

# Chapter 3: Environmental Noise





# Environmental Noise

## 1. Introduction

Environmental noise is unwanted or harmful outdoor sound arising from all areas of human activity. Although noise is a product of many human activities, including neighbourhood, industrial, commercial and entertainment activities, the most widespread sources of noise pollution and exposure in Ireland are various forms of transport.

Reducing noise pollution is an ambition of the European Union (EU) Zero Pollution Action Plan (EC, 2021) and the Environmental Noise Directive (END) (2002/49/EC). Environmental noise has become a significant environmental health concern for European citizens and policymakers (EC, 2023), although in Ireland noise is often regarded as the forgotten pollutant (King and Murphy, 2016). The data from a recent noise mapping exercise in Ireland indicate that noise exposure from transport sources requires further investigation and follow-up action through local authority noise action plans, as over 1 million people are exposed to noise levels above the reporting thresholds set in the END.

The human ear hears sound pressures over a wide range of frequencies. Measurements in decibels (dB) correspond to the way our ears interpret sound pressures and are given on a logarithmic scale (Figure 3.1).

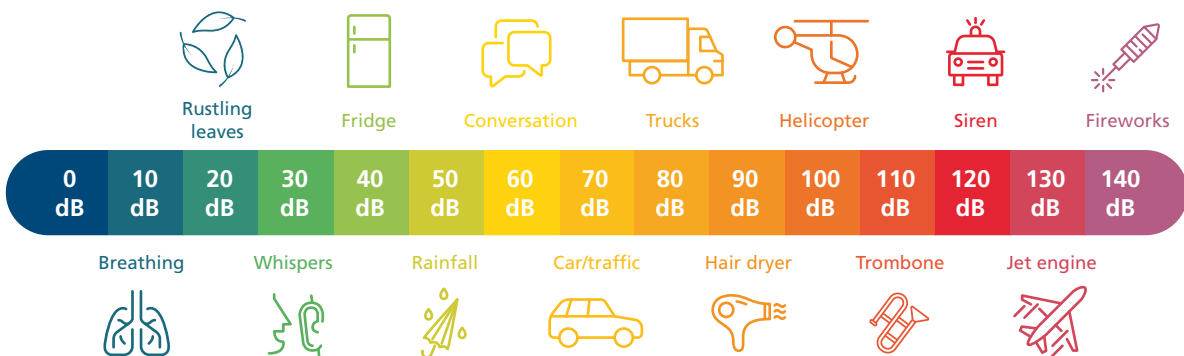
The EU's END mandatory noise level reporting thresholds are 55 dB  $L_{den}$  and 50 dB  $L_{night}$ :

- $L_{den}$  is the day-evening-night long-term average noise indicator. It is 'weighted' to account for extra annoyance in the evening and during night-time periods.
- $L_{night}$  is the night-time long-term average noise indicator and is used in the assessment of sleep disturbance.

These indicators are based on year-long averages for the day-time (07:00-19:00), evening (19:00-23:00) and night-time (23:00-07:00) periods.

Under EU legislation, Ireland must produce strategic noise maps every 5 years. The fourth round of noise mapping is the most recent undertaken (round 4). The maps cover major roads, major railways, one major airport (Dublin Airport) and the cities of Dublin, Cork and Limerick (i.e. agglomerations of more than 100,000 inhabitants).

**Figure 3.1** Human auditory range



Source: Adapted from Nuheara<sup>1</sup>

1 [www.nuheara.com/usa/news/human-hearing-frequency-range/](http://www.nuheara.com/usa/news/human-hearing-frequency-range/) (Accessed 26 September 2024).



## 2. Impacts of environmental noise

### Harmful effects of environmental noise

Research shows that at least one in five people in the EU is exposed to long-term noise levels considered harmful to their health. Health issues related to these exposures include annoyance, sleep disturbance, cardiovascular and metabolic issues (EEA, 2023a). There is also evidence of an association between transport noise and cognitive impairment in children (EEA, 2023a).

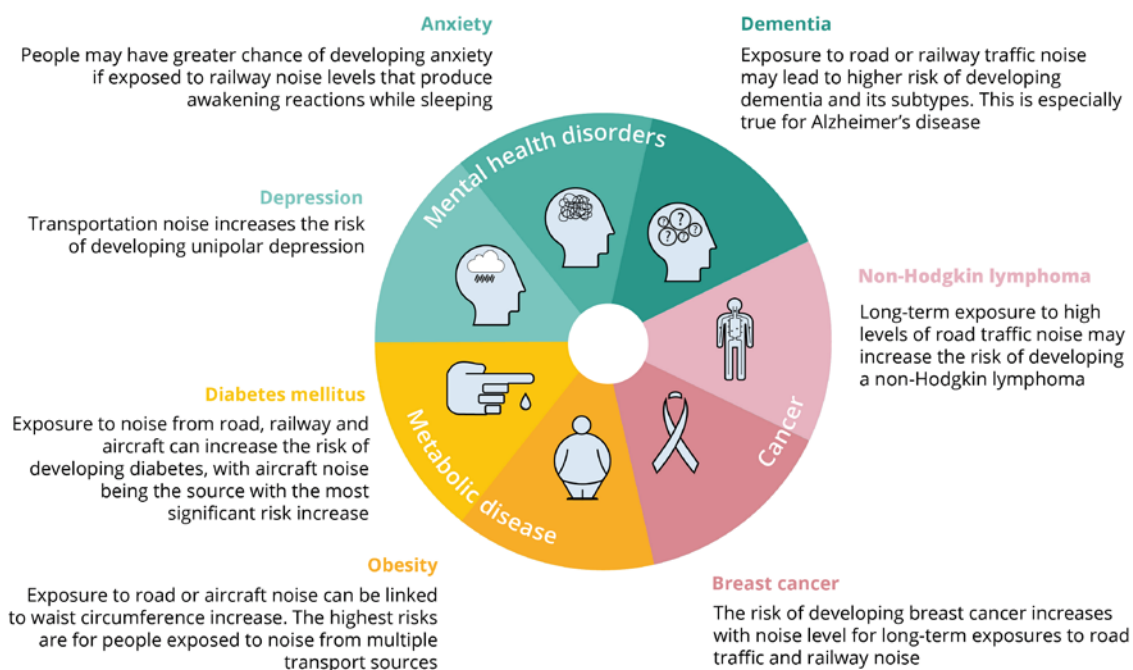
Long-term exposure to environmental noise is an important public health issue (Figure 3.2). Across the EU, the most recent collated data show that 22 million people suffer chronic high levels of annoyance, 12,500 schoolchildren suffer learning impairment in school caused by aircraft noise, and 12,000 premature deaths are caused by long-term exposure to environmental noise (EC, 2023). People in urban areas are the most affected, particularly by road traffic noise (EEA, 2023a). The European Environment Agency (EEA) is planning to provide an updated assessment of strategic noise mapping across Europe in late 2024.

The World Health Organization (WHO) has established that excessive noise, particularly from transport sources, has negative impacts on health and wellbeing. WHO guidelines show that environmental noise affects sleep and cardiovascular and metabolic functions (WHO, 2018).

### Other impacts of environmental noise

Anthropogenic noise remains a pressure on marine mammals and other wildlife (see Chapter 9) as reported by OSPAR, the government and EU body that works to protect the marine environment in the North-East Atlantic (OSPAR, 2023). Its latest assessment has prompted OSPAR to commit to developing a regional action plan to reduce marine noise. The EEA also reports that noise pollution can affect wildlife, causing various physical and behavioural issues in animals and increasing their levels of stress (EEA, 2023b).

Figure 3.2 Growing evidence of the health impacts of environmental noise



Source: EEA, 2022a



### 3. Assessment of environmental noise from transport sources in Ireland

#### Strategic noise mapping

The EU END deals with environmental noise from major transport infrastructure including roads, railways and airports. The directive sets out a two-stage process for addressing environmental noise by requiring Member States to:

- establish the scale of the noise problem by preparing 'strategic noise maps' for major roads, railways, airports, agglomerations and industries
- develop noise action plans to reduce the level of noise where necessary and to maintain environmental noise quality where it is good.

Strategic noise maps show noise exposure levels in terms of two noise indicators,  $L_{den}$  and  $L_{night}$ . Mapping is not undertaken across the whole of each Member State but within designated major cities, in the vicinity of major road and rail transport corridors, and around major airports. The thresholds that apply to the noise mapping are:

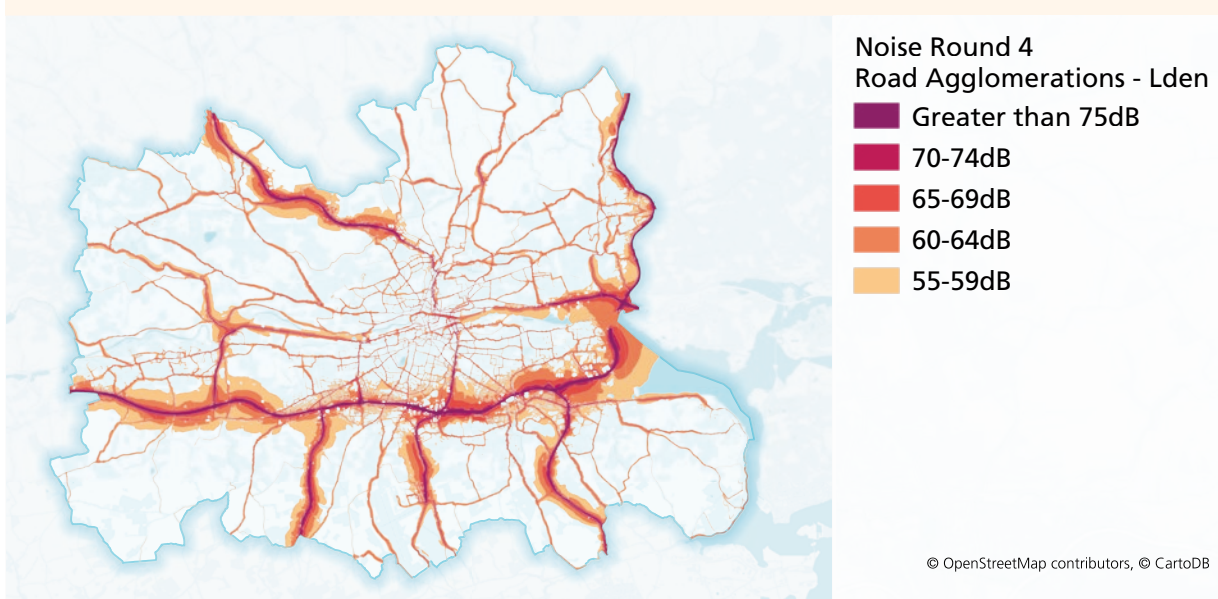
- major roads – more than 3 million vehicle passages per year
- major railways – more than 30,000 train passages per year

- major airports – more than 50,000 air movements per year
- major cities – in excess of 100,000 population, which in Ireland includes Dublin, Cork and Limerick.

Strategic noise maps are prepared using computer modelling techniques that use various types of source data to estimate noise levels, including traffic flow, types of road and rail, types of vehicles and vehicle speeds. As the designated national authority for the purposes of noise regulations (S.I. No. 549/2018 and S.I. No. 663/2021), the Environmental Protection Agency (EPA) has responsibility for overseeing their implementation. Responsibility for the preparation of the strategic noise maps lies with the designated noise mapping bodies. These include Transport Infrastructure Ireland (TII), the various local authorities, Iarnród Éireann-Irish Rail and Dublin Airport Authority.

Presenting information on strategic noise maps increases public awareness of noise exposure and provides data for the identification of priority areas for noise action plans. Round 4 strategic noise mapping uses 2021 data as the representative year. The maps can be viewed on the EPA Maps section of the EPA website.<sup>2</sup> An example for Cork is shown in Figure 3.3.

**Figure 3.3** Illustrative strategic noise map ( $L_{den}$ ) for Cork city agglomeration using data from the environmental noise maps, available on [gis.epa.ie/EPAMaps/](https://gis.epa.ie/EPAMaps/) (June 2024)



2 [gis.epa.ie](https://gis.epa.ie) (accessed 20 July 2024).



### Environmental noise and exposure modelling data for major transport sources

In Ireland, road traffic, particularly inside urban areas, is the predominant source of transport noise (EEA, 2021a). Results from round 4 noise mapping indicate that approximately 41% of the total population living in the three urban areas of Dublin, Cork and Limerick were exposed to noise levels above the END mandatory reporting threshold of  $\geq 55$  dB  $L_{den}$  from road traffic noise, while the preliminary data would suggest that approximately 53% were exposed to road traffic noise above the 53 dB  $L_{den}$  WHO guideline level. Of those people living outside these areas, approximately 22% of the total population living in the mapped areas were exposed to a noise level of  $\geq 55$  dB  $L_{den}$  (the END reporting threshold) from road transport noise.

In noise modelling for round 4 mapping, the estimated number of people in the areas modelled exposed to noise levels above the mandatory reporting thresholds for road traffic set in the EU regulations was just over 1.03million ( $L_{den}$ ). This figure is comprised of approximately 690,000 people for all roads in the three urban areas listed above and approximately an additional 343,000 in major roads elsewhere nationwide. In Ireland, an estimated 1,326,000 people are exposed to road traffic noise from major roads above the WHO guidance levels of 53dB  $L_{den}$ . This preliminary data includes 885,000 people in Cork, Dublin and Limerick and an additional 441,000 people outside these cities. Table 3.1 shows the numbers of people exposed to road traffic at the different noise level bands, as modelled for Dublin, Cork and Limerick ( $L_{den}$ ).

**Table 3.1** Number of people in dwellings in Cork, Dublin and Limerick exposed to road traffic noise –  $L_{den}$

Noise level (dB) $L_{den}$	Cork		Dublin		Limerick	
	All roads (No. people)	Major roads (No. people)	All roads (No. people)	Major roads (No. people)	All roads (No. people)	Major roads (No. people)
53-54	23,300	13,400	160,000	88,900	11,400	8300
55-59	50,200	22,900	287,400	151,000	24,500	13,600
60-64	32,800	10,900	160,500	78,800	13,100	5000
65-69	10,400	5800	78,700	53,600	4700	2800
70-74	1700	1600	23,100	20,700	600	600
$\geq 75$	300	300	2500	2400	0	0
<b>Total number of people exposed to noise above 55<sup>a</sup></b>	<b>95,400</b>	<b>41,500</b>	<b>552,200</b>	<b>306,500</b>	<b>42,900</b>	<b>22,000</b>
<b>Total number of people exposed to noise above 53<sup>b</sup></b>	<b>118,700</b>	<b>54,900</b>	<b>712,200</b>	<b>395,400</b>	<b>54,300</b>	<b>30,300</b>
<b>Total population</b>	<b>219,287</b>	<b>219,287</b>	<b>1,355,968</b>	<b>1,355,968</b>	<b>101,029</b>	<b>101,029</b>
<b>Proportion (above 55)<sup>a</sup></b>	<b>44%</b>	<b>19%</b>	<b>41%</b>	<b>23%</b>	<b>42%</b>	<b>22%</b>
<b>Proportion (above 53)<sup>b</sup></b>	<b>54%</b>	<b>25%</b>	<b>53%</b>	<b>29%</b>	<b>54%</b>	<b>30%</b>

**Note:** Exposure statistics rounded to the nearest 100.

<sup>a</sup> EU reporting threshold (END).

<sup>b</sup> WHO guideline level (as road traffic noise above 53 dB  $L_{den}$  can be associated with adverse health effects).



When noise modelling data for round 4 mapping using the END threshold are compared with data using the threshold in the WHO *Environmental Noise Guidelines for the European Region* (WHO, 2018), the preliminary results show that the proportion of people exposed is higher using the WHO guideline level, as shown in Table 3.1. For the major rail and major airport areas that were also modelled, the numbers of people exposed to noise levels above the  $L_{den}$  mandatory reporting thresholds were approximately 82,600 and 13,400, respectively.<sup>3</sup>

$L_{night}$  figures are given in Table 3.2 for comparison with Table 3.1. Figure 3.4 is an illustrative map showing population exposure to road traffic noise at night for Limerick city ( $L_{night}$ ).

**Table 3.2** Number of people in dwellings in Cork, Dublin and Limerick exposed to road traffic noise –  $L_{night}$

Noise level (dB) $L_{night}$	Cork		Dublin		Limerick	
	All roads (No. people)	Major roads (No. people)	All roads (No. people)	Major roads (No. people)	All roads (No. people)	Major roads (No. people)
45-49	49,200	25,600	301,500	186,600	22,600	16,200
50-54	20,800	12,400	169,200	104,800	10,000	7,200
55-59	5,400	4,400	78,400	54,700	800	700
60-64	1,900	1,900	33,000	29,000	400	400
65-69	400	400	6,300	6,200	100	100
≥ 70	0	0	400	400	0	0
<b>Total number of people exposed to noise above 50<sup>a</sup></b>	<b>28,500</b>	<b>19,100</b>	<b>287,300</b>	<b>195,100</b>	<b>11,300</b>	<b>8,400</b>
<b>Total number of people exposed to noise above 45<sup>b</sup></b>	<b>77,700</b>	<b>44,700</b>	<b>588,800</b>	<b>381,700</b>	<b>33,900</b>	<b>24,600</b>
<b>Total population</b>	<b>219,287</b>	<b>219,287</b>	<b>1,355,968</b>	<b>1,355,968</b>	<b>101,029</b>	<b>101,029</b>
<b>Proportion (above 50)<sup>a</sup></b>	<b>13%</b>	<b>9%</b>	<b>21%</b>	<b>14%</b>	<b>11%</b>	<b>8%</b>
<b>Proportion (above 45)<sup>b</sup></b>	<b>35%</b>	<b>20%</b>	<b>43%</b>	<b>28%</b>	<b>34%</b>	<b>24%</b>

**Note:** Exposure statistics rounded to the nearest 100.

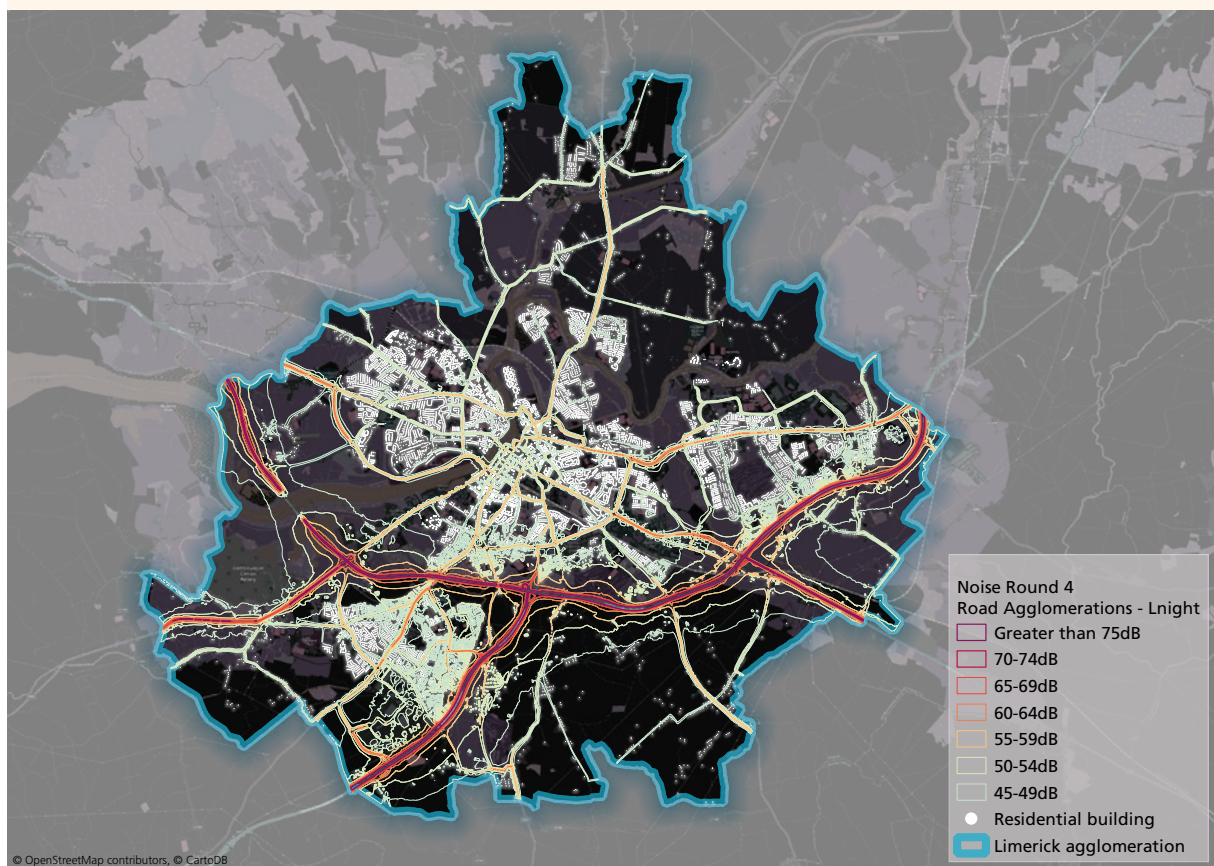
<sup>a</sup> EU reporting threshold (END).

<sup>b</sup> WHO guideline level (as night-time road traffic noise above 45 dB  $L_{night}$  can be associated with adverse effects on sleep).

<sup>3</sup> Noise modelling for round 4 mapping used 2021 data (per the requirements of the END), when there were 8.5 million passengers using Dublin Airport, while in 2023 there were 32 million passengers using the airport. This was due to the removal of COVID-19 restrictions and the opening of the new north runway.



**Figure 3.4** Illustrative population exposure to road traffic noise at night ( $L_{night}$ ) for Limerick city agglomeration using data from the environmental noise maps, available on [gis.epa.ie/EPAMaps/](https://gis.epa.ie/EPAMaps/) (June 2024)



### Assessment of harmful effects from transport noise

Annex III of the END describes the methods for assessing the harmful effects caused by long-term exposure to specific noise sources. The methods include dose-effect relationships for a set of health end points such as cardiovascular disease, annoyance and sleep disturbance. These dose-effect relationships in the revised Annex III are based on a scientific review of the health effects, as contained in the WHO *Environmental Noise Guidelines for the European Region*. In 2021, Ireland transposed the revised Directive (EU) 2020/367, which amended Annex III to the END, through the Environmental Communities (Environmental Noise) (Amendment) Regulations 2021 (S.I. No. 663/2021).

Preliminary data from the Annex III assessment, available for round 4 noise action plans, provide statistical information on the effects of exposure to the harmful effects of environmental noise on representative populations. The harmful effects that were assessed and reported on were the:

- number of people who were highly annoyed by noise from roads, railways and aircraft
- number of people who were highly sleep disturbed by noise from roads, railways and aircraft
- incidence of ischaemic heart disease caused by exposure to noise from roads.

When combined with the statistical analysis of harmful effects, the preliminary mapping results categorised around 8% of the urban populations in Dublin, Cork and Limerick as highly annoyed due to their exposure to road traffic noise and approximately 2% as highly sleep disturbed (Table 3.3). Within the areas mapped alongside major roads outside the agglomerations, approximately 4.6% of the population were highly annoyed and an estimated 1.4% were highly sleep disturbed.



**Table 3.3** Number and proportion of the population estimated to be at risk of harmful effects from exposure to road traffic noise in Cork, Dublin and Limerick (preliminary results)

Harmful effect	Cork				Dublin				Limerick			
	All roads		Major roads		All roads		Major roads		All roads		Major roads	
	No. people <sup>b</sup>	%	No. people <sup>b</sup>	%	No. people <sup>b</sup>	%	No. people <sup>b</sup>	%	No. people <sup>b</sup>	%	No. people <sup>b</sup>	%
Highly Annoyed <sup>a</sup>	17,724	8.08	8,200	3.74	108,380	7.99	62,765	4.63	7,916	7.84	4,331	4.29
Highly Sleep Disturbed <sup>a</sup>	3,382	1.54	2,075	0.95	28,996	2.14	19,636	1.45	1,387	1.37	1,022	1.01
Ischaemic Heart Disease	17	0.01	8	0.00	101	0.01	61	0.00	7	0.01	4	0.00
<b>Total Population</b>	<b>219,287</b>		<b>219,287</b>		<b>1,355,968</b>		<b>1,355,968</b>		<b>101,029</b>		<b>101,029</b>	

<sup>a</sup> Based on WHO guidelines including statistical analysis of noise level bands, in which the noise levels above which health effects begin to occur are > 53 dB L<sub>den</sub> for highly annoyed and > 45 dB L<sub>night</sub> for highly sleep disturbed.

<sup>b</sup> For No. people, the numbers are rounded to whole numbers.

### Improvements in round 4 noise mapping and action planning

While a lot remains to be done to tackle environmental noise, as set out later in this chapter, there have been considerable advances in mapping noise, and determining priority areas, following recommendations made in the previous State of the Environment Report (EPA, 2020) and EPA research projects.

This fourth round of noise mapping has seen many improvements:

- incorporation of the CNOSSOS-EU methodology, including a standardised approach for population exposure estimation<sup>4</sup>
- revision of the extent of agglomerations (Dublin, Cork and Limerick)
- industrial noise assessments included in agglomerations
- all roads within the agglomerations are now modelled
- a more centralised mapping process.

The fourth round of action planning has also delivered many improvements:

- revision of the priority matrix to include a harmful effects assessment using WHO thresholds and links to the EU Zero Pollution Action Plan
- a recommended approach for local authorities to follow when determining actions throughout the noise action planning cycle
- a more centralised and consistent noise action planning process at local authority level.

### Noise action plans

Following the preparation of strategic noise maps, designated action planning authorities, i.e. the relevant local authorities, are required to consult with the noise mapping bodies, the EPA and the public in the preparation of their noise action plans. The primary objective of these action plans is to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, of exposure to environmental noise. Furthermore, the plans must also seek to identify and maintain areas where environmental noise quality is good. Public consultations on the draft noise action plans were underway or just completed for many of the draft plans at the time of writing (August 2024).

<sup>4</sup> The new EU common noise assessment method (CNOSSOS-EU) used in round 4 noise mapping calculates noise emissions, propagation and residential population exposure differently from the methods used in previous rounds. As a result, round 4 strategic noise maps are not directly comparable with maps generated under rounds 1-3.





The development of these noise action plans provides an opportunity for sections within a local authority to work collaboratively with other departments, particularly where synergies exist with issues such as road maintenance and traffic management, to get the most out of existing projects, in addition to considering noise measures in their own right.

### Noise action plan guidance

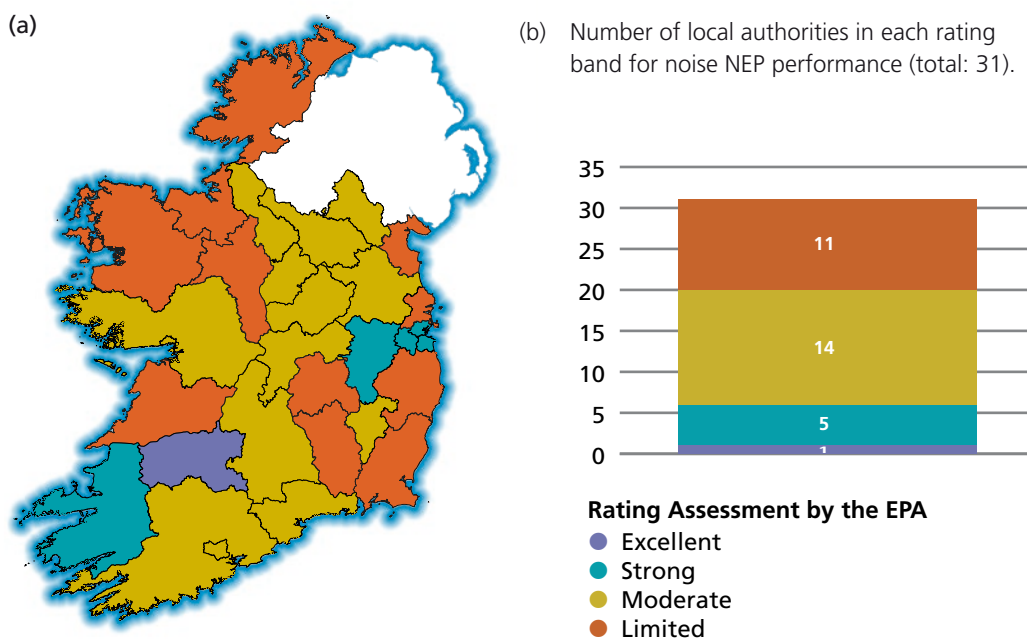
New EPA draft noise action planning guidance recommends that the action planning authorities (i.e. local authorities) consider several aspects in selecting priority important areas (PIAs), including a history of noise complaints. These locations are identified by a local authority as areas to be assessed during the implementation of their noise action plan. The guidance also recommends that the development of noise action plans is undertaken through a collaborative local authority working group that includes team members from various departments who have knowledge of noise and complaints. Organisations with responsibilities for roads, including TII, should be involved in the PIA selection process.

### Noise action plan progress reports

Local authorities are required to report annual progress on their noise action plans to the EPA under the European Communities (Environmental Noise) Regulations (S.I. No. 549/2018). END compliance is assessed as a national enforcement priority (NEP) under the 'air and noise' thematic area in the EPA Local Authority Environmental Enforcement Performance Framework.<sup>5</sup> The EPA's evaluation of performance in relation to noise is based on information contained in each local authority's noise action plan progress report.

Each local authority is required to set out the steps that have been taken to prevent, protect against and reduce excessive environmental noise, as identified in their noise action plan. The plans are assessed by the EPA regarding the effectiveness of plan implementation and associated actions (Figure 3.5). In 2022, only 19% of local authorities achieved the required standard in this NEP, compared with 33% in 2021 (EPA, 2023a). Noise was the lowest performing enforcement priority across the entire performance framework.

**Figure 3.5** (a) Summary assessment of the 2022 noise action plan progress reports covering round 3 and (b) Summary assessment of END compliance in 2022 showing the number of local authorities in each rating band for noise NEP performance.



Source: EPA, 2024

<sup>5</sup> Local authority performance is evaluated by the EPA against the NEPs, which are focused on achieving environmental outcomes. The NEPs fall under four themes: governance processes, waste, water, and air and noise. There are 20 NEPs in total with five in each of the four thematic areas.



The EPA summary noise action plan progress report for 2022 (EPA, 2024) relates to round 3 plans. It demonstrates that, in many cases, local authority reports did not outline any specific actions that were implemented in 2022. Where progress was reported by local authorities, such as Limerick (excellent) and Dublin (strong), action mainly related to the use of low-noise road surfaces (such as stone mastic asphalt during pavement rehabilitation), traffic calming measures to reduce speeds, noise monitoring at residential locations, or identifying quiet areas – an important aspect of the END aimed at providing spaces away from noise pollution. However, most local authorities show only moderate or limited progress. Figure 3.6 shows an example of noise mitigation for roads.

**Figure 3.6** Lower noise road surface using stone mastic asphalt (left) and traditional coarse road surface using hot-rolled asphalt (right) on the M4 near Kilcock, Co. Kildare.



Credit: John O'Neill, Kildare Co. Co.

### Noise research

The EPA-funded research project, Noise-Adapt (Murphy *et al.*, 2021), provided a transitional needs assessment and guidance for adapting common noise assessment methods in Europe (CNOSSOS-EU) to the Irish context for road and rail sources. It was used by the EPA in generating draft technical guidance and round 4 mapping guidance for the noise mapping bodies.

Another EPA-funded research project, Noise-Health Ireland (Murphy *et al.*, 2022), assessed the relationship between environmental noise and health in a national and international context. The project identified some key policy recommendations such as developing an ambient noise strategy for Ireland and centralising the strategic noise mapping process. It also proposed that the noise mapping bodies include the complete road networks of Cork, Dublin and Limerick when preparing strategic noise mapping data.

## 4. Impacts of noise and noise complaints

### Sources of noise complaints

Apart from transport noise, environmental noise can also arise from a variety of other sources including the night-time economy (pubs, clubs and other hospitality and event venues), domestic or neighbourhood noise, industrial or commercial activity, wind farms, marine noise and some relatively new sources such as drone noise.

In Ireland, noise complaints about different sources normally fall into three main categories under various regulatory authorities:

1. local domestic noise nuisance including industry and commercial – local authority
2. major industrial and waste licensed sites – EPA
3. transport – TII, Iarnród Éireann-Irish Rail, Dublin Airport Authority, local authorities, etc.

### Noise complaints received by local authorities

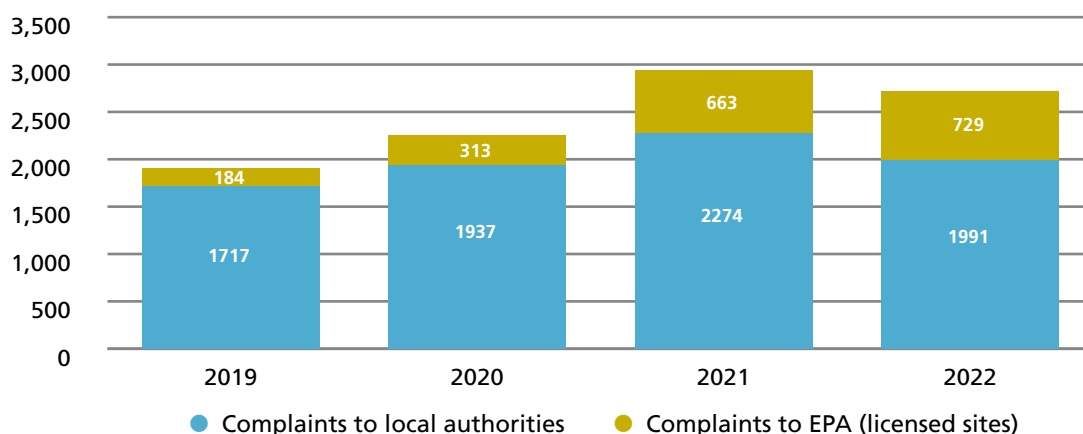
Figure 3.7 shows the noise complaints received by local authorities for the years 2019-2022. Compared with 2019 levels, the number of noise complaints received by local authorities increased by approximately 32% in 2021 and 15% in 2022. The increases may be understood in the context of the COVID-19 lockdowns and increased working from home. In the 2021-2022 period, local authorities issued over 500 noise warning letters. They also issued a significant number of notices requiring action<sup>6</sup> (43 in 2021, 32 in 2022) to be taken in relation to excessive noise. During this 2-year period, no prosecutions for non-compliance with these notices were made.

<sup>6</sup> Section 107 of the EPA Act 1992 gives powers to the local authority or the EPA to require measures to be taken to prevent or limit noise from a permitted or licensed facility.



A national protocol for local authorities to deal with noise complaints (NIECE, 2016) provided a more integrated approach to addressing noise issues in Ireland. However, in view of the increasing number of noise complaints nationally, this could be an area to consider further, and the protocol is due to be revised in 2024.

**Figure 3.7** General noise complaints received by local authorities and noise complaints about EPA-licensed sites received by the EPA (2019-2022)



### Noise complaints made about industrial activities licensed by the EPA

At least half of all complaints received by the EPA about EPA-licensed sites in 2022 related to noise issues (EPA, 2023b). Figure 3.7 shows the number of noise complaints received for the years 2019-2022 for industrial emissions-licensed facilities regulated by the EPA. While the data show that noise complaints have been increasing since 2019, over 300 complaints each year (2021-2022) relate to just one facility. Between 2019 and 2022, 13 compliance investigations addressing noise concerns at EPA-licensed sites were undertaken by the EPA. Eight of these were new with five having been instigated before 2019. The noise complaints mainly related to food and drink licensed sites. See Chapter 13 for more information about the regulation of industry.

### Noise complaints made about transport sources

The main bodies responsible for investigating road traffic noise complaints are TII and local authorities. TII is responsible for the management of motorways and the national road network in Ireland. Local authorities are largely responsible for all other roads in Ireland (regional, public and local roads). While Iarnród Éireann-Irish Rail provides information on environmental noise and strategic noise maps on its website,<sup>7</sup> it does not have a specific section there that deals with noise complaints.

Dublin Airport's WebTrak Flight Monitoring System allows members of the public to monitor flights and submit noise complaints (Topic Box 3.1).

<sup>7</sup> Iarnród Éireann-Irish Rail; [www.irishrail.ie/en-ie/search?q=noise&c=3055](http://www.irishrail.ie/en-ie/search?q=noise&c=3055) (accessed 24 April 2024).



### Topic Box 3.1 Airport noise: monitoring system

The WebTrak Flight Monitoring System<sup>8</sup> is a web-based service that monitors and provides information on flights and noise levels related to aircraft using Dublin Airport. It offers near-real-time information on flight origin and destinations, aircraft types, altitudes and flight paths, and noise levels registered at Dublin Airport's noise monitoring terminals. The system also provides a simplified way for members of the public to monitor flights and submit noise complaints. Users can identify their location by Eircode or on the map provided and view related flight data. The automated noise complaint system supplements existing electronic, telephone and postal options.

### Managing rail and aircraft noise

Iarnród Éireann-Irish Rail is in the process of designing for increasing capacity on the rail network in Ireland. At present, three railway order applications are under consideration by An Bord Pleanála, for DART+ West, DART+ South West and infrastructural improvements on the Cork-Middleton line. Railway order applications are essentially a combined planning application and compulsory purchase application and are subject to environmental assessment.<sup>9</sup> To prevent future noise issues arising, the implications for noise impacts and its mitigation using best international practice should be an important factor in the design and development of these infrastructure projects. Project owners should also consult with and take into consideration the relevant noise action plans within which the rail infrastructure resides.

The Aircraft Noise Competent Authority (ANCA)<sup>10</sup> is an independent directorate within Fingal County Council and is the designated competent authority in Ireland for the purposes of Regulation (EU) No 598/2014 (Aircraft Noise Regulation). ANCA has a remit to monitor and, where appropriate, make decisions and conditions for the management of aircraft noise at Dublin Airport using the balanced approach of the International Civil Aviation Organization.

ANCA publishes annual noise monitoring reports on its website together with noise contour maps that display the evolving aircraft noise impact on the communities around Dublin Airport. Maps for 2023 are available from ANCA that cover the first full year of operation of the new north runway, following the commencement of operations in September 2022.

Fingal County Council is responsible for developing the Dublin Airport Noise Action Plan. This plan is designed to manage noise issues and effects associated with Dublin Airport and, where necessary and practical, present measures to reduce the adverse effects of aviation noise.

## 5. Outlook for noise policy and mitigation measures

### Noise in the Zero Pollution Action Plan

Reducing the share of people chronically disturbed by transport noise by 30% is the EU-wide target for 2030 under the EU Zero Pollution Action Plan (EC, 2021). However, the EEA's transport noise outlook for 2030 estimates that noise pollution is unlikely to decrease significantly (EEA, 2022b). Under an optimistic scenario that includes the implementation of a large set of ambitious measures, the number of people highly annoyed by transport noise is predicted to decline by about 19% by 2030. Under a less ambitious scenario, the number of people affected by noise is predicted to increase by 3%. The best practice case studies contained in the European Commission's Phenomena study demonstrate how measures such as reducing traffic speed limits, redesigning roadways, creating low-noise-emission zones or retrofitting trains with quiet brakes and pads can contribute towards the aims of the 2030 zero pollution objectives.

Road noise remains the largest source of negative health effects due to noise exposure across Europe and is likely to be the focus for noise mitigation actions in the coming years. According to the EEA, low-noise tyres and pavements should be further promoted, as increased demand for such products will also encourage tyre manufacturers and road contractors to innovate and make them available (EEA, 2022b).

8 [Process of lodging a complaint on WebTrak \(dublinairport.com\)](https://www.dublinairport.com) (accessed 24 April 2024).

9 Environmental impact assessment report rail information: [www.dartplus.ie/en-ie/railwayorder/dartwest](https://www.dartplus.ie/en-ie/railwayorder/dartwest); [www.dartplus.ie/en-ie/railwayorder/dart-south-west-railway-order](https://www.dartplus.ie/en-ie/railwayorder/dart-south-west-railway-order); [gmttrailwayorder.ie/](https://www.gmttrailwayorder.ie/); [www.fingal.ie/aircraftnoiseca](https://www.fingal.ie/aircraftnoiseca); [www.metrolinkro.ie/](https://www.metrolinkro.ie/) (accessed 24 April 2024).

10 [www.fingal.ie/aircraftnoiseca](https://www.fingal.ie/aircraftnoiseca) (accessed 24 April 2024).



### The need for better implementation of noise action plans

While some local authorities are making progress on their noise action plan implementation, there remains significant room for improvement in the overall implementation of the plans (EPA, 2024). A new approach for the development of round 4 noise action plans should assist the local authorities in developing more consistent plans that focus on priority important areas (PIAs).

The approach involves the initial screening of noise-exposed sites based on strategic noise mapping. This process identifies important areas and most important areas (areas of greatest exposure to environmental noise using the results of the strategic noise mapping and harmful effects assessment), from which PIAs are to be selected to provide the greatest noise mitigation returns, in terms of reducing harmful effects. It is anticipated that each action planning authority will focus on these areas within their noise action plans.

When implementing noise action plans, on-site noise measurements around PIAs should also be undertaken. These measurements will confirm the extent of noise exposure and can be used to validate the strategic noise models as a baseline for the assessment of noise mitigation measures.

### Candidate quiet areas

To avoid the harmful effects of environmental noise in the future, it is useful to consider measures that could provide some protection from the potential impacts of increasing noise sources and exposure and that would look to preserve and maintain areas where environmental noise levels are deemed to be good. These quiet areas may be delimited<sup>11</sup> (defined) under the environmental noise regulations and, in addition to their good environmental sound quality, may also be considered for other amenity and social benefits.

For round 4, 10-20 candidate quiet areas have been identified in Cork and Limerick by the local authorities and over 100 in Dublin, using available parks, gardens and green space data sets and the results of strategic noise mapping. During the noise action plan implementation, some of these candidate quiet areas can be evaluated further through measurements, soundscape assessment and other criteria with a view to identifying areas that could be delimited as quiet areas, as set out in the noise regulations.

A 'soundscape' is defined as the acoustic environment as perceived or experienced and/or understood by a person or people in context (ISO, 2014). The soundscape assessment is a valuable investigation tool that can be used in the evaluation of candidate quiet areas. Pilot soundscape assessments have been used to evaluate candidate quiet areas in Limerick city (Topic Box 3.2).



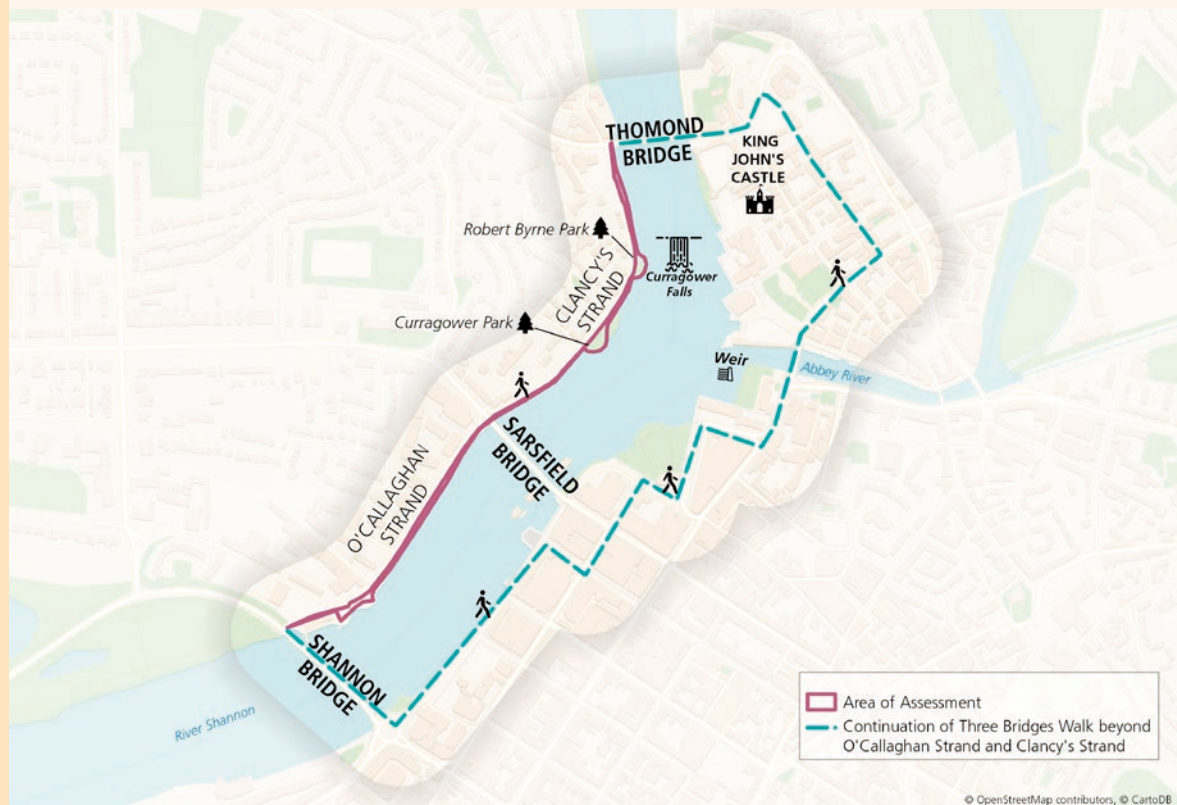
11 Article 10 (1) of the Environmental Noise Regulations (S.I. No. 549/2018) [www.irishstatutebook.ie/eli/2018/si/549/made/en/print#:~:text=The%20fundamental%20objective%20of%20action%20plans%20is%20the%20prevention](http://www.irishstatutebook.ie/eli/2018/si/549/made/en/print#:~:text=The%20fundamental%20objective%20of%20action%20plans%20is%20the%20prevention) (accessed 24 September 2024).



### Topic Box 3.2 Investigation of quiet areas for Limerick city

To evaluate the acoustic environment of a principal walkway in Limerick city beside the River Shannon (Figure 3.8), a citizen science and soundscape approach was taken (Jennings *et al.*, 2023). The project used the citizen science mobile app Hush City to allow the public to evaluate the acoustic environment and the multidimensional experiential qualities of the publicly accessible spaces being assessed. The use of the citizen science mobile app was shown to be a reliable method for evaluating the quality of the acoustic environment. The results demonstrate the potential of using this approach to complement quantitative analyses (based on the review of strategic noise maps) for considering the suitability of locations for designation as quiet areas under the END as well as to help local authorities to identify infrastructural improvements that would benefit the acoustic environment for the public.

**Figure 3.8** Area of assessment in Limerick City: Clancy's Strand/O'Callaghan Strand section of the Three Bridges Walk



Source: Adapted from Jennings, *et al.*, 2023



### National Planning Framework in Ireland

The roll-out of policy objective 65 in the *Project Ireland 2040: National Planning Framework* (DHLGH, 2019a) was seen as a first step in developing environmental noise policy in Ireland. Policy objective 65 requires the following:

**Promote the pro-active management of noise where it is likely to have significant adverse impacts on health and quality of life and support the aims of the Environmental Noise Regulations through national planning guidance and Noise Action Plans.**

While progress on this policy objective has been delayed, there remains a clear need to develop national noise planning guidance for local authorities. Such guidance would ensure better consistency in avoiding, preventing or reducing, on a prioritised basis, the harmful effects of exposure to environmental noise, including annoyance, as specified in the environmental noise regulations. In some instances, local authorities are developing their own guidance. The first revision of the NFP is currently underway. It would be important that it clarifies roles and responsibilities and includes concrete measures around the practical implementation of the proposed new policy objective 91 on environmental noise (DHLGH, 2024).

### Wind energy

In the State of the Environment Report 2020 (EPA, 2020) it was reported that the Department of Housing, Local Government and Heritage undertook a public consultation on the draft revised wind energy guidelines (DHLGH, 2019b). It was envisaged that the guidelines would be published by the end of 2020. This has not been the case and these revised guidelines are still pending and the work is ongoing. With Ireland seeking to develop and improve the conditions necessary for the delivery of wind energy targets it is important that this type of technical guidance, which also covers noise, is available for the sector, local communities and relevant enforcement authorities.

### World Health Organization noise guidelines for the protection of human health

WHO published noise guidelines for policymakers on the noise levels above which it considers that adverse effects on health and sleep occur (WHO, 2018), as shown in Table 3.4. The guidelines supplement earlier WHO guidance (WHO, 1999, 2009).

**Table 3.4** Summary of WHO noise guideline values

Level of effect	Source of noise	Level	WHO guidelines
No effects on sleep are observed	Any	Below 30 dB $L_{night}$ , inside Below 42 dB $L_{Amax}$ , inside	WHO, 2009
Lowest observed adverse effect level for night noise	Any	40 dB $L_{night}$ , outside	WHO, 2009
Noise above these levels is associated with adverse health effects and adverse effects on sleep	Aircraft	45 dB $L_{den}$ , outside 40 dB $L_{night}$ , outside	WHO, 2018
	Railways	54 dB $L_{den}$ , outside 44 dB $L_{night}$ , outside	WHO, 2018
	Roads	53 dB $L_{den}$ , outside 45 dB $L_{night}$ , outside	WHO, 2018
	Wind Turbines	45 dB $L_{den}$ , outside	WHO, 2018

Sources: WHO, 2009, 2018

$L_{Amax}$ , maximum sound level.



The purpose of the guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various transport sources (road traffic, railways and aircraft). The guidelines formulate recommendations, based on the available evidence, and maximum exposure values based on increasing risk of adverse health effects. The 2018 WHO guidance levels are below the END mandatory noise level reporting thresholds of 55 dB  $L_{den}$  and 50 dB  $L_{night}$ .

## 6. Noise initiatives

### Low-traffic neighbourhoods

Dublin City Council, in partnership with the National Transport Authority, has published the draft Dublin City Centre Transport Plan 2023. Meanwhile, the Dublin City Development Plan 2022-2028 sets out a vision for the city, and in the area of transport sets out very challenging and ambitious targets to be achieved, including a 40% reduction in general traffic volume and significant increases in walking, cycling and public transport use.

The traffic management changes envisaged as part of the draft transport plan aim to significantly reduce volumes of car traffic in the city centre, opening up space for sustainable transport modes and significantly improving the public realm by allowing greening and the development of new public spaces for residents, workers and visitors to the city centre.<sup>12</sup> A public consultation was undertaken as part of this process. Other local authorities, such as Dun Laoghaire-Rathdown County Council, are also looking at similar proposals to reduce traffic volumes.

### Centralisation of resources in the local authority sector

The Department of the Environment, Climate and Communications (DECC) is looking to develop a business case for an enhanced enforcement structure known as REGAIN to support the provision of improved coordination, expertise and advice to underpin the consistent implementation of environmental noise, noise nuisance and air quality legislation across the country. Establishment of a suitable support structure will be essential in providing advice, guidance, training, advocacy and other supports, which would ensure a more consistent approach to air and noise enforcement

and the successful undertaking of statutory functions such as the delivery of strategic noise maps, noise action plans and health assessments across the state.

## 7. Emerging issues

### Night-time economy

The night-time economy includes cultural activities, entertainment, hospitality, festivals, sport and retail activities, with the aim of providing a safe and secure space in which to work and/or socialise.<sup>13</sup>

Noise is an issue that needs serious consideration if the protection of residential amenity and the operation of new initiatives such as the night-time economy are to be managed in a balanced manner, allowing our cities and towns to develop as vibrant places to live, socialise and work.

There are proposals for the reform and streamlining of licensing laws to support and stimulate the night-time economy, and this will inevitably be associated with an increased need for noise management. It is important that steps are taken early to ensure that robust noise mitigation actions are taken to minimise any need to address breaches in the first place.

### Drones (unmanned aircraft systems)

The EEA has stated that drones are a technology with uncertain potential for reducing greenhouse gas emissions from e-commerce and the logistics industry, with concerns over increased noise pollution and threats to wildlife (EEA, 2021b). The Irish Aviation Authority supervises and implements the Unmanned Aircraft Systems Regulation in Ireland (S.I. No. 24/2023). The perception of drones by the public has been negatively affected by the noise they make, often perceived as annoying. Some recent research has studied how the impact of drone noise on communities can be reduced by both diverting their flight paths away from quieter areas and optimising vehicle design.<sup>14</sup>

12 Draft Dublin City Centre Transport Plan: [consultation.dublincity.ie/traffic-and-transport/draft-dublin-city-centre-transport-plan/](https://consultation.dublincity.ie/traffic-and-transport/draft-dublin-city-centre-transport-plan/) (accessed 24 April 2024).

13 Night-Time Economy Taskforce: [www.gov.ie/en/publication/d86df-night-time-economy-taskforce/](https://www.gov.ie/en/publication/d86df-night-time-economy-taskforce/) (accessed 24 April 2024).

14 [researchoutreach.org/articles/how-make-noisy-drones-little-less-irritating/](https://researchoutreach.org/articles/how-make-noisy-drones-little-less-irritating/) (accessed 24 April 2024).





### Heat pumps

Electrical heat pumps use a compressor to draw heat from a low-temperature source, such as external air or the ground, to heat the building interior. Most modern air source heat pumps should not make more than a low whirring sound when working properly. The outdoor unit should be sited as far away from windows and neighbouring property as possible. As their use and uptake increases, there may need to be further information on noise mitigation and guidance.

## 8. Conclusions

### Environmental noise can have an adverse impact on health and quality of life

Local authorities and other organisations implementing noise legislation, in collaboration with those authorities responsible for transport infrastructure, need to focus more on resolving noise issues, including the increasing numbers of complaints, particularly in more urban areas with high exposure from road traffic noise and around Dublin Airport.

In relation to urban renewal and development projects, the Healthy Ireland initiative highlights the potential to maximise the health and environmental co-benefits of such projects by involving health and local authorities in their design and implementation. The Sláintecare Healthy Communities Programme, the Healthy Ireland Fund and the Healthy Cities and Counties initiative are all ways in which local communities, local authorities, the health system and national policy can be linked to improve facilities and supports for health and wellbeing at the local level.

### There is a need for better implementation of local authority noise action plans

Most local authorities struggle to implement their noise action plans and reduce overall exposure to excessively noisy environments. Protection of areas where environmental noise quality is good should be prioritised through the designation of quiet areas in the action plans.

The noise action plan progress reports show that many of the local authorities have not been prioritising their noise action plan-related actions. There has also been an issue in which some local authorities have been unsuccessful

in securing funding for possible remedial measures for roads from relevant funding agencies such as TII. Thus, clarity on roles, responsibilities and funding is a critical issue that will need to be addressed going forward.

### Meeting the targets set in the EU Zero Pollution Action Plan – a major challenge

Specific measures are needed to allow Ireland to contribute to the overall 30% reduction target across the EU to reduce the negative impacts of exposure to transport noise by 2030, as set out in the EU Zero Pollution Action Plan (EC, 2021).

A range of options should be considered in relation to better noise management, including better urban and transport planning and significant reductions in road traffic noise. Other measures could include better acoustic design for developments, reducing speed limits on Irish roads, redesigning roadways using low-noise road surfaces, a balanced approach around airport operations, and creating low-noise-emission zones and quiet areas.

### National Planning Framework supporting the proactive management of noise

Statutory planning guidance would be useful to set out how our approach and actions to avoid, mitigate or reduce environmental noise should be implemented on the ground at a local level. This guidance could also consider the proactive implementation of the 2018 WHO noise and health guidelines, similar to the way that the WHO air quality guidelines are being integrated into the Clean Air Strategy for Ireland.<sup>15</sup> Furthermore, the implementation of the noise policy objective in the National Planning Framework 2040 (DHLGH, 2019a) would be a welcome step in improving planning and noise management.

Urban sound planning refers to the task of managing and improving the acoustic environment within the scope of urban planning projects (EPA Network, 2021). Local authorities, urban planners and landscape architects could take into account acoustic components in their design choices. When considering the acoustic design of developments and construction, urban and transport planning needs to consider potential noise impacts to prevent new high-exposure situations developing. To help reduce overall noise exposure all organisations with responsibilities for roads, including TII and the

15 [www.gov.ie/en/publication/927e0-clean-air-strategy/](http://www.gov.ie/en/publication/927e0-clean-air-strategy/) (accessed 30 April 2024).



Department of Transport, have a key part to play and should actively work to incorporate measures for noise reduction and mitigation for national roads into local authority noise action plans, including considerations around low-noise road surfaces (Topic Box 3.3).

#### Topic Box 3.3 Low-noise road surfaces

The interaction between tyres and the road surface is generally one of the most common sources of traffic noise. Noise-reducing road surfaces, such as porous asphalt, can have significant benefits in reducing noise. In Ireland, we sometimes categorise stone mastic asphalt (SMA) of 12-14 mm diameter as a low road noise surface, but this is not in line with the CNOSSOS-EU categorisation in which a low road surface should have an SMA stone grading of 6-8 mm. TII has published interim CNOSSOS-EU road surface correction factors (TII, 2022) based on research undertaken on three common road surfaces used on national roads in Ireland. The research shows that all three surfaces result in noise emissions above those of the CNOSSOS-EU reference surface. For comparison, the SMA 10 mm surfaces currently in use in the Netherlands' strategic road network may be up to 6 dB less noisy (Shilton *et al.*, 2023) than the Irish road surfaces examined. Given the link between road surface type and noise generation, this is an area that merits further research in the Irish context.

### A national noise strategy would drive improvements

In Ireland, noise is often regarded as a forgotten pollutant. As demonstrated in the 2018 WHO noise guidelines, excessive noise is an important public health issue, while the round 4 noise maps have clearly shown that road noise, particularly in the larger urban areas, is affecting a significant portion of the population. In this context, a national noise policy statement or strategy has the potential to provide the framework within which integrated noise measures could be identified and promoted across government, industry and society.

The national noise strategy could also consider a cross-sectoral approach to noise pollution. Strategies that may be effective for mitigating both environmental noise and air pollution from transport include traffic calming measures, improvements in cycling and walking infrastructure, the use of environmentally friendly vehicles, urban planning measures, improvements in public transport and increases in greenery, and the use of energy-efficient buildings.

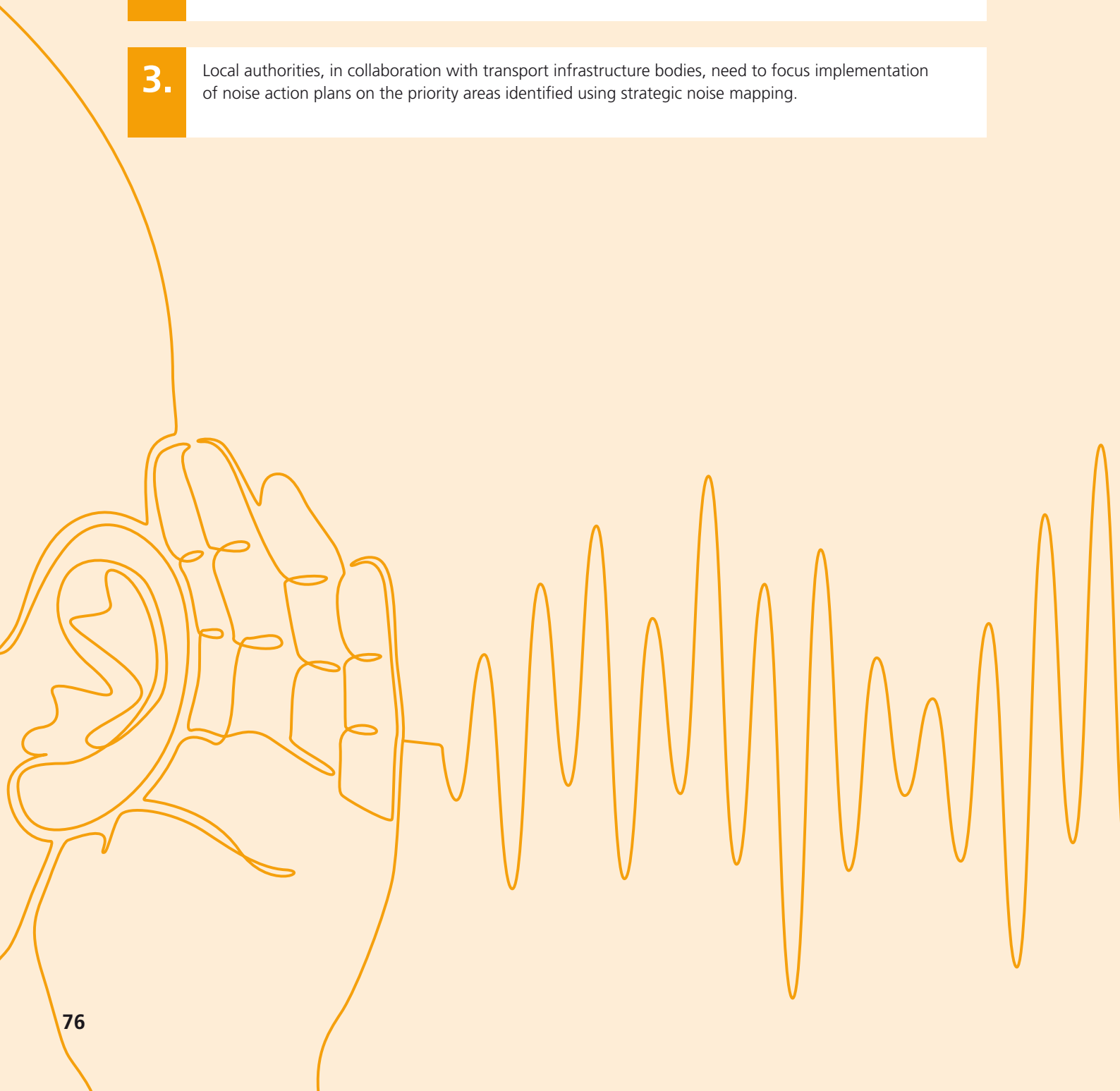
Overall, in the transport noise area there is also a need for clarity about the funding available for noise mitigation measures, about the responsibility for measures for national roads identified in the noise action plans, and about linking the plans to a national strategy for environmental noise and the development of noise planning guidance. These systemic issues and uncertainties make it challenging for local authorities to progress their noise action plans.





## Key chapter messages

- 1.** Environmental noise is the second biggest environmental cause of health problems in the EU. In Ireland, over 1 million people are likely to be exposed to noise levels above the mandatory reporting thresholds.
- 2.** National policy for environmental noise is not as well advanced as in other environmental areas. There is a need for coordinated national policy and actions around planning, health and transport infrastructure to reduce noise exposure.
- 3.** Local authorities, in collaboration with transport infrastructure bodies, need to focus implementation of noise action plans on the priority areas identified using strategic noise mapping.





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