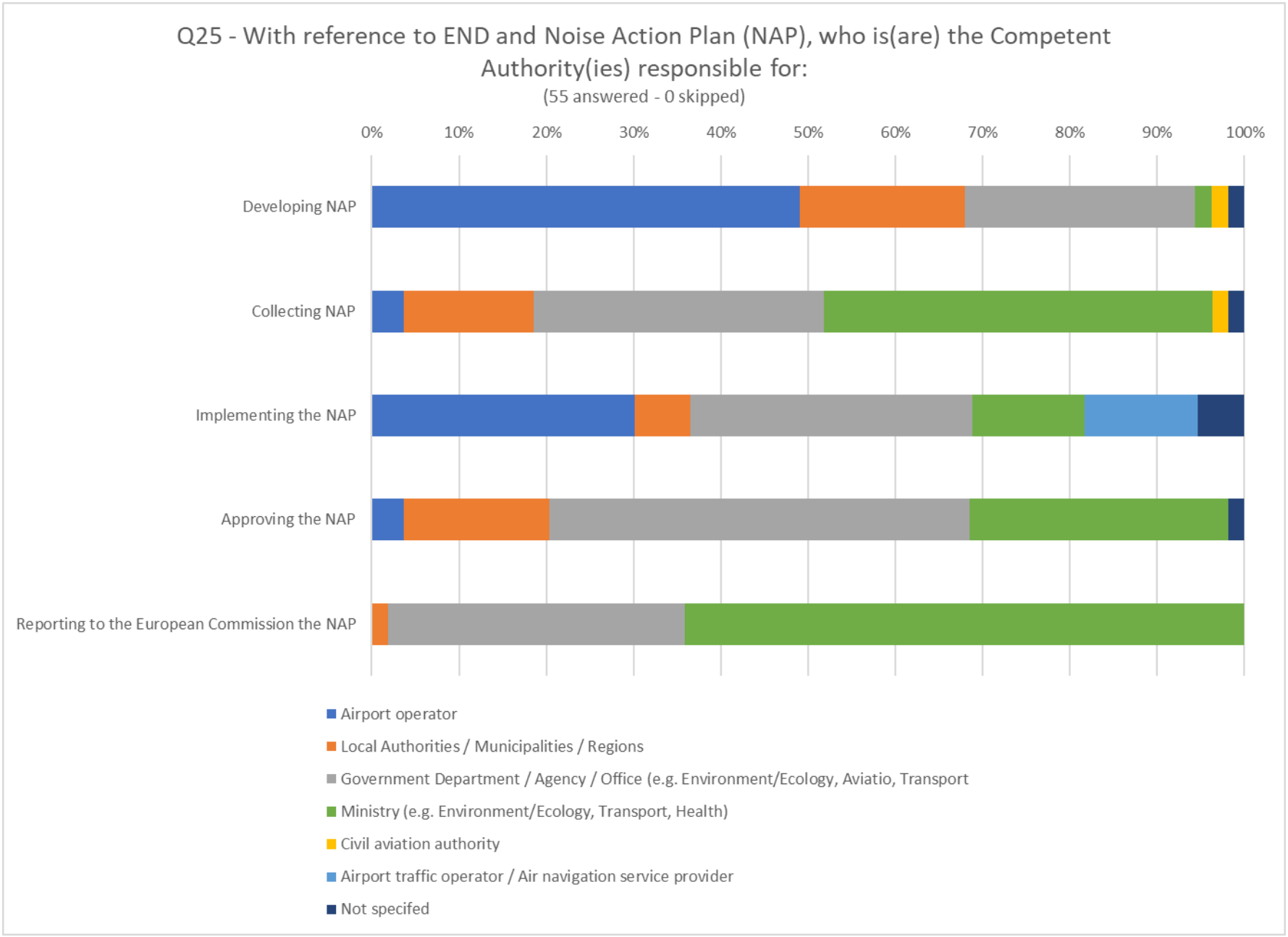
(53 answered but not for all END years - 2 skipped)

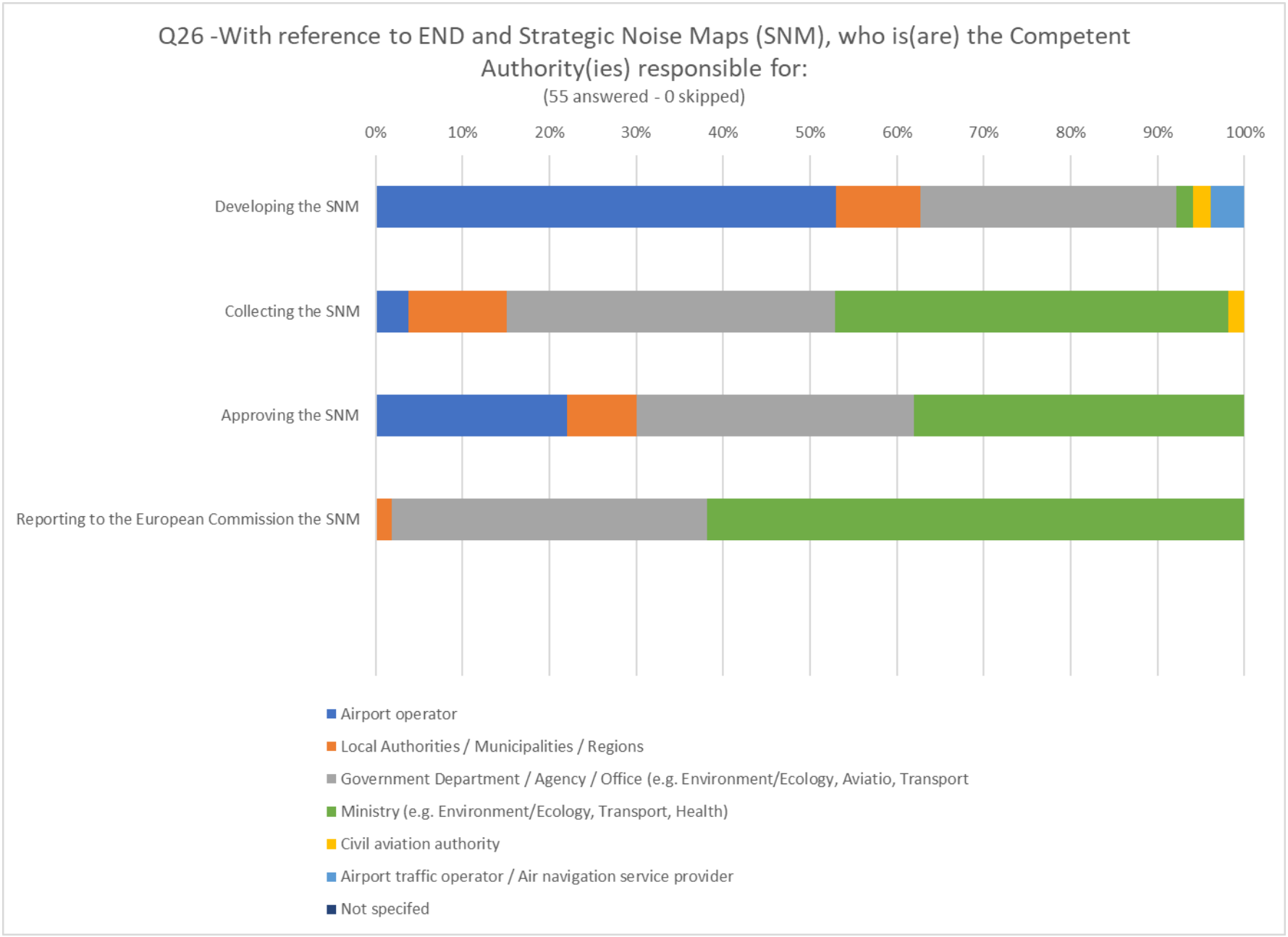
Data reported in Appendix E

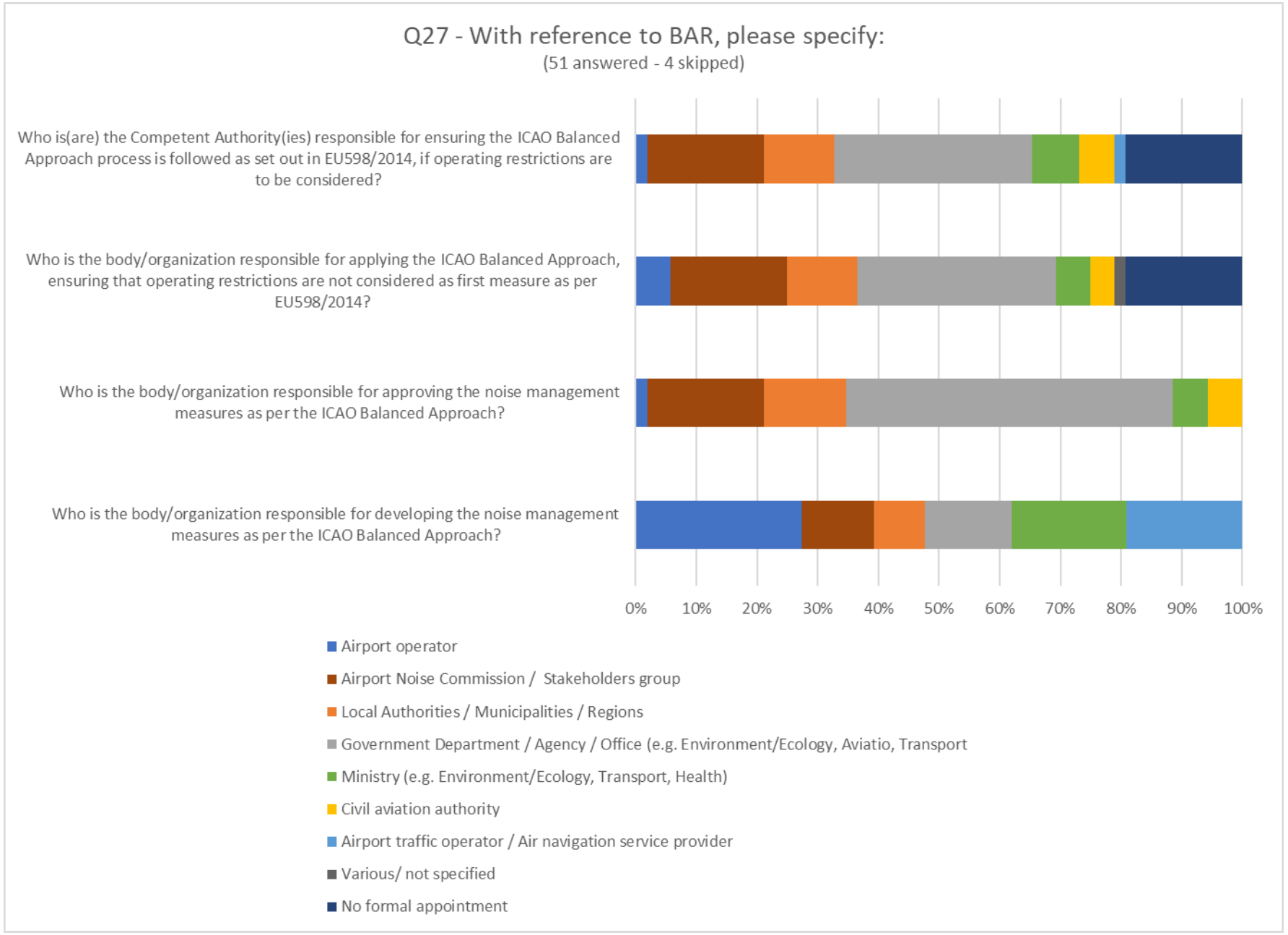

Q22 - How often are Strategic Noise Mapping Contours (Lden, Lnight, Lday, Levening) produced?
(43 answered - 12 skipped)
12%
21%
67%
Annually
Bi-annually
Every 5 years
Other, please specify

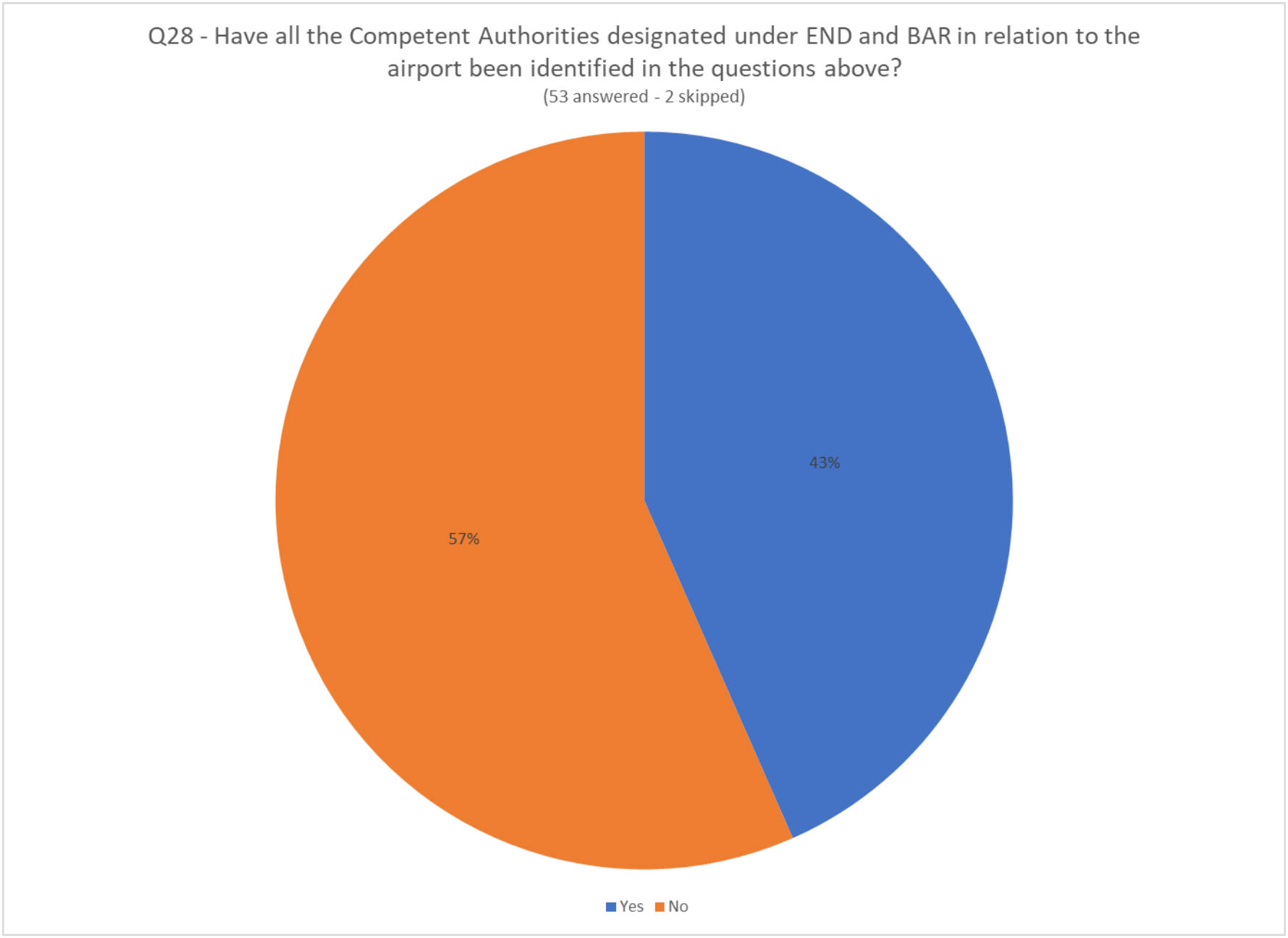

Q23- In addition to Lden and Lnight, what supplementary noise metrics are used to describe the noise situation at the airport?
(55 answered - 0 skipped)
% of major airports
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
No supplementary noise metrics used
Leq,T (e.g. Lday, Levening, Leq,16hrs, Leq,8hr etc.)
N above
Overflights

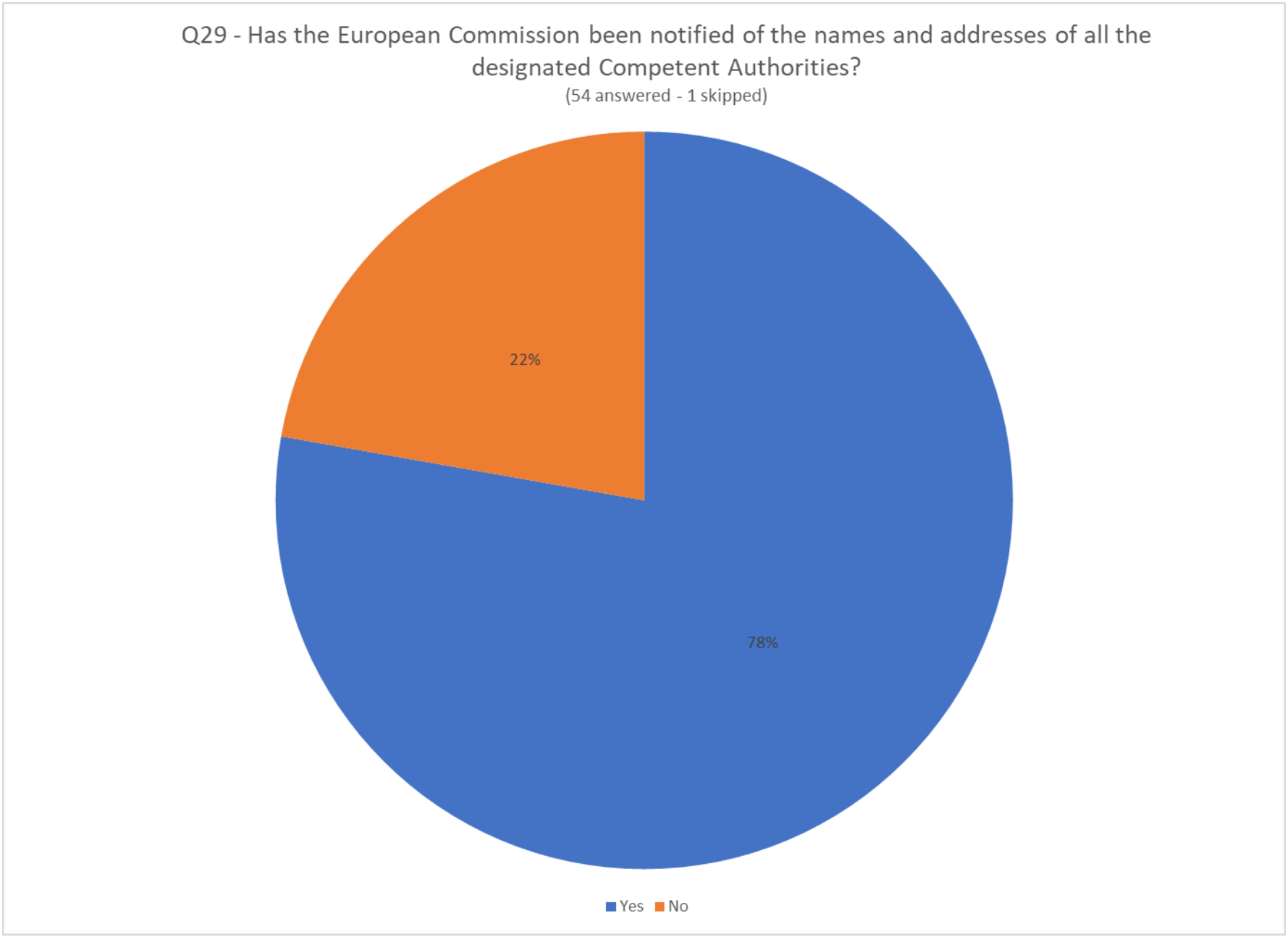

Q24 - Are forecasts of future Strategic Noise Maps being produces?
(54 answered - 1 skipped)
41%
59%
Yes
No

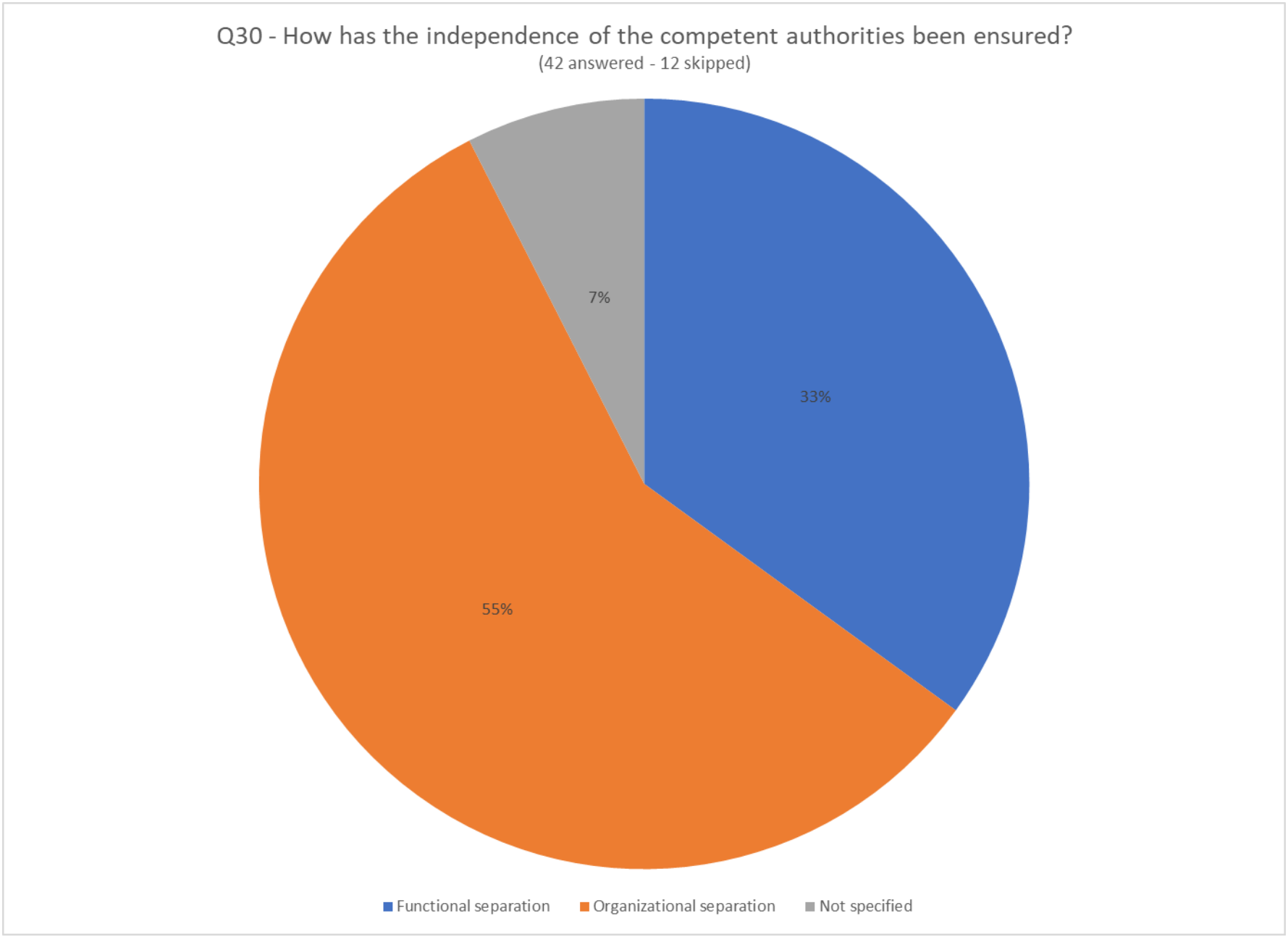

Q25 - With reference to END and Noise Action Plan (NAP), who is(are) the Competent Authority(ies) responsible for:
(55 answered - 0 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Developing NAP
Collecting NAP
Implementing the NAP
Approving the NAP
Reporting to the European Commission the NAP
Airport operator
Local Authorities / Municipalities / Regions
Government Department / Agency / Office (e.g. Environment/Ecology, Aviatio, Transport
Ministry (e.g. Environment/Ecology, Transport, Health)
Civil aviation authority
Airport traffic operator / Air navigation service provider
Not specifed

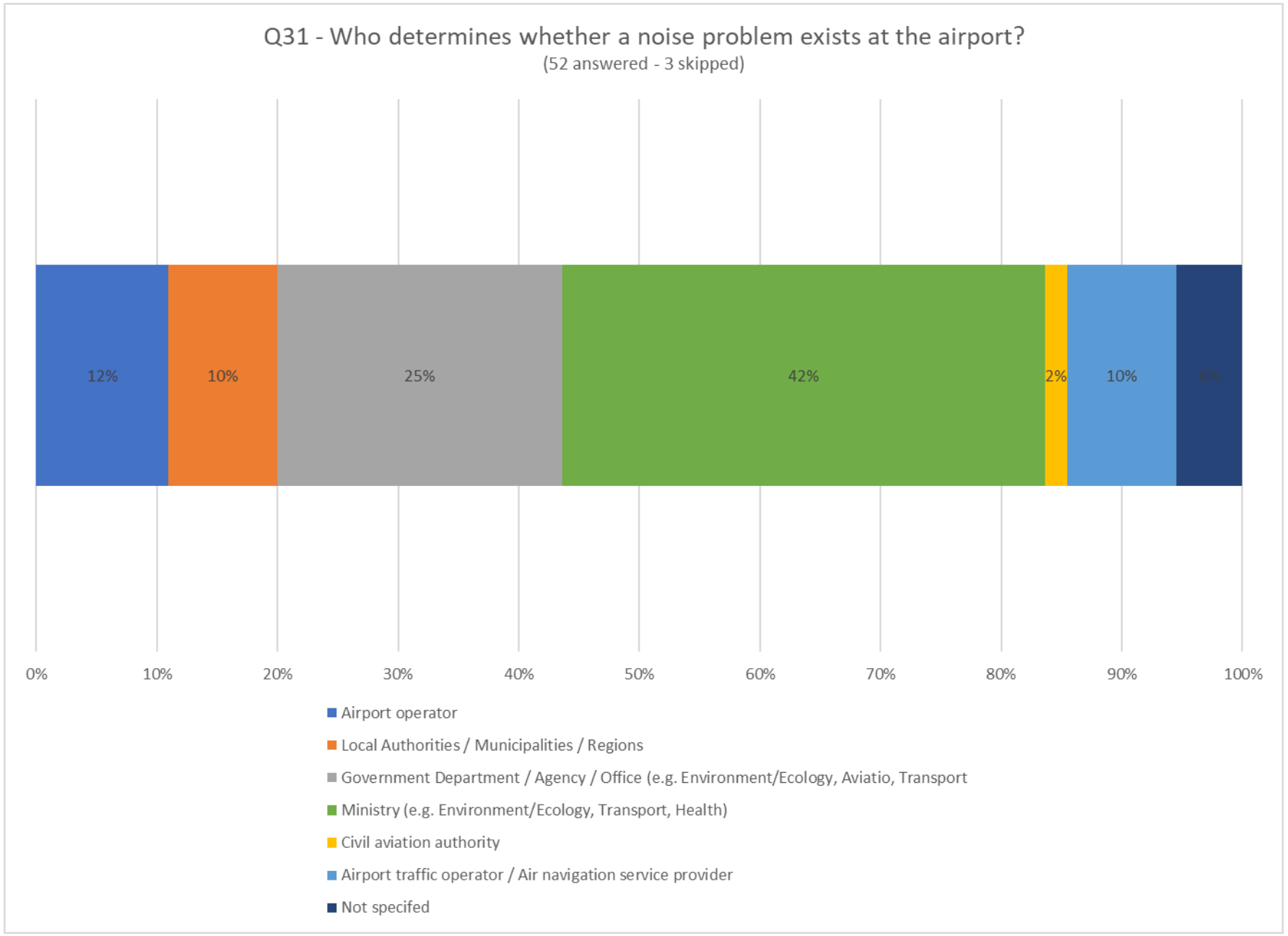

Q26 -With reference to END and Strategic Noise Maps (SNM), who is(are) the Competent Authority(ies) responsible for:
(55 answered - 0 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Developing the SNM
Collecting the SNM
Approving the SNM
Reporting to the European Commission the SNM
Airport operator
Local Authorities / Municipalities / Regions
Government Department / Agency / Office (e.g. Environment/Ecology, Aviatio, Transport
Ministry (e.g. Environment/Ecology, Transport, Health)
Civil aviation authority
Airport traffic operator / Air navigation service provider
Not specifed

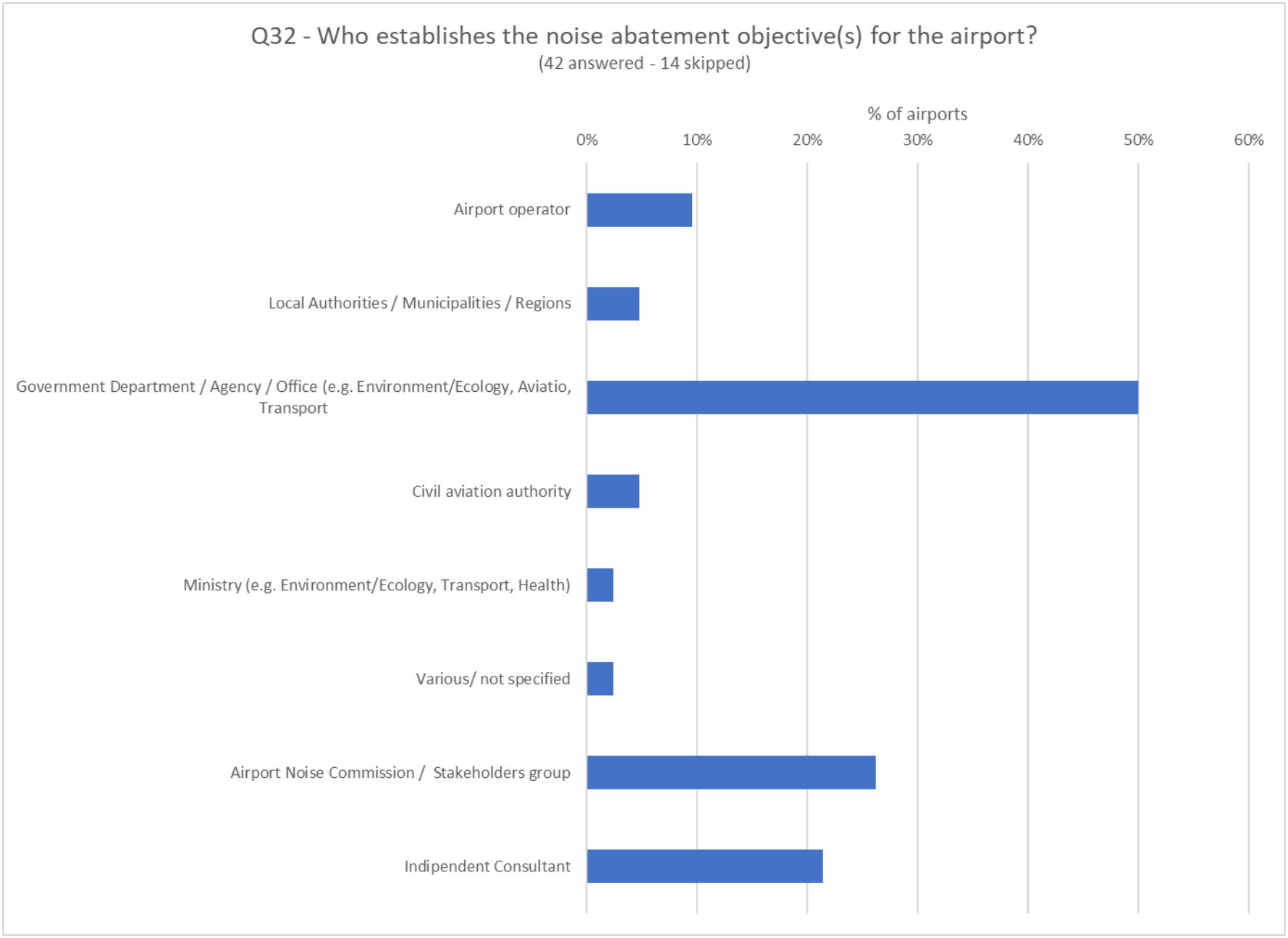

Q27 - With reference to BAR, please specify:
(51 answered - 4 skipped)
Who is(are) the Competent Authority(ies) responsible for ensuring the ICAO Balanced Approach process is followed as set out in EU598/2014, if operating restrictions are to be considered?
Who is the body/organization responsible for applying the ICAO Balanced Approach, ensuring that operating restrictions are not considered as first measure as per EU598/2014?
Who is the body/organization responsible for approving the noise management measures as per the ICAO Balanced Approach?
Who is the body/organization responsible for developing the noise management measures as per the ICAO Balanced Approach?
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Airport operator
Airport Noise Commission / Stakeholders group
Local Authorities / Municipalities / Regions
Government Department / Agency / Office (e.g. Environment/Ecology, Aviatio, Transport
Ministry (e.g. Environment/Ecology, Transport, Health)
Civil aviation authority
Airport traffic operator / Air navigation service provider
Various/ not specified
No formal appointment

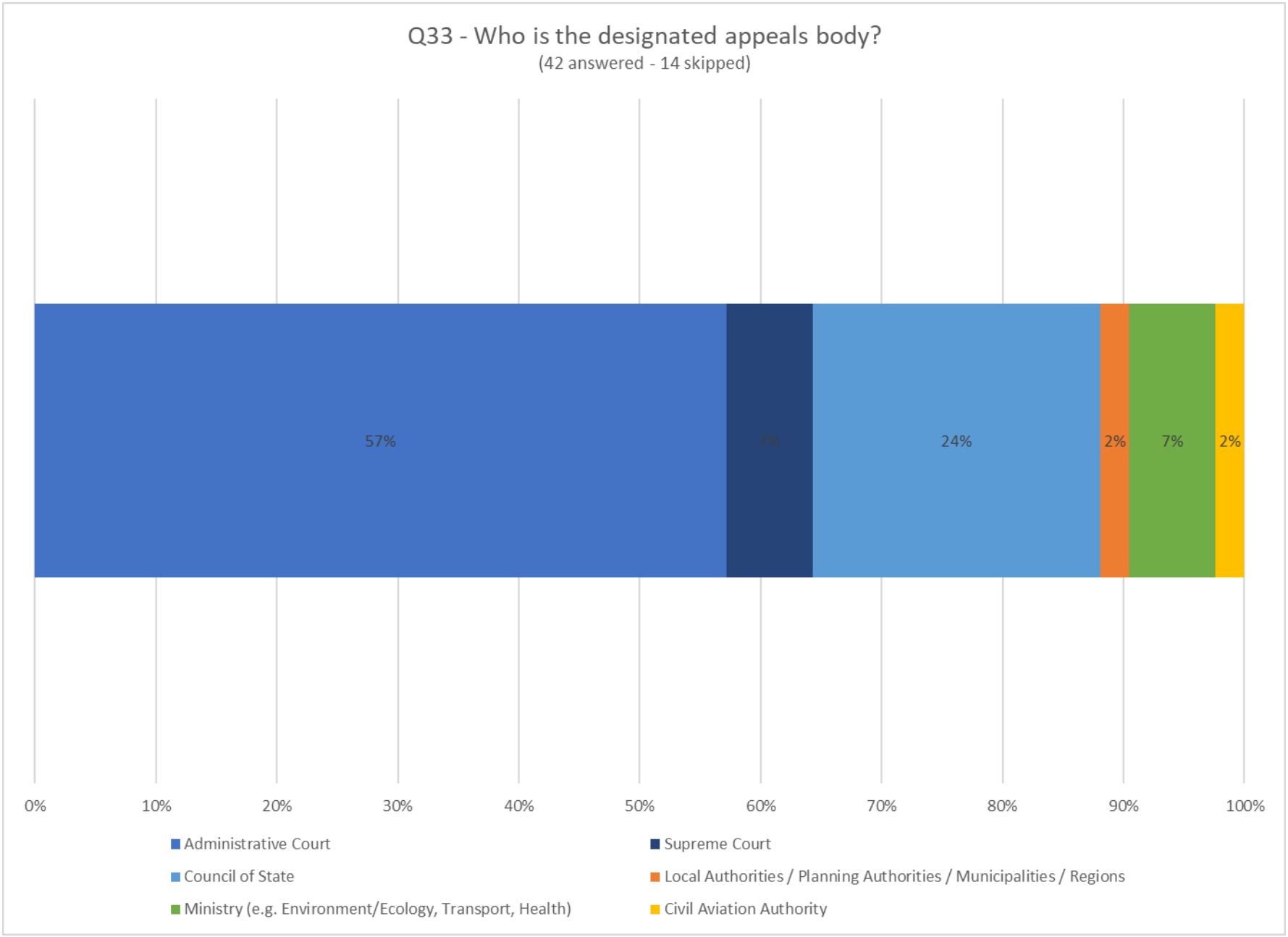

Q28 - Have all the Competent Authorities designated under END and BAR in relation to the airport been identified in the questions above?
(53 answered - 2 skipped)
43%
57%
Yes
No

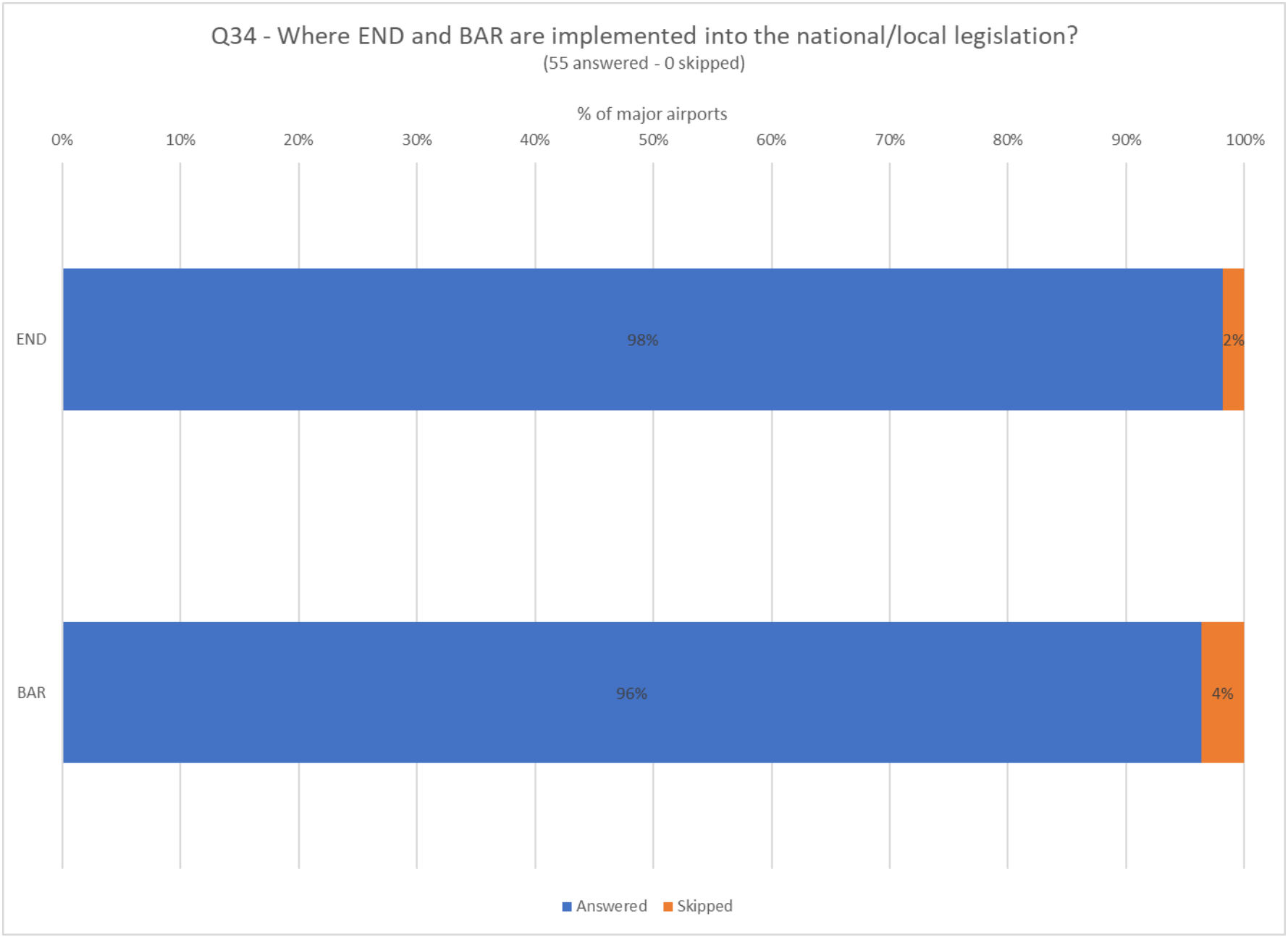

Q29 - Has the European Commission been notified of the names and addresses of all the designated Competent Authorities?
(54 answered - 1 skipped)
22%
78%
Yes
No

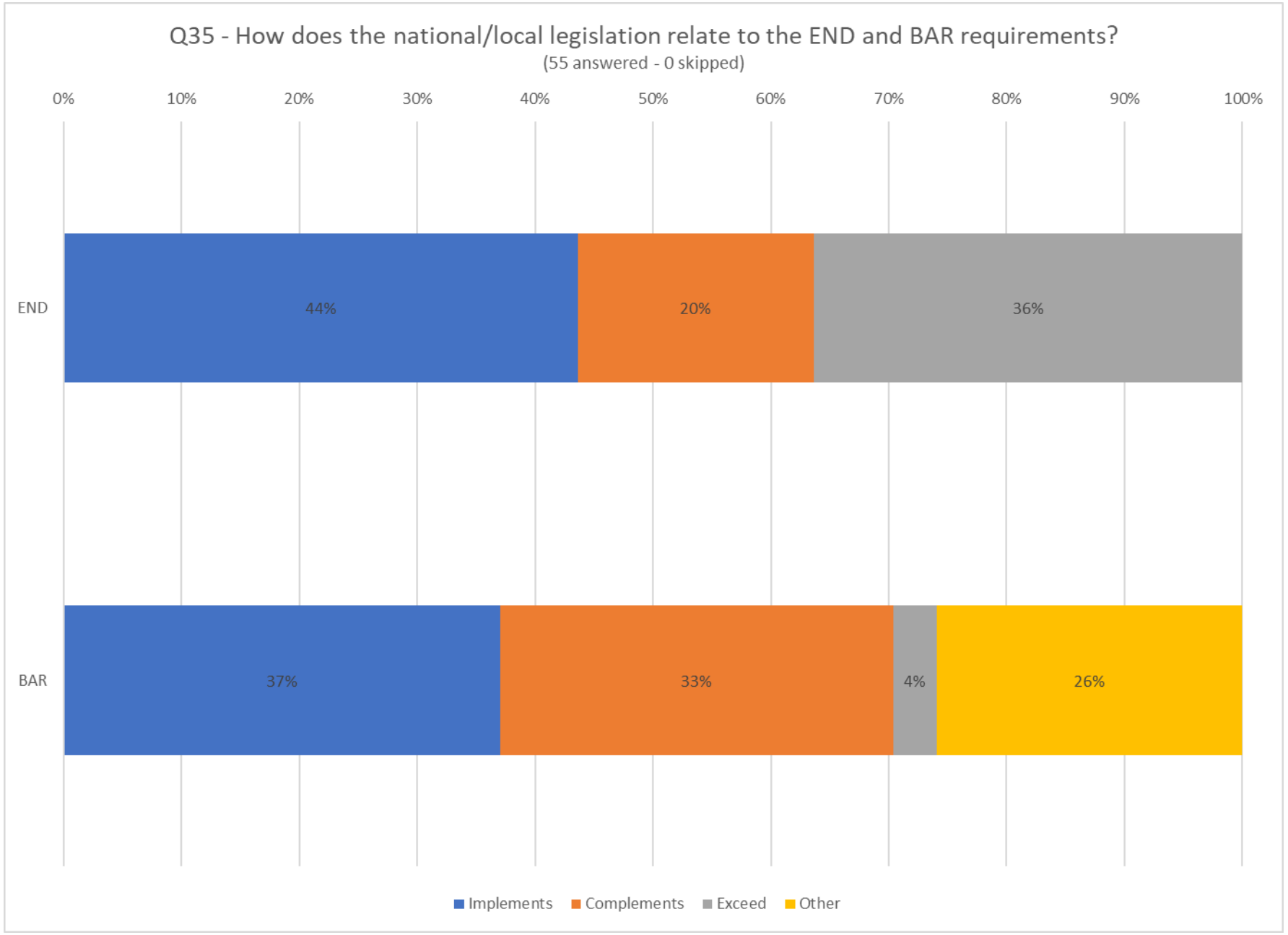

Q30 - How has the independence of the competent authorities been ensured?
(42 answered - 12 skipped)
7%
33%
55%
Functional separation
Organizational separation
Not specified

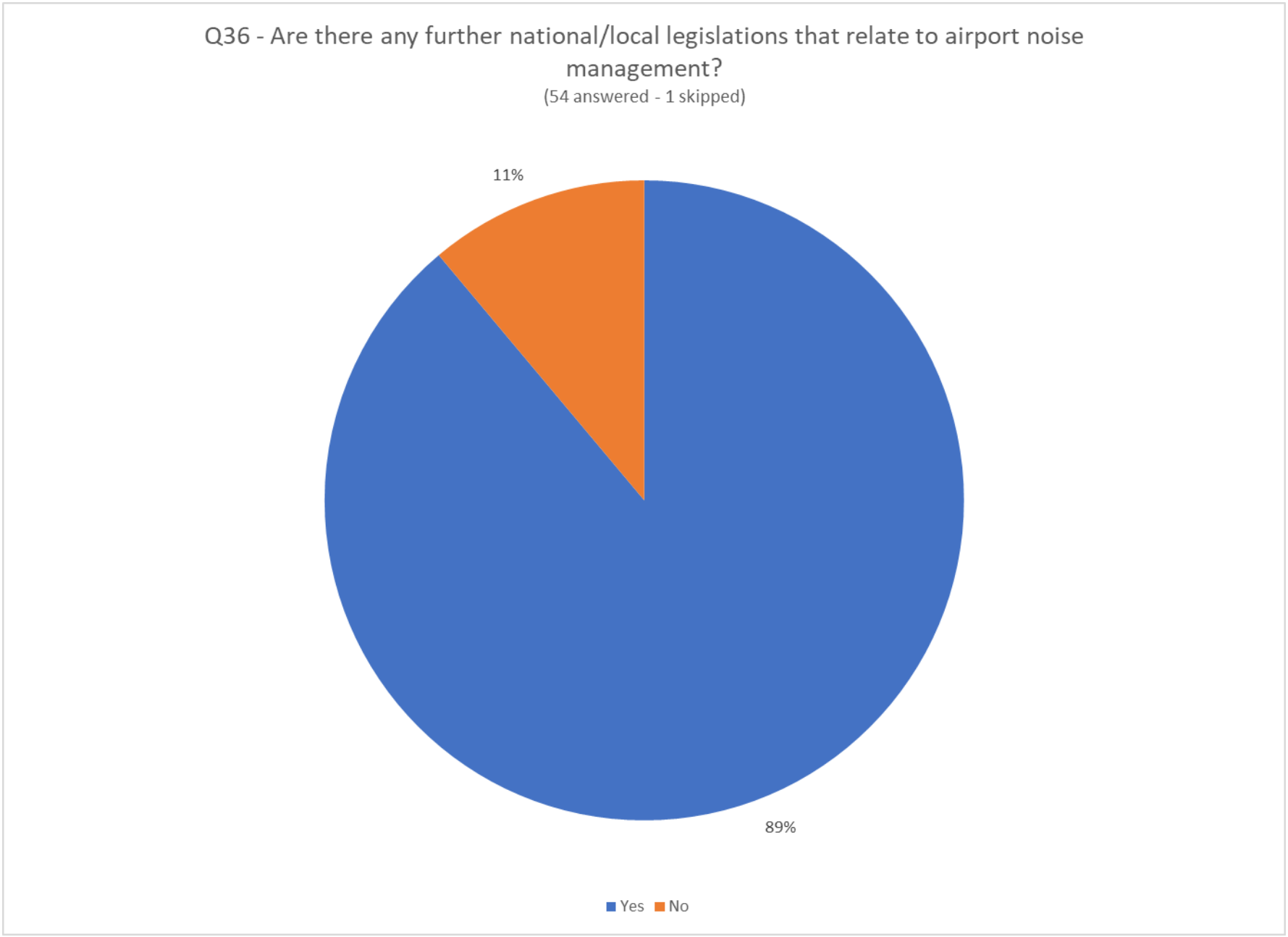

Q31 - Who determines whether a noise problem exists at the airport?
(52 answered - 3 skipped)
12%
10%
25%
42%
2%
10%
6%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Airport operator
Local Authorities / Municipalities / Regions
Government Department / Agency / Office (e.g. Environment/Ecology, Aviatio, Transport
Ministry (e.g. Environment/Ecology, Transport, Health)
Civil aviation authority
Airport traffic operator / Air navigation service provider
Not specifed

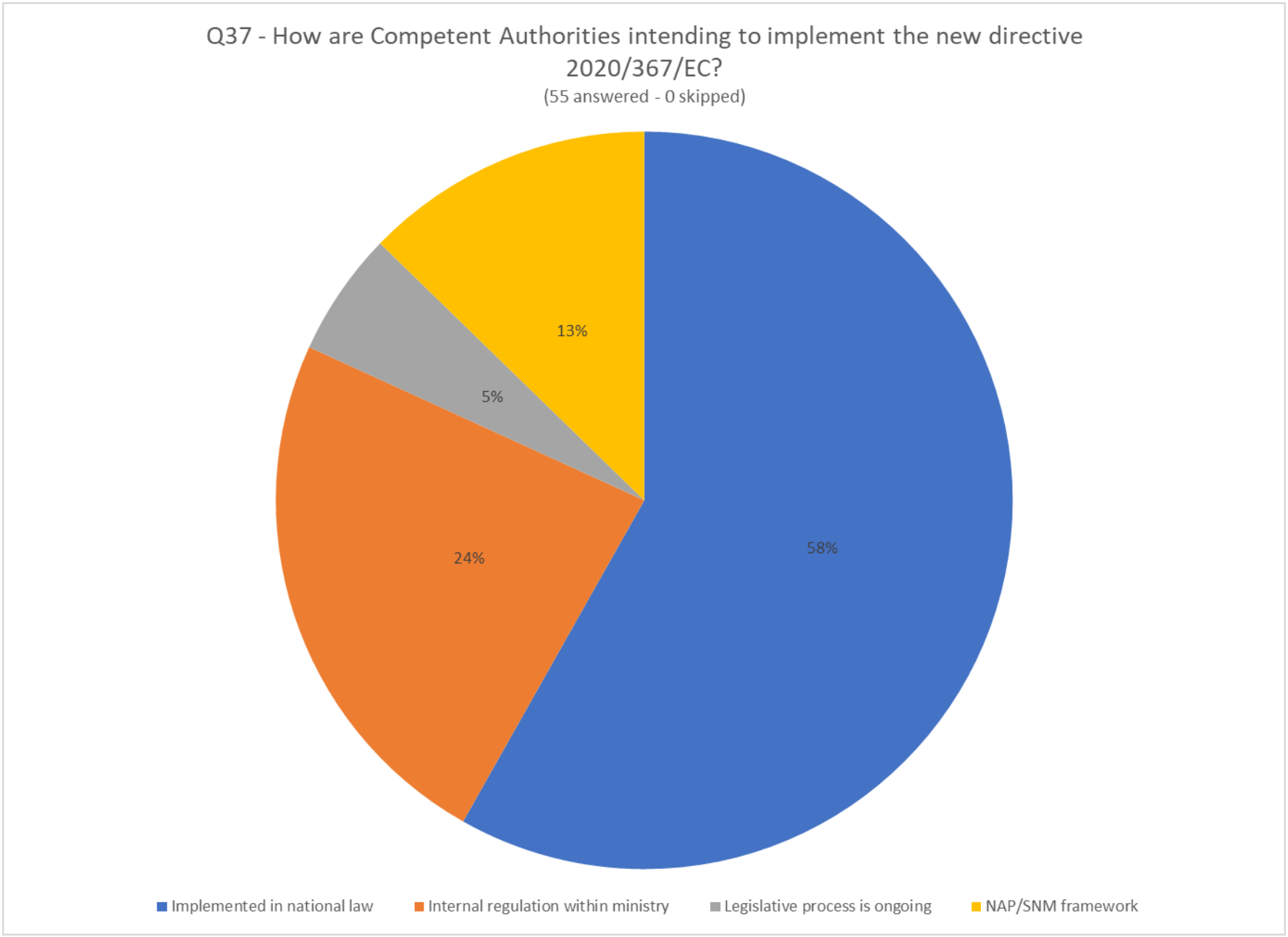

Q32 - Who establishes the noise abatement objective(s) for the airport?
(42 answered - 14 skipped)
% of airports
0%
10%
20%
30%
40%
50%
60%
Airport operator
Local Authorities / Municipalities / Regions
Government Department / Agency / Office (e.g. Environment/Ecology, Aviatio, Transport
Civil aviation authority
Ministry (e.g. Environment/Ecology, Transport, Health)
Various/ not specified
Airport Noise Commission / Stakeholders group
Indipendent Consultant

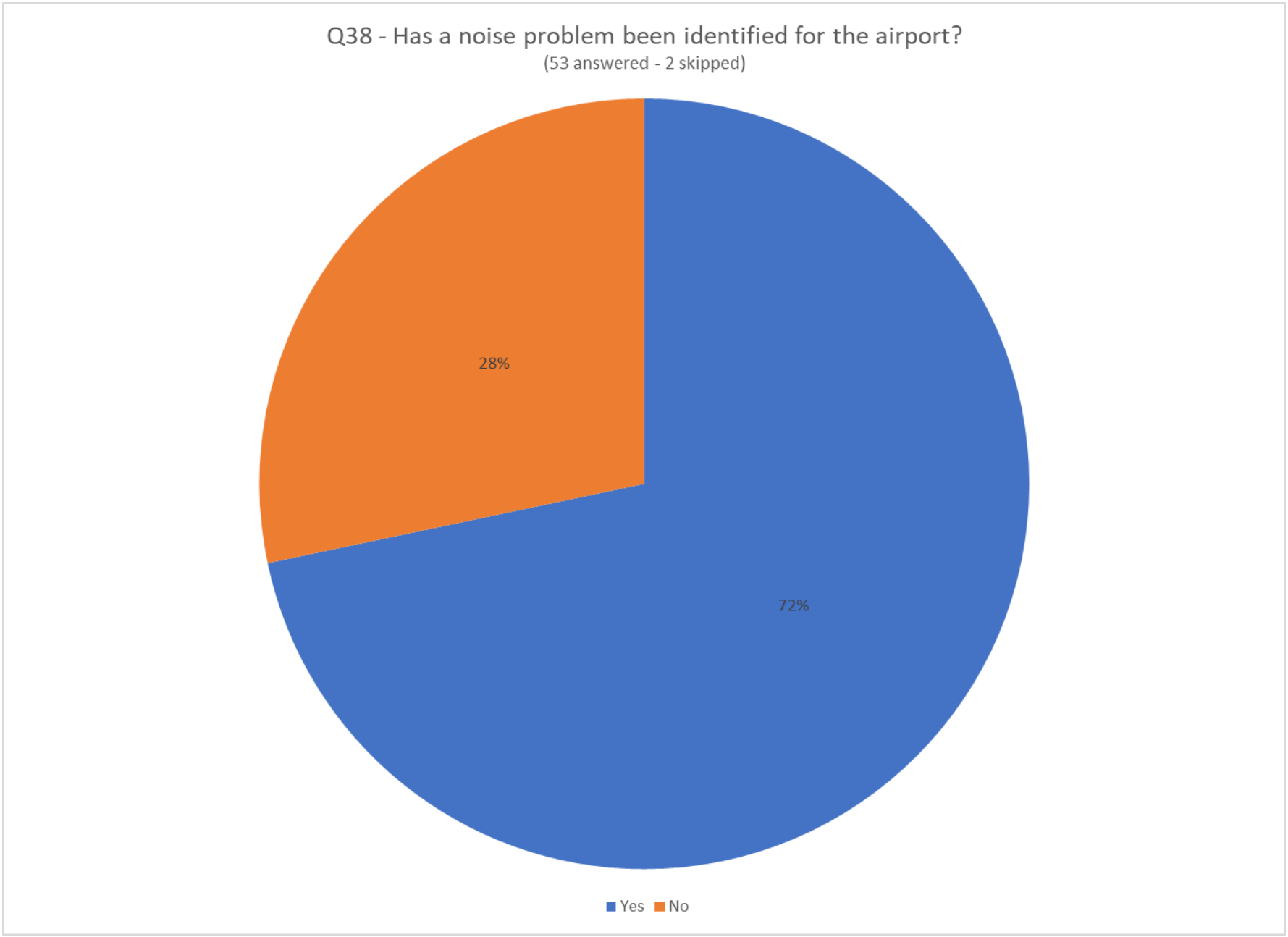

Q33 - Who is the designated appeals body?
(42 answered - 14 skipped)
57%
7%
24%
2%
7%
2%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Administrative Court
Supreme Court
Council of State
Local Authorities / Planning Authorities / Municipalities / Regions
Ministry (e.g. Environment/Ecology, Transport, Health)
Civil Aviation Authority

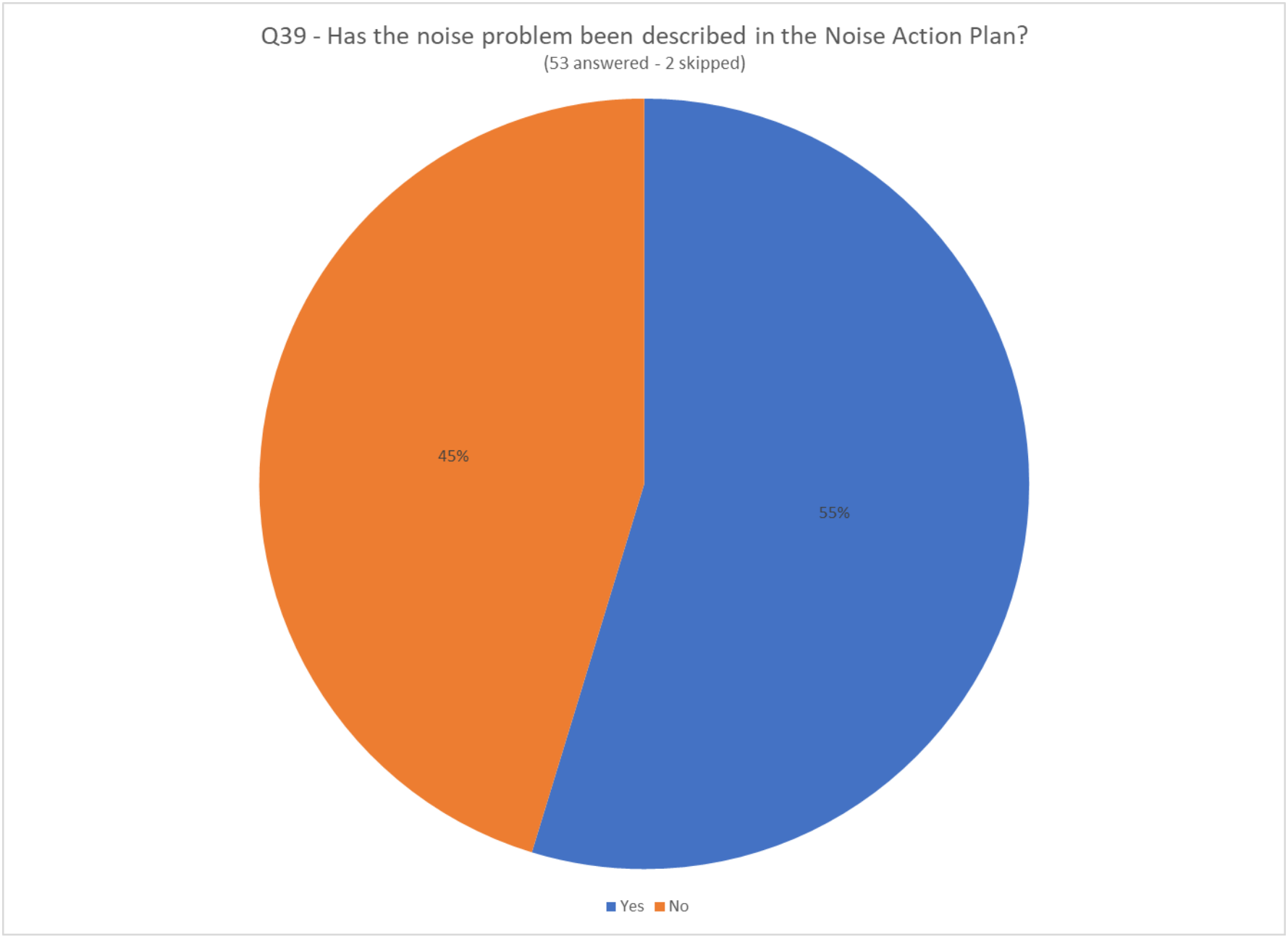

Q34 - Where END and BAR are implemented into the national/local legislation?
(55 answered - 0 skipped)
% of major airports
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
END
98%
2%
BAR
96%
4%
Answered
Skipped

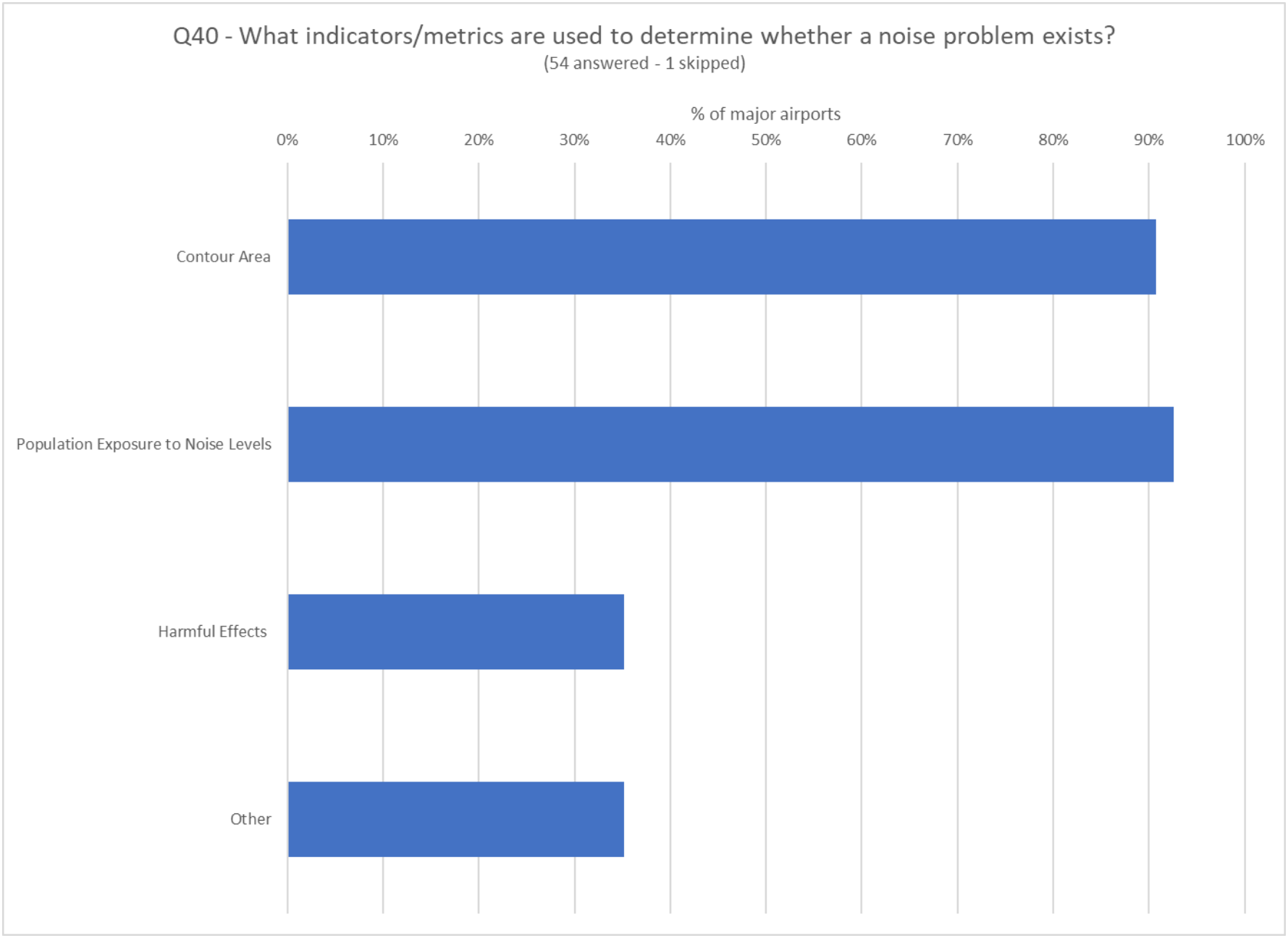

Q35 - How does the national/local legislation relate to the END and BAR requirements?
(55 answered - 0 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
END
44%
20%
36%
BAR
37%
33%
4%
26%
Implements
Complements
Exceed
Other

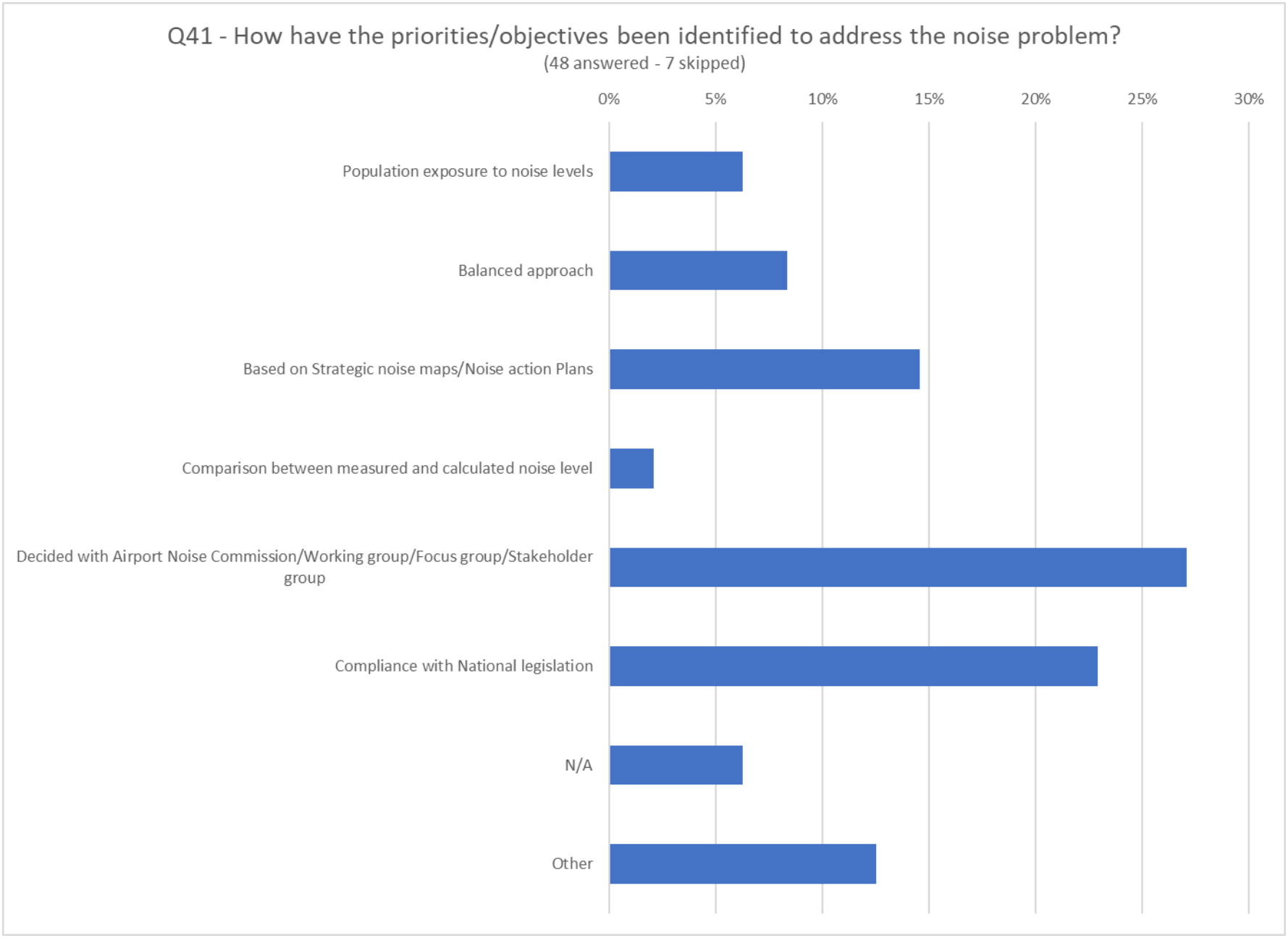

Q36 - Are there any further national/local legislations that relate to airport noise management?
(54 answered - 1 skipped)
11%
89%
Yes
No

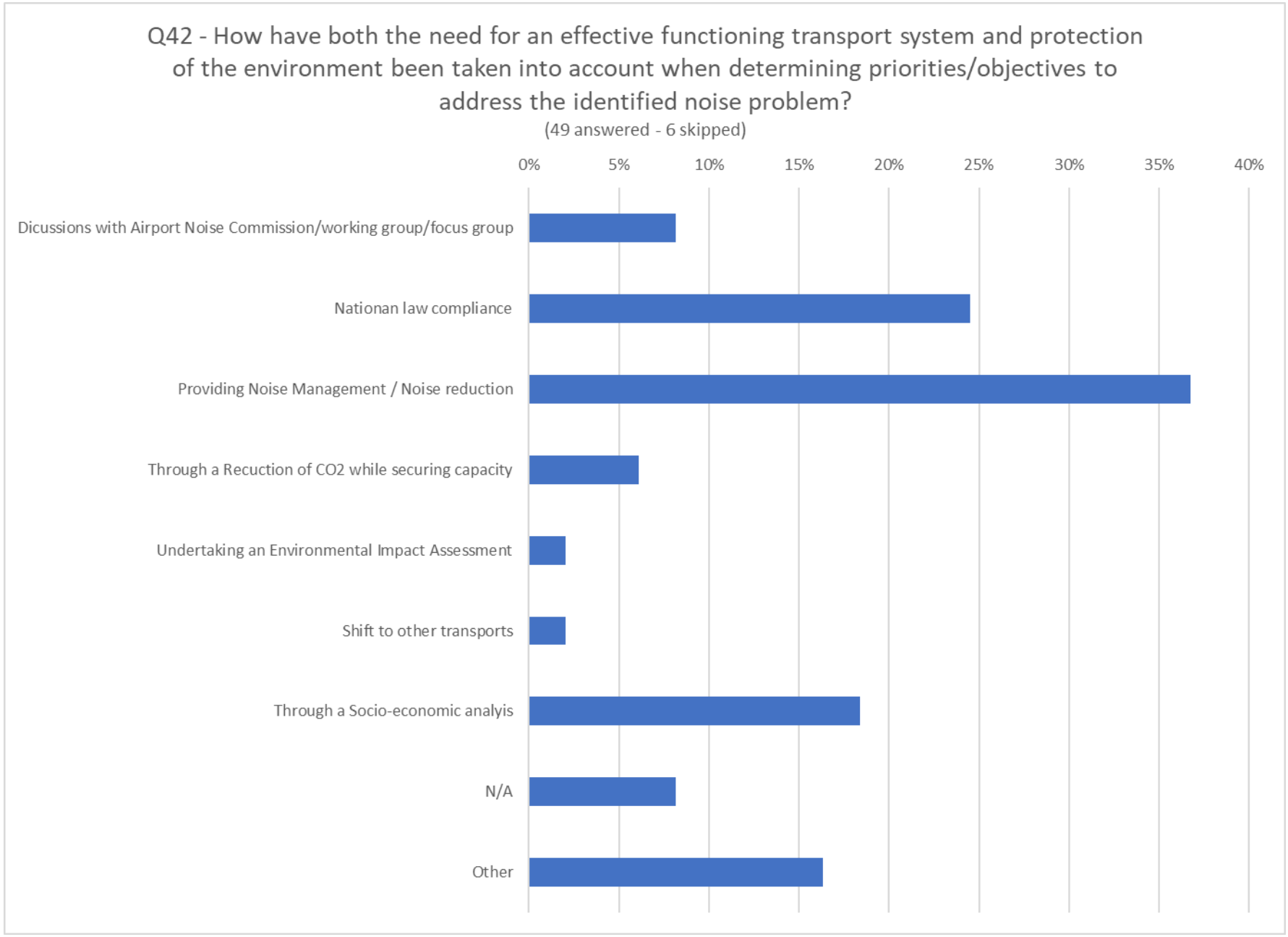

Q37 - How are Competent Authorities intending to implement the new directive 2020/367/EC?
(55 answered - 0 skipped)
58%
24%
5%
13%
Implemented in national law
Internal regulation within ministry
Legislative process is ongoing
NAP/SNM framework

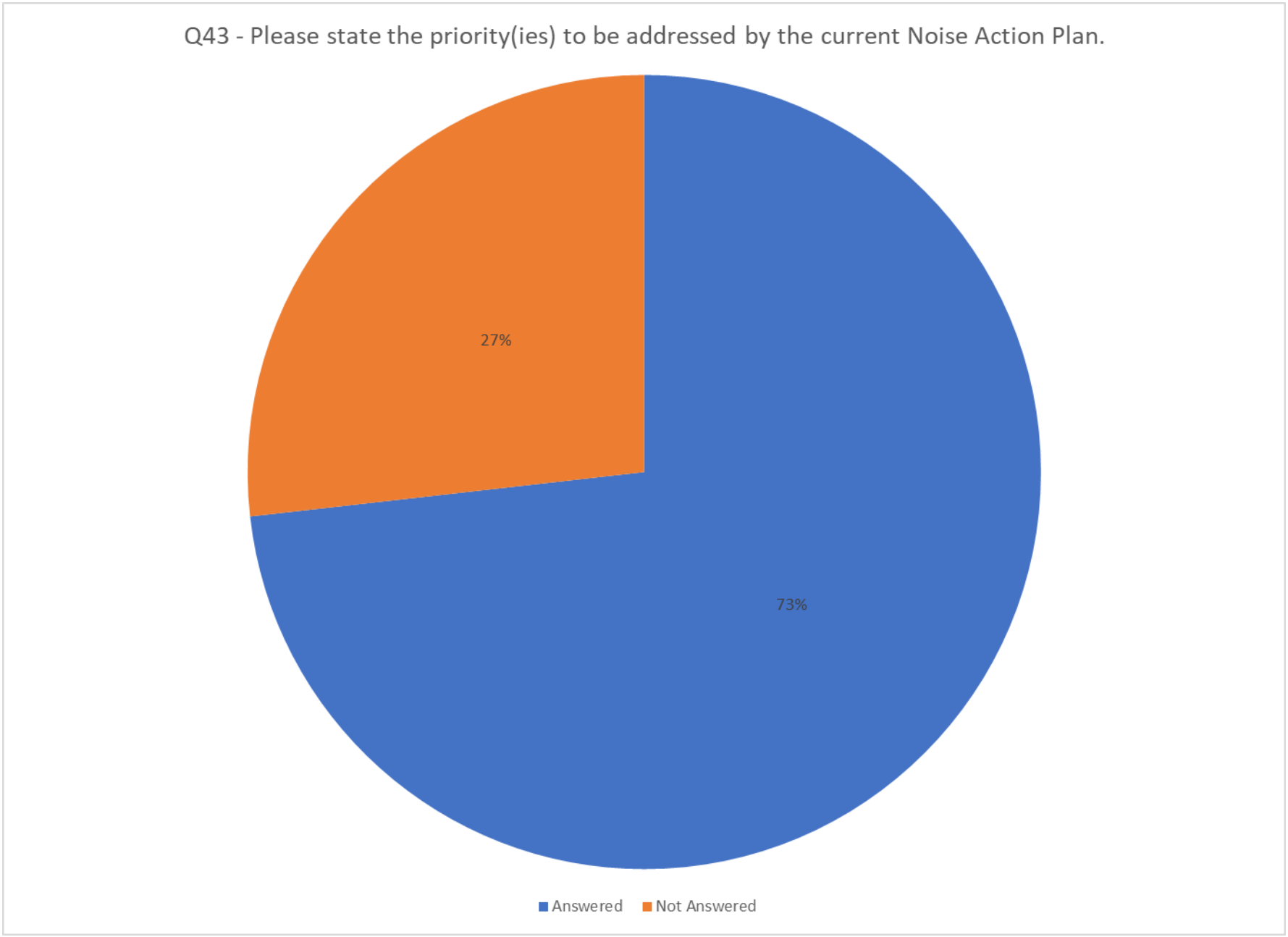

Q38 - Has a noise problem been identified for the airport?
(53 answered - 2 skipped)
28%
72%
Yes
No

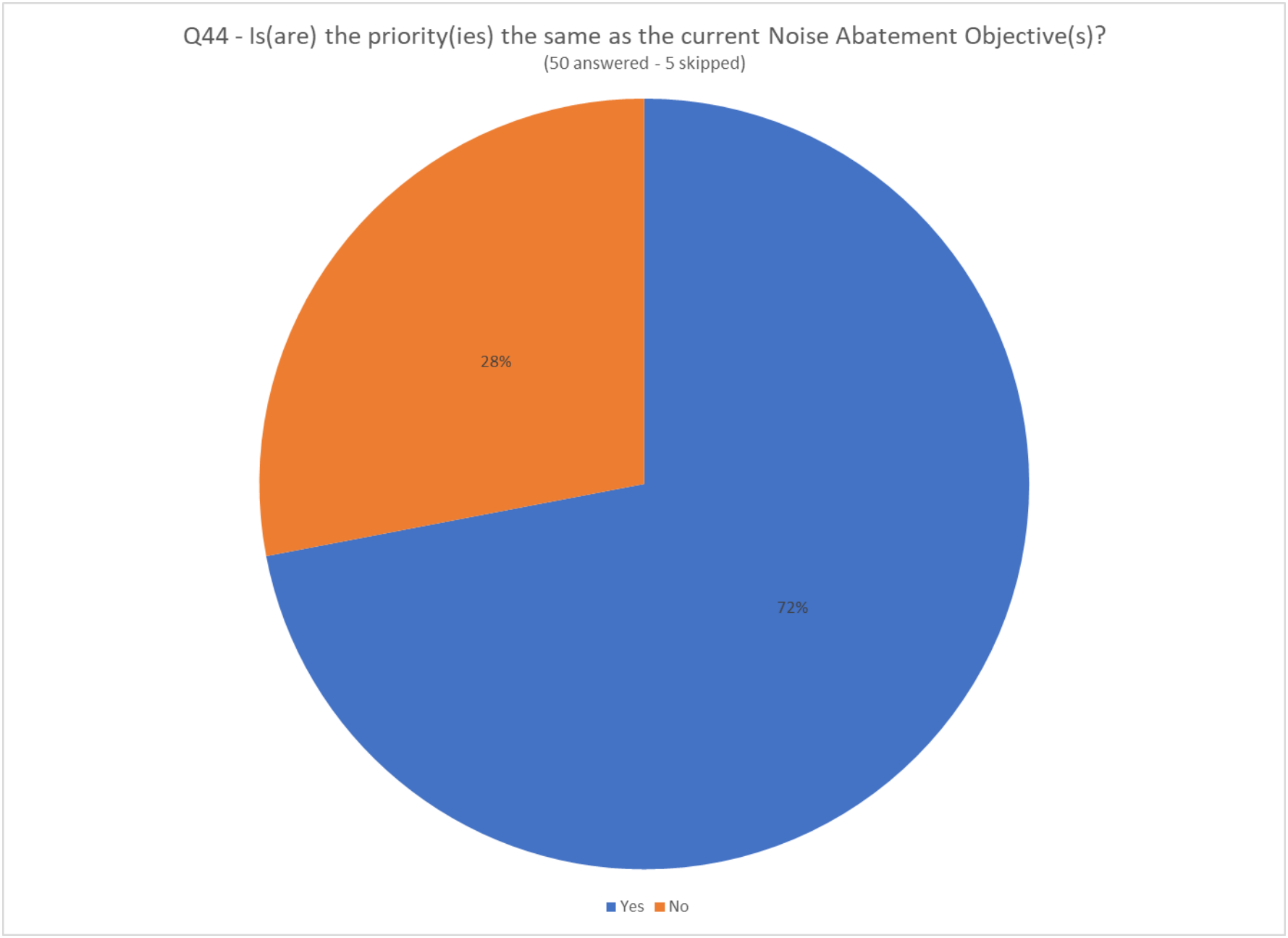

Q39 - Has the noise problem been described in the Noise Action Plan?
(53 answered - 2 skipped)
45%
55%
Yes
No

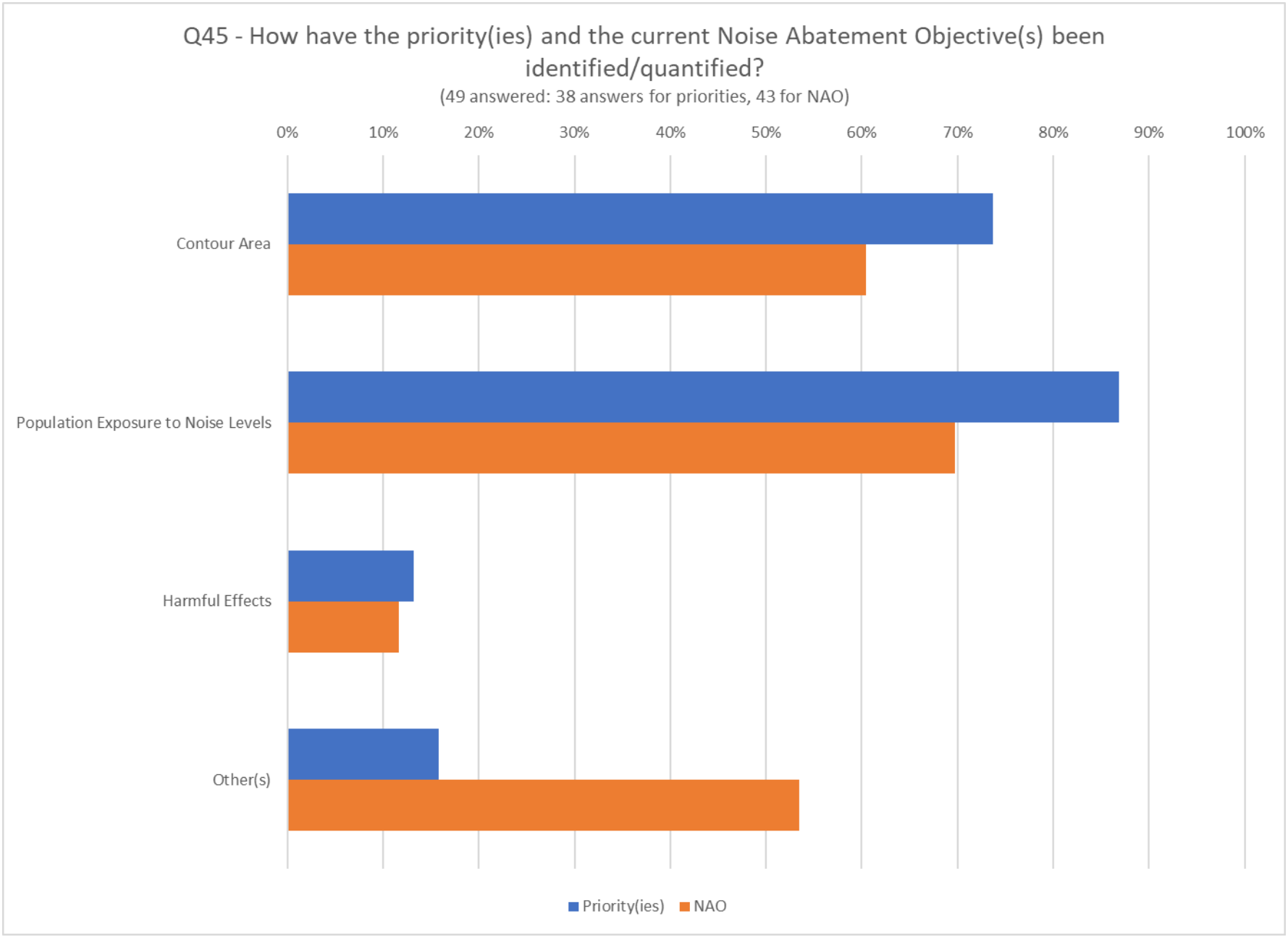

Q40 - What indicators/metrics are used to determine whether a noise problem exists?
(54 answered - 1 skipped)
% of major airports
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Contour Area
Population Exposure to Noise Levels
Harmful Effects
Other

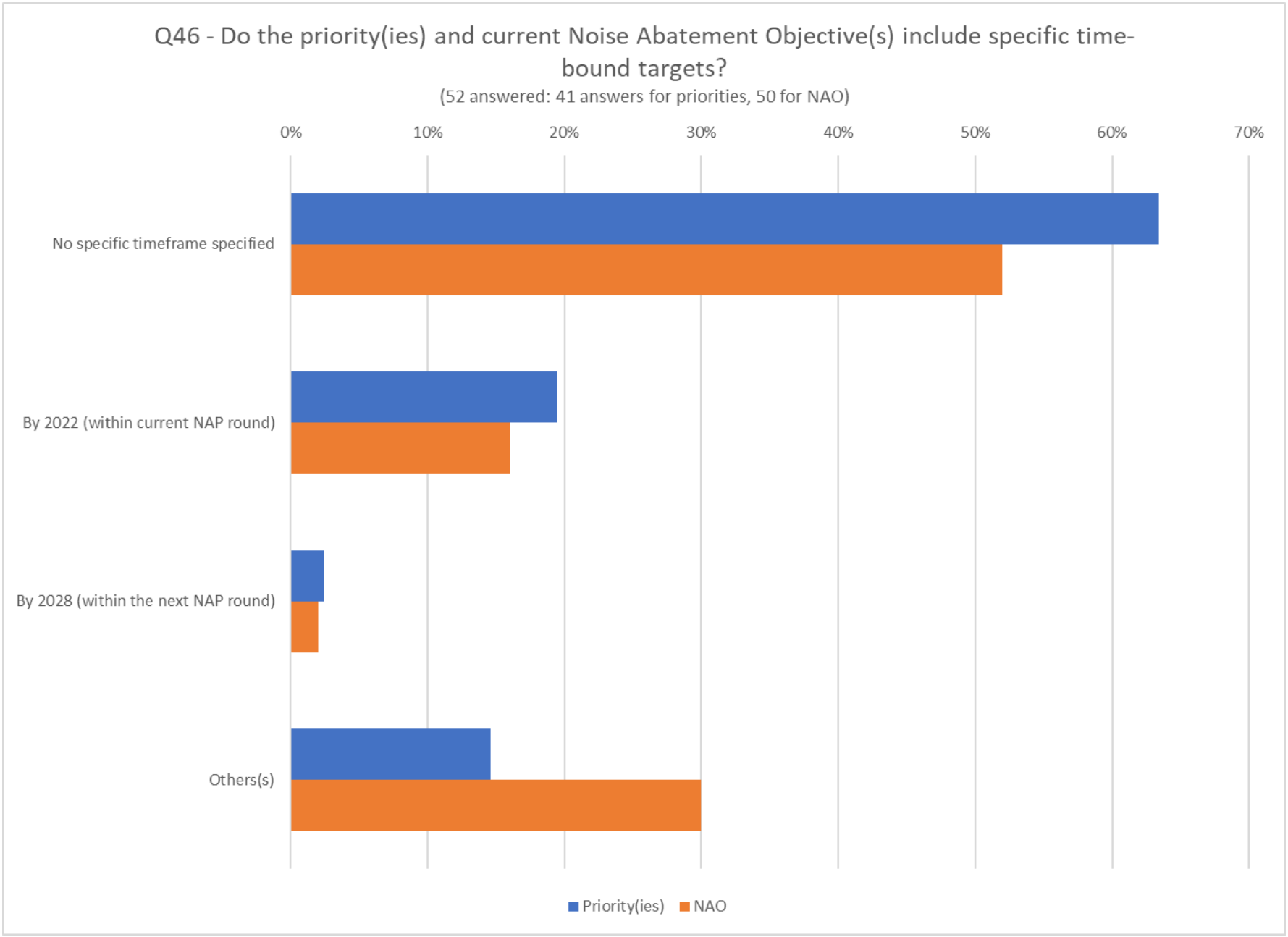

Q41 - How have the priorities/objectives been identified to address the noise problem?
(48 answered - 7 skipped)
0%
5%
10%
15%
20%
25%
30%
Population exposure to noise levels
Balanced approach
Based on Strategic noise maps/Noise action Plans
Comparison between measured and calculated noise level
Decided with Airport Noise Commission/Working group/Focus group/Stakeholder group
Compliance with National legislation
N/A
Other

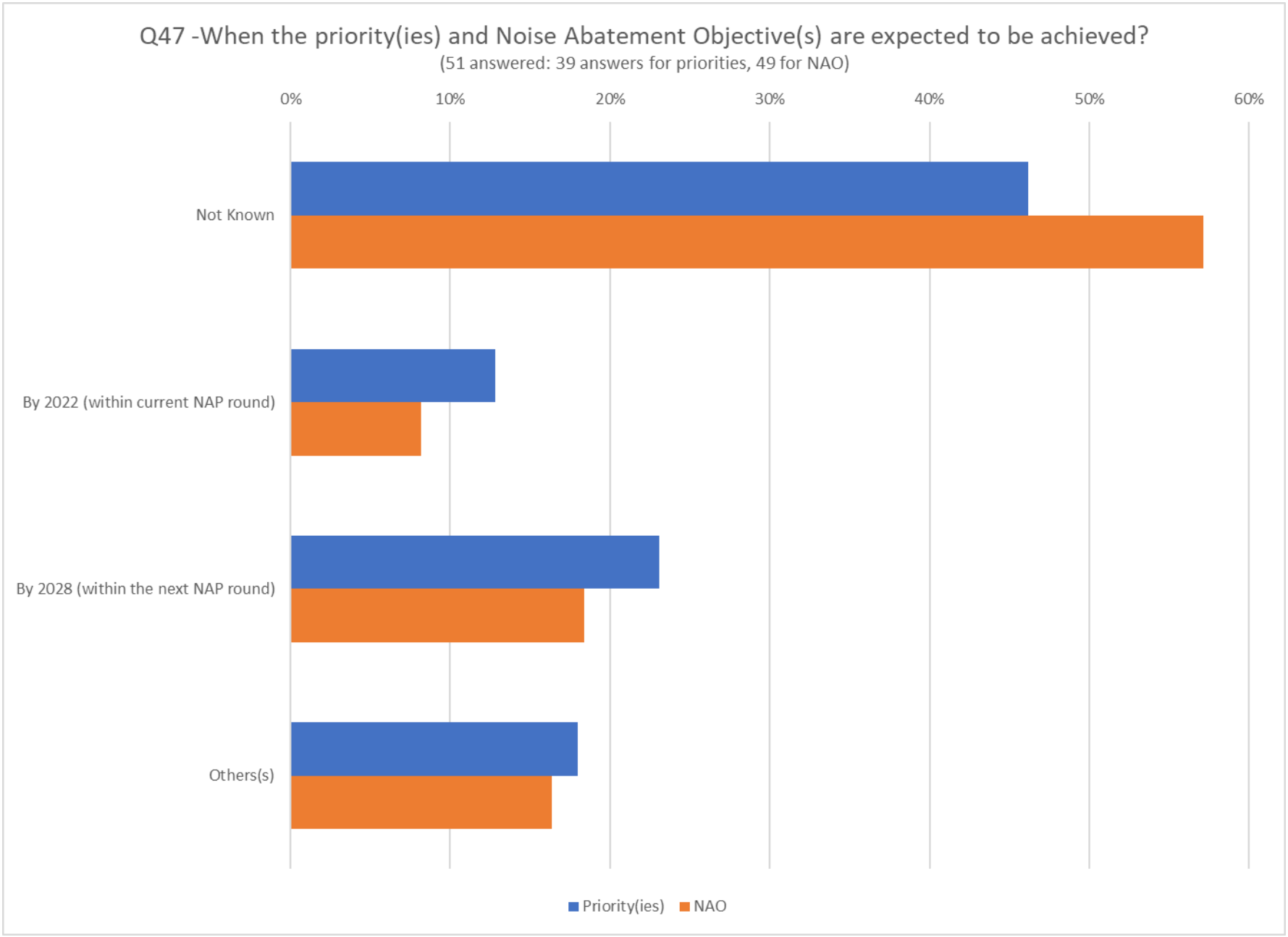

Q42 - How have both the need for an effective functioning transport system and protection of the environment been taken into account when determining priorities/objectives to address the identified noise problem?
(49 answered - 6 skipped)
0%
5%
10%
15%
20%
25%
30%
35%
40%
Dicussions with Airport Noise Commission/working group/focus group
Nationan law compliance
Providing Noise Management / Noise reduction
Through a Recuction of CO2 while securing capacity
Undertaking an Environmental Impact Assessment
Shift to other transports
Through a Socio-economic analyis
N/A
Other

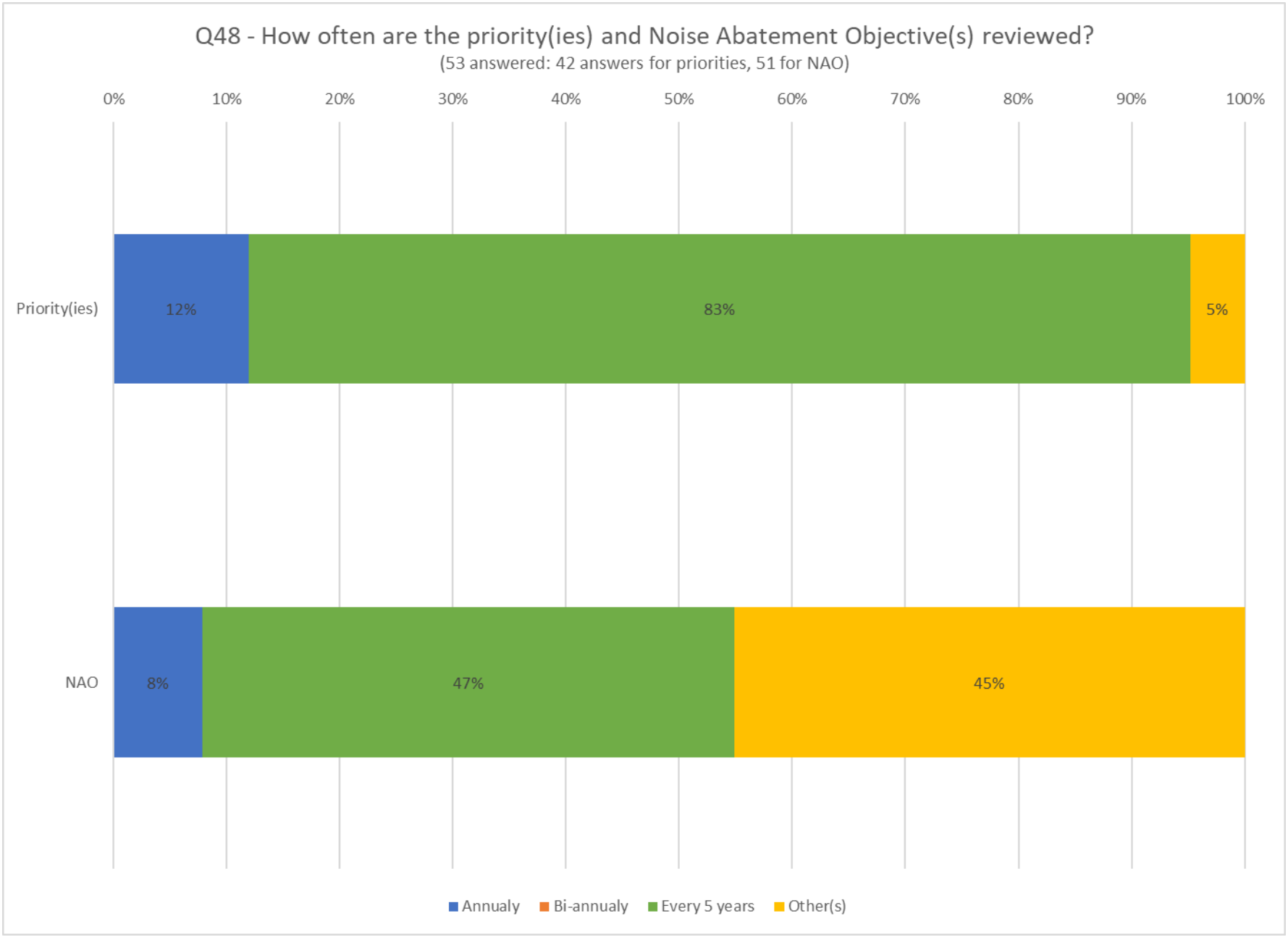

Q43 - Please state the priority(ies) to be addressed by the current Noise Action Plan.
27%
73%
Answered
Not Answered

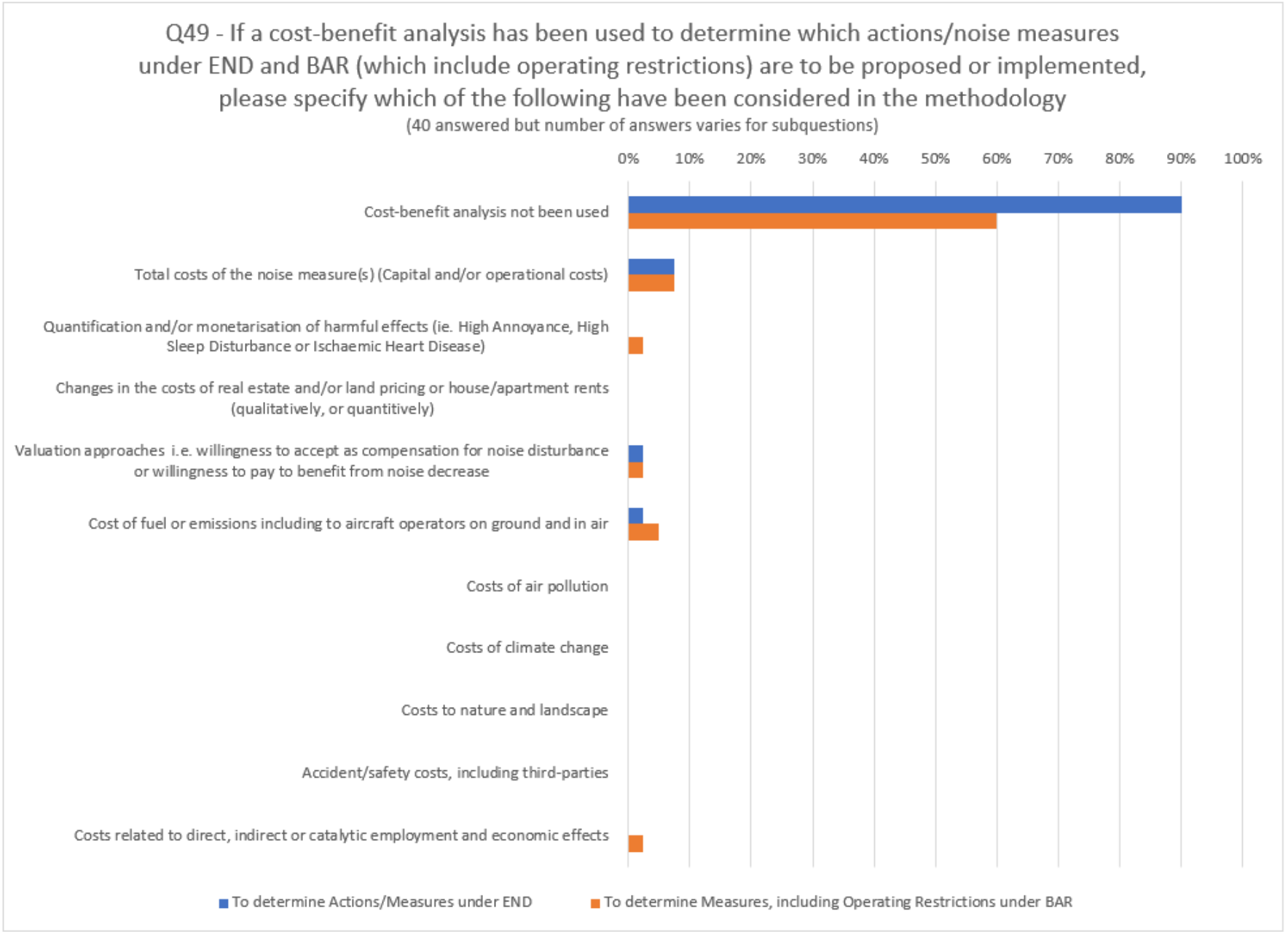

Q44 - Is(are) the priority(ies) the same as the current Noise Abatement Objective(s)?
(50 answered - 5 skipped)
28%
72%
Yes
No

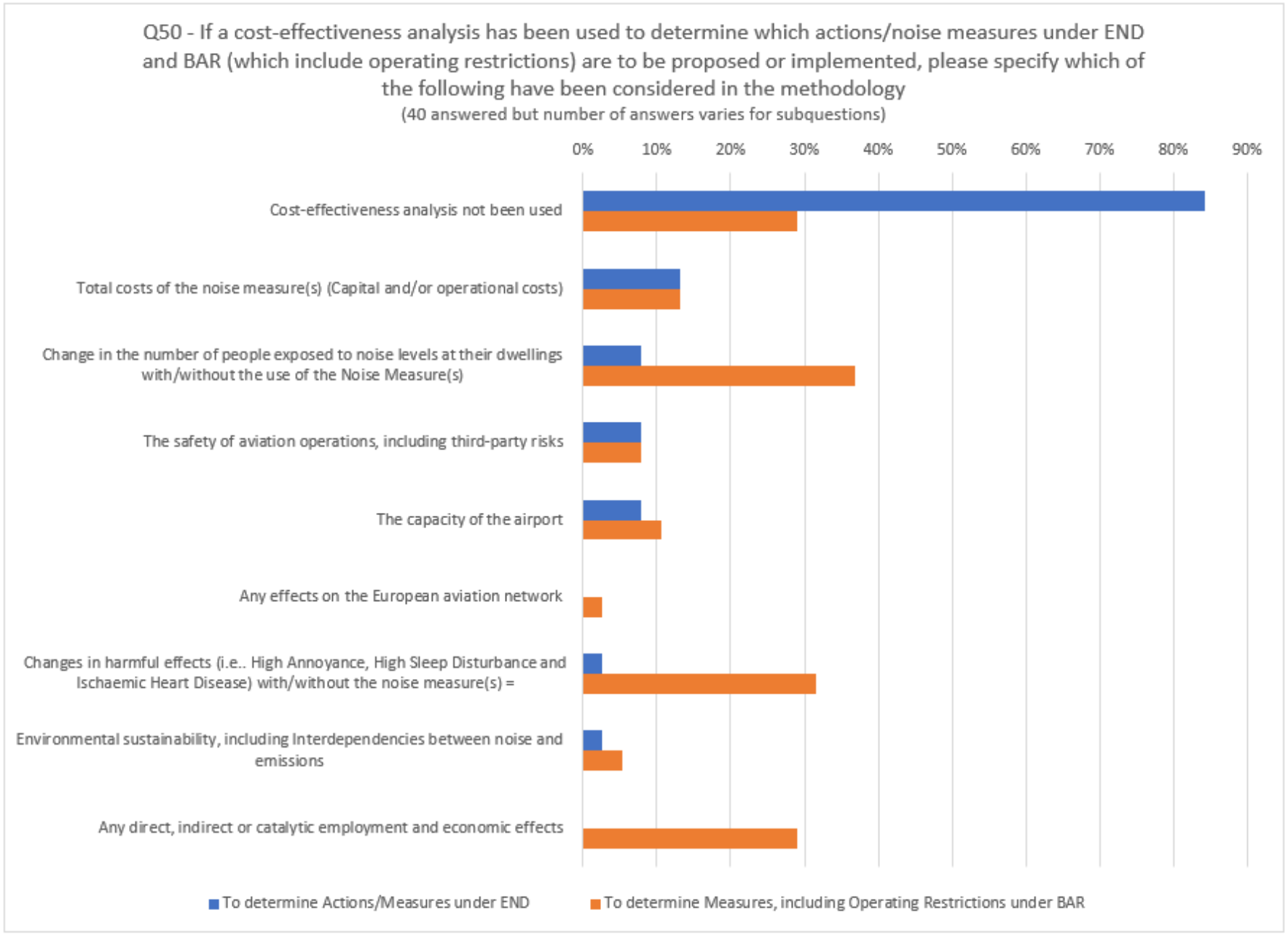

Q45 - How have the priority(ies) and the current Noise Abatement Objective(s) been identified/quantified?
(49 answered: 38 answers for priorities, 43 for NAO)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Contour Area
Population Exposure to Noise Levels
Harmful Effects
Other(s)
Priority(ies)
NAO

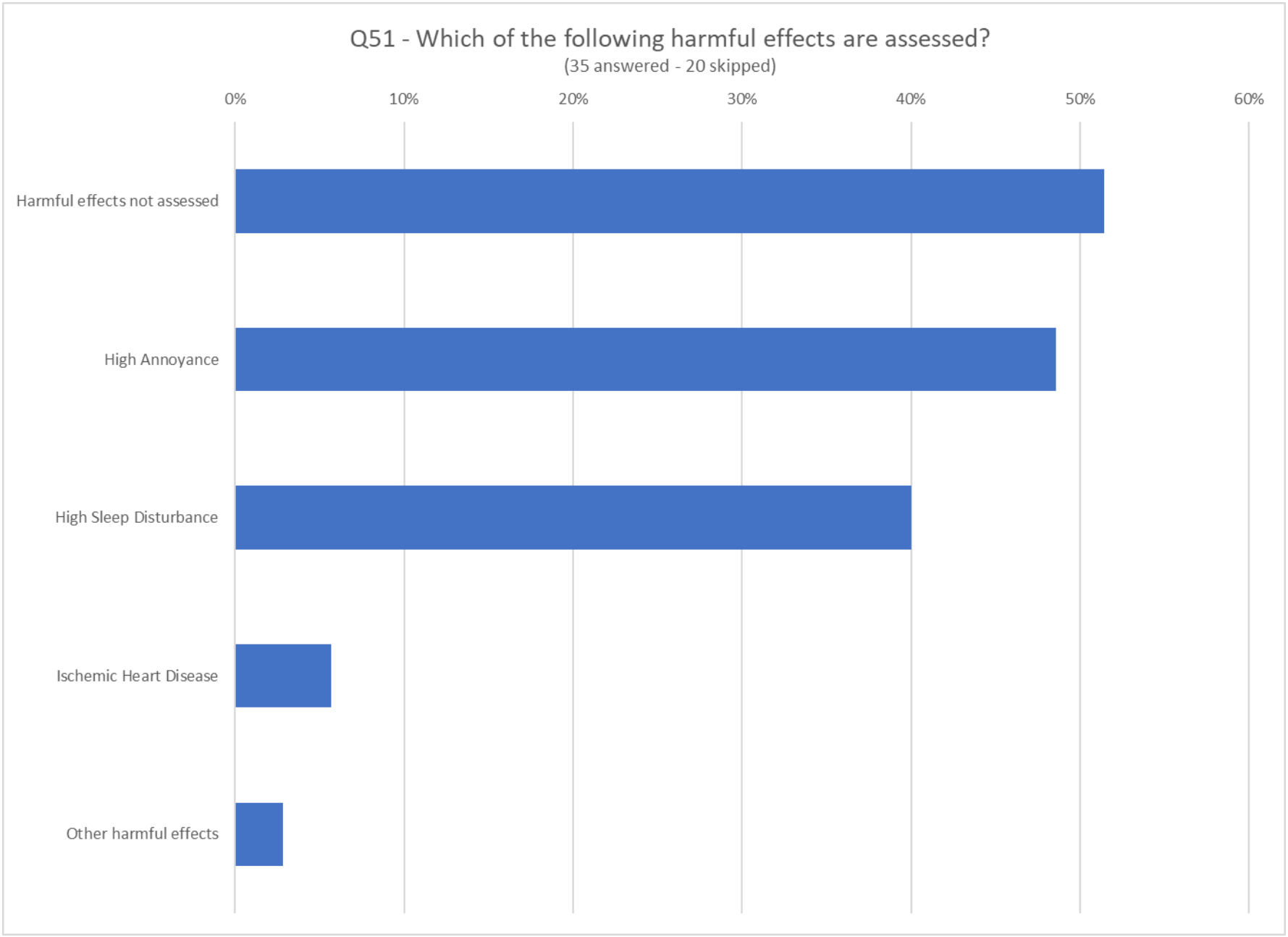

Q46 - Do the priority(ies) and current Noise Abatement Objective(s) include specific time-bound targets?
(52 answered: 41 answers for priorities, 50 for NAO)
0%
10%
20%
30%
40%
50%
60%
70%
No specific timeframe specified
By 2022 (within current NAP round)
By 2028 (within the next NAP round)
Others(s)
Priority(ies)
NAO

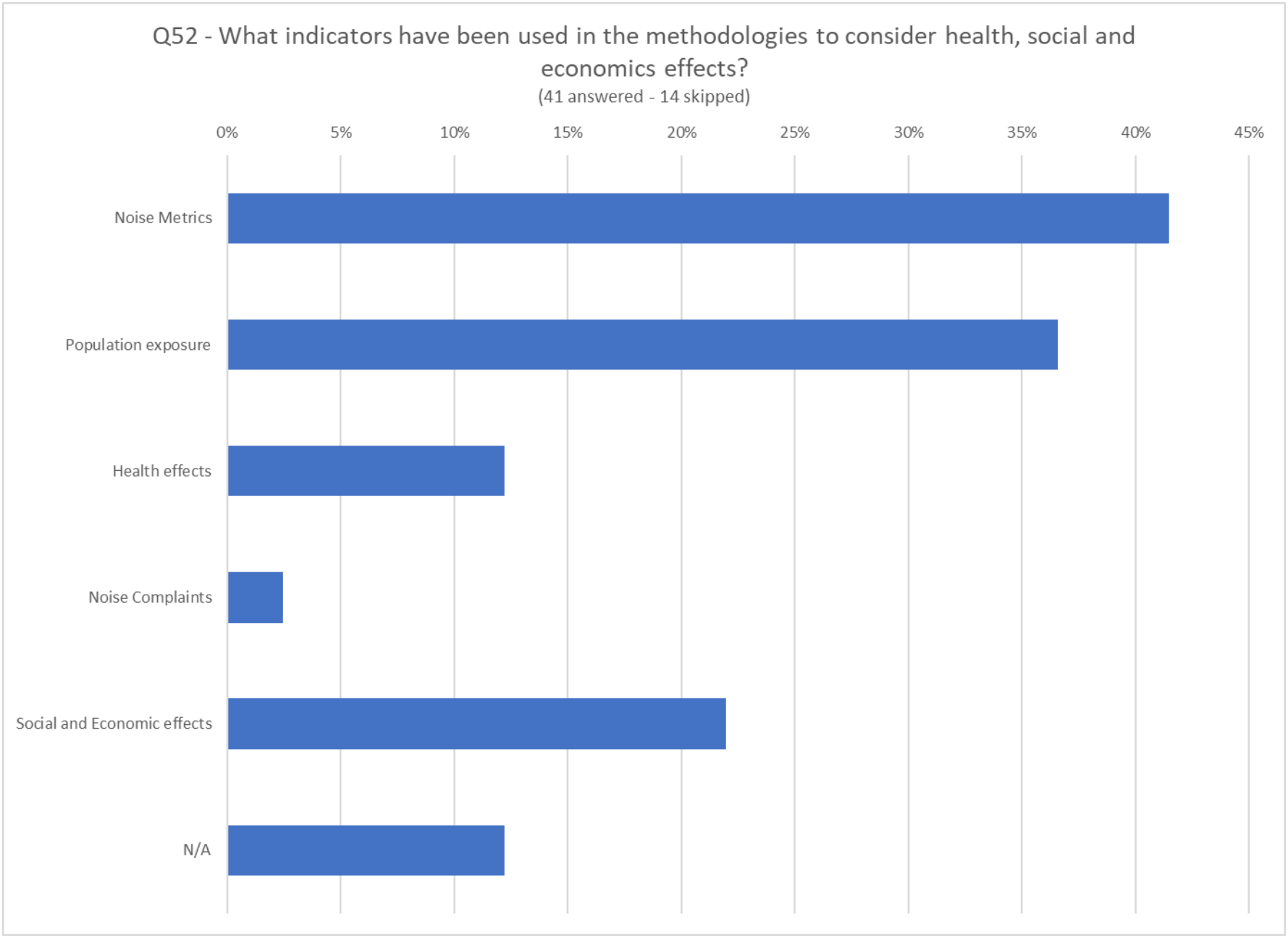

Q47 -When the priority(ies) and Noise Abatement Objective(s) are expected to be achieved?
(51 answered: 39 answers for priorities, 49 for NAO)
0%
10%
20%
30%
40%
50%
60%
Not Known
By 2022 (within current NAP round)
By 2028 (within the next NAP round)
Others(s)
Priority(ies)
NAO

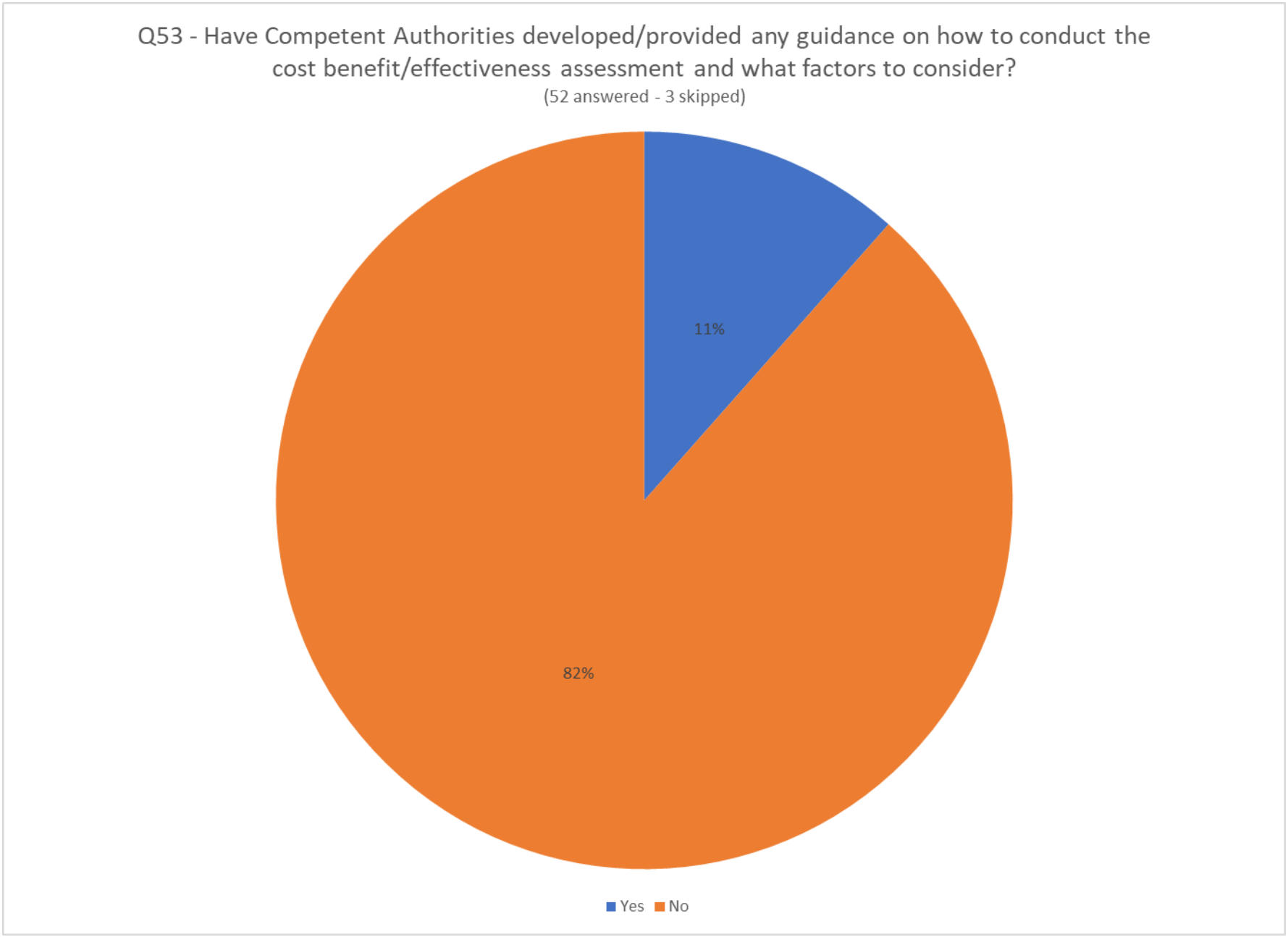

Q48 - How often are the priority(ies) and Noise Abatement Objective(s) reviewed?
(53 answered: 42 answers for priorities, 51 for NAO)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Priority(ies)
12%
83%
5%
NAO
8%
47%
45%
Annualy
Bi-annualy
Every 5 years
Other(s)

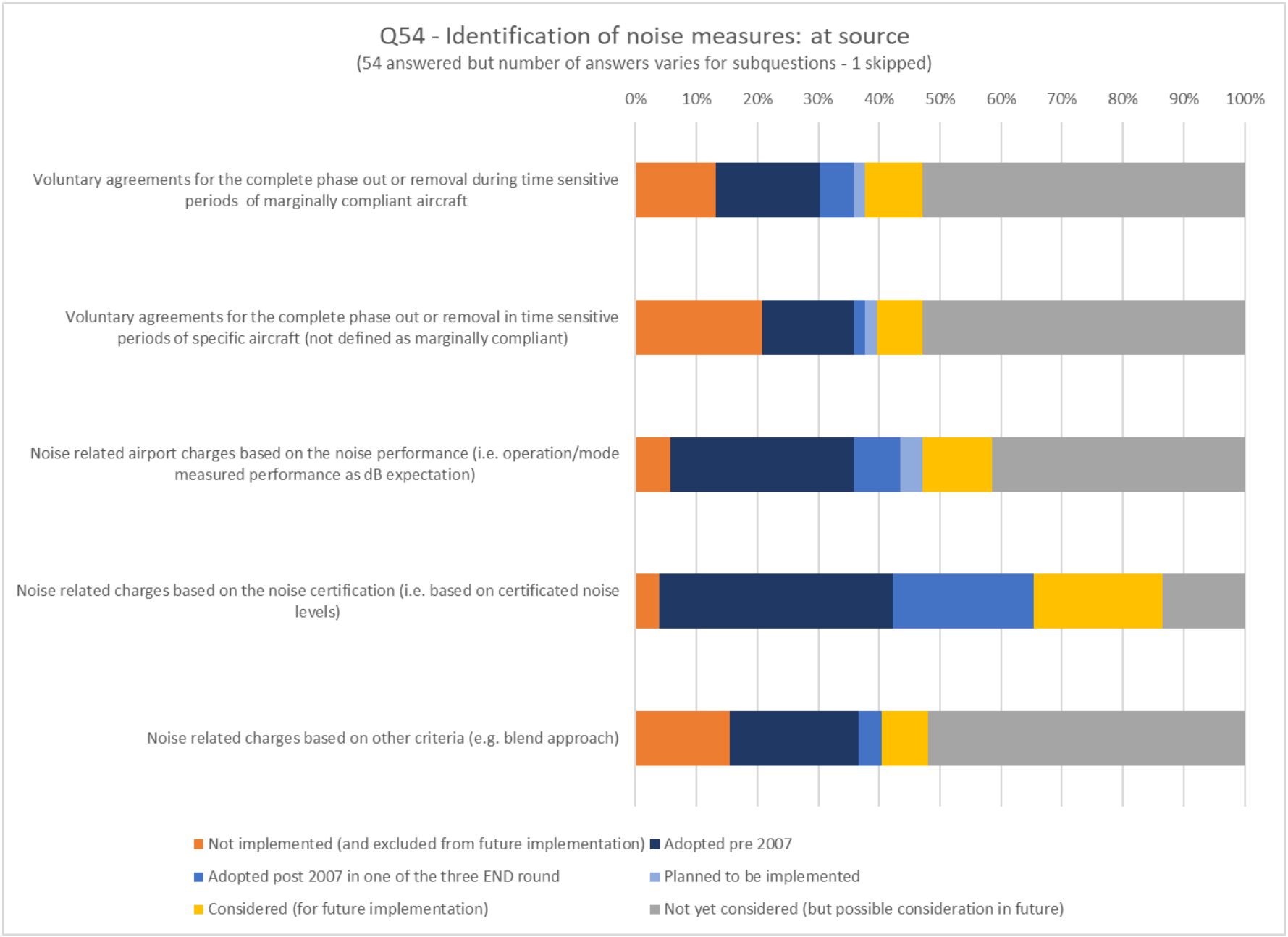

Q49 - If a cost-benefit analysis has been used to determine which actions/noise measures under END and BAR (which include operating restrictions) are to be proposed or implemented, please specify which of the following have been considered in the methodology
(40 answered but number of answers varies for subquestions)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Cost-benefit analysis not been used
Total costs of the noise measure(s) (Capital and/or operational costs)
Quantification and/or monetarisation of harmful effects (ie. High Annoyance, High Sleep Disturbance or Ischaemic Heart Disease)
Changes in the costs of real estate and/or land pricing or house/apartment rents (qualitatively, or quantitively)
Valuation approaches i.e. willingness to accept as compensation for noise disturbance or willingness to pay to benefit from noise decrease
Cost of fuel or emissions including to aircraft operators on ground and in air
Costs of air pollution
Costs of climate change
Costs to nature and landscape
Accident/safety costs, including third-parties
Costs related to direct, indirect or catalytic employment and economic effects
To determine Actions/Measures under END
To determine Measures, including Operating Restrictions under BAR

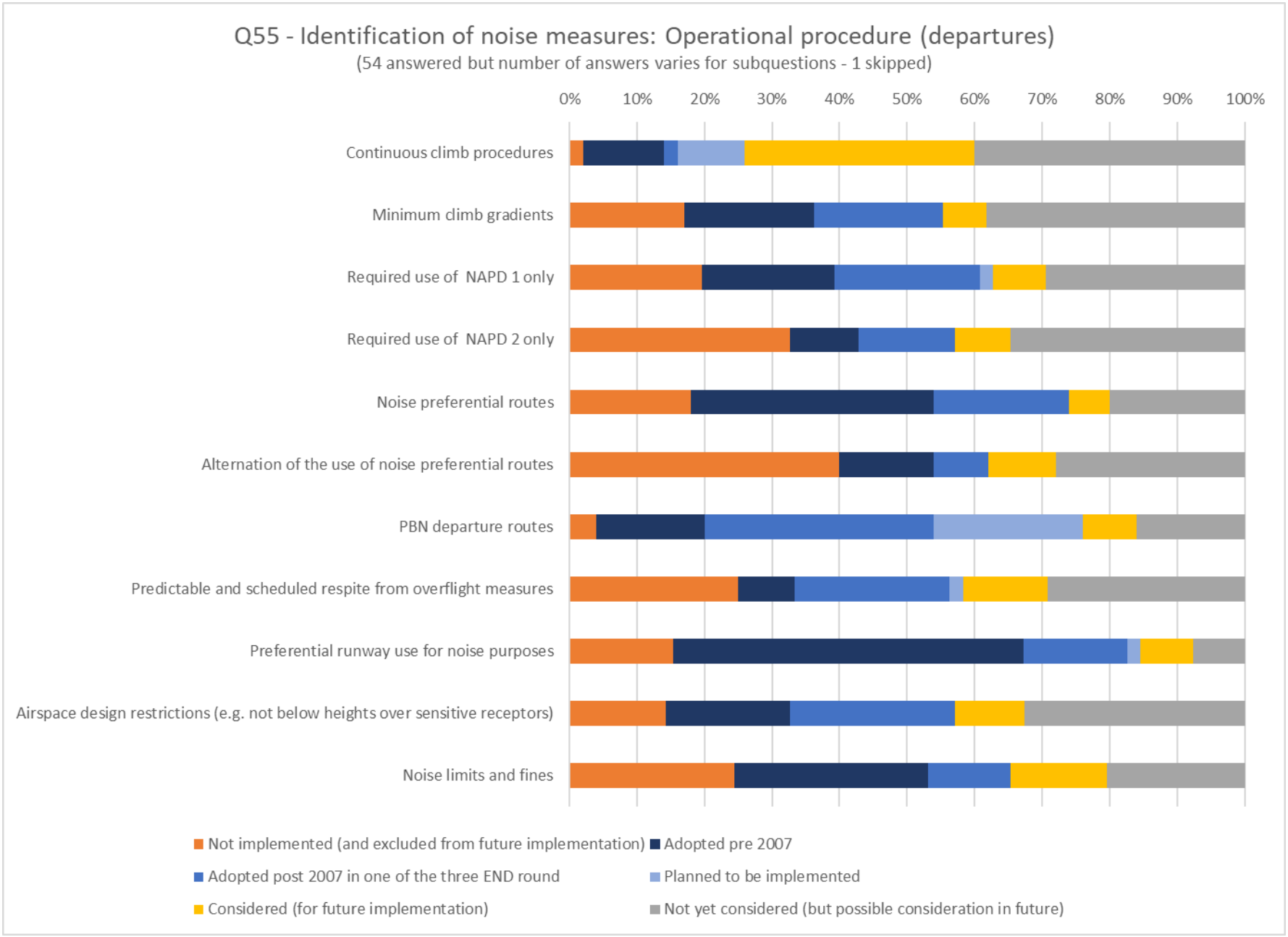

Q50 - If a cost-effectiveness analysis has been used to determine which actions/noise measures under END and BAR (which include operating restrictions) are to be proposed or implemented, please specify which of the following have been considered in the methodology
(40 answered but number of answers varies for subquestions)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
Cost-effectiveness analysis not been used
Total costs of the noise measure(s) (Capital and/or operational costs)
Change in the number of people exposed to noise levels at their dwellings with/without the use of the Noise Measure(s)
The safety of aviation operations, including third-party risks
The capacity of the airport
Any effects on the European aviation network
Changes in harmful effects (i.e.. High Annoyance, High Sleep Disturbance and Ischaemic Heart Disease) with/without the noise measure(s) =
Environmental sustainability, including Interdependencies between noise and emissions
Any direct, indirect or catalytic employment and economic effects
To determine Actions/Measures under END
To determine Measures, including Operating Restrictions under BAR

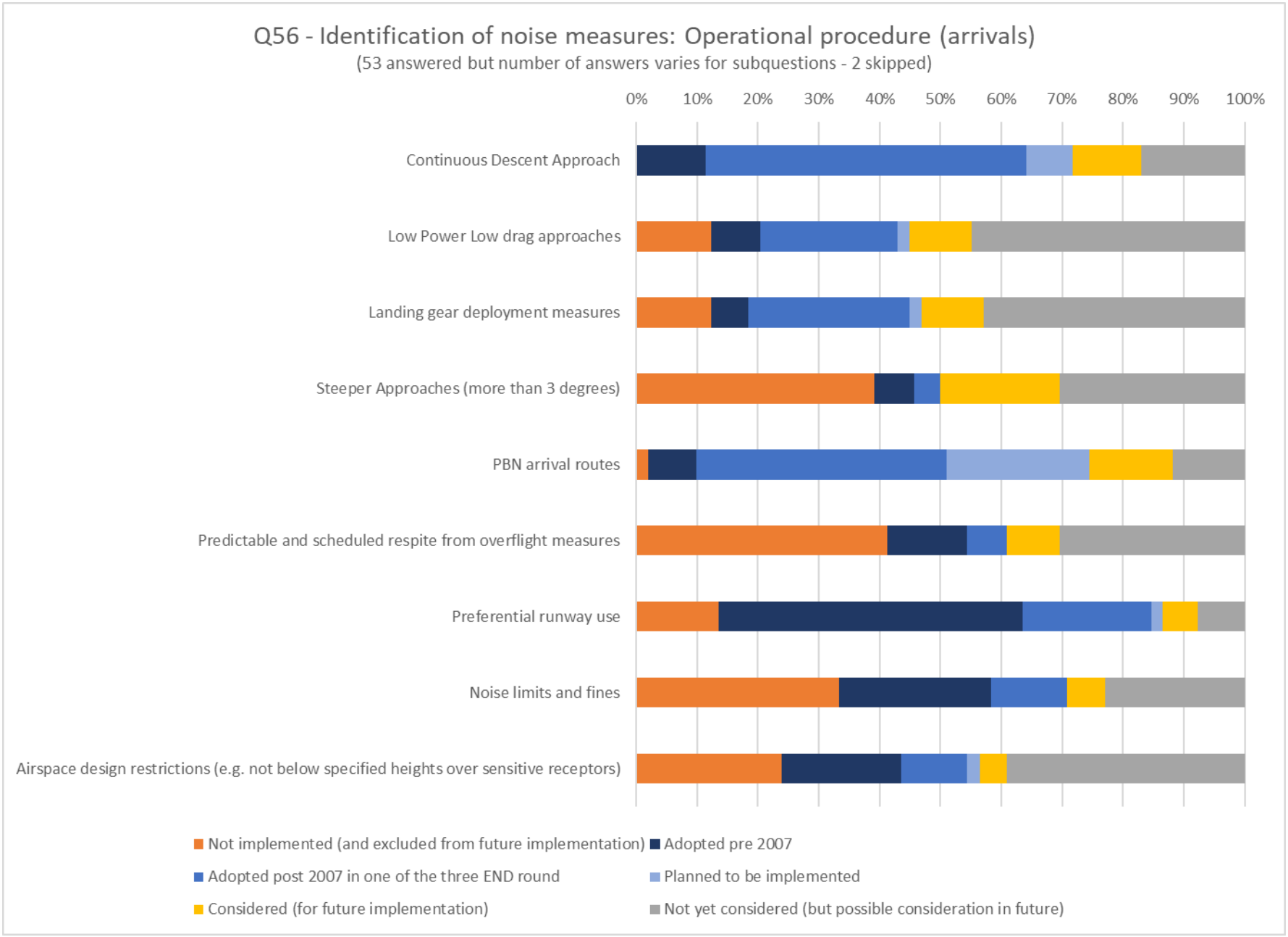

Q51 - Which of the following harmful effects are assessed?
(35 answered - 20 skipped)
0%
10%
20%
30%
40%
50%
60%
Harmful effects not assessed
High Annoyance
High Sleep Disturbance
Ischemic Heart Disease
Other harmful effects

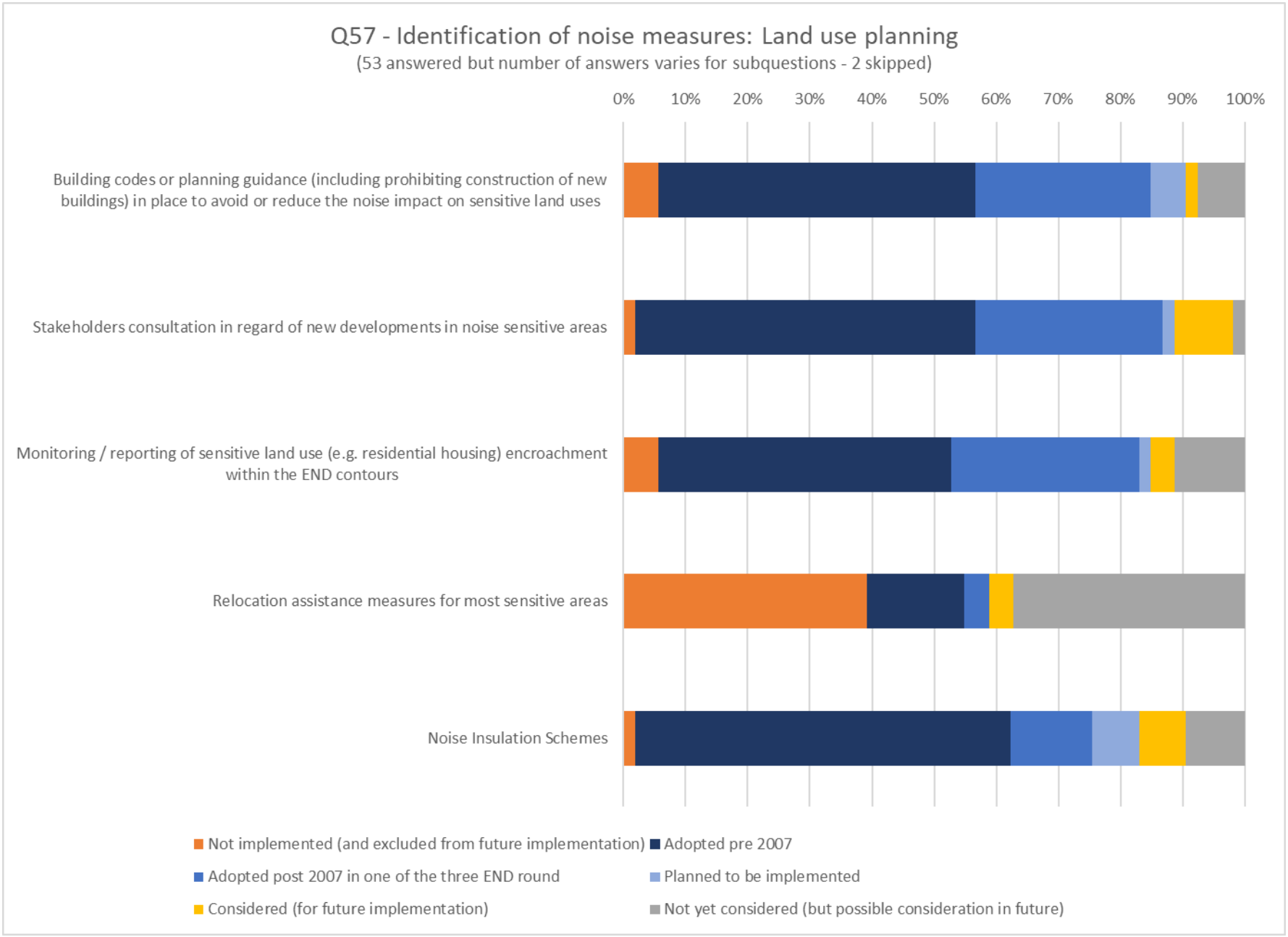

Q52 - What indicators have been used in the methodologies to consider health, social and economics effects?
(41 answered - 14 skipped)
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
Noise Metrics
Population exposure
Health effects
Noise Complaints
Social and Economic effects
N/A

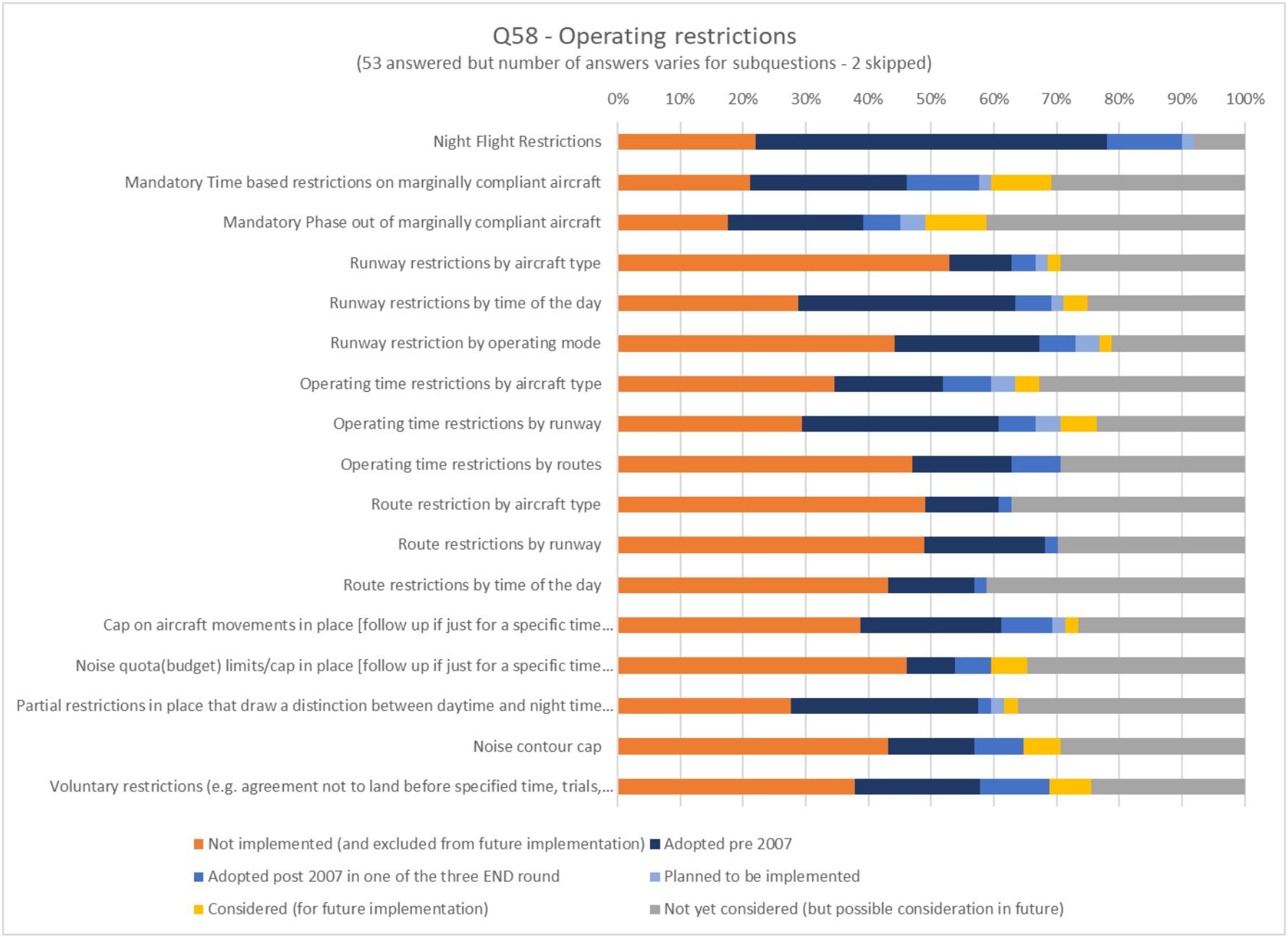

Q53 - Have Competent Authorities developed/provided any guidance on how to conduct the cost benefit/effectiveness assessment and what factors to consider?
(52 answered - 3 skipped)
11%
82%
Yes
No

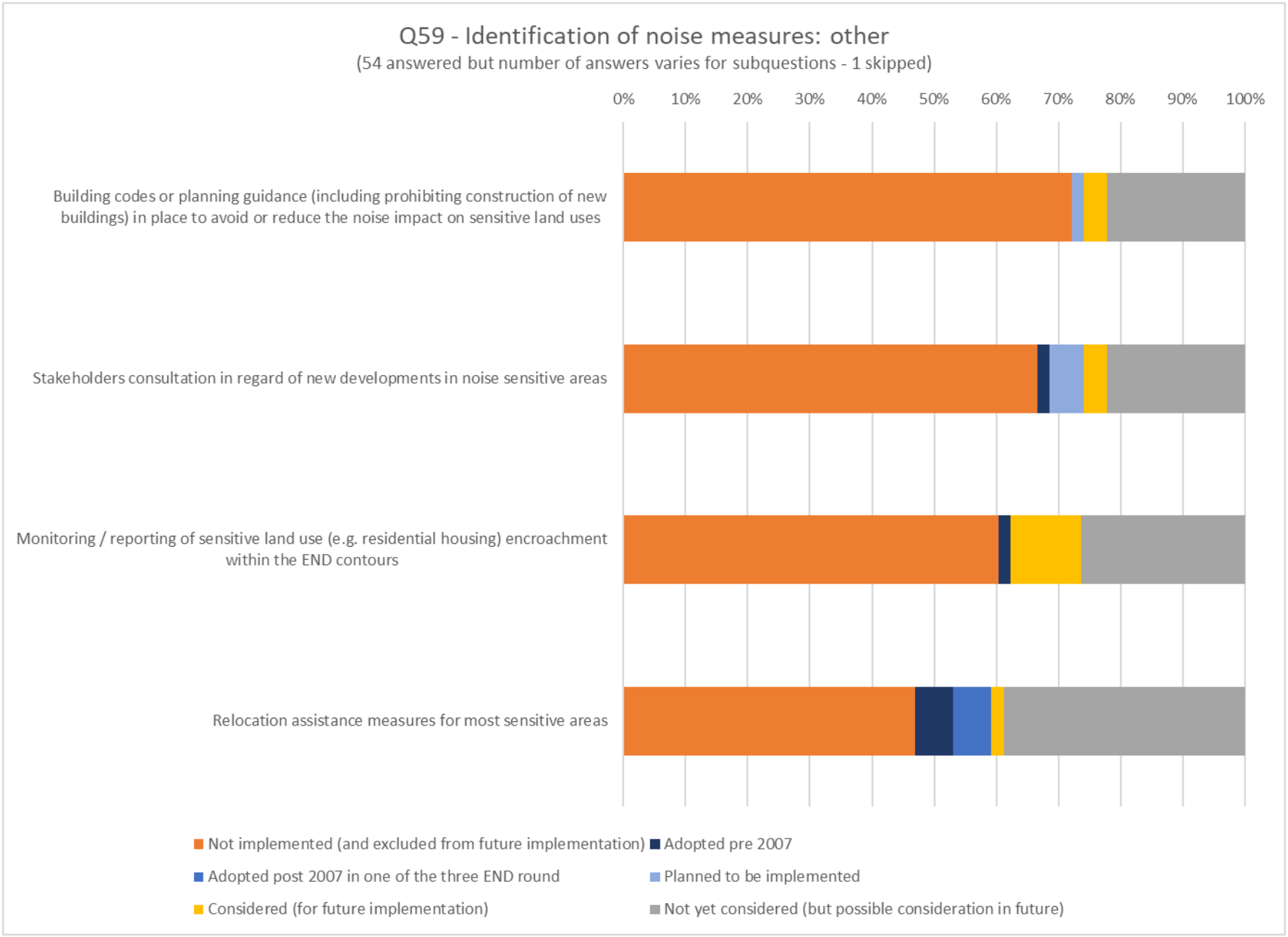

Q54 - Identification of noise measures: at source
(54 answered but number of answers varies for subquestions - 1 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Voluntary agreements for the complete phase out or removal during time sensitive periods of marginally compliant aircraft
Voluntary agreements for the complete phase out or removal in time sensitive periods of specific aircraft (not defined as marginally compliant)
Noise related airport charges based on the noise performance (i.e. operation/mode measured performance as dB expectation)
Noise related charges based on the noise certification (i.e. based on certificated noise levels)
Noise related charges based on other criteria (e.g. blend approach)
Not implemented (and excluded from future implementation)
Adopted pre 2007
Adopted post 2007 in one of the three END round
Planned to be implemented
Considered (for future implementation)
Not yet considered (but possible consideration in future)

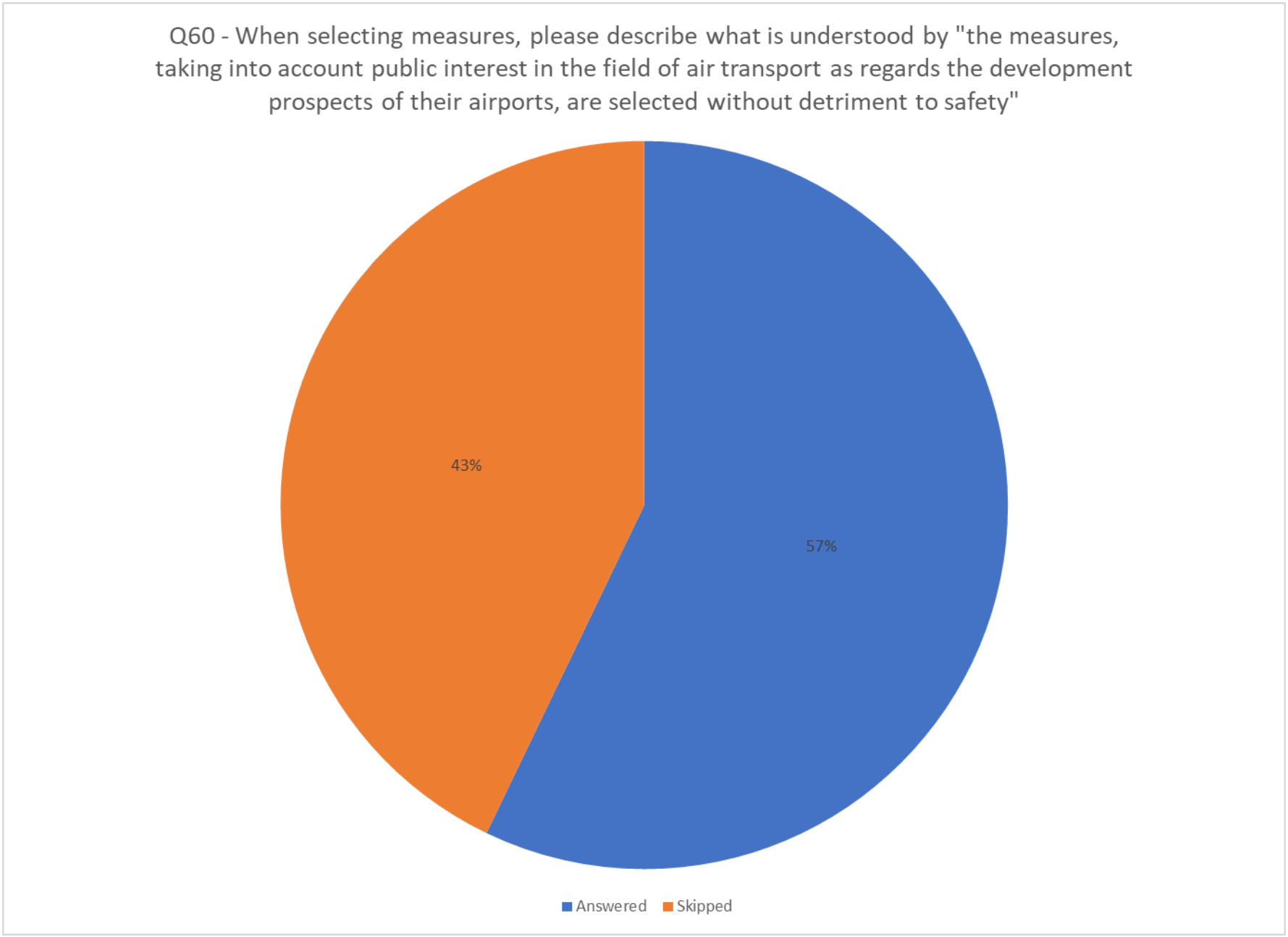

Q55 - Identification of noise measures: Operational procedure (departures)
(54 answered but number of answers varies for subquestions - 1 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Continuous climb procedures
Minimum climb gradients
Required use of NAPD 1 only
Required use of NAPD 2 only
Noise preferential routes
Alternation of the use of noise preferential routes
PBN departure routes
Predictable and scheduled respite from overflight measures
Preferential runway use for noise purposes
Airspace design restrictions (e.g. not below heights over sensitive receptors)
Noise limits and fines
Not implemented (and excluded from future implementation)
Adopted pre 2007
Adopted post 2007 in one of the three END round
Planned to be implemented
Considered (for future implementation)
Not yet considered (but possible consideration in future)

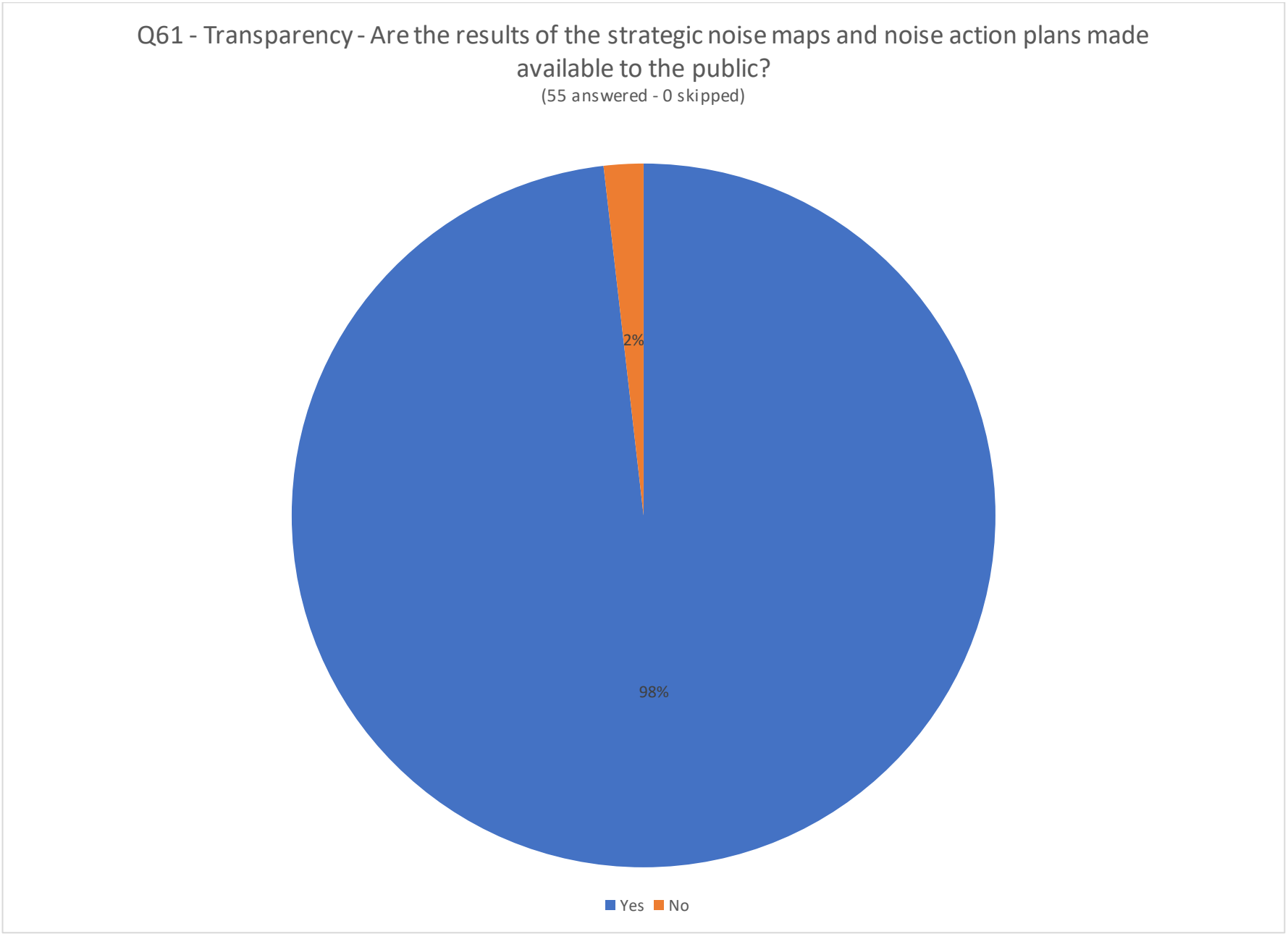

Q56 - Identification of noise measures: Operational procedure (arrivals)
(53 answered but number of answers varies for subquestions - 2 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Continuous Descent Approach
Low Power Low drag approaches
Landing gear deployment measures
Steeper Approaches (more than 3 degrees)
PBN arrival routes
Predictable and scheduled respite from overflight measures
Preferential runway use
Noise limits and fines
Airspace design restrictions (e.g. not below specified heights over sensitive receptors)
Not implemented (and excluded from future implementation)
Adopted pre 2007
Adopted post 2007 in one of the three END round
Planned to be implemented
Considered (for future implementation)
Not yet considered (but possible consideration in future)

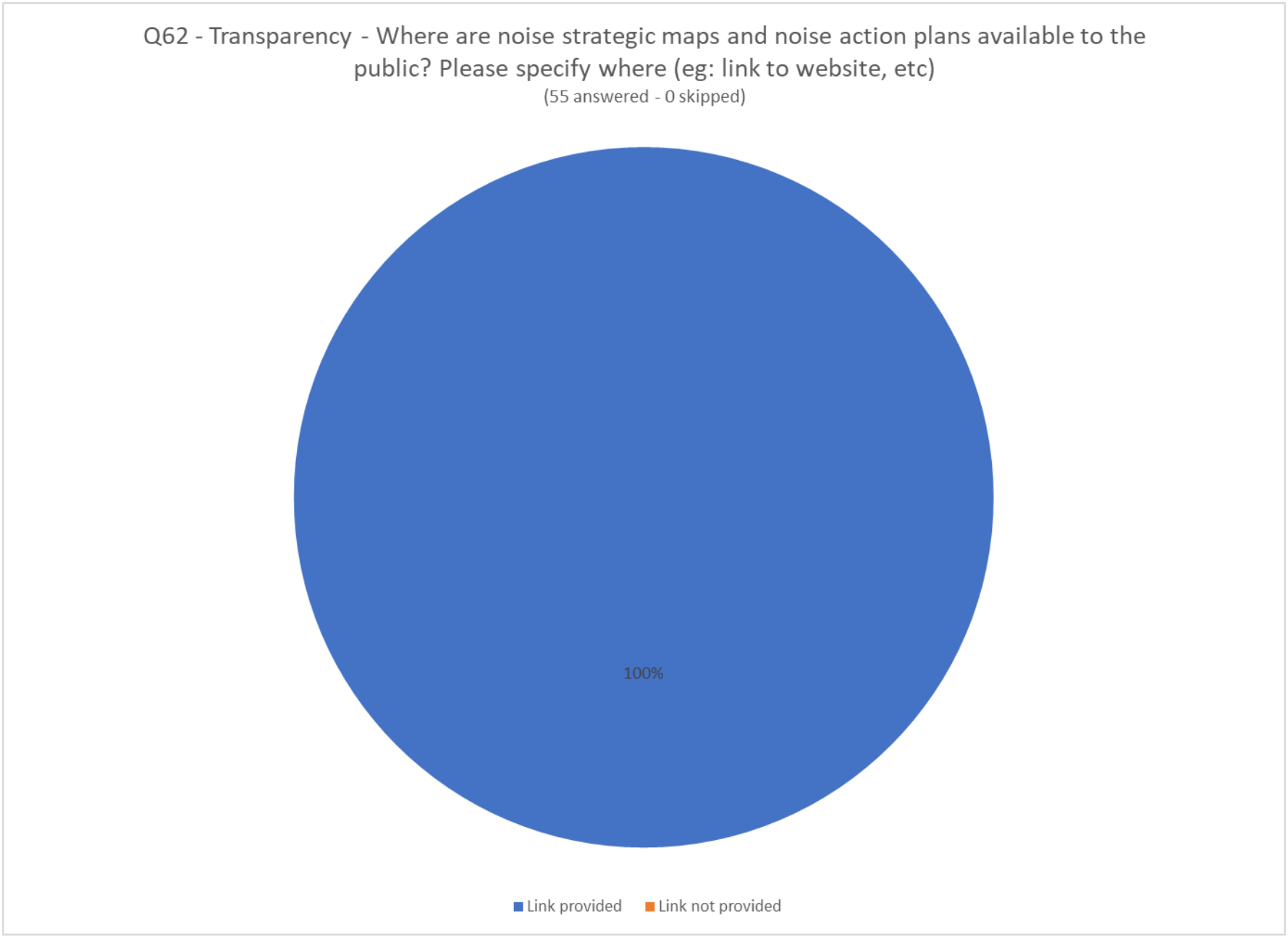

Q57 - Identification of noise measures: Land use planning
(53 answered but number of answers varies for subquestions - 2 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Building codes or planning guidance (including prohibiting construction of new buildings) in place to avoid or reduce the noise impact on sensitive land uses
Stakeholders consultation in regard of new developments in noise sensitive areas
Monitoring / reporting of sensitive land use (e.g. residential housing) encroachment within the END contours
Relocation assistance measures for most sensitive areas
Noise Insulation Schemes
Not implemented (and excluded from future implementation)
Adopted pre 2007
Adopted post 2007 in one of the three END round
Planned to be implemented
Considered (for future implementation)
Not yet considered (but possible consideration in future)

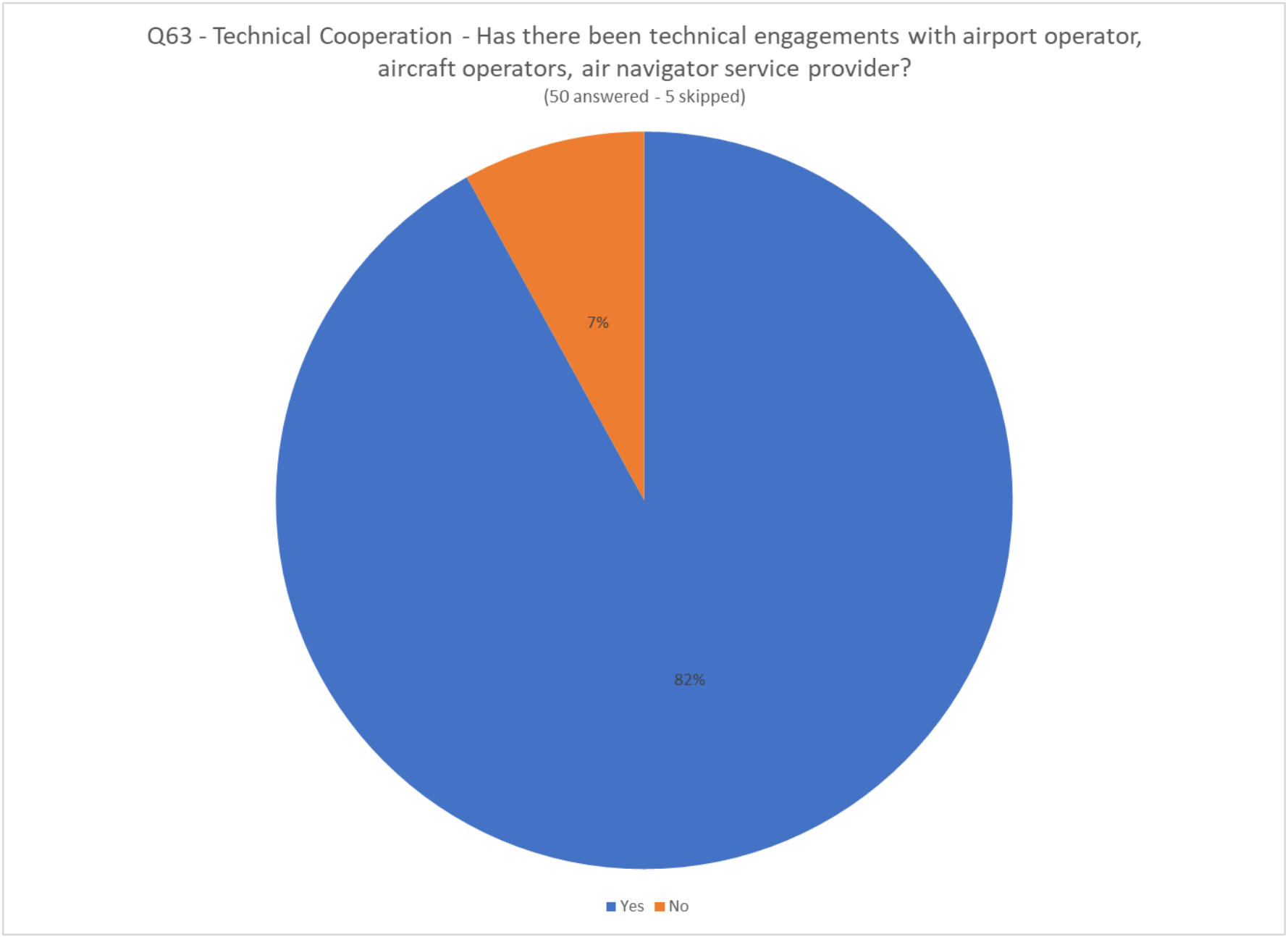

Q58 - Operating restrictions
(53 answered but number of answers varies for subquestions - 2 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Night Flight Restrictions
Mandatory Time based restrictions on marginally compliant aircraft
Mandatory Phase out of marginally compliant aircraft
Runway restrictions by aircraft type
Runway restrictions by time of the day
Runway restriction by operating mode
Operating time restrictions by aircraft type
Operating time restrictions by runway
Operating time restrictions by routes
Route restriction by aircraft type
Route restrictions by runway
Route restrictions by time of the day
Cap on aircraft movements in place [follow up if just for a specific time...
Noise quota(budget) limits/cap in place [follow up if just for a specific time...
Partial restrictions in place that draw a distinction between daytime and night time...
Noise contour cap
Voluntary restrictions (e.g. agreement not to land before specified time, trials,...
Not implemented (and excluded from future implementation)
Adopted pre 2007
Adopted post 2007 in one of the three END round
Planned to be implemented
Considered (for future implementation)
Not yet considered (but possible consideration in future)

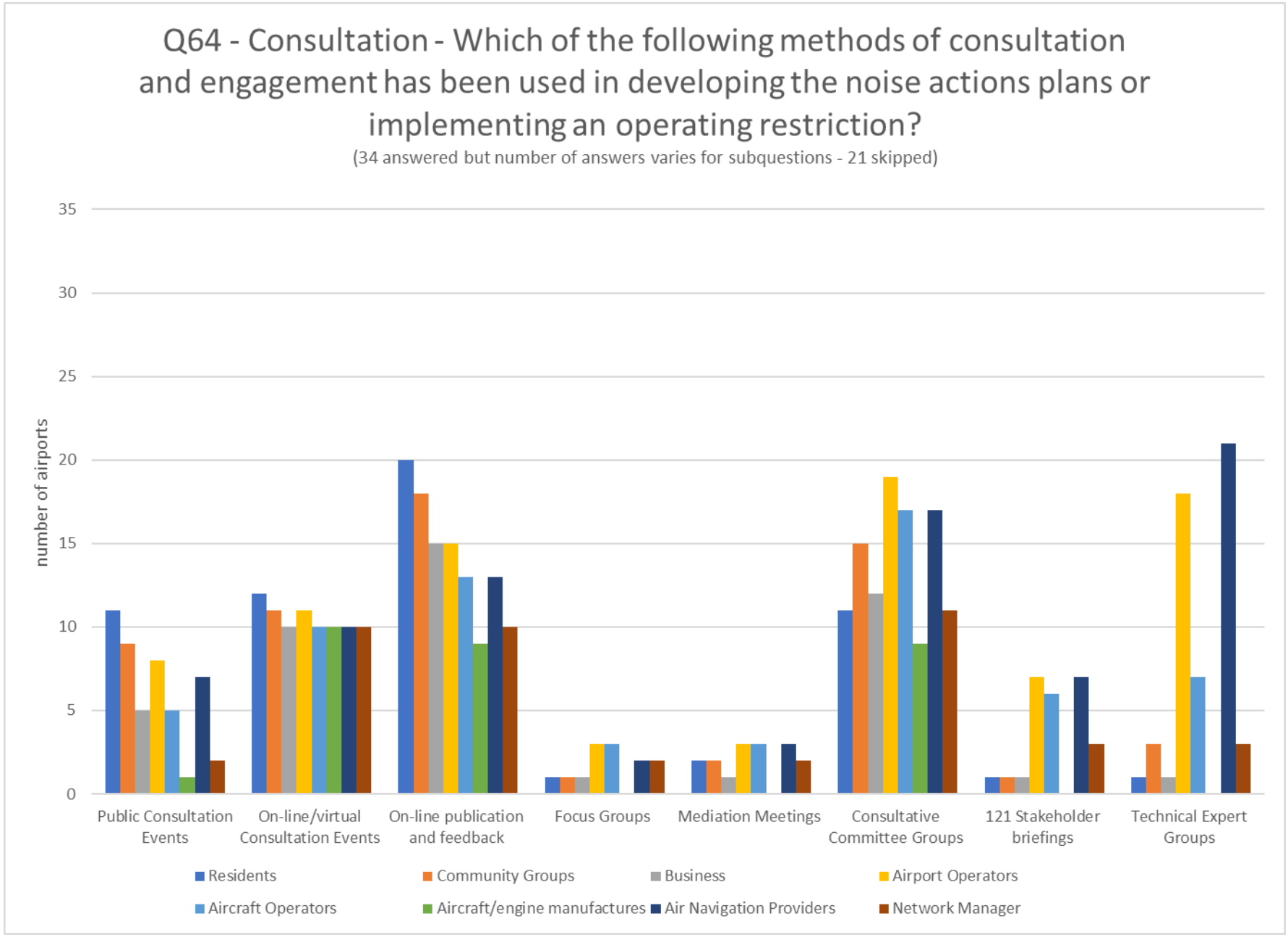

Q59 - Identification of noise measures: other
(54 answered but number of answers varies for subquestions - 1 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Building codes or planning guidance (including prohibiting construction of new buildings) in place to avoid or reduce the noise impact on sensitive land uses
Stakeholders consultation in regard of new developments in noise sensitive areas
Monitoring / reporting of sensitive land use (e.g. residential housing) encroachment within the END contours
Relocation assistance measures for most sensitive areas
Not implemented (and excluded from future implementation)
Adopted pre 2007
Adopted post 2007 in one of the three END round
Planned to be implemented
Considered (for future implementation)
Not yet considered (but possible consideration in future)

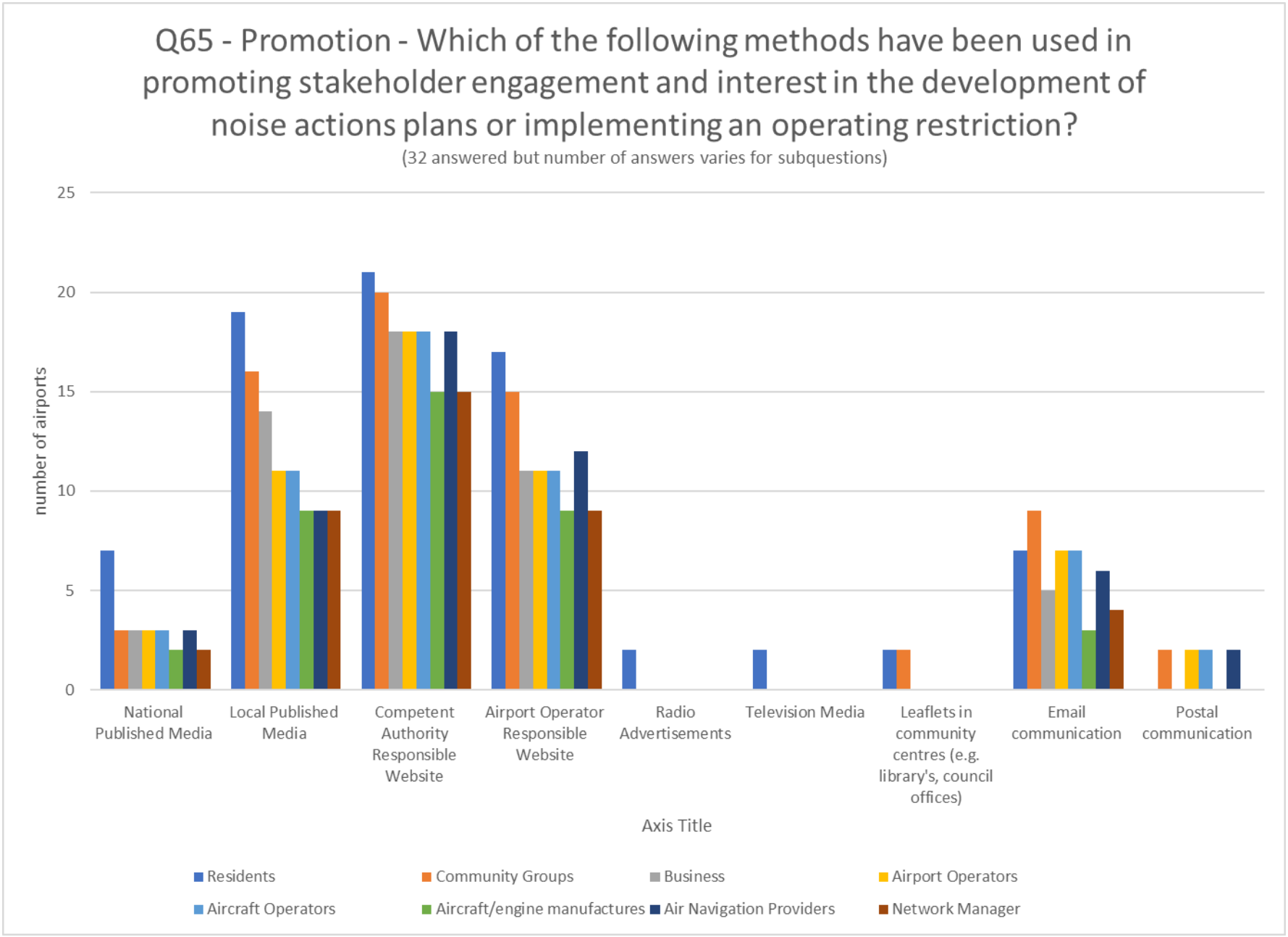

Q60 - When selecting measures, please describe what is understood by "the measures, taking into account public interest in the field of air transport as regards the development prospects of their airports, are selected without detriment to safety"
43%
57%
Answered
Skipped

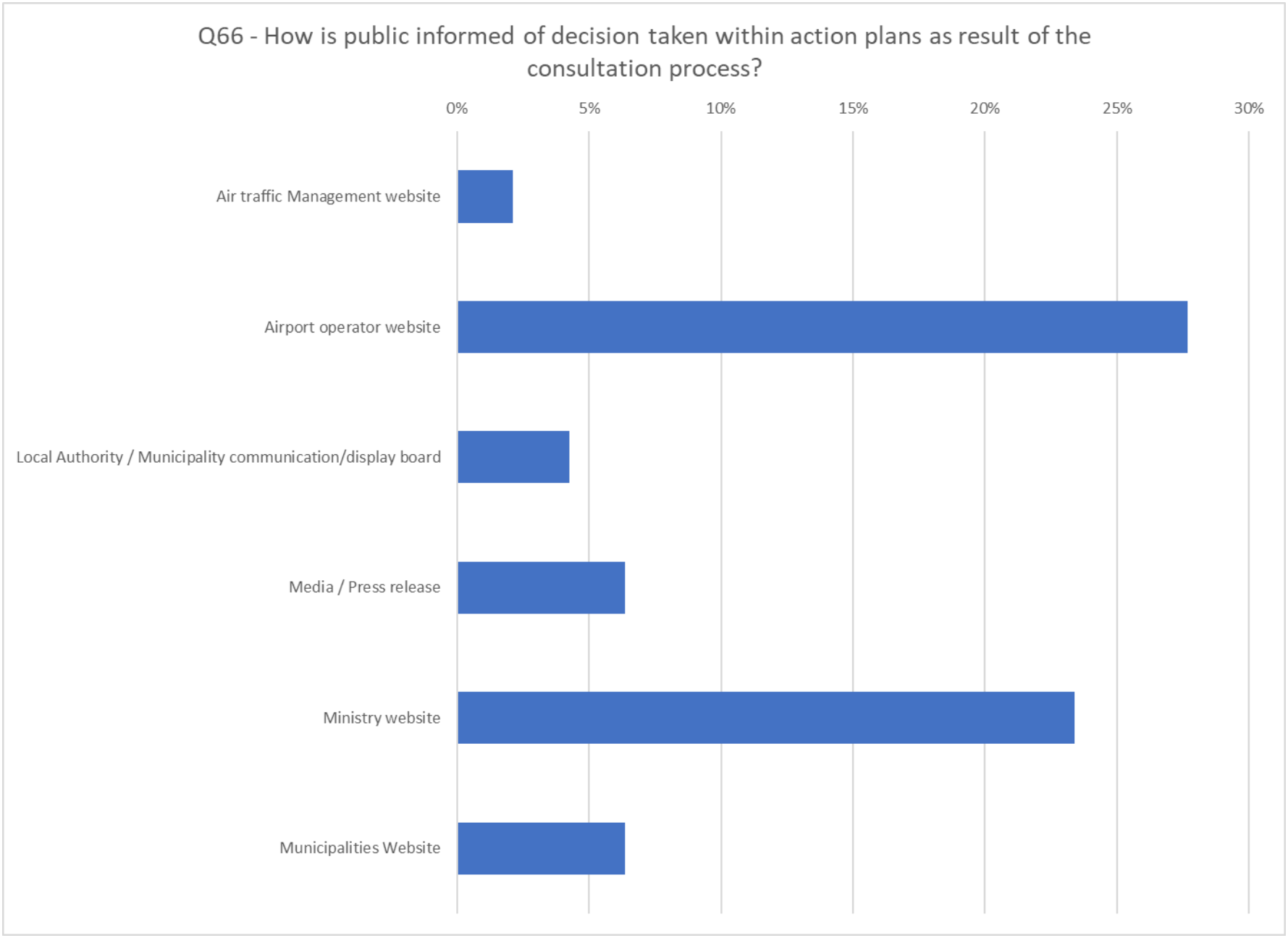

Q61 - Transparency - Are the results of the strategic noise maps and noise action plans made available to the public?
(55 answered - 0 skipped)
2%
98%
Yes
No

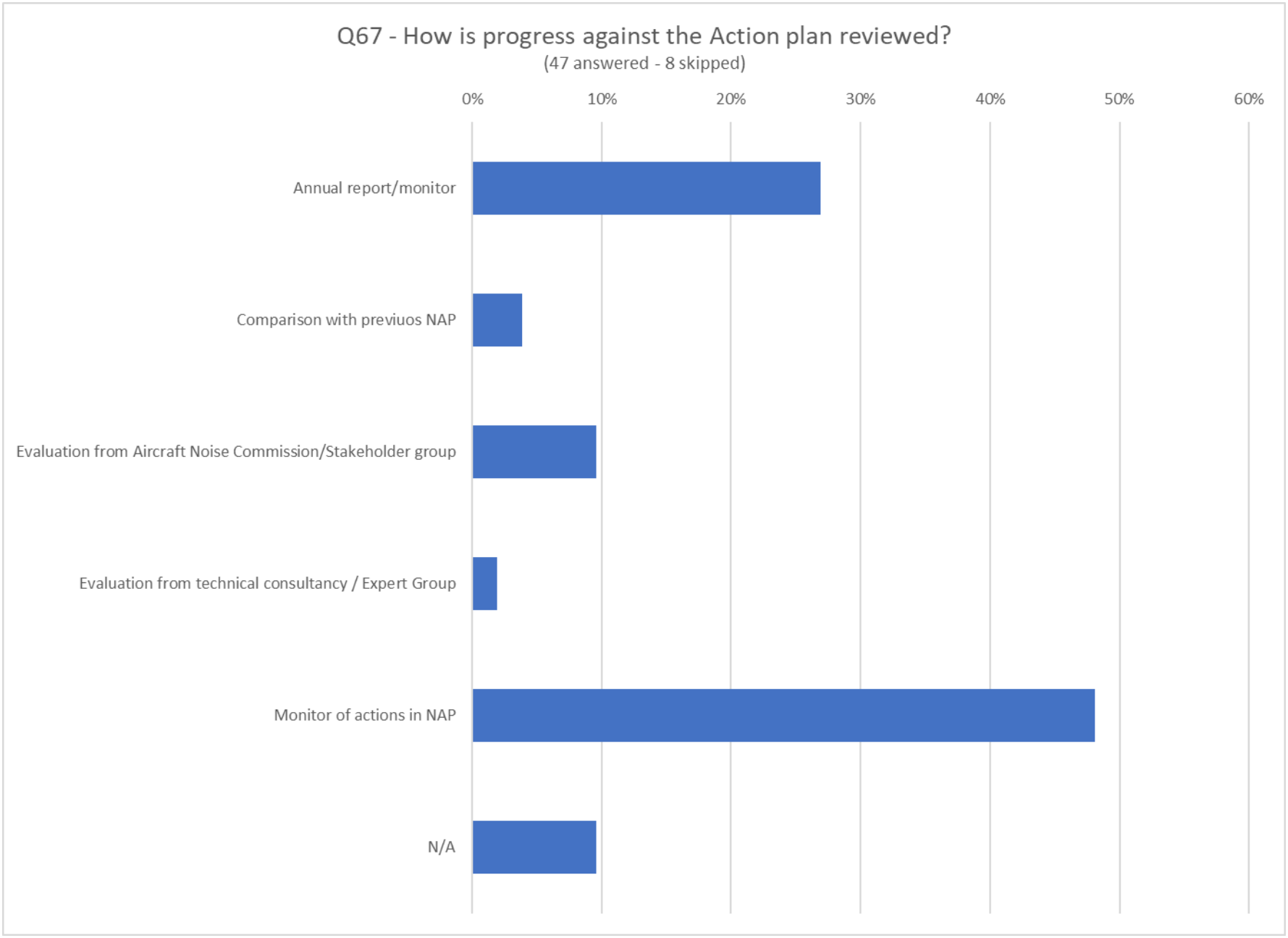

Q62 - Transparency - Where are noise strategic maps and noise action plans available to the public? Please specify where (eg: link to website, etc)
(55 answered - 0 skipped)
100%
Link provided
Link not provided

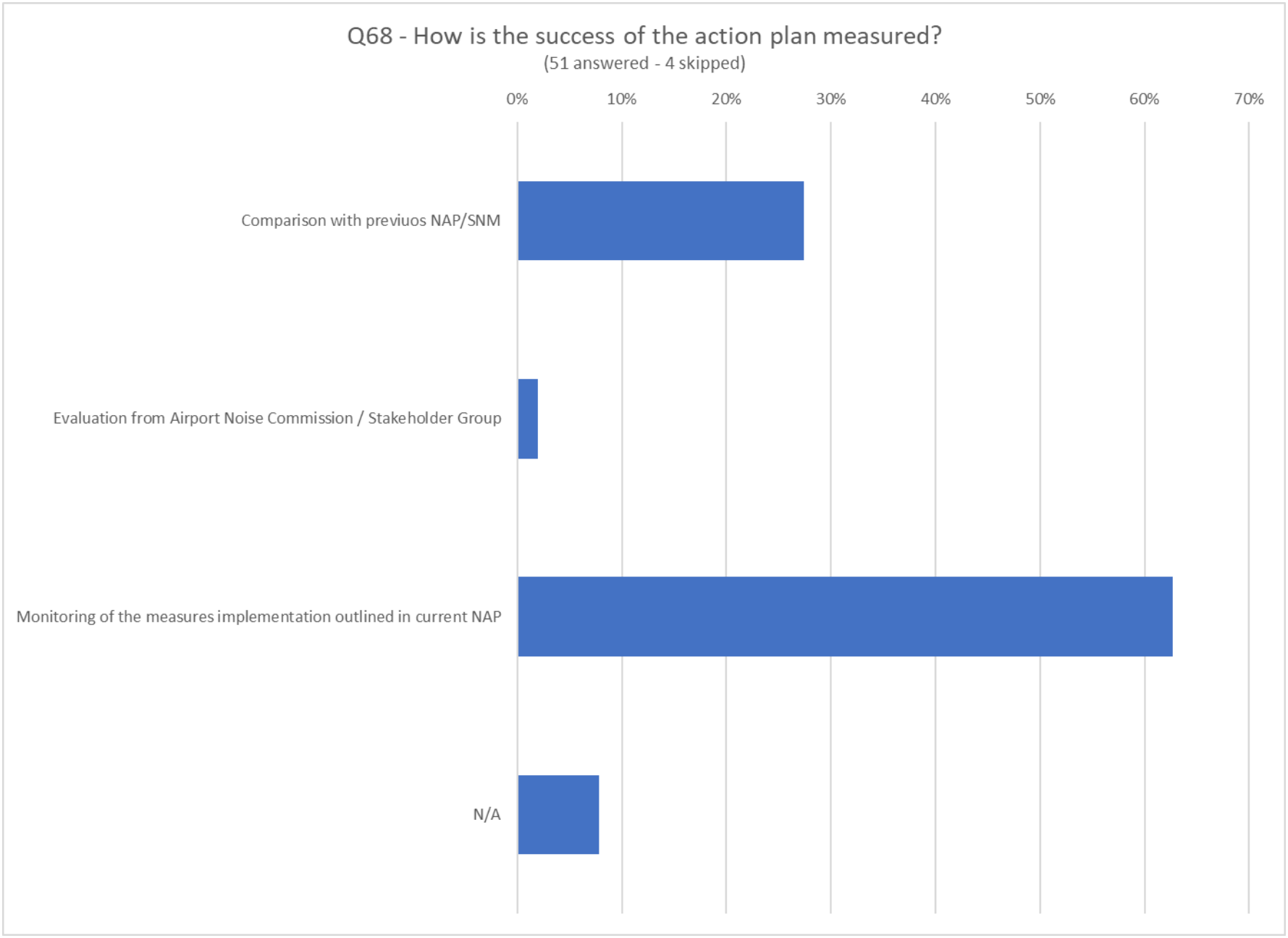

Q63 - Technical Cooperation - Has there been technical engagements with airport operator, aircraft operators, air navigator service provider?
(50 answered - 5 skipped)
7%
82%
Yes
No

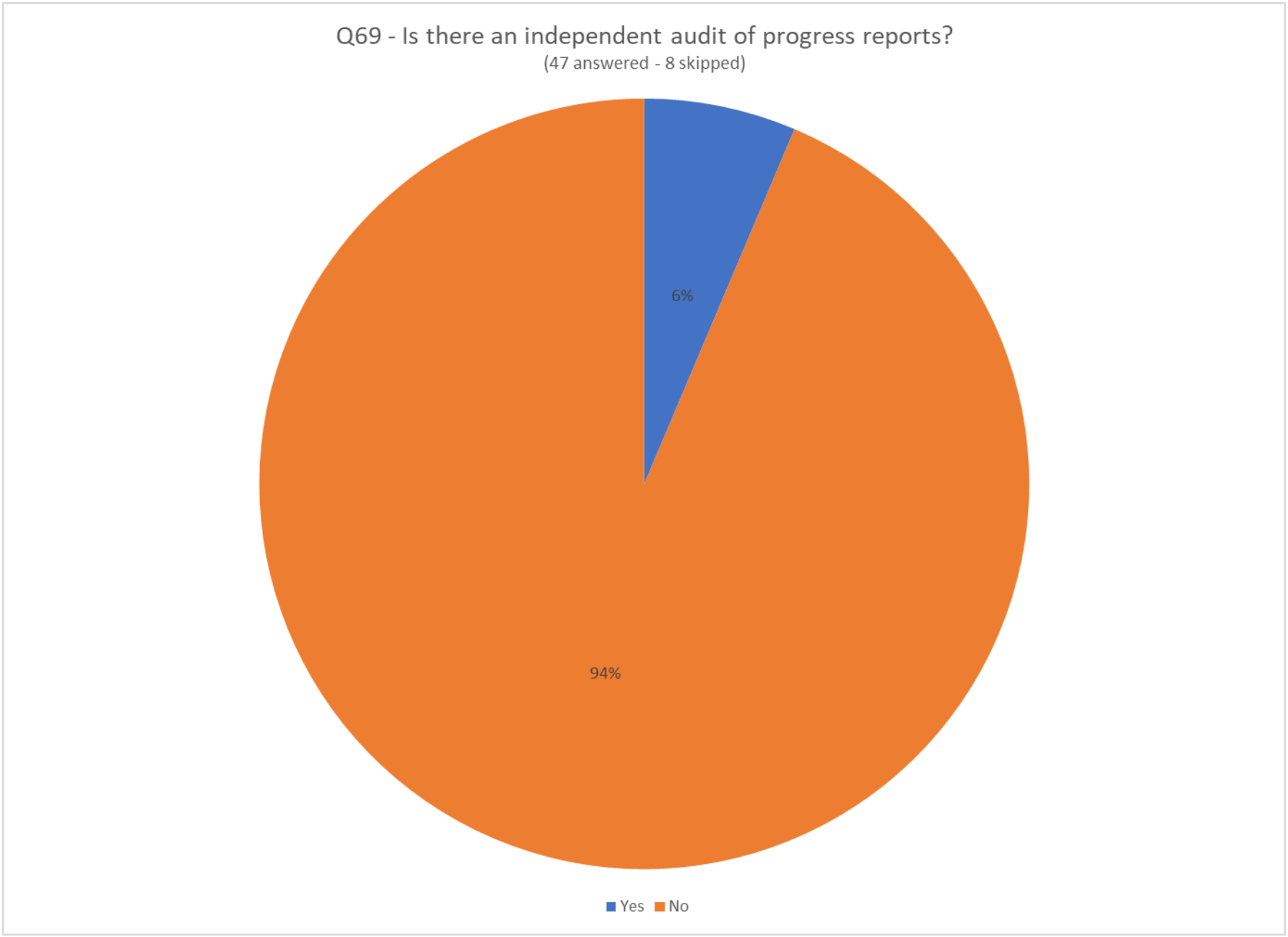

Q64 - Consultation - Which of the following methods of consultation and engagement has been used in developing the noise actions plans or implementing an operating restriction?
(34 answered but number of answers varies for subquestions - 21 skipped)
number of airports
35
30
25
20
15
10
5
0
Public Consultation Events
On-line/virtual Consultation Events
On-line publication and feedback
Focus Groups
Mediation Meetings
Consultative Committee Groups
121 Stakeholder briefings
Technical Expert Groups
Residents
Community Groups
Business
Airport Operators
Aircraft Operators
Aircraft/engine manufactures
Air Navigation Providers
Network Manager

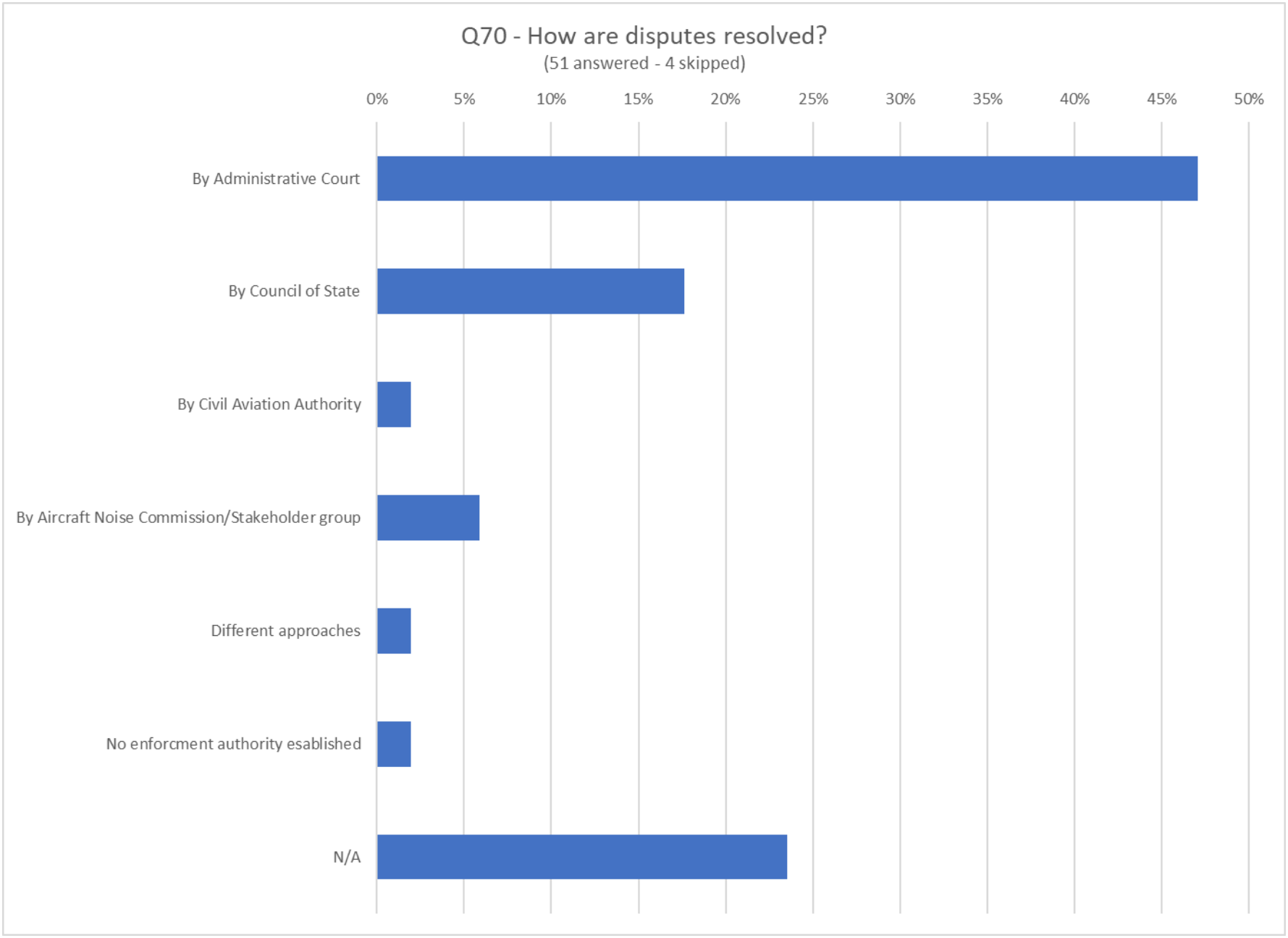

Q65 - Promotion - Which of the following methods have been used in promoting stakeholder engagement and interest in the development of noise actions plans or implementing an operating restriction?
(32 answered but number of answers varies for subquestions)
number of airports
25
20
15
10
5
0
National Published Media
Local Published Media
Competent Authority Responsible Website
Airport Operator Responsible Website
Radio Advertisements
Television Media
Leaflets in community centres (e.g. library's, council offices)
Email communication
Postal communication
Axis Title
Residents
Community Groups
Business
Airport Operators
Aircraft Operators
Aircraft/engine manufactures
Air Navigation Providers
Network Manager

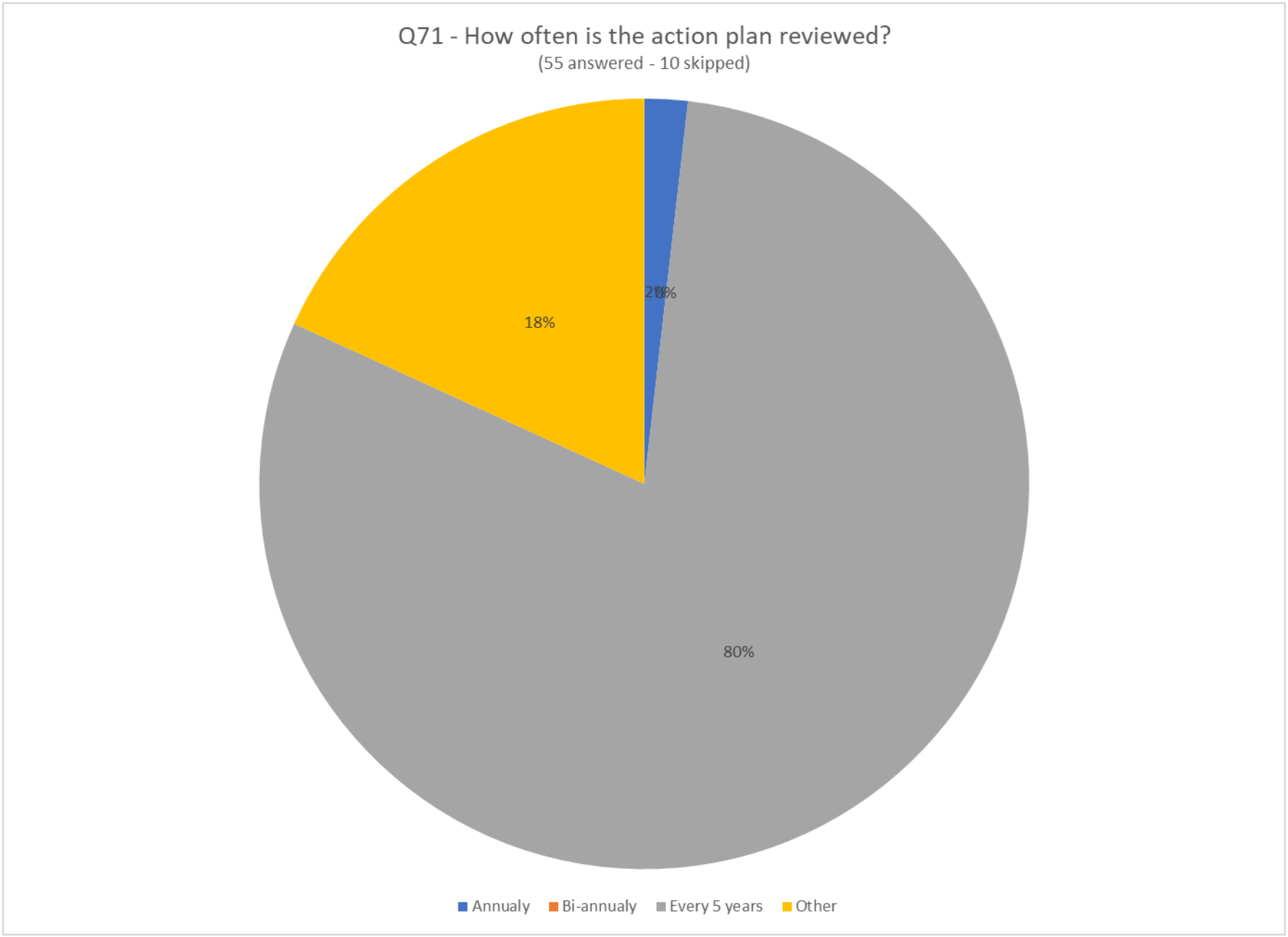

Q66 - How is public informed of decision taken within action plans as result of the consultation process?
0%
5%
10%
15%
20%
25%
30%
Air traffic Management website
Airport operator website
Local Authority / Municipality communication/display board
Media / Press release
Ministry website
Municipalities Website

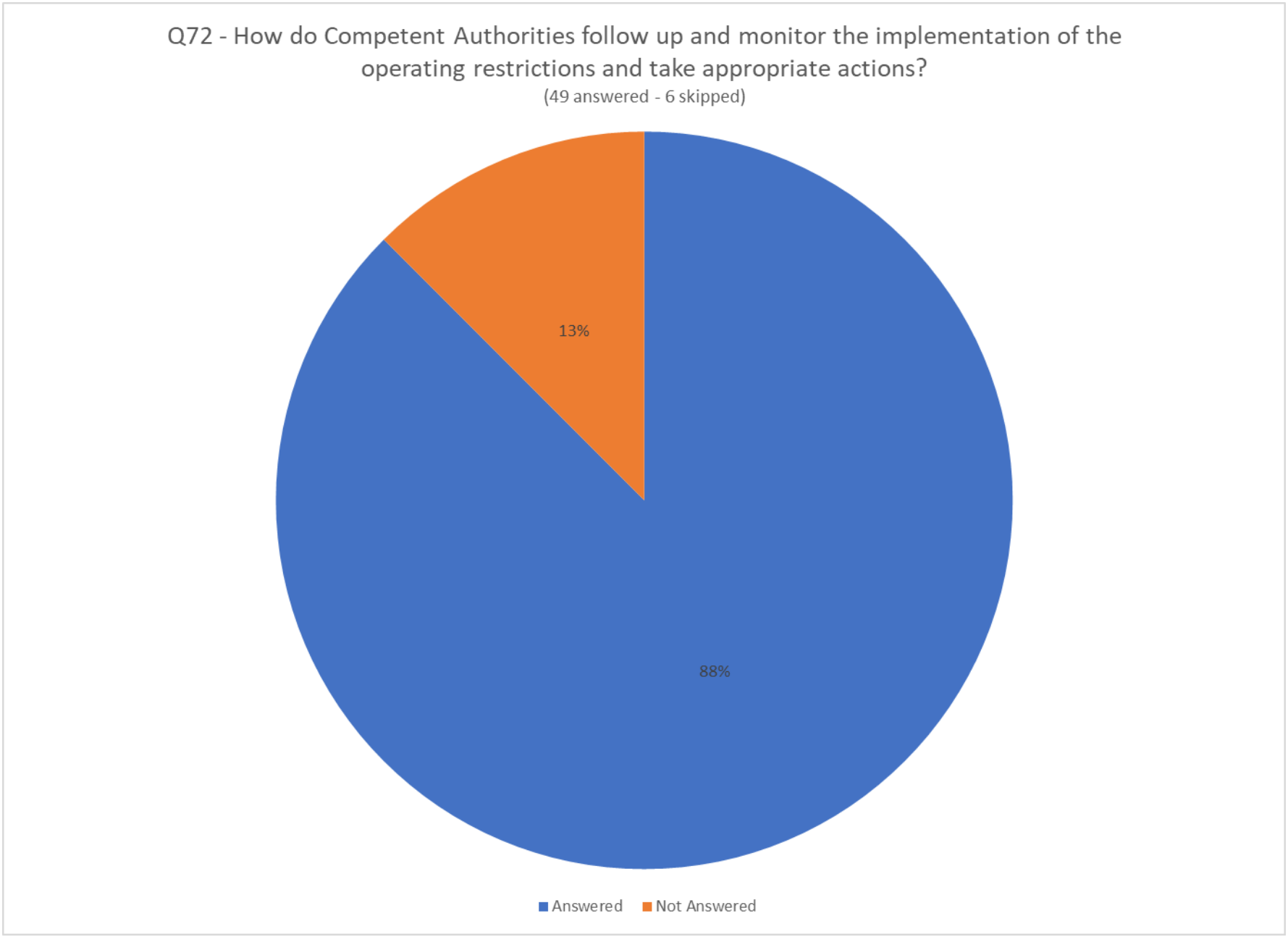

Q67 - How is progress against the Action plan reviewed?
(47 answered - 8 skipped)
0%
10%
20%
30%
40%
50%
60%
Annual report/monitor
Comparison with previuos NAP
Evaluation from Aircraft Noise Commission/Stakeholder group
Evaluation from technical consultancy / Expert Group
Monitor of actions in NAP
N/A

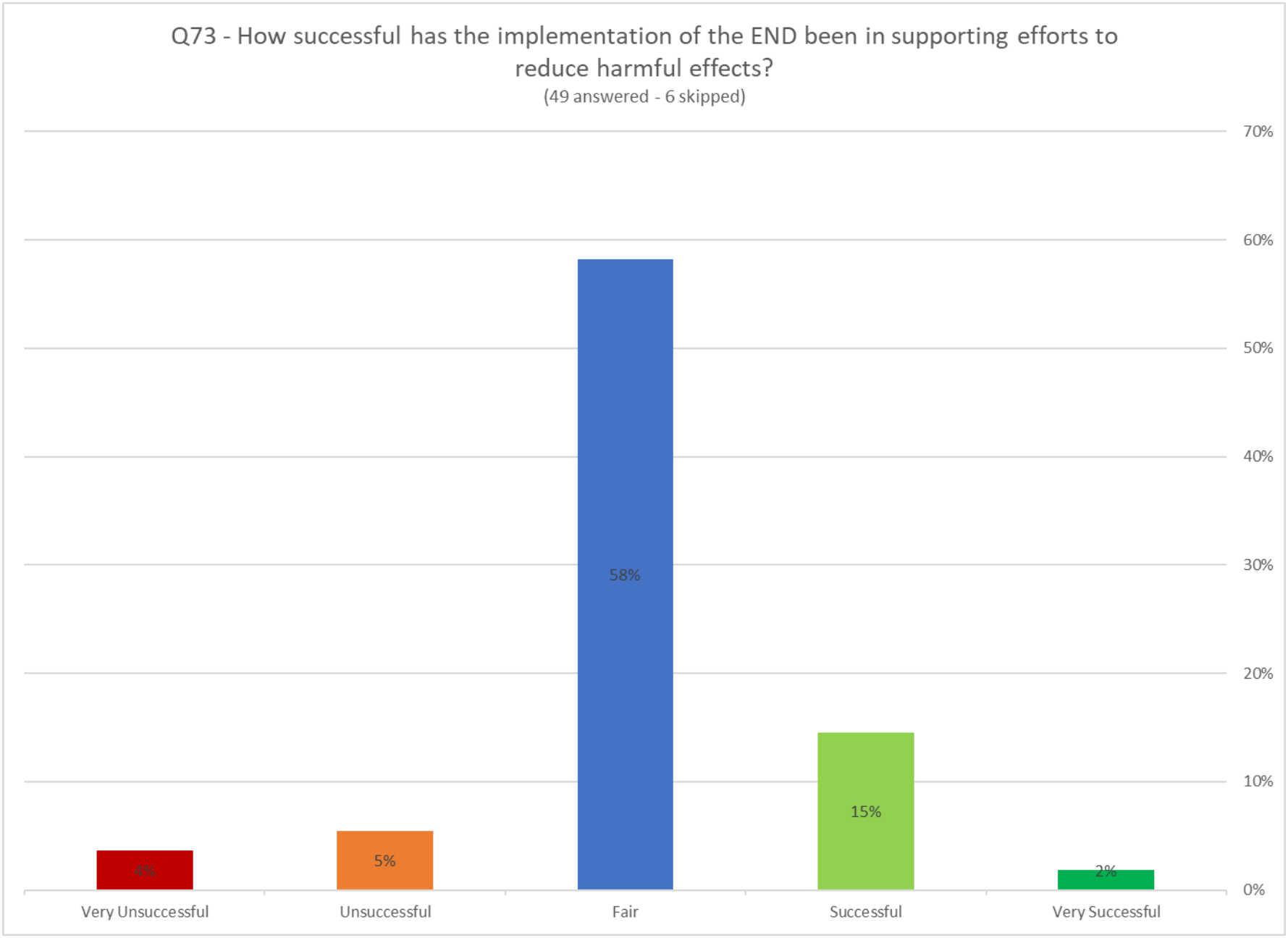

Q68 - How is the success of the action plan measured?
(51 answered - 4 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
Comparison with previuos NAP/SNM
Evaluation from Airport Noise Commission / Stakeholder Group
Monitoring of the measures implementation outlined in current NAP
N/A

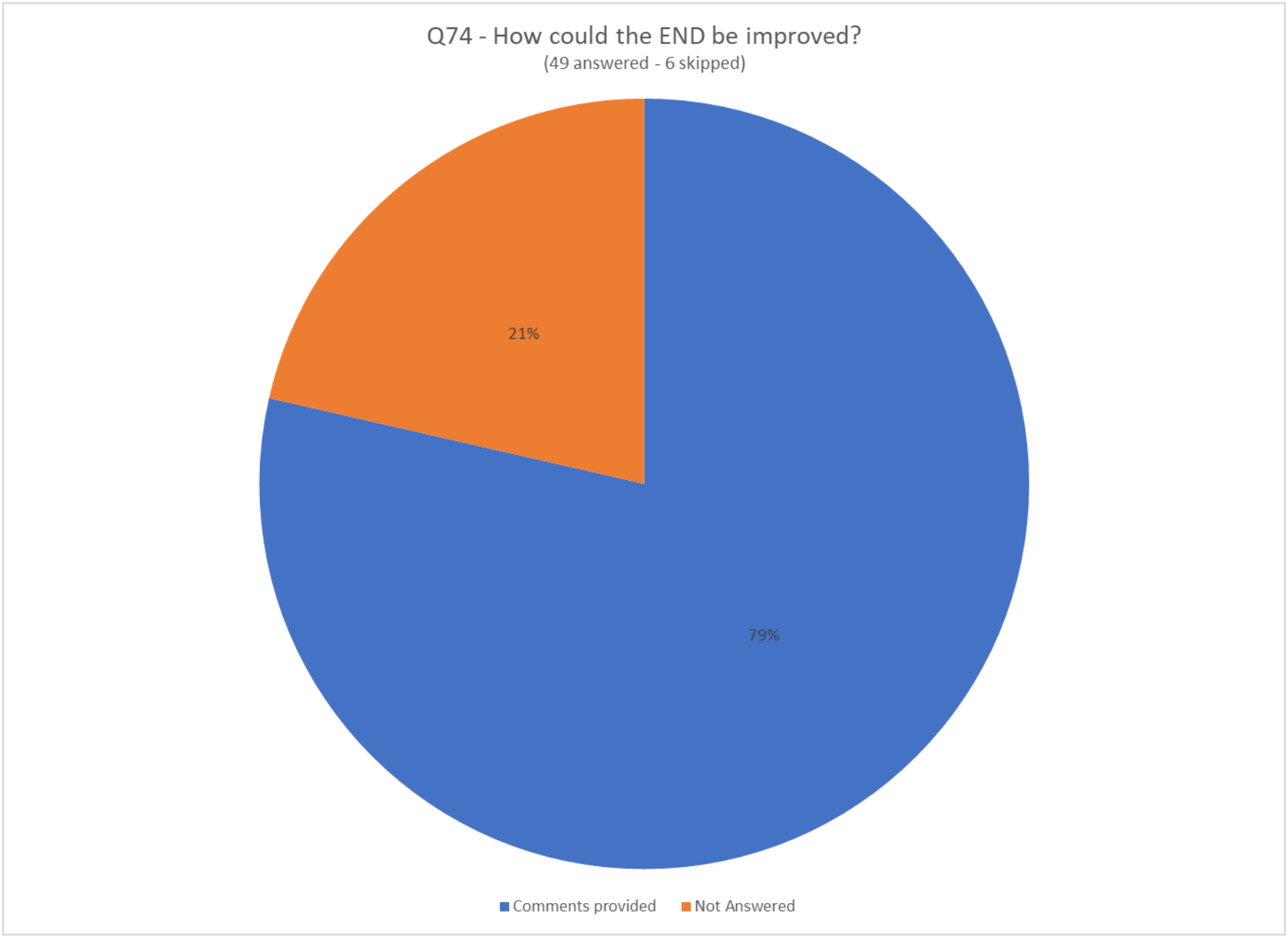

Q69 - Is there an independent audit of progress reports?
(47 answered - 8 skipped)
6%
94%
Yes
No

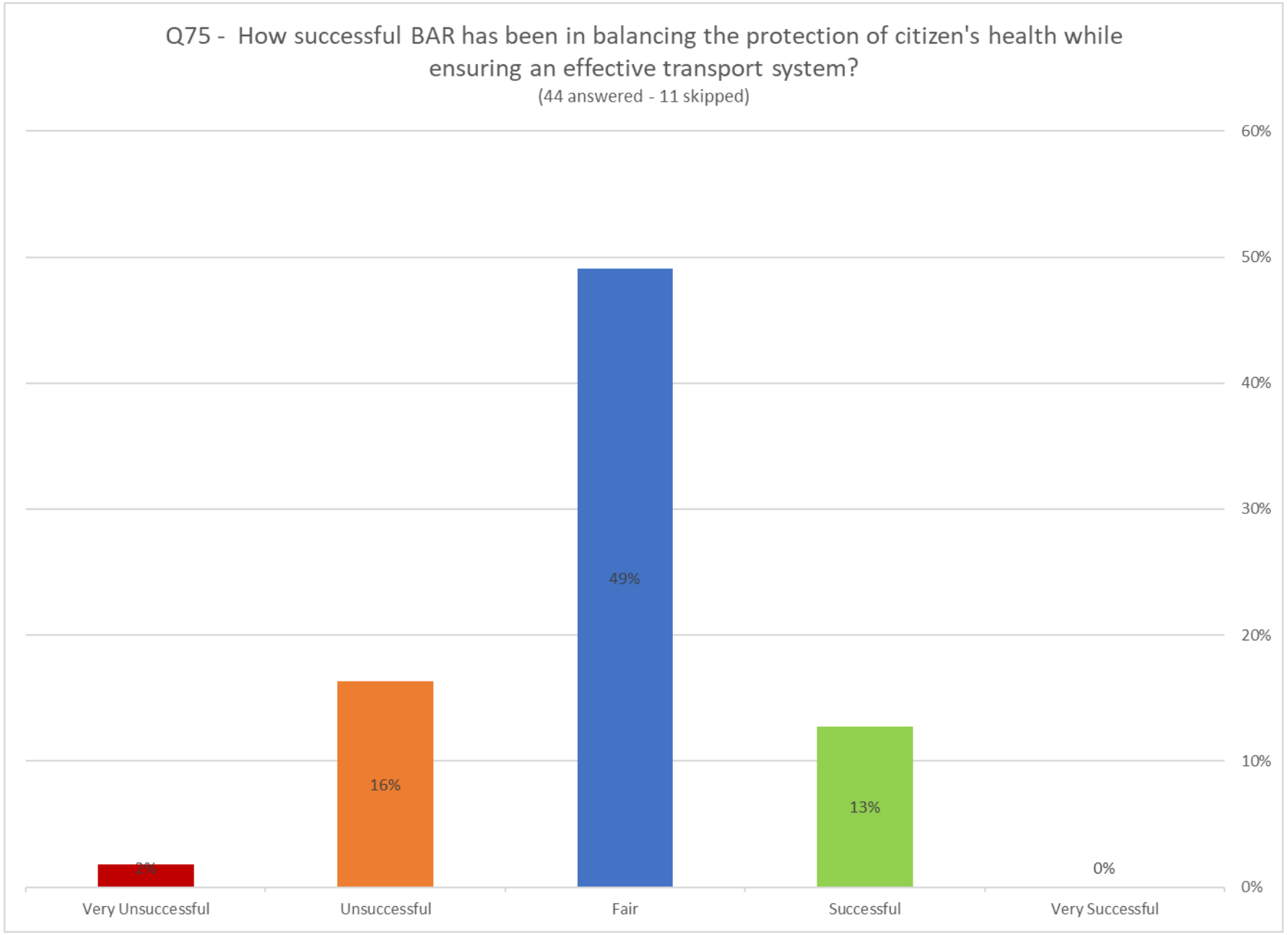

Q70 - How are disputes resolved?
(51 answered - 4 skipped)
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
50%
By Administrative Court
By Council of State
By Civil Aviation Authority
By Aircraft Noise Commission/Stakeholder group
Different approaches
No enforcment authority esablished
N/A

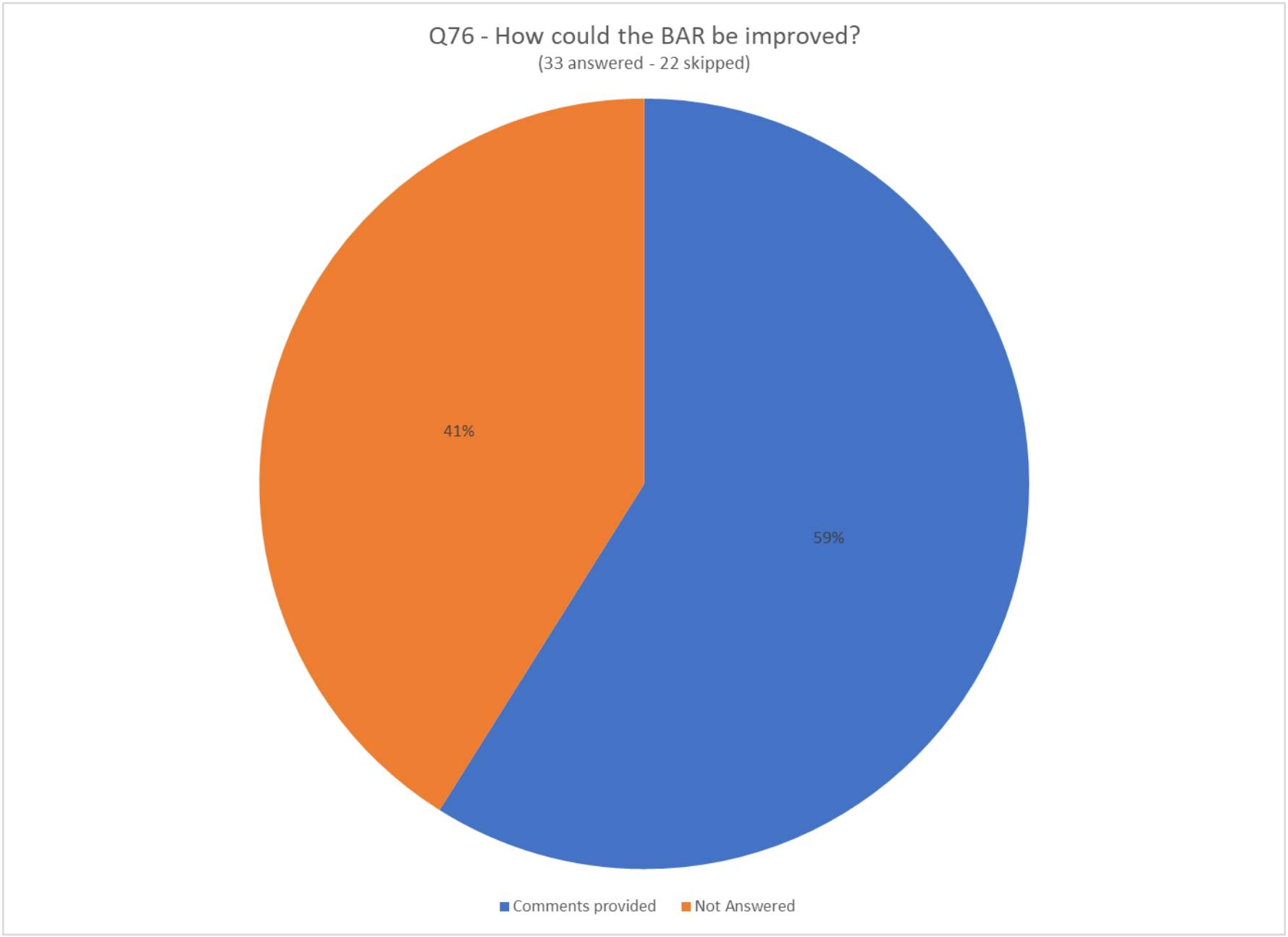

Q71 - How often is the action plan reviewed?
(55 answered - 10 skipped)
2%
18%
80%
Annualy
Bi-annualy
Every 5 years
Other

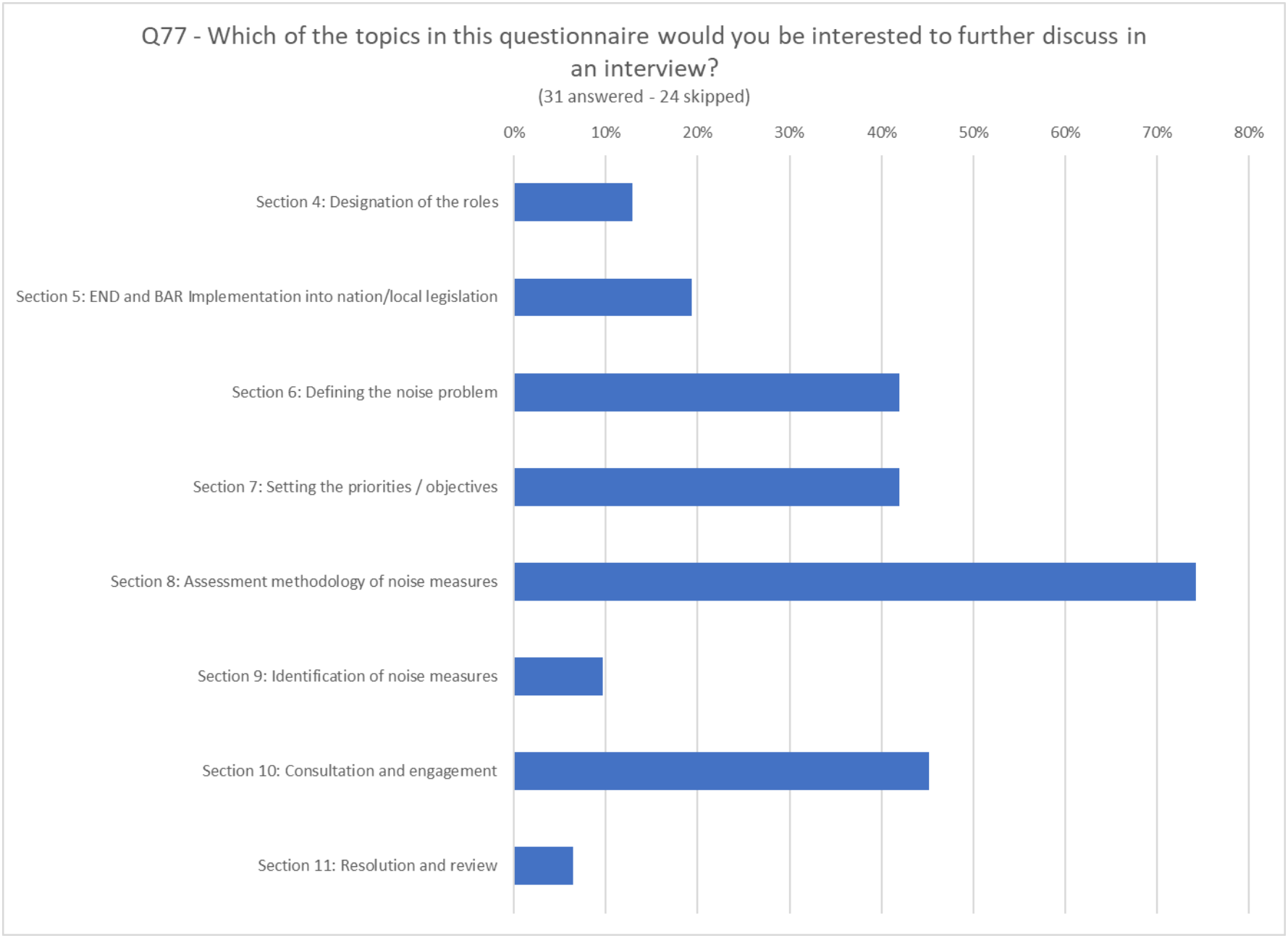

Q72 - How do Competent Authorities follow up and monitor the implementation of the operating restrictions and take appropriate actions?
(49 answered - 6 skipped)
13%
88%
Answered
Not Answered


Q73 - How successful has the implementation of the END been in supporting efforts to reduce harmful effects?
(49 answered - 6 skipped)
70%
60%
50%
40%
30%
20%
10%
0%
4%
5%
58%
15%
2%
Very Unsuccessful
Unsuccessful
Fair
Successful
Very Successful


Q74 - How could the END be improved?
(49 answered - 6 skipped)
21%
79%
Comments provided
Not Answered


Q75 - How successful BAR has been in balancing the protection of citizen's health while ensuring an effective transport system?
(44 answered - 11 skipped)
60%
50%
40%
30%
20%
10%
0%
2%
16%
49%
13%
0%
Very Unsuccessful
Unsuccessful
Fair
Successful
Very Successful


Q76 - How could the BAR be improved?
(33 answered - 22 skipped)
41%
59%
Comments provided
Not Answered


Q77 - Which of the topics in this questionnaire would you be interested to further discuss in an interview?
(31 answered - 24 skipped)
0%
10%
20%
30%
40%
50%
60%
70%
80%
Section 4: Designation of the roles
Section 5: END and BAR Implementation into nation/local legislation
Section 6: Defining the noise problem
Section 7: Setting the priorities / objectives
Section 8: Assessment methodology of noise measures
Section 9: Identification of noise measures
Section 10: Consultation and engagement
Section 11: Resolution and review

Appendix D – Information collected from ad-hoc interviews

Table 14 - Aggregated information captured from ad-hoc interviews (1/3)

Topic:	Ownership			Designation of Competent Authorities				The role of the airport operator		
Identified delivery model	Land owned by the State Airport infrastructure is private (or major shareholder is private) Airport operator is private	Land and airport infrastructure are State owned Airport operations are through concession to a private company	Land and airport infrastructure are State owned Airport operator is private but State is the owner / majority shareholder	The airport operator is one of the Competent Authorities designated under the END and BAR along with other Gov't agencies or ministries	Airport operator is responsible for the majority of the roles being across all aspects of the noise management process, offering a degree of efficiency and continuity	The Competent Authorities designated under the END and BAR are usually a few national or local government/ministry agencies/departments, which helps make the process of developing noise action plans more efficient	The Competent Authority designation is fragmentated	The airport operator is the designated Competent Authority responsible of the development of the noise action plans	The airport operator is the Competent Authority for most of the roles detailed in the legislation	The airport operator is one of the stakeholders engaged by the Competent Authorities along with the other stakeholders
Airport operator among Competent Authorities in the noise management framework	x	x	x	**X**	x			**X**	x	
National/Local institutions as Competent Authorities and airport operator as a stakeholder		x	x			**X**	x			**X**

X	Raised by most of the interviewed Competent Authorities
x	Raised by few of the interviewed Competent Authorities

Table 15 - Aggregated information captured from ad-hoc interviews (2/3)

Topic:	Noise problem definition		Noise abatement objective			Process used in defining noise related actions / operating restrictions		
Identified delivery model	In defining a noise problem a set process is not followed, rather it is the product of existing national/local legislations, and the requirements to produce strategic noise maps	The fragmentation of the roles makes Competent Authority coordination for the definition of noise problem more complex	There is no single noise abatement objective statement or expected outcomes defined	While there is no single noise abatement objective statement or expected outcomes defined, objectives might be established and if required operating restrictions implemented	The fragmentation of the roles among multiple Competent Authorities makes coordination for the definition of noise problem, establishment of objectives, and identification of noise measures, more complex	The identified noise related actions included in the noise action plans are based on specific factors that are considered important by the various stakeholders within the Airport Commission / Technical Group	The identification of the noise measures mainly follows the national legislation process (as Environmental permits, Planning Applications or Strategic Development Plans), where the definition of the actions are actually carried out.	Cost benefit or cost effectiveness have been used in the definition of the noise related actions / operating restrictions
Airport operator among Competent Authorities in the noise management framework	**X**		**X**			x	**X**	
National/Local institutions as Competent Authorities and airport operator as a stakeholder	**X**	x	x	**X**	x	x	x	**X**

X	Raised by most of the interviewed Competent Authorities
x	Raised by few of the interviewed Competent Authorities

Table 16 - Aggregated information captured from ad-hoc interviews (3/3)

Topic:	Cost Benefit Analysis / Cost Effectiveness Analysis		Progress monitoring		Stakeholder engagement arrangements				
Identified delivery model	There is no structured cost benefit or cost effectiveness assessment tool	Cost benefit or cost effectiveness tools exist	Monitoring activities verify the progress of the actions outlined in the noise action plans.	Progress or success are measured by a consensus of feedback from the key stakeholder group that has confidence in the process, focused more on the implementation of the actions rather than their effectiveness.	Stakeholder engagement and collaboration are key for the implementation of the END provisions and to develop the Noise Action Plan.	The engagement is facilitated by the establishment of an Airport Commission or Technical Group which include the airport operator, the other Competent Authorities such as government agencies or ministries, local authorities, industrial and local stakeholders.	The engagement with the public often occurs through established forums	An independent mediator assures the transparency of information.	Stakeholder engagement follows the national legislation process (as Environmental permits, Planning Applications or Strategic Development Plans)
Airport operator among Competent Authorities in the noise management framework	**X**		**X**	x	x	**X**			**X**
National/Local institutions as Competent Authorities and airport operator as a stakeholder	x	**X**	**X**	x			**X**	x	x

X	Raised by most of the interviewed Competent Authorities
x	Raised by few of the interviewed Competent Authorities

Appendix E – Data collected through the questionnaire in relation to ATM, population exposure and contour areas for the three END rounds

Table 17 – END L_{den} data provided through questionnaire

Respondent	END R1 2007							END R2 2012							END R3 2017						
	ATM	Contour Area, L_{den}			Population Exposure, L_{den}			ATM	Contour Area, L_{den}			Population Exposure, L_{den}			ATM	Contour Area, L_{den}			Population Exposure, L_{den}		
		>55 dB	>65 dB	>75 dB	55-65 dB	65-75 dB	>75 dB		>55 dB	>65 dB	>75 dB	55-65 dB	65-75 dB	>75 dB		>55 dB	>65 dB	>75 dB	55-65 dB	65-75 dB	>75 dB
03 - Bulgaria - Sofia Airport	< 50,000							< 50,000							57,000	5	0.75	0.25	400	0	0
06 - Denmark - Copenhagen Airport	265,000	30	11.25	2.3	3,500	300	0	245,000	30	11.25	2.3	3,500	300	0	265,000	29	10.5	2.1	4,000	300	0
08 - Finland - Helsinki Vantaa Airport	180,000	54	8	N.A.	10,000	100	0	195,000	64	9	0	16,250	100	0	167,500	68	9	1	25,000	200	0
10 - France - Bordeaux-Merignac Airport	68,000	18	3	0.65	3,500	0	0		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	85,000	26	3.5	0.55	5,500	100	0
11 - France - EuroAirport Basel– Mulhouse-Freiburg	75,000	N.A.	N.A.	N.A.	700	0	0		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	95,000	32	4.5	0.85	8,000	0	0
12 - France - Lyon-Saint Exupery Airport	130,000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	110,000	40	6	N.A.	5,000	0	0
13 - France - Marseille Provence Airport	120,000	33	5.25	0	16,250	900	0		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	117,500	44	6	0.75	17,500	1,300	0
14 - France - Nice Cote d'Azur Airport	162,500	54	9	1.3	6,500	0	0								177,500	43	7.75	1	10,000	0	0
15 - France - Paris Charles de Gaulle Airport	>500,000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	497,500	>190	35.5	5.85	235,000	600	0		>190	35.5	5.85	235,000	600	0
16 - France - Paris Le Bourget Airport		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	59,000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	55,000	15	2.5	0.5	25,000	200	0
17 - France - Paris Orly Airport	220,000	80	11.25	1.7	90,000	8,400	0	220,000	80	11.25	1.7	90,000	8,400	0		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
18 - France - Toulouse Blagnac Airport	92,500	31	5.25	1.15	35,000	500	0		0	N.A.	N.A.	N.A.	N.A.	N.A.	105,000	35	5	0.1	35,000	800	0
19 - Germany - Berlin Schonefeld Airport	58,000							65,000							95,000						
21 - Germany - Cologne Bonn Airport	150,000	102	17.5	2.9	75,000	1,100	0	135,000	113	18.5	3.1	85,000	900	0	142,500	120	20	3	100,000	600	0
22 - Germany - Dusseldorf Internatinal Airport	215,000	58	9.5	1	35,000	3,300	0	225,000	64	11	1.6	45,000	3,300	0	220,000		10	2	52,500	3,400	0
23 - Germany - Frankfurt am Main Airport	485,000	>190	43	>9.50	240,000	>40,000	0	475,000	>190	>45	>9.50	197,500	0	0	470,000	>190	>45	>9.50	190,000	100	0
24 - Germany - Hamburg Airport		31	6	1	42,500	2,400	0		34	6	1	47,500	2,700	0		35	6	1	52,500	4,000	0
25 - Germany - Hanover Langenhagen Airport	87,500	44	5.75	1.1	20,000	300	0	75,000	42	5.5	0.9	18,750	200	0	77,500	51	6.5	0.5	18,750	200	0
26 - Germany - Leipzig/Halle Airport	< 50,000	10	1.5	0.2	2,500	0	0	65,000	120	18.25	3	12,500	0	0	65,000	104	17.5	3	10,000	0	0
27 - Germany - Munich Airport	395,000	131	21	4	7,500	100	0	412,500	159	25	4	11,250	100	0	380,000	162	27	5	13,750	200	0
28 - Germany - Nuremberg Airport	72,000	28	4	1	10,000	200	0	74,000	29	4	1	10,000	100	0	64,000	30	4	1	12,500	100	0
30 - Greece - Athens International Airport "Eleftherios Venizelos"	190,000	69	12.5	2.3	15,000	0	0	172,500	58	9.5	1.9	11,250	0	0	190,000	61	10.5	2.1	16,250	0	0
31 - Hungary - Budapest Ferihegy International Airport	130,000	127	21.75	3.5	280,000	2,600	0	110,000	67	9.5	1.6	50,000	500	0	97,500	37	4.25	1.15	32,500	100	0
32 - Ireland - Dublin Airport																					
33 - Italy - Bologna Guglielmo Marconi Airport	67,000	21	3.5	0.6	12,500	400	0	68,000	20	3	0.6	13,750	5,400	0	72,000	22	3	1.05	17,500	4,300	0
34 - Italy - Catania Fontanarossa Airport	61,000	23	3	0.5	5,000	0	0	55,000	27	4.25	0.65	2,000	400	61	68,000	15	2	0.3	200	5,000	0
35 - Italy - Ciampino-G. B. Pastine International Airport	66,000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	51,000	21	3.25	0.85	17,500	5,200	0	54,000	19	2.75	0.75	15,000	4,600	0
36 - Italy - Fiumicino – Leonardo da Vinci International Airport	335,000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	315,000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	297,500	98	15.5	2.9	1,500	900	0
37 - Italy - Il Caravaggio International Airport	56,000	36	5	0.9	37,500	1,600	0	72,000	45	5.5	0.8	42,500	1,600	0	80,000	50	6.5	0.9	47,500	1,800	0
38 - Italy - Milan Malpensa Airport	245,000	75	11.25	2.75	30,000	600	0	182,500	N.A.	N.A.	N.A.	23,750	600	0	165,000	78	14	2.3	30,000	500	0
39 - Italy - Milano Linate Airport	125,000	35	5.5	1	67,500	5,100	0	115,000	N.A.	N.A.	N.A.	32,500	1,500	0	117,500	22	3.25	0.45	35,000	400	0
40 - Italy - Naples International Airport	63,000	13	2	0.5	25,000	200	0	66,000	14	2	0.45	27,500	200	0	65,000	13	2	0.35	32,500	200	0
41 - Italy - Turin Airport	62,000	14	2.75	1	4,500	1,300	0	52,000	15	2.25	0.8	11,250	200	0	< 50,000	11	1.5	0.45	8,500	0	0
42 - Italy - Venice Marco Polo Airport	87,500	35	5	0.5	2,000	0	0	85,000	24	3.5	0.55	2,000	0	0	92,500	24	3.5	0.5	2,000	0	0
43 - Latvia - Riga International Airport	< 50,000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	72,000	18	2.75	0.4	600	0	0	68,000	26	3.25	0.65	1,500	0	0
44 - Luxembourg - Luxembourg Findel Airport	61,000	63	10.75	1.9	30,000	3,900	0	73,000	64	9.75	2	50,000	3,100	0	87,500	60	9	1.85	65,000	2,400	0
45 - Netherlands - Amsterdam Airport Schiphol	435,000	189	26.25	3.65	42,500	200	0	425,000	189	27	3.45	55,000	400	0	500,000	>190	31	3.35	47,500	500	0
46 - Poland - Warsaw Chopin Airport	145,000	39	6	1	42,500	800	0	137,500	32	6	0	47,500	200	0	155,000	31	5.75	1.5	52,500	200	0
47 - Portugal - Francisco Sa Carneiro Airport		N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	< 50,000	4	0.75	0.05	3,500	0	0	77,500	36	4.75	0.9	8,000	200	0
48 - Portugal - Lisbon Portela Airport	135,000	36	5.5	1.05	1,500	100	0	142,500	34	5	1	1,000	100	0	182,500	78	12.5	2.35	3,000	300	1
49 - Romania - Bucharest Henri Coandă International Airport	55,000	67	8.25	0.8	3,000	100	0	69,000	99	9	3.2	6,500	0	0	105,000	78	10	1.5	15,000	100	0
50 - Spain - Alicante-Elche Airport	75,000	18	4	1	8,500	200	0	75,000	17	3.25	0.7	0	0	0	87,500	25	4.75	0.75	0	0	0
51 - Spain - Barcelona El Prat Airport	352,500	28	4	1	7,500	200	50	302,500	25	8.5	1.9	2,000	200	100	305,000	31	12.25	2.5	3,000	200	100
52 - Spain - Gran Canaria Airport	112,500	28	4	1	3,500	500	0	112,500	15	4.25	0.8	2,500	200	0	112,500	19	4.25	0.9	2,500	100	0
53 - Spain - Ibiza Airport								62,000	7	2.25	0.6	1,000	200	0	73,000	8	2.75	0.65	1,500	400	0
54 - Spain - Lanzarote Airport								50,000							55,000	12	2.25	0.4	8,000	300	0
55 - Spain - Madrid Barajas Airport	485,000	153	30	5	42,500	2,700	0	430,000	113	20.75	3.45	30,000	1,900	0	377,500	172	30	4.05	42,500	1,900	100
56 - Spain - Malaga Airport	125,000				300	200	0	107,500	19	4	0.8	200	200	0	125,000	35	6.5	1	2,500	200	0
57 - Spain - Palma de Mallorca Airport	182,500	41	8	2	100	0	0	180,000	32	7	1.35	300	0	0	197,500	48	9	1.7	300	0	0
58 - Spain - Tenerife North Airport	61,000	12	2	0	16,250	1,100	0	63,000	10	2	0.35	2,500	0	0	56,000	8	1.25	0.25	1,500	0	0
59 - Spain - Tenerife South Airport	63,000	23	4	1	12,500	100	0	59,000	18	3.25	0.6	4,500	100	0	66,000	24	4.5	0.75	13,750	100	0
60 - Spain - Valencia Airport	97,500	23	3	1	40,000	100	0	70,000	18	2.5	0.65	30,000	100	0	63,000	25	3.5	0.65	47,500	100	0
61 - Sweden - Göteborg-Landvetter Airport	64,000	19	3	0.6	600	0	0	69,000	N.A.	N.A.	N.A.	700	0	0	72,000	25	4	1	500	0	0
62 - Sweden - Stockholm-Arlanda Airport	217,500	64	10.75	1.8	1,500	0	0	210,000	N.A.	N.A.	N.A.	1,500	0	0	227,500	72	11	2	1,500	0	0
63 - Sweden - Stockholm-Bromma Airport	62,000	N.A.	N.A.	N.A.	4,000	0	0	67,000	N.A.	N.A.	N.A.	12,500	0	0	59,000	7	2	0	12,500	0	0

Table 18– END Lnight data provided through questionnaire

Respondent	END R1 2007						END R2 2012						END R3 2017					
	Contour Area, L_{night}			Population Exposure, L_{night}			Contour Area, L_{night}			Population Exposure, L_{night}			Contour Area, L_{night}			Population Exposure, L_{night}		
	>50 dB	>60 dB	>70 dB	50-60 dB	60-70 dB	>70 dB	>50 dB	>60 dB	>70 dB	50-60 dB	60-70 dB	>70 dB	>50 dB	>60 dB	>70 dB	50-60 dB	60-70 dB	>70 dB
03 - Bulgaria - Sofia Airport	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1,000	<100	0	N.A.	N.A.	N.A.
06 - Denmark - Copenhagen Airport	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.				N.A.	N.A.	1,000	<100	0	N.A.	N.A.	N.A.
08 - Finland - Helsinki Vantaa Airport	N.A.	N.A.	22,500	2,300	0	N.A.	N.A.	35,000	1,300	0	N.A.	N.A.	45,000	600	0	N.A.	N.A.	N.A.
10 - France - Bordeaux-Merignac Airport			1,000	<100	0			1,000	<100	0			1,000	100	0			
11 - France - EuroAirport Basel– Mulhouse–Freiburg	2	0	3,500	0	0	14	0	3,500	0	0	16	2	4,500	0	0	15	2	0
12 - France - Lyon-Saint Exupery Airport	N.A.	N.A.	N.A.	N.A.	N.A.	7	N.A.	100	0	N.A.	15	2	800	0	N.A.	N.A.	N.A.	N.A.
13 - France - Marseille Provence Airport	10	0.6	1,000	0	0	63	0.5	4,000	0	0	70	8.5	2,000	0	0	63	10	0.6
14 - France - Nice Cote d'Azur Airport			800	0	0			9,500	<100	0			8,000	<100	0			
15 - France - Paris Charles de Gaulle Airport			1,500	400	0			200	<100	0			600	<100	0			
16 - France - Paris Le Bourget Airport			N.A.	N.A.	N.A.			2,000	0	0			4,000	0	0			
17 - France - Paris Orly Airport	>30.00	5	107,500	0	0	160	7	60,000	300	0	140	26	37,500	0	0	195	>30.00	5
18 - France - Toulouse Blagnac Airport	2	0	5,000	0	0	7	0	4,500	0	0	10	2	9,500	200	0	13	2	0
19 - Germany - Berlin Schonefeld Airport	12.5	2.2	40,000	100	0	81	2.3	40,000	400	0	87	14.75	52,500	300	0	75	12.5	2.2
21 - Germany - Cologne Bonn Airport	2	0.2	7,500	100	0	17	0.2	8,500	100	0	22	2.25	10,000	0	0	16	2	0.2
22 - Germany - Dusseldorf Internatinal Airport			1,000	100	0			200	200	100			200	100	0			
23 - Germany - Frankfurt am Main Airport																		
24 - Germany - Hamburg Airport			5,000	100	0			3,000	100	0			6,000	100	0			
25 - Germany - Hanover Langenhagen Airport													100	0	0			
26 - Germany - Leipzig/Halle Airport			3,000	100	0			600	0	0			2,000	0	0			
27 - Germany - Munich Airport			1,000	100	<100			200	200	100			200	100	<100			
28 - Germany - Nuremberg Airport			0	0	0			0	0	0			0	0	0			
30 - Greece - Athens International Airport "Eleftherios Venizelos"			2,000	100	0			0	0	0			0	0	0			
31 - Hungary - Budapest Ferihegy International Airport			8,500	0	0			6,500	0	0			12,500	100	0			
32 - Ireland - Dublin Airport								1,000	100	0			900	100	0			
33 - Italy - Bologna Guglielmo Marconi Airport			1,500	200	0			800	0	0			800	0	0			
34 - Italy - Catania Fontanarossa Airport			300	100	0			200	100	0			200	100	0			
35 - Italy - Ciampino–G. B. Pastine International Airport	2.5	0.5	6,500		0	11	1	3,000	0	0	11	2.5	5,000	0	0	15	2.5	0.5
36 - Italy - Fiumicino – Leonardo da Vinci International Airport	7	1	800	0	0	76	2	3,500	0	0	78	12	3,500	0	0	48	7	1
37 - Italy - Il Caravaggio International Airport	N.A.	N.A.	7,500	100	0	N.A.	N.A.	5,000	0	0	N.A.	N.A.	9,000	0	0	N.A.	N.A.	N.A.
38 - Italy - Milan Malpensa Airport	5	0.5	4,000	<100	0	36	0	4,000	<100	0	40	5	9,000	<100	0	32	5	0.5
39 - Italy - Milano Linate Airport	7	N.A.	4,500	0	0	34	N.A.	1,500	0	0	15	2.75	2,500	0	0	44	7	N.A.
40 - Italy - Naples International Airport	1	0.2	0	0	0	10	0.2	0	0	0	13	1.75	0	0	0	8	1	0.2
41 - Italy - Turin Airport	1	0.3	200	0	0	5	0.1	1,000	0	0	6	0.75	9,500	0	0	7	1	0.3
42 - Italy - Venice Marco Polo Airport			2,000	0	0			900	300	<100			25,000	0	0			
43 - Latvia - Riga International Airport	N/A	N/A	3,500	0	0	N/A	N/A	5,000	0	0	N/A	N/A	5,500	0	0	N/A	N/A	N/A
44 - Luxembourg - Luxembourg Findel Airport	3.5	0.7	15,000	1,100	0	24	0.5	15,000	700	0	26	3.75	16,250	800	0	22	3.5	0.7
45 - Netherlands - Amsterdam Airport Schiphol	1.75	0.4	23,750	200	0	N.A.	N.A.	10,000	0	0	N.A.	N.A.	16,250	<100	0	14	1.75	0.4
46 - Poland - Warsaw Chopin Airport	6.75	1.5	11,250	200	0	N.A.	N.A.	9,000	0	0	N.A.	N.A.	13,750	100	0	37	6.75	1.5
47 - Portugal - Francisco Sa Carneiro Airport	1.5	0.4	3,000	800	0	4	0.6	4,000	1,000	0	2	1.25	2,500	500	0	7	1.5	0.4
48 - Portugal - Lisbon Portela Airport											1	0.5	0	0	0			
49 - Romania - Bucharest Henri Coandă International Airport			1,500	<100	0			200	0	0			5,500	<100	0			
50 - Spain - Alicante-Elche Airport																		
51 - Spain - Barcelona El Prat Airport	N.A.	N.A.	200	0	0	N.A.	N.A.	200	0	0	N.A.	N.A.	200	0	0	N.A.	N.A.	N.A.
52 - Spain - Gran Canaria Airport	2.5	0.4	8,500	<100	0	N.A.	N.A.	N.A.	N.A.	N.A.	13	2	15,000	0	0	13	2.5	0.4
53 - Spain - Ibiza Airport	2.75	0.4	30,000	100	0	22	0.4	30,000	100	0	N.A.	N.A.	N.A.	N.A.	N.A.	22	2.75	0.4
54 - Spain - Lanzarote Airport	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	3	0.5	300	0	0	N.A.	N.A.	N.A.
55 - Spain - Madrid Barajas Airport	N.A.	N.A.	N.A.	N.A.	N.A.	135	3.1	72,500	<100	0	135	17.75	72,500	<100	0	N.A.	N.A.	N.A.
56 - Spain - Malaga Airport	4.75	0.7	0	0	0						15	2	2,000	0	0	26	4.75	0.7
57 - Spain - Palma de Mallorca Airport	2.75	0.5	6,500	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	21	3	8,000	200	0	15	2.75	0.5
58 - Spain - Tenerife North Airport	N.A.	N.A.	<100	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	21	3.5	400	0	0	N.A.	N.A.	N.A.
59 - Spain - Tenerife South Airport	N.A.	N.A.	N.A.	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	16	2.5	1,500	0	0	N.A.	N.A.	N.A.
60 - Spain - Valencia Airport	1	0.1	<100	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	8	1	1,000	0	0	5	1	0.1
61 - Sweden - Göteborg-Landvetter Airport	9	2	47,500	200	0	33	0	8,000	0	0	14	1.75	6,000	0	0	60	9	2
62 - Sweden - Stockholm-Arlanda Airport	N.A.	N.A.	0	0	0	N.A.	N.A.	0	0	0	N.A.	N.A.	0	0	0	N.A.	N.A.	N.A.
63 - Sweden - Stockholm-Bromma Airport	N.A.	N.A.	100	0	0	N.A.	N.A.	200	0	0	N.A.	N.A.	200	0	0	N.A.	N.A.	N.A.

Table 19– END L_{den} data provided through questionnaire on whether agglomeration has been considered

Respondent	END R1		END R2 2012		END R3 2017	
	Contour Area, L_{den}	Population Exposure, L_{den}	Contour Area, L_{den}	Population Exposure, L_{den}	Contour Area, L_{den}	Population Exposure, L_{den}
03 - Bulgaria - Sofia Airport					No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
06 - Denmark - Copenhagen Airport			No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
08 - Finland - Helsinki Vantaa Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
10 - France - Bordeaux-Merignac Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
11 - France - EuroAirport Basel– Mulhouse–Freiburg	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
12 - France - Lyon-Saint Exupery Airport			Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
13 - France - Marseille Provence Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
14 - France - Nice Cote d'Azur Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
15 - France - Paris Charles de Gaulle Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
16 - France - Paris Le Bourget Airport	N/A - population in agglomerations have been excluded from all exposures	N/A - agglomeration area has been excluded from all the exposures	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration
17 - France - Paris Orly Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
18 - France - Toulouse Blagnac Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
19 - Germany - Berlin Schonefeld Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
21 - Germany - Cologne Bonn Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
22 - Germany - Dusseldorf Internatinal Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
23 - Germany - Frankfurt am Main Airport						
24 - Germany - Hamburg Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
25 - Germany - Hanover Langenhagen Airport					No – all exposure occurs outside an agglomeration	N/A - population in agglomerations have been excluded from all exposures
26 - Germany - Leipzig/Halle Airport	N/A - population in agglomerations have been excluded from all exposures	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	N/A - population in agglomerations have been excluded from all exposures	No – all exposure occurs outside an agglomeration	N/A - population in agglomerations have been excluded from all exposures
27 - Germany - Munich Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
28 - Germany - Nuremberg Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
30 - Greece - Athens International Airport "Eleftherios Venizelos"	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
31 - Hungary - Budapest Ferihegy International Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
32 - Ireland - Dublin Airport			Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
33 - Italy - Bologna Guglielmo Marconi Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
34 - Italy - Catania Fontanarossa Airport	N/A - population in agglomerations have been excluded from all exposures		Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
35 - Italy - Ciampino–G. B. Pastine International Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
36 - Italy - Fiumicino – Leonardo da Vinci International Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
37 - Italy - Il Caravaggio International Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
38 - Italy - Milan Malpensa Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
39 - Italy - Milano Linate Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
40 - Italy - Naples International Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
41 - Italy - Turin Airport	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration
42 - Italy - Venice Marco Polo Airport	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration
43 - Latvia - Riga International Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
44 - Luxembourg - Luxembourg Findel Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
45 - Netherlands - Amsterdam Airport Schiphol	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration		Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
46 - Poland - Warsaw Chopin Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
47 - Portugal - Francisco Sa Carneiro Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
48 - Portugal - Lisbon Portela Airport					Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
49 - Romania - Bucharest Henri Coandă International Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
50 - Spain - Alicante-Elche Airport						
51 - Spain - Barcelona El Prat Airport	Partially - some exposures occur within an agglomeration	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	Partially - some exposures occur within an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
52 - Spain - Gran Canaria Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration			Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
53 - Spain - Ibiza Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration		
54 - Spain - Lanzarote Airport					Yes – all exposure occurs within an agglomeration	
55 - Spain - Madrid Barajas Airport			Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
56 - Spain - Malaga Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration			Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
57 - Spain - Palma de Mallorca Airport	Yes - all exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration			Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
58 - Spain - Tenerife North Airport					Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
59 - Spain - Tenerife South Airport	Partially - some exposures occur within an agglomeration				Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
60 - Spain - Valencia Airport	Yes - all exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration			Partially – some exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
61 - Sweden - Göteborg-Landvetter Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
62 - Sweden - Stockholm-Arlanda Airport	Yes - all exposures occur within an agglomeration			Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
63 - Sweden - Stockholm-Bromma Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration		No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration

Table 20 – END Lnight data provided through questionnaire on whether agglomeration has been considered

Respondent	END R1		END R2 2012		END R3 2017	
	Contour Area, L_{night}	Population Exposure, L_{night}	Contour Area, L_{night}	Population Exposure, L_{night}	Contour Area, L_{night}	Population Exposure, L_{night}
03 - Bulgaria - Sofia Airport					No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
06 - Denmark - Copenhagen Airport			No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
08 - Finland - Helsinki Vantaa Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
10 - France - Bordeaux-Merignac Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
11 - France - EuroAirport Basel– Mulhouse–Freiburg	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
12 - France - Lyon-Saint Exupery Airport			Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
13 - France - Marseille Provence Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
14 - France - Nice Cote d'Azur Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
15 - France - Paris Charles de Gaulle Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
16 - France - Paris Le Bourget Airport	N/A - population in agglomerations have been excluded from all exposures	N/A - agglomeration area has been excluded from all the exposures	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration
17 - France - Paris Orly Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
18 - France - Toulouse Blagnac Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
19 - Germany - Berlin Schonefeld Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
21 - Germany - Cologne Bonn Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
22 - Germany - Dusseldorf Internatinal Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
23 - Germany - Frankfurt am Main Airport						
24 - Germany - Hamburg Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
25 - Germany - Hanover Langenhagen Airport					No – all exposure occurs outside an agglomeration	N/A - population in agglomerations have been excluded from all exposures
26 - Germany - Leipzig/Halle Airport	N/A - population in agglomerations have been excluded from all exposures	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	N/A - population in agglomerations have been excluded from all exposures	No – all exposure occurs outside an agglomeration	N/A - population in agglomerations have been excluded from all exposures
27 - Germany - Munich Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
28 - Germany - Nuremberg Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
30 - Greece - Athens International Airport "Eleftherios Venizelos"	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
31 - Hungary - Budapest Ferihegy International Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
32 - Ireland - Dublin Airport			Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
33 - Italy - Bologna Guglielmo Marconi Airport	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
34 - Italy - Catania Fontanarossa Airport	N/A - population in agglomerations have been excluded from all exposures		Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures	Partially – some exposure occurs within an agglomeration	N/A - population in agglomerations have been excluded from all exposures
35 - Italy - Ciampino–G. B. Pastine International Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
36 - Italy - Fiumicino – Leonardo da Vinci International Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
37 - Italy - Il Caravaggio International Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
38 - Italy - Milan Malpensa Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
39 - Italy - Milano Linate Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
40 - Italy - Naples International Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
41 - Italy - Turin Airport	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration
42 - Italy - Venice Marco Polo Airport	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration	Yes – all exposure occurs within an agglomeration	No - all exposures occur outside an agglomeration
43 - Latvia - Riga International Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
44 - Luxembourg - Luxembourg Findel Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
45 - Netherlands - Amsterdam Airport Schiphol	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration		Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
46 - Poland - Warsaw Chopin Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
47 - Portugal - Francisco Sa Carneiro Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
48 - Portugal - Lisbon Portela Airport					Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
49 - Romania - Bucharest Henri Coandă International Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
50 - Spain - Alicante-Elche Airport						
51 - Spain - Barcelona El Prat Airport	Partially - some exposures occur within an agglomeration	No – all exposure occurs outside an agglomeration	No – all exposure occurs outside an agglomeration	Partially - some exposures occur within an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration
52 - Spain - Gran Canaria Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration			Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
53 - Spain - Ibiza Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration		
54 - Spain - Lanzarote Airport					Yes – all exposure occurs within an agglomeration	
55 - Spain - Madrid Barajas Airport			Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
56 - Spain - Malaga Airport	Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration			Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
57 - Spain - Palma de Mallorca Airport	Yes - all exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration			Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
58 - Spain - Tenerife North Airport					Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
59 - Spain - Tenerife South Airport	Partially - some exposures occur within an agglomeration				Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
60 - Spain - Valencia Airport	Yes - all exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration			Partially – some exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
61 - Sweden - Göteborg-Landvetter Airport	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration	Partially – some exposure occurs within an agglomeration	Partially - some exposures occur within an agglomeration
62 - Sweden - Stockholm-Arlanda Airport	Yes - all exposures occur within an agglomeration			Yes - all exposures occur within an agglomeration	Yes – all exposure occurs within an agglomeration	Yes - all exposures occur within an agglomeration
63 - Sweden - Stockholm-Bromma Airport	No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration		No - all exposures occur outside an agglomeration	No – all exposure occurs outside an agglomeration	No - all exposures occur outside an agglomeration

Appendix F – EEA data as formally reported by Competent Authorities for the three END rounds on ATM, population exposure and contour areas

Table 21 – EEA data as formally reported by Competent Authorities for the three END rounds on ATM, population exposure and contour areas (agglomeration included)

Respondent	END R1 2007							END R2 2012							END R3 2017						
	ATM	Contour Area, L_{den}			Population Exposure, L_{den}			ATM	Contour Area, L_{den}			Population Exposure, L_{den}			ATM	Contour Area, L_{den}			Population Exposure, L_{den}		
		>55 dB	>65 dB	>75 dB	>55 dB	>65 dB	>75 dB		>55 dB	>65 dB	>75 dB	>55 dB	>65 dB	>75 dB		>55 dB	>65 dB	>75 dB	>55 dB	>65 dB	>75 dB
03 - Bulgaria - Sofia Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	51,759	5.291029	0.87188	0.130955	400	0	0
06 - Denmark - Copenhagen Airport	258,356	30	11	2	2,600	300	0	258,356	30.063	11.278	2.286	3,800	300	0	251,799	28.5	10.4	2.1	4,300	300	0
08 - Finland - Helsinki Vantaa Airport	180,000	76.29	12.12	1.28	11,700	100	0	185,000	63.7	8.8	3.4	14,000	100	0	168,704	68	9	1	23,400	100	0
10 - France - Bordeaux-Merignac Airport	56,900	18	3	1	4,000	0	0	56,900	N/A	N/A	N/A	N/A	N/A	N/A	56,900	N/A	N/A	N/A	N/A	N/A	N/A
11 - France - EuroAirport Basel– Mulhouse–Freiburg	66,445	15	2	0	700	0	0	66,445	N/A	N/A	N/A	N/A	N/A	N/A	66,445	N/A	N/A	N/A	N/A	N/A	N/A
12 - France - Lyon-Saint Exupery Airport	122,273	37	10	3	3,900	0	0	122,273	N/A	N/A	N/A	N/A	N/A	N/A	122,273	N/A	N/A	N/A	N/A	N/A	N/A
13 - France - Marseille Provence Airport	96,969	33	5	0	16,000	900	0	96,969	N/A	N/A	N/A	N/A	N/A	N/A	96,969	N/A	N/A	N/A	N/A	N/A	N/A
14 - France - Nice Cote d'Azur Airport	164,079	56	9	1	6,600	0	0	164,079	N/A	N/A	N/A	N/A	N/A	N/A	164,079	N/A	N/A	N/A	N/A	N/A	N/A
15 - France - Paris Charles de Gaulle Airport	516,398	224	38	14	171,300	1,500	0	516,398	N/A	N/A	N/A	N/A	N/A	N/A	516,398	N/A	N/A	N/A	N/A	N/A	N/A
16 - France - Paris Le Bourget Airport	57,224	25	5	2	67,600	700	0	57,224	N/A	N/A	N/A	N/A	N/A	N/A	57,224	N/A	N/A	N/A	N/A	N/A	N/A
17 - France - Paris Orly Airport	218,760	51	24	6	109,300	16,900	1,400	218,760	N/A	N/A	N/A	N/A	N/A	N/A	218,760	N/A	N/A	N/A	N/A	N/A	N/A
18 - France - Toulouse Blagnac Airport	77,282	31	5	1	35,900	500	0	77,282	N/A	N/A	N/A	N/A	N/A	N/A	77,282	N/A	N/A	N/A	N/A	N/A	N/A
19 - Germany - Berlin Schonefeld Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	76,607	37	5	1	15,900	200	0	70,324	125	20	4	34,600	400	0
21 - Germany - Cologne Bonn Airport	131,833	0	N/A	N/A	N/A	N/A	N/A	143,050	56	10	2	240,500	20,500	0	182,200	68	11	2	278,800	25,300	0
22 - Germany - Dusseldorf Internatinal Airport	152,652	101.62	17.39	2.9	77,300	1,100	0	135,938	113	19	3	85,000	900	0	123,241	120	20	3	101,400	600	0
23 - Germany - Frankfurt am Main Airport	200,583	58.6	9.5	1	38,300	3,400	0	225,089	64	11	2	48,400	3,300	0	210,720	58	10	2	56,700	3,400	0
24 - Germany - Hamburg Airport	494,483	317.6	55.4	12	238,700	0	0	487,162	277	51	10	197,400	0	0	469,026	258	49	10	189,300	100	0
25 - Germany - Hanover Langenhagen Airport	168,617	51	8.1	1.4	51,100	2,400	0	158,309	63	11	1	58,600	2,900	0	153,876	55	9	1	63,300	4,100	0
26 - Germany - Leipzig/Halle Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	86,000	42	6	1	18,300	200	0	91,213	51	7	1	19,300	200	0
27 - Germany - Munich Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	64,906	121	18	3	12,100	0	0	63,569	104	18	3	10,600	0	0
28 - Germany - Nuremberg Airport	395,070	157	24	4	7,800	100	0	411,440	159	25	4	11,300	100	0	376,852	162	27	3	13,700	200	0
30 - Greece - Athens International Airport "Eleftherios Venizelos"	71,918	33	5	1	10,700	200	0	73,778	29	4	1	10,500	100	0	61,718	30	4	1	12,200	100	0
31 - Hungary - Budapest Ferihegy International Airport	191,000	0	N/A	N/A	N/A	N/A	N/A	191,000	N/A	N/A	N/A	N/A	N/A	N/A	191,000	N/A	N/A	N/A	N/A	N/A	N/A
32 - Ireland - Dublin Airport	111,753	126.82	21.55	4.09	281,700	2,600	0	109,875	106.412	14.854	1.56	50,900	500	0	96,705	56.45	7.01	1.12	31,700	100	0
33 - Italy - Bologna Guglielmo Marconi Airport	173,110	51	9	2	14,400	200	0	154,451	45.3	7.6	1.4	12,400	200	0	215,078	67	10	2	20,300	300	0
34 - Italy - Catania Fontanarossa Airport	69,179	21.49	3.47	0.592	13,200	400	0	64,945	20	3	1	19,600	5,400	0	65,471	13.505	5.855	1.854	21,300	0	0
35 - Italy - Ciampino–G. B. Pastine International Airport	57,661	27.09	4.28	0.66	1,800	400	6,100	57,661	27	4	1	2,400	500	100	59,926	15.10	2.01	0.30	100	0	0
36 - Italy - Fiumicino – Leonardo da Vinci International Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	57,585	21	3	1	22,200	1,800	0	53,153	18.63	2.77	0.76	19,700	1,600	0
37 - Italy - Il Caravaggio International Airport	315,627	130.24	21.62	4.24	34,400	2,300	200	324,497	74	13	3	2,500	200	0	315,217	98.3	15.6	2.9	2,500	200	0
38 - Italy - Milan Malpensa Airport	51,635	36.49	5.13	0.94	40,300	1,600	0	65,314	45	6	1	44,400	1,600	0	67,674	50.401	6.523	0.946	49,300	1,800	0
39 - Italy - Milano Linate Airport	247,456	89.57	14.2	2.75	37,200	900	0	183,182	63	10	2	25,200	700	0	166,509	78.37	14.1	2.34	32,800	500	0
40 - Italy - Naples International Airport	100,113	42.39	6.72	1.06	73,800	5,100	0	93,764	26	4	1	36,400	1,600	0	112,804	22.39	3.4	0.48	36,800	500	0
41 - Italy - Turin Airport	63,400	13.24	2.05	0.49	86,500	700	0	66,182	14	2	0	101,900	900	0	64,712	13.58	1.9	0.35	85,700	700	0
42 - Italy - Venice Marco Polo Airport	56,000	19.5	3.8	1	7,600	1,300	0	56,419	18	3	1	11,300	200	0	42,463	12.673706	1.902818	0.446865	8,700	0	0
43 - Latvia - Riga International Airport	75,800	34.97	5.17	0.5	200	0	0	75,800	24	3	1	200	0	0	90,084	24.03	3.5	0.52	200	0	0
44 - Luxembourg - Luxembourg Findel Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	60,087	17.8	2.8	0.4	600	0	0	65,819	27	3	1	1,700	0	0
45 - Netherlands - Amsterdam Airport Schiphol	84,055	62.89	10.83	1.91	34,100	3,900	0	84,100	64.188	9.8058	2.045	52,800	3,100	0	N/A	59.906	8.859	1.8516	66,400	2,400	0
46 - Poland - Warsaw Chopin Airport	440,153	189.2	26.3	3.6	43,700	300	0	433,000	188.52	27.02	3.45	64,500	500	0	470,800	197.65	27.76	3.34	44,500	500	0
47 - Portugal - Francisco Sa Carneiro Airport	153,480	39.03	6.02	0.67	41,800	800	0	138,605	32	6	0	47,000	200	0	138,605	30.5	5.7	1.5	51,400	200	0
48 - Portugal - Lisbon Portela Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53,906	4	1	0	21,600	300	0	63,834	36.6	4.7	0.9	62,400	1,400	0
49 - Romania - Bucharest Henri Coandă International Airport	135,007	36.11	5.51	1.04	136,500	11,500	0	136,038	34	5	1	124,500	9,500	0	159,795	78.52	12.62	2.37	288,100	36,900	100
50 - Spain - Alicante-Elche Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	76,966	9916	857	321	6,500	0	0	76,966	77.999	10.029	1.528	15,400	100	0
51 - Spain - Barcelona El Prat Airport	72,005	18	4	1	11,100	100	0	76,877	16.78	3.29	0.7	6,500	100	0	87,113	24.96	4.78	0.75	10,500	200	0
52 - Spain - Gran Canaria Airport	349,450	28	11	2	7,800	200	0	349,465	25.37	8.62	1.89	2,800	100	100	283,850	31.12	12.32	2.51	4,400	100	100
53 - Spain - Ibiza Airport	104,610	18	4	1	3,600	400	0	107,378	14.88	4.08	0.8	2,400	200	0	111,996	18.58	4.16	0.87	3,300	300	0
54 - Spain - Lanzarote Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	51,587	6.74	2.3	0.59	1,300	100	0	72,503	8.16	2.82	0.63	1,700	300	0
55 - Spain - Madrid Barajas Airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	54,632	11.38	2.08	0.4	8,200	300	0
56 - Spain - Malaga Airport	481,885	153	30	5	43,300	2,600	0	481,885	112.64	20.72	3.44	31,200	1,800	0	342,601	171.53	29.91	4.01	42,600	1,800	0
57 - Spain - Palma de Mallorca Airport	115,968	90	49	5	6,900	500	100	122,298	19.27	4.17	0.84	5,800	400	0	123,700	35.03	6.64	1.04	12,400	500	0
58 - Spain - Tenerife North Airport	179,921	41	8	2	12,100	200	0	195,891	31.52	6.86	1.37	9,300	200	0	197,639	47.98	9.13	1.74	15,900	500	0
59 - Spain - Tenerife South Airport	53,776	12	2	0	18,200	1,000	0	58,919	9.63	1.76	0.35	11,800	300	0	55,669	7.72	1.24	0.23	8,200	100	0
60 - Spain - Valencia Airport	60,666	23	4	1	11,500	100	0	61,725	17.33	3.05	0.59	4,200	100	0	65,881	23.85	4.43	0.75	13,000	100	0
61 - Sweden - Göteborg-Landvetter Airport	81,224	23	3	1	48,700	100	0	81,224	17.77	2.66	0.65	34,300	100	0	62,798	24.51	3.57	0.65	64,100	100	0
eden - Stockholm-Arlanda Airport	66,500	18.6	3	0.6	300	0	0	63,776	N/A	N/A	0	N/A	400	0	60,000	24.5	3.5	0.6	500	0	0
63 - Sweden - Stockholm-Bromma Airport	245,300	63.6	10.8	1.8	1,400	0	0	218,570	N/A	N/A	0	N/A	1,700	0	225,000	72.3	11	1.6	1,700	0	0