An tÚdarás Inniúil um Thorann Aerárthaí
Aircraft Noise Competent Authority

# A review of the effectiveness of noise mitigation measures at Dublin Airport in achieving the noise abatement objective during 2023

23 August 2024

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# Glossary

**ANCA** - Aircraft Noise Competent Authority.

**Balanced Approach** - The aircraft noise management policy of the International Civil Aviation Organization that consists of identifying a noise problem at a specific airport and analysing various measures available to reduce noise. The Balanced Approach aims to address noise problems on an individual airport basis and identify the noise related measures that achieve maximum environmental benefit most cost effectively using objective and measurable criteria.

**daa** - The airport authority for Dublin Airport.

**Highly Annoyed (HA)** – Metric used to describe the number of people calculated to be Highly Annoyed by Aircraft Noise.

**Highly Sleep Disturbed (HSD)** – Metric used to describe the number of people calculated to be Highly Sleep Disturbed by Aircraft Noise.

**ICAO** - International Civil Aviation Organization, a specialised agency of the United Nations to coordinate the principles and techniques of international air navigation and transport.

**$L_{den}$** - (day-evening-night noise level in dB). The long-term annual average indicator in decibels, designed to assess annoyance. It refers to an A-weighted average sound pressure level over all days, evenings and nights in a year, with an evening weighting of 5 dB and a night weighting of 10 dB as noise is generally more annoying during these periods.

**$L_{night}$** - (night noise level in dB). The long-term annual average indicator in decibels, designed to assess sleep disturbance. It refers to an A-weighted annual average night period of exposure.

**NAO** - Noise Abatement Objective

**WHO** - The World Health Organization. A specialised agency of the United Nations responsible for international public health.

# Foreword

ANCA is the independent authority for monitoring and regulating where necessary, for the management of aircraft noise at and around Dublin Airport. The monitoring functions of ANCA are aligned with methodologies that are standardised across the European Union for assessing and reporting on the impact of environmental noise. Road, railway, and aircraft activity are significant contributors to environmental noise and can have a negative impact on human health and wellbeing. Legislation places emphasis on the priorities of determining the levels of exposure, providing information, and preventing and reducing environmental noise. The noise climate should be assessed on a regular basis and public participation is an essential component of any proposal to amend a noise management framework. Objectives may be established to address noise problems at an airport, having regard to the specific airport characteristics, projected traffic growth and legal framework.

In the context of Dublin Airport, the measures currently in place to manage aircraft noise were implemented through several processes, including planning conditions to mitigate the impact of development at the airport. Measures that were implemented through planning condition remain in place until amended or removed through the planning process. In some instances, there may be a period between a regulatory decision made by ANCA and the determination of any appeals regarding the proposed measures. In these circumstances it is not possible or appropriate to implement interim measures that have not been through a robust process of assessment and consultation. Sustainable development requires an integrated management approach that recognises the aspirations of everyone that neighbours, uses or benefits from aviation activity. This is delivered through the establishment of a noise abatement objective (NAO) for Dublin Airport that provides for reductions to noise exposure over time.

It is a key objective of the authority to ensure that information is available in a format that is clear and accessible to as wide an audience as possible. This report reviews the effectiveness of the measures that are in place to manage aircraft noise at Dublin Airport during 2023, in delivering the noise abatement objective outcomes.

# 01

# Aircraft noise management

# **01** Aircraft noise management

## Management of aircraft noise

### Policy and legislation

Aviation policy is coordinated at an international level by the International Civil Aviation Organization (ICAO). ICAO is a specialist division of the United Nations that guides the planning and development of the international air transport system through the participation of member states. The recommendations of ICAO are given legislative effect at European and national level.

Through a process of assessment that is standardised across the European Union, member states may provide for measures to manage aircraft noise through an integrated approach that aims to ensure both the effective functioning of transport systems and protection of the environment.


The principal aircraft noise management policy of ICAO is the Balanced Approach. This policy requires the establishment of a noise objective that permits the evaluation of all available options to achieve the maximum environmental benefit in a cost-effective manner using objective and measurable criteria. It identifies four elements to address noise around airports: reduction at source, land-use management and planning, noise abatement operational procedures, and operating restrictions. Operating restrictions are the highest tier of aircraft noise management and limit aircraft access to an airport. Operating restrictions are only applied after a noise assessment determines that no less restrictive measures are available that would deliver an equally effective outcome to address an identified noise problem.

## Noise Abatement Objective

A noise abatement objective is a plan to manage noise at an airport to address an identified noise problem or to ensure that growth is managed in a sustainable way. Through a process of aircraft noise assessment that included the application of the ICAO Balanced Approach and public consultation, ANCA established an NAO for Dublin Airport in June 2022. The NAO for Dublin Airport has five parts:

| | |
|---|---|
| **Part 1** | **Policy Objective**<br>Limit and reduce the long-term adverse effects of aircraft noise on health and quality of life, particularly at night, as part of the sustainable development of Dublin Airport. |
| **Part 2** | **Explaining the Objective**<br>Noise from Dublin Airport should be limited and reduced in line with principles of sustainable development. As Dublin Airport grows, the long-term adverse effects on human health and quality of life should progressively reduce over the lifetime of this NAO. The Balanced Approach will be used to ensure that cost-effective, practicable and sustainable measures are implemented to achieve this objective. |
| **Part 3** | **Measurable Criteria**<br>The NAO will be primarily measured through the number of people highly sleep disturbed and highly annoyed in accordance with the approach recommended by the World Health Organization's Environmental Noise Guidelines 2018 as endorsed by the European Commission through Directive 2020/367, taking into account noise exposure from 45 dB $L_{den}$ and 40 dB $L_{night}$. These metrics describe those chronically disturbed by aircraft noise.<br>These metrics help articulate the effect of aircraft noise on health and quality of life. The following will also be used to help identify where noise exposure results in the populations experiencing the harmful effects. These are the number of people exposed to aircraft noise above:<br>• 55 dB $L_{night}$ (a level of night-time noise exposure described by the WHO as representing a clear risk to health)<br>• 65 dB $L_{den}$ (where a large proportion of those living around Dublin Airport can be considered highly annoyed.<br>In order to measure performance, these metrics shall be completed using a noise model prepared in accordance with the methodology described in Directive 2015/996 (European Civil Aviation Conference (ECAC) Doc.29 4th Edition or as amended). The noise model shall be validated using local noise and track keeping performance data from Dublin Airport's systems. |

| | |
|---|---|
| **Part 4** | **Expected Outcomes**<br>In context of its recovery from the global pandemic, noise exposure from Dublin Airport is expected to increase up to 2025. Whilst the resultant health effects are expected to be lower than those which occurred prior to the pandemic and in the years 2018 and 2019, these effects should then reduce over the medium to long-term, to improve the noise situation at Dublin Airport whilst allowing for sustainable growth. ANCA therefore expects the following outcomes to be achieved through this NAO as set against the measures described in Part 3.<br>The number of people highly sleep disturbed and highly annoyed shall reduce compared to conditions in 2019:<br>• The number of people highly sleep disturbed and highly annoyed in 2030 shall reduce by 30% compared to 2019;<br>• The number of people highly sleep disturbed and highly annoyed in 2035 shall reduce by 40% compared to 2019;<br>• The number of people highly sleep disturbed and highly annoyed in 2040 shall reduce by 50% compared to 2019 and;<br>• The number of people exposed to aircraft noise above 55 dB $L_{night}$ and 65 dB $L_{den}$ shall be reduced compared to 2019. |
| **Part 5** | **Monitoring**<br>Monitoring of the NAO will be informed by annual reports which will be reviewed by ANCA as part of its obligations under the Aircraft Noise (Dublin Airport) Regulation Act 2019. |

## Management of aircraft noise at Dublin Airport

Measures to manage the impact of aircraft noise at Dublin Airport may be introduced in several ways -

- Introduced directly by the airport authority;
- Through new technology developed by aircraft manufacturers;
- Flight procedures implemented by aircraft operators;
- Prescribed by planning conditions to mitigate the impact of development proposals;
- Prescribed through regulation by ANCA following an aircraft noise assessment;
- Identified and implemented through the Noise Action Planning process.

Noise management may target localised activity or the impact of the airport operating in its entirety. The airport authority, in response to a request from ANCA as part of an ongoing noise assessment, identified the noise mitigation measures at Dublin Airport in the table below.

| Item | Description |
|---|---|
| 1 | Encourage daa to work with airline partners to introduce quieter aircraft, particularly at night – including consideration of incentives |
| 2 | Encourage daa to promote quieter aircraft through incentives such as Fly Quiet programmes. |
| 3 | Two Runway Preferential Runway Programme |
| 4 | Two Runway Noise Preferential Routes (NPR's) and Track Keeping |
| 5 | Noise Abatement Departure Procedures (NADP) Climb Profile |
| 6 | Visual Approach Jet Aircraft (Cat C/D) |
| 7 | Continuous Climb Operations / Continuous Decent Approach |
| 8 | Reverse Thrust |
| 9 | Engine Ground Running |
| 10 | Monitor and Report |
| 11 | Sound Insulation (RNIS) |
| 12 | Voluntary Dwelling Purchase Scheme |
| 13 | Voluntary School Sound Insulation |
| 14 | Stakeholder Engagement |
| 15 | Community Engagement Programme |
| 16 | Noise & Flight Track Monitoring System |
| 17 | Noise Complaint Management Systems |
| 18 | Runway 10L-28R shall not be used for take-off or landing between 2300 hours and 0700 hours |
| 19 | The average number of nighttime aircraft movements at the airport shall not exceed 65/night (between 2300 hours and 0700 hours) when measured over the 92-day modelling period[1] |

1 Condition 5 of the north runway planning permission ABP Ref. No. PL06F.217429 (establishing this provision), is the subject of ongoing High Court proceedings brought by daa bearing the Record Number: 2023 / 916 JR In which Fingal County Council is the Respondent.

# 02

# Aircraft activity at Dublin Airport

# **02** Aircraft activity at Dublin Airport

## Aircraft movements at Dublin Airport

Methodologies for the assessment of noise impact due to aviation activity are standardised across the European Union. This process establishes a common framework for assessing, reporting, and managing environmental noise. For this purpose, the noise impact of aviation is averaged across all the night-time and day-evening-night periods of a calendar year. The day-evening-night metric ($L_{den}$) includes 'noise weightings' of 5 dB across the evening periods and 10 dB across the night periods. This recognises the additional disturbance and health impact of environmental noise during these periods. It is important therefore, to consider both the overall scale of aviation activity and the periods of time in which it occurs in the context of the measures in place to manage the noise impact.

There are three operational runways in place at Dublin Airport. Aircraft operations are affected by wind direction and all runways will not be operational at the same time. There are two primary runways that are approximately aligned in an east-west direction with a shorter crosswind runway. Planning conditions provide for the selection of runway use on a prioritised basis and prescribe specific limitations to the use of the north and cross-wind runways.

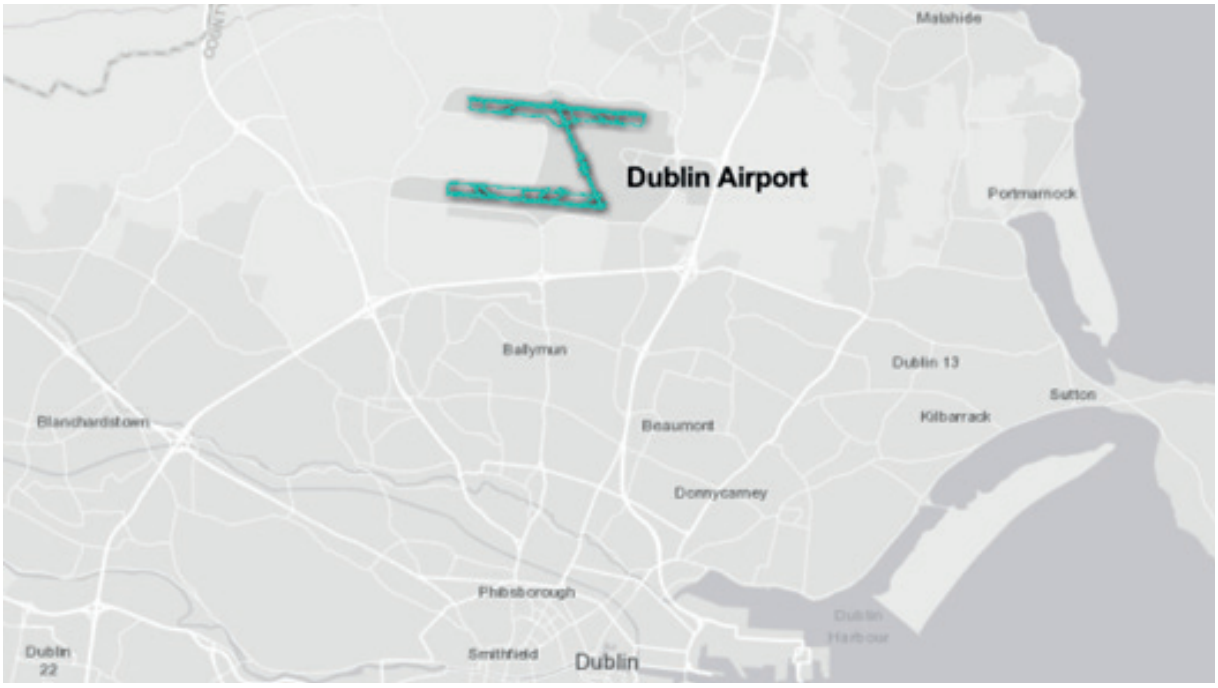



**Figure 1 – Dublin Airport location map**

An increase or decrease in aircraft activity is not a reliable indicator of the ensuing noise impact as the aircraft fleet mix is also a necessary consideration. Nonetheless, it is relevant to consider the possible implications of any changes to the distribution of activity at the airport across the periods of the day.

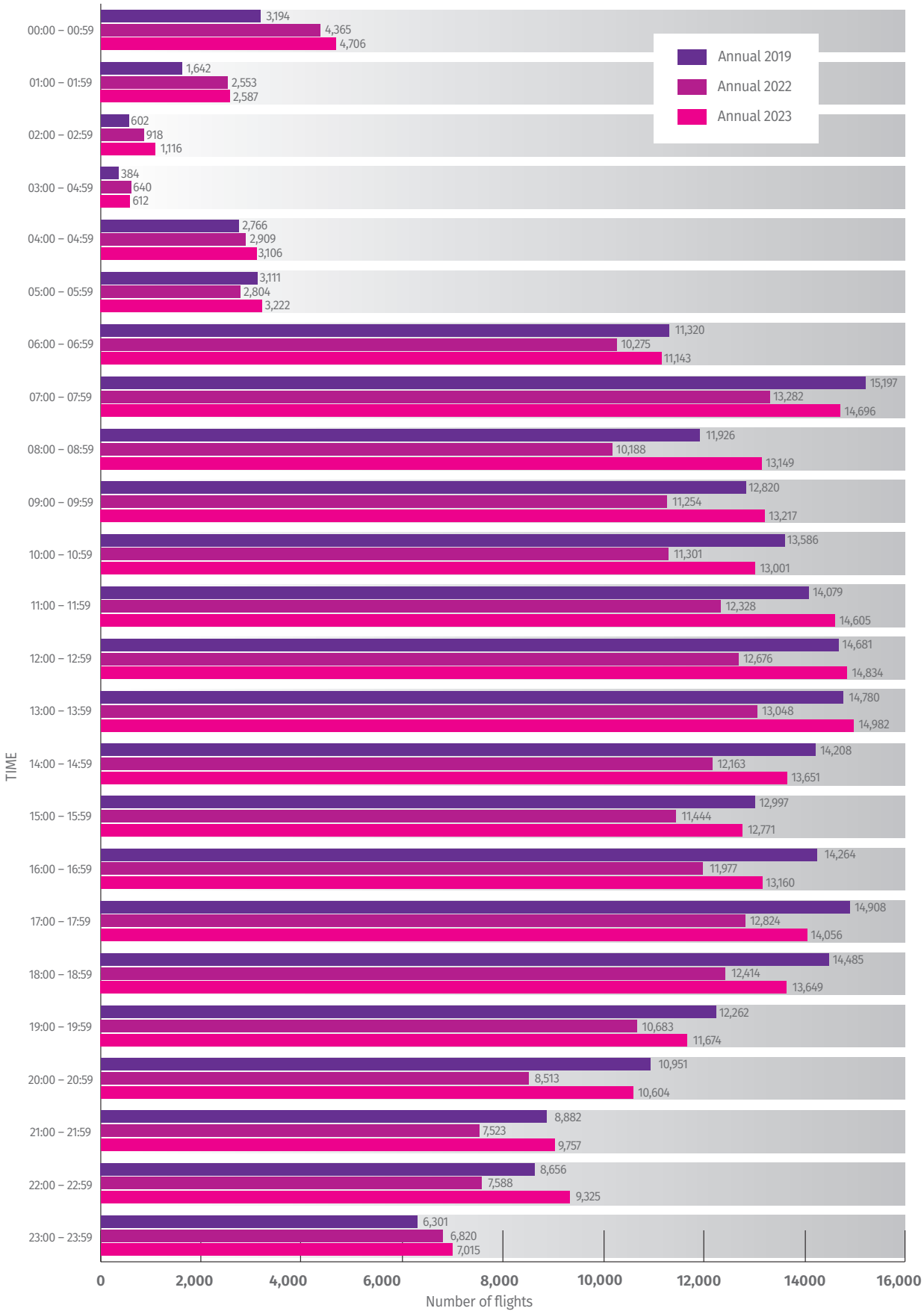



**Figure 2 – Number of annual flights by hour**

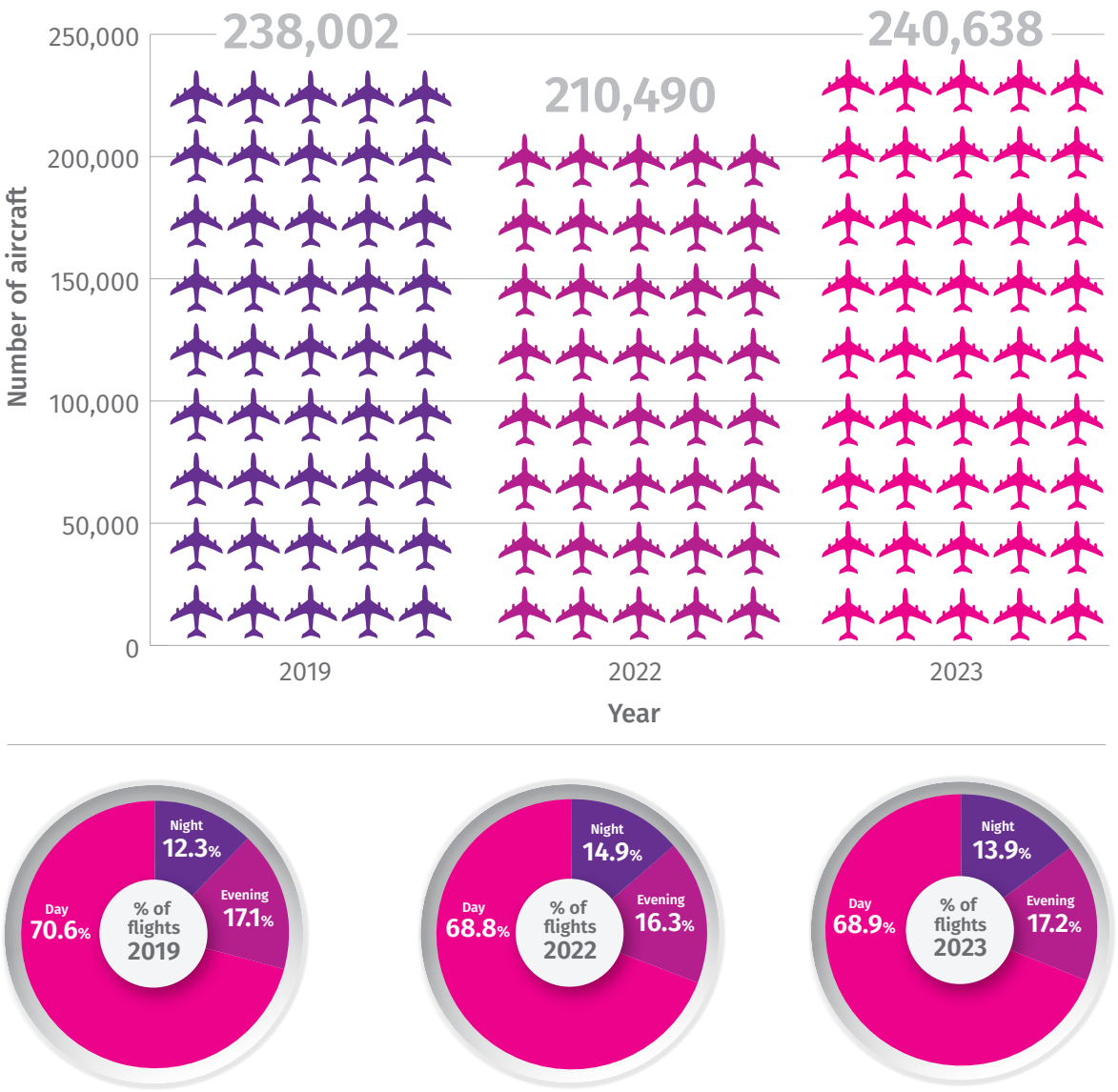



**Figure 3 - Numbers and distribution of aircraft flights by period of day**

Aircraft movements during 2023 marginally surpassed the previous activity peak year of 2019 for the first time since the COVID pandemic. As post pandemic activity continues to evolve, fluctuations may be observed in the annual hourly activity and the percentage of movements occurring in the discrete periods of the day, evening and night where:

Day is 07:00-19:00

Evening is 19:00-23:00

Night is 23:00-07:00

The percentage of night-time aircraft activity at Dublin Airport was higher in 2023 when compared to 2019 but lower in comparison to 2022.

# 03

# The noise impact of aircraft activity

# **03** The noise impact of aircraft activity

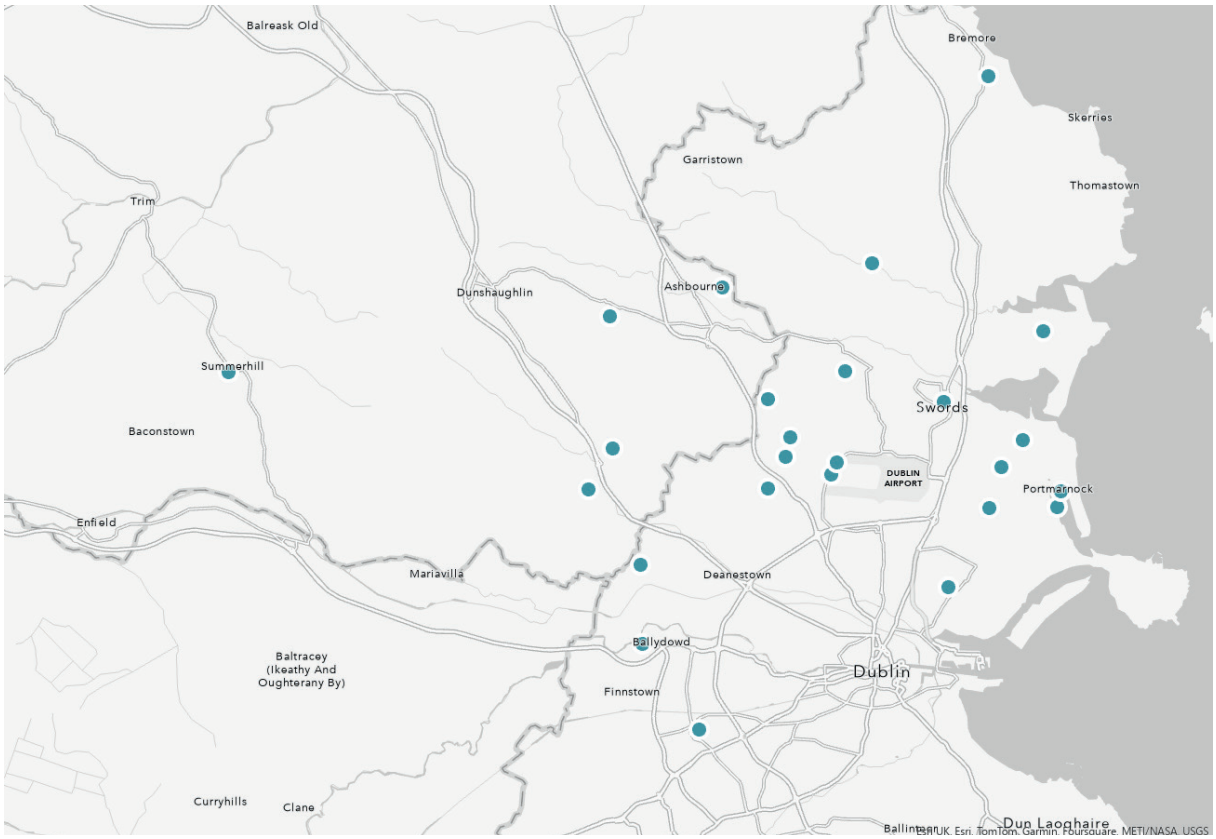



**Figure 4 – Noise monitors around Dublin Airport**

The noise impact of individual aircraft may be examined on the public web portal[2] of the airport authority as they pass within range of community noise monitors. The monitors are located across a representative number of distances around the airport. These locations serve also to monitor representative aircraft altitudes around the airport. This information is helpful to understand the impact of each individual event but does not provide a mechanism for the management of aircraft noise across longer periods of time. For this purpose, averaged noise contours are used. There are also other ways to present the impact of aircraft noise and these can provide complementary information that can be used for different purposes. There is more information on the ANCA website that explains what noise metrics are used by the authority and what they mean.

Noise contours are lines on a map that connect points of the same levels of noise exposure. Contours are a standardised industry method of presenting the average aircraft noise experienced (or projected to be experienced) by people living around an airport. As contour lines only provide information for the noise impact along the contour line, it can be more informative for noise to be presented in bands between contours e.g. 40-44 dB. This provides noise impact information for all locations within the mapped area – not just properties located along a single contour line.

2 https://webtrak.emsbk.com/dub1

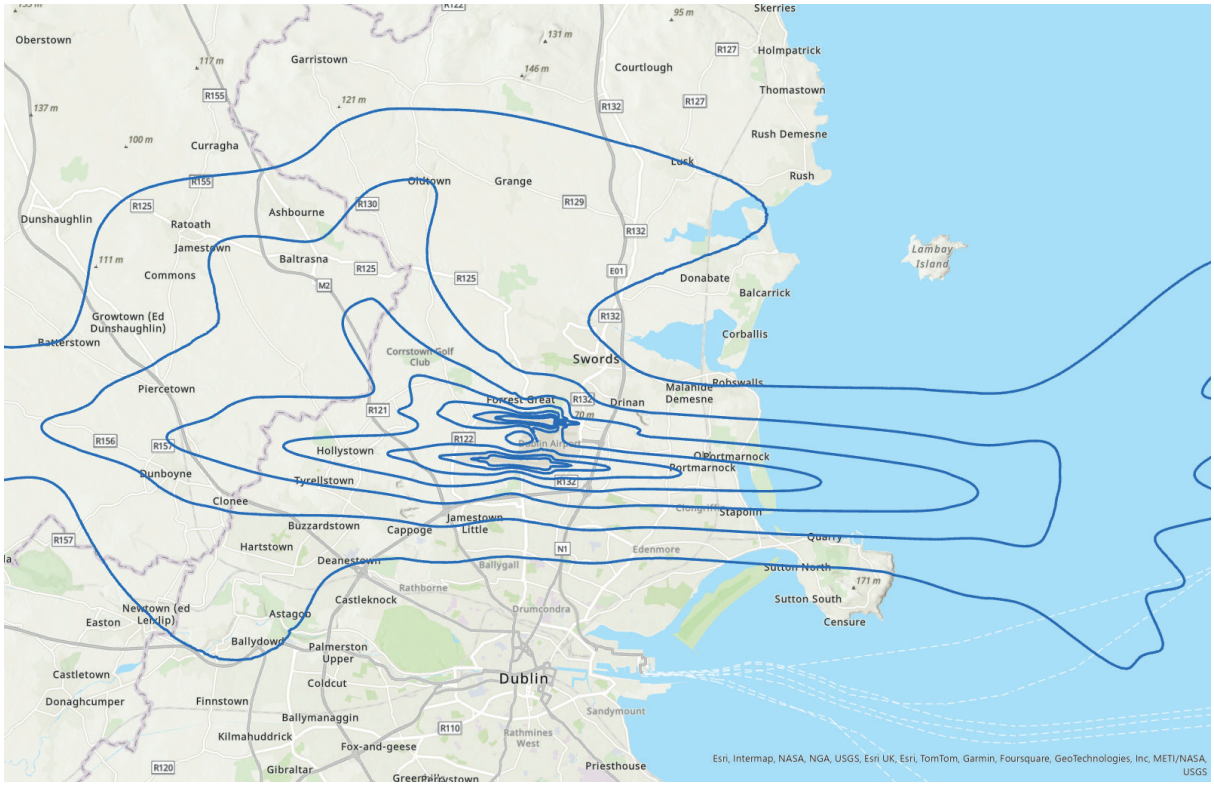



**Figure 5 – Sample map of single contour lines**

The use of the average noise indicators $L_{den}$ and $L_{night}$ are prescribed by legislation for the purposes of quantifying and reporting environmental noise on a common basis (see Glossary). This method also facilitates a comparison of different operating scenarios and an examination of the predicted impact of development proposals.

As noise is not experienced in an average way, it is important to have access to information on both single level events and noise exposure over longer periods of time. While single-level events provide insight into individual aircraft noise events, noise contours offer a broader perspective by considering cumulative noise exposure over time. These methods of presenting noise impact are not directly comparable and are used for different purposes.

## The day-evening-night aircraft noise impact 2023

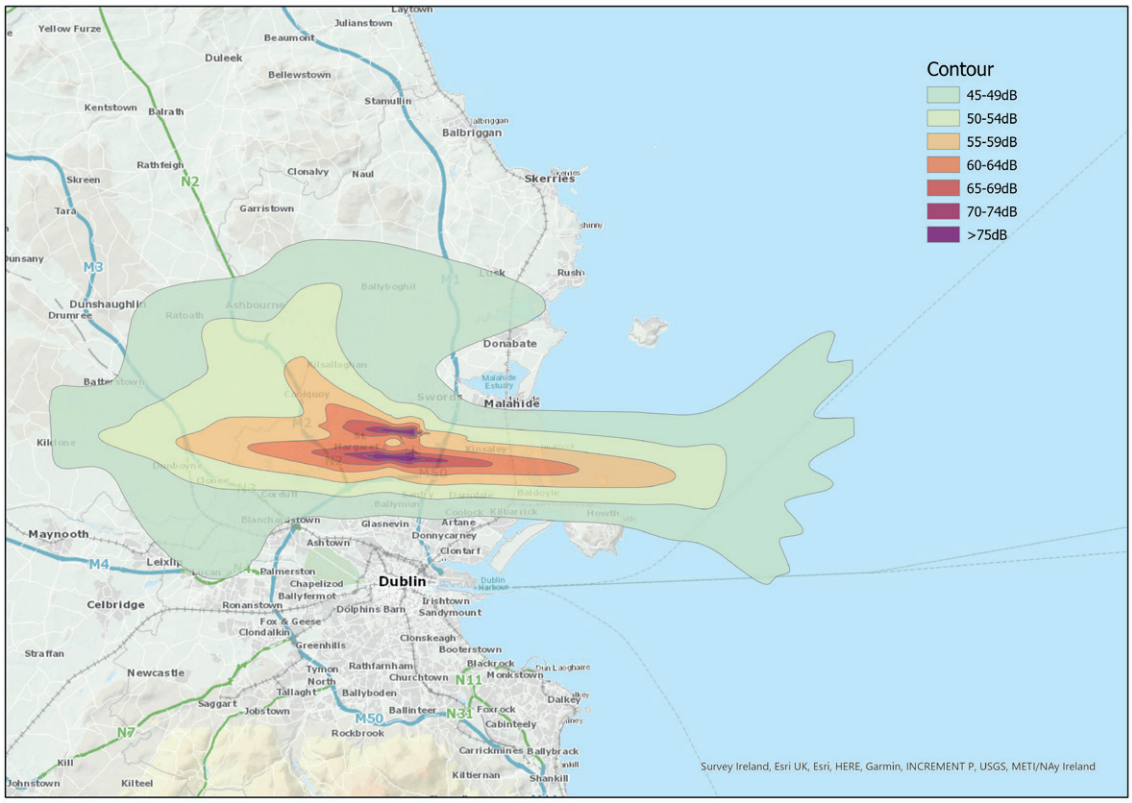



**Figure 6- 2023 contour map $L_{den}$**

2023 was the first full year of aircraft activity for the airport operating two primary parallel runways. The 2023 contour map reflects the change in distribution of aircraft traffic for a full year with two parallel runways in operation. Interactive contour maps are available on the ANCA website that facilitate a comparison of the noise climate for all years since the authority was established in 2019.

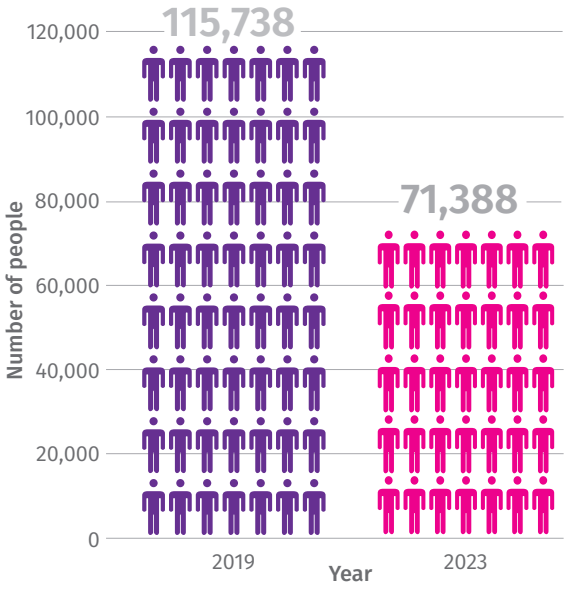
The contour maps that reflect this distribution of activity facilitate the identification of people exposed to aircraft noise within the mapped area in addition to the calculation of the numbers likely to be experiencing the most significant health effects. The noise objectives for the airport were established having regard to these health indicators.

NAO measurable criteria:

**Compared to the situation in 2019:**

- The number of people highly annoyed in 2030 shall reduce by 30%;
- The number of people highly annoyed in 2035 shall reduce by 40%;
- The number of people highly annoyed in 2040 shall reduce by 50%.

The indicator ($L_{den}$) is the metric prescribed in environmental legislation for assessing annoyance arising from environmental noise. The legislation also sets out the mathematical formulae used to calculate the number of people categorised as highly annoyed.




Compared to the situation in 2019, the number of people categorised as highly annoyed was significantly lower during 2023 - a reduction of 38.3%.

**Figure 7 - Number of people highly annoyed by year**

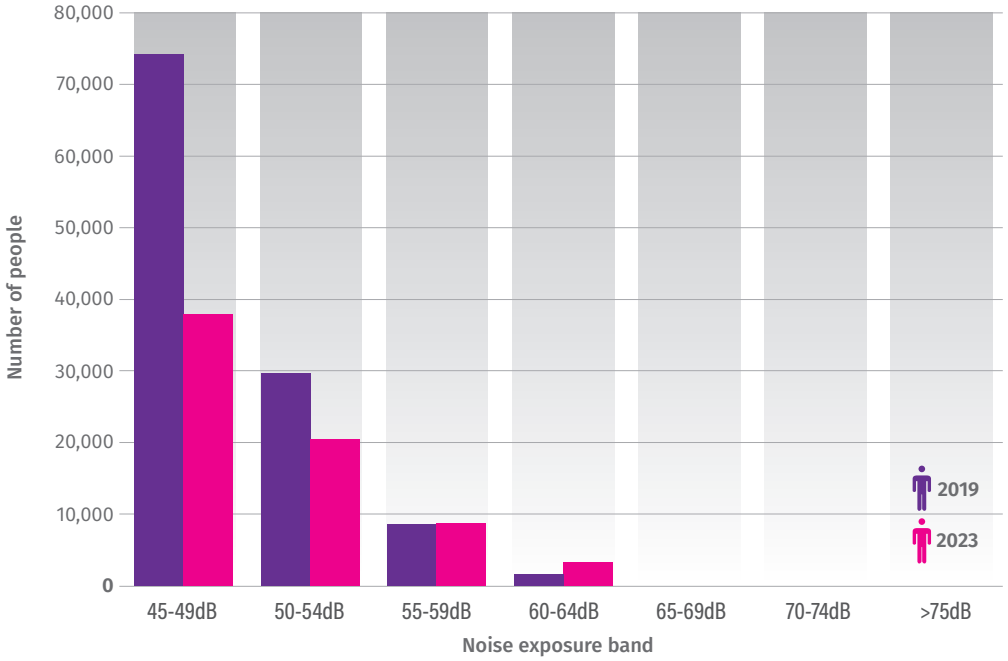



**Figure 8 – Number of people broken down by exposure band ($L_{den}$)**

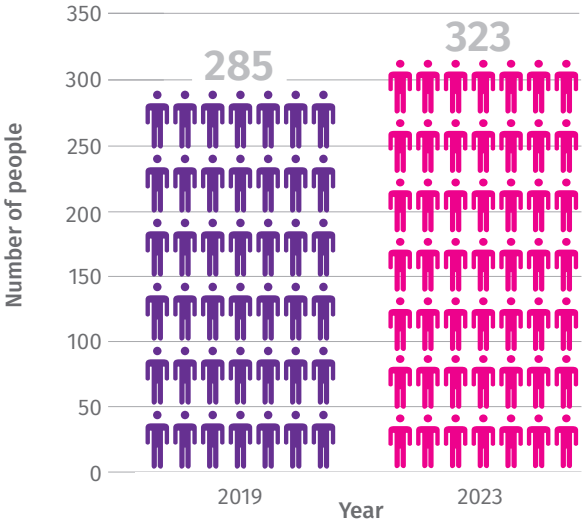
| | 45-49 dB | 50-54 dB | 55-59 dB | 60-64 dB | 65-69 dB | 70-74 dB | >75 dB |
|---|---|---|---|---|---|---|---|
| **2019** | 74,905 | 29,814 | 8,546 | 2,328 | 126 | 15 | 4 |
| **2023** | 37,959 | 20,983 | 8,753 | 3,532 | 148 | 13 | 0 |

Further examination of this indicator shows a reduction across all noise bands except 55-59 dB, 60-64 dB and 65-69 dB. The contour maps on the ANCA website can be examined down to the level of individual properties for all mapped noise bands.

NAO measurable criteria:

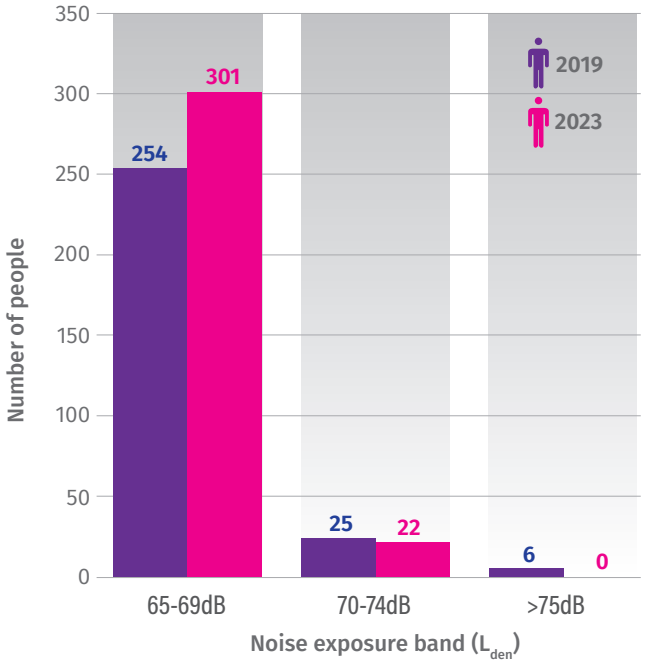
**Compared to the situation in 2019:**

- The number of people exposed to aircraft noise above 65 dB $L_{den}$ shall be reduced.




Compared to the situation in 2019, the numbers of people exposed to the NAO priority limit of 65 dB $L_{den}$ was higher in 2023 by 13%.

**Figure 9 – Number of people exposed to aircraft noise above 65 dB $L_{den}$**




In examining this outcome at the level of individual noise bands, the observed increase arises in the 65-69 dB noise band with decreases occurring in the 70-74 dB and >75 dB noise bands.

**Figure 10 – Number of people exposed to noise exposure above 65 dB $L_{den}$ by band**

## The night-time aircraft noise impact 2023

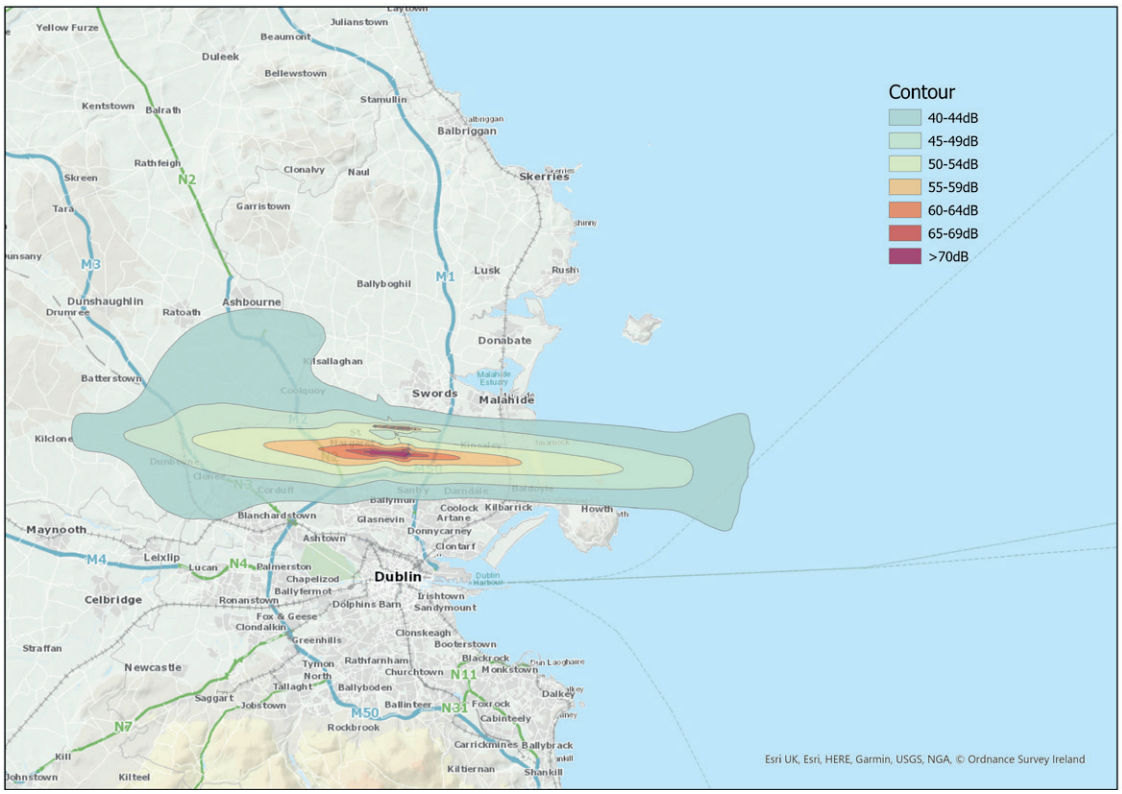



**Figure 11- Night-time contours ($L_{night}$)**

Contours maps are also available on the ANCA website that show the distribution of aircraft noise as averaged across all the night periods of the year. Environmental noise legislation designates the period 23:00-07:00 as nighttime for the purposes of the assessment of all the major sources of environmental noise. There are planning conditions in place that limit the use of the north parallel runway during the night to defined situations only. The 2023 night-time contours therefore are predominately aligned with the south runway but also reflect the limited use of the north runway.

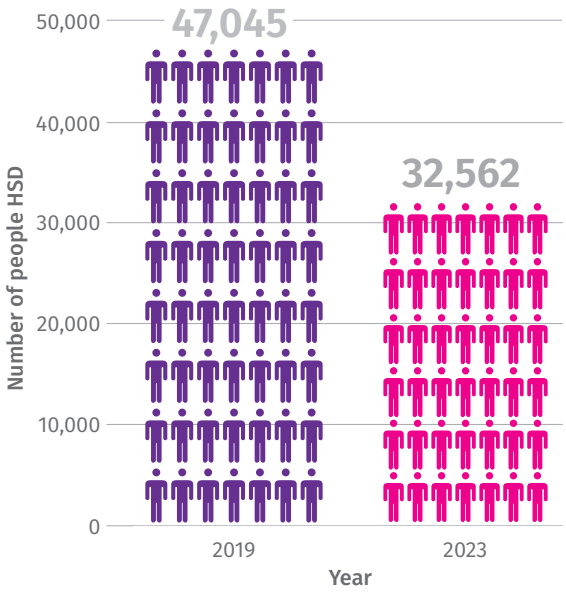
The maps that reflect this distribution of activity facilitate the identification of people exposed to night-time aircraft noise in addition to the calculation of numbers likely to be experiencing sleep disturbance. The NAO for Dublin Airport also has assessment metrics associated with night-time aircraft activity.

NAO measurable criteria:

**Compared to the situation in 2019:**

- The number of people highly sleep disturbed in 2030 shall reduce by 30%;
- The number of people highly sleep disturbed in 2035 shall reduce by 40%;
- The number of people highly sleep disturbed in 2040 shall reduce by 50%..

The indicator ($L_{night}$) is the metric prescribed in environmental legislation for assessing sleep disturbance arising from environmental noise. The legislation also sets out the mathematical formulae used to calculate the number of people categorised as highly sleep disturbed.




Compared to the situation in 2019, the number of people categorised as highly sleep disturbed was significantly lower during 2023 - a reduction of 31%. This indicator remains on target for a reduction of 30% by 2030. The contour maps on the ANCA website can be examined down to the level of individual properties for all mapped noise bands.

**Figure 12 - Number of people highly sleep disturbed by year**

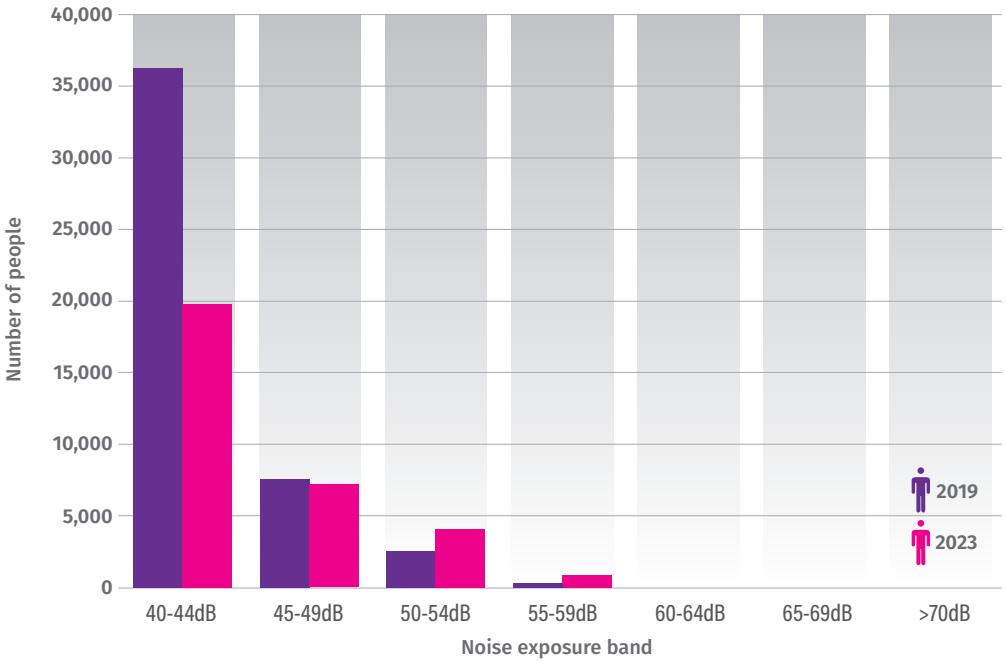



**Figure 13 – Number of People Highly Sleep Disturbed broken down by exposure band ($L_{night}$)**

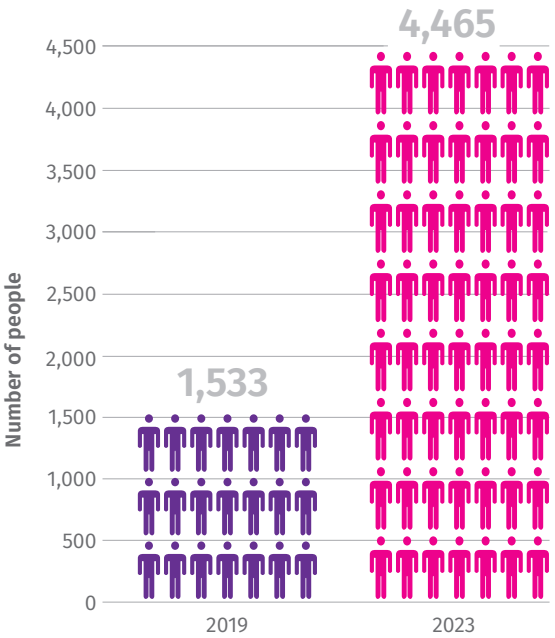
| | 40-44 dB | 45-49 dB | 50-54 dB | 55-59 dB | 60-64 dB | 65-69 dB | >70 dB |
|---|---|---|---|---|---|---|---|
| **2019** | 36,339 | 7,622 | 2,665 | 380 | 34 | 5 | 0 |
| **2023** | 20,101 | 7,252 | 4,003 | 1,147 | 55 | 4 | 0 |

Further examination of this indicator shows a reduction across all noise bands except 50-54 dB, 55-59 dB and 60-64 dB. The noise level >70 dB remains static with no reported properties within this level.

NAO measurable criteria:

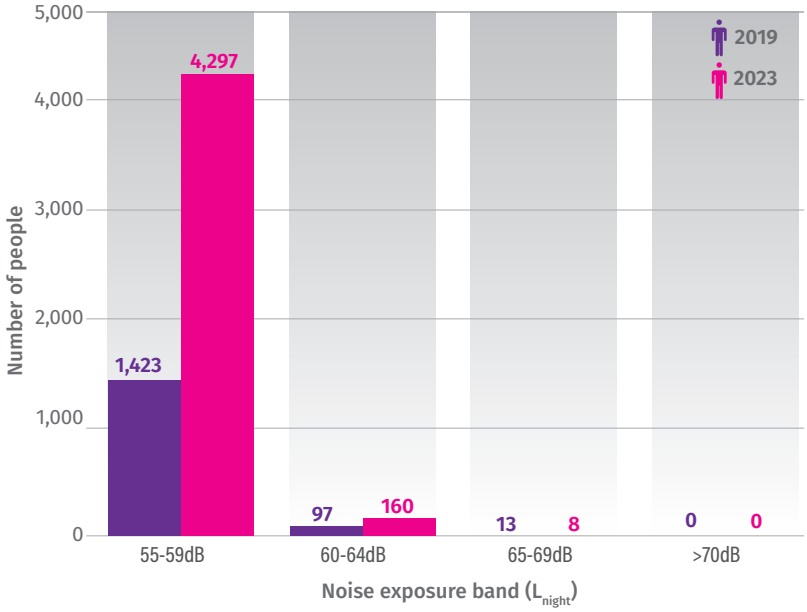
**Compared to the situation in 2019:**

- The number of people exposed to aircraft noise above 55 dB $L_{night}$ shall be reduced.




When compared to the situation in 2019, the number of people exposed to the NAO priority limit of 55 dB $L_{night}$ was higher in 2023 by 2,932 (191%)

**Figure 14 – Number of people exposed to aircraft noise above 55db $L_{night}$**




In examining this outcome at the level of individual noise bands, the increase arises in the 55-59 dB and 60-64 dB noise bands with decreases occurring in the 65-69 dB noise band.

**Figure 15 – Number of people exposed to >55dB $L_{night}$ by noise exposure band per year**

# 04

# Summary

# **04** Summary

## This report reviews, for the full year of 2023, the effectiveness of the noise mitigation measures at Dublin Airport in achieving the noise abatement objective (NAO).

Aircraft noise at Dublin Airport is managed through a combination of measures that were developed and implemented through a number of processes. These mitigation measures, which aim to reduce the negative impacts of aircraft noise on local communities, are in place to ensure delivery of the NAO outcomes for Dublin Airport

The NAO contains provisions to limit and reduce the number of people exposed to aircraft noise. It also contains longer term targets which seek to reduce the health impacts of aircraft noise.

The airport authority (daa), provided to ANCA as part of a current noise assessment, a list of nineteen measures for Dublin Airport in 2023 for the management of aircraft noise. The report considers the effectiveness of these measures in achieving the noise abatement objective.

Through a process of aircraft noise assessment and public consultation ANCA made a regulatory decision in June 2022 that contained measures to support the delivery of the NAO. Additionally, the regulatory decision made provision for home insulation measures to mitigate the impact of night-time activity and included a ban on the noisiest aircraft accessing the airport during night-time hours. The decision of the planning authority, that contains the regulatory decision, remains under appeal through the planning process.

The longer-term health-impact reduction targets, set within the NAO for achievement by 2030, indicate that the reduction target for this milestone is on track to be achieved. Ongoing monitoring and reporting are appropriate however, to ensure that these outcomes remain on track to be achieved or exceeded by 2030.

Through consideration of the numbers of people exposed to aircraft noise above 55dB $L_{night}$ and 65dB $L_{den}$, the review finds, however, that the noise-limit aspects of the NAO have not been achieved for the 2023 assessment year. It is noted that not all of the nineteen noise management measures associated with Dublin Airport were implemented during 2023. The implementation of all identified measures may have supported the achievement of this aspect of the NAO. The noise mitigation measures in place at the airport cannot therefore be considered effective in this respect. The short-term noise limit objectives remain outside of target outcomes in that:

a) There is a significant increase, compared to 2019, in the number of people exposed to night-time aircraft noise above the NAO priority level of 55 dB $L_{night}$. The figure for 2023 was 4,465, which is 2,932 more people exposed to night-time aircraft noise above 55 dB $L_{night}$, than in 2019.

b) The NAO day-evening-night priority that seeks to limit the number of people exposed to noise levels above 65 dB $L_{den}$ also remained outside of target outcomes during 2023. The number of people exposed to noise levels above 65 dB $L_{den}$ in 2023 was 323, which is 38 higher than in 2019.

In the context of the findings of this report, ANCA has a remit to ensure that appropriate measures are in place that will be effective towards achieving the NAO. In that regard:

a) An Bord Pleanála consideration of the appeal of the planning decision that contains the regulatory decision (PL06F.314485, F20A/0668), is ongoing. ANCA has responded to An Bord Pleanála's requests for submissions and observations by way of letters dated 13 December 2023 and 2 April 2024. The ABP decision, whatever the outcome is, will likely have an impact on the noise climate at Dublin Airport.

b) An aircraft noise assessment (that applies the Balanced Approach where a noise problem is identified) is currently underway by ANCA and is having regard to changes in the noise climate that occurred following the opening of the north parallel runway and operational changes to some departure routes. The assessment is having regard to the noise impact on all communities around the airport. The assessment is also considering the potential noise impact of proposals to develop Dublin Airport through the infrastructure and passenger capacity planning application (F23A/0781). To inform the assessment, ANCA directed daa to provide additional information on 1 March 2024. The outcome of the noise assessment may result in a new regulatory decision being made.

Although the percentage of flights occurring in the night period decreased during 2023 when compared to 2022, the number of night-time flights was higher during 2023 than in all preceding years. ANCA notes that the planning authority of Fingal County Council has issued an enforcement notice to require daa to conform with Condition 5 of the North Runway Permission F04A/1755 ABP PL 06F.217429, which, if adhered to, may support compliance with the NAO in the short term. Judicial Review proceedings are ongoing. ANCA will take account of the outcome of those proceedings as it progresses the actions identified.

Ongoing monitoring and reporting of progress against the delivery metrics of the NAO provide detailed insight into the aircraft noise impact on health and quality of life and helps identify where noise exposure results in areas of population experiencing harmful effects. Where effective measures are not in place to ensure that the outcomes of the NAO will be achieved, and notwithstanding the potential impact of other relevant processes currently underway, priority should be given to identifying and implementing noise management and/or mitigation measures for areas within the 55-59 dB and 60-64 dB $L_{night}$ and 65-69 dB $L_{den}$ contours – areas that were outside of the NAO target outcomes during 2023.

# Regulatory statement

This review report has been prepared in accordance with the provisions of Section 21(2) of the Aircraft Noise (Dublin Airport) Regulation Act 2019.

An tÚdarás Inniúil um Thorann Aerárthaí

Aircraft Noise Competent Authority

Comhairle Contae Fhine Gall

Fingal County Council