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IDENTIFYING EMERGING ENVIRONMENTAL NOISE CHALLENGES AND FUTURE PRIORITIES IN IRELAND: INSIGHTS FROM THE FIRST NATIONAL NOISE SUMMIT

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Abstract

Technological advancements are reshaping environmental noise environments, with emerging sources such as electric vehicles and drones increasingly present in urban areas. In this context, the EPA-funded Noise 2050 project in Ireland explores future noise environments towards 2050 and how to prepare for emerging challenges. To support this objective, Ireland's first National Noise Summit was organised, bringing together stakeholders from government, research, consultancy, infrastructure and industry. In advance of the event, participants completed a structured questionnaire addressing current noise challenges, key barriers, priority emerging sources, and future challenges. Transport noise remains the dominant concern, while emerging technologies and energy-related sources are expected to increase future noise complexity. Key barriers relate mainly to governance and implementation capacity. Findings suggest that future noise challenges are shaped by both source diversity and policy constraints. The survey informed summit discussions and provides insights into future environmental noise challenges in Ireland and informs the strategic direction of the Noise 2050 project.

Keywords: *environmental noise, stakeholder perspectives, emerging noise sources, future noise challenges*

1. Introduction

Technological developments are reshaping urban sound environments through the emergence of new noise sources such as electric mobility, heat pumps, drones, and other transport innovations. At the same time,

urban growth and infrastructure expansion are increasing exposure to environmental noise, expanding the reach and complexity of affected areas.

Environmental noise is linked to adverse health outcomes including sleep disturbance, annoyance, cognitive impairment, and cardiovascular disease [1]. Despite WHO guidelines identifying transportation noise as a major health risk, European Environment Agency assessments show that a substantial share of the population, including in Ireland, remains exposed to levels above guidelines, particularly from road, rail, and aircraft noise [2], [3]. Nevertheless, environmental noise remains an underprioritised public health issue across Europe [4].

In Ireland, environmental noise governance is primarily based on the EU Environmental Noise Directive [5], transposed through the Environmental Noise Regulations governing strategic noise mapping and action planning (S.I. 140/2006, later amended by S.I. 549/2018 and S.I. 663/2021) [6], [7], [8]. The Environmental Protection Agency Act (1992) [9] also provides for noise management at local authority level. At policy level, Project Ireland 2040 – the National Planning Framework [10] recognises the importance of proactive noise management through National Policy Objective 65, although Ireland currently lacks a dedicated national noise strategy and does not set any statutory environmental noise limits at national level.

To support long-term environmental noise planning, the EPA-funded Noise 2050 Project investigates future sound environments and emerging challenges towards 2050. Within this framework, the project organised Ireland's first National Noise Summit, bringing together stakeholders from government, research, and industry. A pre-event questionnaire capture perspectives on current noise issues, barriers, emerging sources, and future challenges, forming the basis of the analysis presented in this paper.

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2. First Noise Summit Ireland

The First National Noise Summit Ireland¹ was held on 29 May 2026 at the University of Galway (Ireland), representing a key milestone of the Noise 2050 project in engaging environmental noise stakeholders and capturing sectoral needs. The event brought together over 70 participants (Fig. 1).



Figure 1: First Noise Summit Ireland at University of Galway (2026), organized by the Noise 2050 project team.

The participant profile was dominated by industry and practitioners (47%), followed by local authorities (19%), researchers (18%), and government bodies (15%). This composition supports a multi-sectoral perspective on environmental noise.

Prior to the event, participants completed a structured questionnaire on environmental noise in Ireland as part of the registration process. The questions were designed as an exploratory scoping exercise to capture stakeholder perspectives and inform discussions during the National Noise Summit. The survey comprised three open-ended questions (Q1A–Q3) addressing: (i) current environmental noise issues and associated barriers (Q1A–Q1B), (ii) emerging noise sources to be prioritised within the Noise 2050 project (Q2), and (iii) key challenges for environmental noise management towards 2050 in Ireland (Q3). As responses were collected through registration rather than in-depth qualitative interviews, the analysis aimed to identify broad thematic patterns and priorities and provide an overview of stakeholder views. Responses were analysed using qualitative content analysis. All answers were systematically reviewed, inductively coded, and organised into thematic categories representing recurring patterns. Category frequencies were then quantified to provide a descriptive overview of the dataset. As respondents could submit multiple answers per question, percentages were calculated based on the total number of responses per item, resulting in category totals exceeding 100%.

3. Results

A total of 69 responses were collected through the pre-event questionnaire. Following data screening, four responses were excluded as outliers, resulting

in a final dataset of 65 valid responses. The analysis identified key themes and categories across the three open-ended questions, which were quantified to provide a descriptive overview of participants' perspectives. Percentages represent the proportion of respondents mentioning each category at least once.

3.1. Current environmental noise issues

Analysis of responses to Q1A identified three main themes describing the current environmental noise issues in Ireland: *transport-related noise sources*; *exposure and local sound environment issues*; and *non-transport-related noise sources* (Table 1). Of the 65 respondents, 63% provided valid answers, while 37% did not respond to this question.

Table 1: Themes, categories and frequencies from Q1A. Percentages refer to respondents mentioning each category.

Question 1A:	
What are Ireland's main environmental noise issues...?	
	%
Transport-related noise sources	80%
Road traffic noise	51%
Aircraft and aviation-related noise (including Advanced Air Mobility)	32%
Transport noise (unspecified mode)	20%
Railway noise	17%
Exposure and local sound environment issues	32%
Increasing exposure due to urbanisation and land-use planning	15%
Neighbourhood noise and local disturbance	15%
Increasing background noise and loss of quiet areas	10%
Non-transport related noise sources	22%
Construction, commercial and industrial noise	17%
Renewable energy and energy infrastructure noise	7%
Heat pumps and building services equipment noise	7%
Noise from emerging technologies	5%

Transport-related noise sources were the dominant response, mentioned by 80% of participants. Road traffic noise was the main concern (51%), followed by aircraft noise (32%) and railway noise (17%). Transport noise was identified as a persistent issue, particularly in urban areas and along major roads, associated with increasing traffic volumes, intensifying transport corridors, and with limitations of existing mitigation measures. Dependence on private vehicles and limited public transport provision further suggest transport noise is viewed as both an acoustical issue and a wider planning and mobility challenge. Aircraft noise, including UAVs (Unmanned Aerial Vehicles) and Advanced Air Mobility, was also highlighted for its potential future relevance to transport systems. The second theme (32%) shifted attention from individual sources to broader exposure patterns and local sound environment quality. Urbanisation and densification were linked to closer residential proximity to noise sources, local nuisance, and community complaints. Increasing background noise, also described as “noise creep”, were associated with continuous or

¹<https://www.noise2050.com/noise-summit-2026>

24-hour operational, including some references to logistics activity and infrastructure operations. Non-transport-related noise sources were mentioned by 22% of respondents and reflected a diverse range of concerns. Construction, commercial and industrial activities formed the largest category, including building works, industrial facilities and data centres. Renewable energy developments, particularly wind farms, together with building services equipment (e.g. heat pumps and ventilation systems) and emerging technologies such as electric vehicle warning sounds, were also identified, reflecting a more diverse noise landscape.

3.2. Current barriers to addressing noise

Analysis of responses to Q1B identified three main themes describing the barriers to addressing current environmental noise issues in Ireland: *governance, policy and institutional coordination barriers*; *implementation capacity, resources and technical constraints*; and *public awareness and engagement* (Table 2). Of the 65 respondents, 80% provided valid answers, while 20% did not respond to this question.

Table 2: Themes, categories and frequencies from Q1B. Percentages refer to respondents mentioning each category.

Question 1B: What are the barriers to addressing the main environmental noise issues identified in Question 1A?		%
Governance, policy and institutional coordination barriers		73%
Fragmented planning and unclear institutional responsibilities		35%
Regulatory and policy gaps		23%
Lack of clear and up-to-date guidance		23%
Competing development and policy priorities		15%
Limited political priority and leadership		12%
Implementation capacity, resources and technical constraints		60%
Funding and resource constraints		19%
Limited technical expertise within authorities		15%
Enforcement limitations and lack of statutory noise limits		13%
Challenges in implementing effective mitigation measures		12%
Data, monitoring and assessment limitations		8%
Public awareness and engagement		10%
Low levels of public awareness and engagement		10%

Governance, policy and institutional coordination barriers constituted the most prominent theme, mentioned by 73% of respondents. The main issues concerned fragmented planning processes and unclear institutional responsibilities, with respondents highlighting dispersed responsibilities across authorities, limited coordination, and the tendency for noise to be addressed reactively rather than integrated into land-use and transport planning from an early stage. Participants also identified gaps in national policy and guidance, including the lack of a coherent national framework, outdated or insufficient guidance, and uncertainty regarding emerging sources and renewable energy developments. In addition, environmental noise was identified as competing with wider prior-

ities such as housing, infrastructure expansion and economic development, while limited political priority and leadership were also identified as barriers to effective noise management.

Implementation capacity, resources and technical constraints were mentioned by 60% of respondents. The main issues concerned funding and resource constraints, including limited and delayed funding for mitigation measures and the under-resourcing of local authorities. Limited technical expertise within authorities was also highlighted, including shortages of noise specialists and training needs for further training and capacity building. Data, monitoring and assessment limitations were reported, particularly in relation to incomplete baseline information and the lack of integrated noise data systems. Respondents also noted challenges in implementing effective mitigation measures, especially for road traffic noise, and preserving quiet areas. Enforcement limitations included inconsistent enforcement practices and the absence of clear statutory noise limits in some contexts.

Public awareness and engagement were identified by 10% of respondents as barriers to effective noise management. Limited awareness of noise impacts and exposure levels was seen as reducing support for mitigation measures, while communication and engagement challenges were also identified.

3.3. Emerging noise sources (project priorities)

Analysis of responses to Q2 identified three main themes describing priority emerging noise sources for consideration within the Noise 2050 project: *emerging technologies and energy transition sources*; *conventional transport noise sources*; and *urban development, logistics and night-time activity sources* (Table 3). Of the 65 respondents, 91% provided valid answers, while 9% did not respond to this question.

Emerging technologies and energy transition sources dominated responses, mentioned by 90% of participants. Drone noise and advanced air mobility was the most cited category (61%), with particular emphasis on delivery drones and their novel acoustic signatures. Heat pumps and building services equipment were also widely identified (46%), reflecting concerns regarding their increasing presence in residential areas. Renewable energy infrastructure, particularly wind turbines (22%), and energy-transition sources (14%), including battery energy storage systems (BESS), grid infrastructure and solar inverters, were identified as contributors to environmental noise. Electric vehicles (14%) were associated with changes in the spectral characteristics of road traffic noise, while data centres and associated digital infrastructure (8%) were identified as additional predominantly continuous noise sources.

Conventional transport noise sources were also mentioned, by 29% of respondents, with road traffic (14%), railway noise (12%) and aircraft noise (5%) all identified. These findings indicate that traditional transport sources remain relevant considerations within the

Table 3: Themes, categories and frequencies from Q2. Percentages refer to respondents mentioning each category.

Question 2: Which emerging noise sources should Noise 2050 Project consider as a priority?		%
Emerging technologies and energy transition sources		90%
Drone noise and advanced air mobility		61%
Heat Pumps and building services equipment noise		46%
Wind turbines and renewable energy infrastructure noise		22%
Electric vehicles noise		14%
Energy storage and electrical infrastructure noise		14%
Data centres and digital infrastructure noise		8%
Conventional transport noise sources		29%
Road traffic noise		14%
Railway noise		12%
Transport noise (unspecified mode)		8%
Aircraft noise		5%
Urban development, logistics and night-time activities sources		14%
Construction and plant noise		10%
Urban development, logistics and night-time activities		7%

scope of future noise challenges addressed by participants.

Urban development, logistics and night-time activity were identified by 14% of respondents. Construction and plant noise (10%) were linked to infrastructure development, while logistics changes, night-time deliveries and higher-density urban environments (7%) emerged as contributors to local noise exposure.

3.4. Biggest challenges for 2050

Analysis of responses to Q3 identified four main themes describing the key challenges for environmental noise management towards 2050 in Ireland: *governance, policy and strategic challenges*; *urban growth and technological change*; *implementation capacity and institutional resources* and *data, monitoring and evidence-based management*; (Table 4). Of the 65 respondents, 80% provided valid answers, while 20% did not respond to this question.

Governance, policy and strategic challenges were the most prominent theme, mentioned by 57% of respondents. Regulatory and policy gaps and the absence of a coherent national framework (25%) were frequently identified, with references to limited legislative clarity, regulatory lag, and the need for stronger integration of noise into planning and policy frameworks. Noise integration into planning and cross-sector coordination challenges (20%) were also highlighted, particularly in relation to fragmented responsibilities, inconsistent planning approaches, and the need for earlier incorporation of noise into decision-making across housing, transport, and infrastructure sectors. Competing policy and development priorities (20%) reflected tensions between noise management objectives and housing delivery, transport expansion, and broader economic

Table 4: Themes, categories and frequencies from Q3. Percentages refer to respondents mentioning each category.

Question 3: Looking ahead, what is the biggest challenge for managing noise towards 2050 in Ireland?		%
Governance, policy and strategic challenges		57%
Regulatory and policy gaps and lack of national framework		25%
Integration of noise management into planning and cross-sector coordination challenges		20%
Competing policy and development priorities		20%
Adapting policy and guidance to emerging technologies		10%
Limited political priority and leadership		8%
Urban growth and technological change		26%
Urbanisation, densification and population growth		15%
Emerging technologies and energy transition		11%
Transport growth and changing mobility patterns		10%
Public awareness and perception of emerging technologies		5%
Implementation capacity and institutional resources		25%
Funding and resource constraints		21%
Regulatory enforcement challenges		5%
Data, monitoring and evidence-based management		18%
Monitoring, data and noise assessment challenges		15%
Identifying effective mitigation measures		8%

development. Additional responses referred to the need to adapt policy and guidance to emerging technologies (10%), while limited political priority and leadership (8%) were also identified as barriers

Challenges associated with urban growth and technological change were mentioned by 26% of respondents. Urbanisation and population growth (15%) were linked to increased exposure to noise through higher population densities and closer proximity to infrastructure and activity sources. Emerging technologies and energy transition-related sources (11%) included drones and renewable energy infrastructure reflecting concerns about evolving acoustic environments. Transport growth and changing mobility patterns (10%) were further identified, reflecting expected changes in traffic and transport systems. A smaller number of responses (5%) also referred to awareness of emerging technologies as contributing factors.

Implementation capacity and institutional resources were identified by 25%. Funding and resource constraints (21%) were the most common issue, followed by enforcement challenges (5%). The fourth theme, data, monitoring and evidence-based management, was mentioned by 18% of respondents. Participants highlighted the need for improved monitoring, higher-quality data and more robust assessment approaches capable of addressing more complex acoustic environments (15%). Identifying effective mitigation measures (8%) was also mentioned, emphasising the need to move from reactive approaches towards more proactive and source-oriented noise control strategies.

4. Discussion

This study provide insights into how environmental noise is perceived and prioritised by stakeholders in Ireland. Rather than being viewed as a set of discrete source-specific issues, environmental noise is increasingly understood as the outcome of interacting sys-

temic pressures, including urban growth, technological change, and evolving mobility patterns. These drivers create a more complex acoustic environment characterised by overlapping sources, continuous exposure, and rising in background noise levels.

There are some limitations that should be acknowledged when interpreting the findings of this study. Results are based on a relatively small sample ($n = 65$) from a single national event. Additionally, the stakeholder composition was weighted towards industry, practitioners, and technical experts, with limited representation from government and without public or community perspectives. As a result, the findings are likely to reflect operational and implementation-oriented viewpoints rather than lived experience of noise exposure. Nevertheless, the study provides a snapshot of contemporary stakeholder perspectives on environmental noise in Ireland and identifies emerging themes that warrant further investigation.

Transport noise remains the dominant environmental noise issue in Ireland. However, respondents also highlighted the growing influence of urban development, cumulative exposure to local sources, and emerging technologies, suggesting that future noise management will need to address an increasingly diverse set of challenges. While road, rail and aircraft noise remain important concerns, future acoustic environments are expected to be shaped by a wider range of distributed and often less well-characterised sources associated with energy systems, digital infrastructure and changing patterns of urban activity.

A notable finding is that the principal barriers identified by respondents were predominantly institutional rather than technical. Governance fragmentation, unclear responsibilities, regulatory gaps and insufficient guidance were the main obstacles. These limitations appear to influence implementation capacity through constrained funding, uneven expertise and limited institutional resources. Although causality cannot be inferred, the responses suggest that implementation challenges reflect broader governance and policy deficiencies. This pattern is further reinforced by the relatively low priority assigned to political leadership, implying that environmental noise continues to occupy a secondary position within wider policy agendas.

Interestingly, although Question 2 explicitly focused on emerging noise sources, respondents also identified conventional transport noise sources as priorities for the Noise 2050 project. This indicates that stakeholders do not perceive emerging and traditional sources as mutually exclusive categories. Instead, future environmental noise management appears likely to involve addressing new technologies and changing acoustic environments while continuing to manage the long-standing impacts of road, rail and aircraft noise.

Participants viewed the main challenge towards 2050 not as controlling individual sources, but as developing governance structures, institutional capacity and evidence-based approaches capable of keeping pace with urban growth, technological change and in-

creasingly complex acoustic environments. Across all questions, a consistent pattern emerged: the principal constraints identified by stakeholders lie not solely in the availability of technical solutions, but in the ability of existing governance arrangements and planning systems to respond effectively to evolving conditions.

Collectively, these findings suggest that environmental noise is increasingly viewed as a systemic planning and governance issue rather than solely a technical or source-specific problem in Ireland. While existing frameworks and mechanisms, including Noise Action Plans, provide an important basis for environmental noise management, respondents highlighted challenges associated with coordination, implementation and the integration of noise considerations into wider planning processes. The responses also point to the limitations of predominantly reactive approaches, whereby noise is often addressed at the level of individual developments or complaints, reinforcing the importance of integrating noise into planning and policy.

An important finding is the limited explicit connection between environmental noise and public health within stakeholder responses. Although there are well established health impacts of environmental noise, participants predominantly framed noise as an operational issue linked to planning, infrastructure and regulation. This suggests a potential disconnect between the health-based framing of environmental noise in international guidelines and its treatment in policy and governance. This disconnect may explain the relatively low political priority afforded to environmental noise, as issues framed primarily in technical or infrastructural terms may receive less attention than those explicitly linked to population health outcomes. The governance and institutional barriers identified may not only constrain implementation capacity, but also reflect the absence of a strong public health framing within policy discourse.

4.1. Implications for noise 2050

The findings provide input to the Noise 2050 project by identifying the range of noise sources that will be relevant for future assessment in Ireland. Responses highlight both emerging sources, such as drones, advanced air mobility, heat pumps, and renewable energy infrastructure, and continued relevance of conventional transport sources, including road, rail, and aircraft noise. This suggests that future work within the project should account for a broad and evolving range of noise sources.

These findings provide an evidence base to support ongoing work within the Noise 2050 project, particularly in relation to the consideration of relevant noise sources, the exploration of emerging environmental noise challenges, and the development of future scenario frameworks. They also contribute to internal project discussions on how stakeholder input can be integrated into the structuring of future research activities.



4.2. Implications for Ireland

From a national perspective, the results indicate that Ireland is entering a period in which environmental noise will increasingly be influenced by structural changes in urban development, transport systems and energy infrastructure. Population growth, housing demand and infrastructure expansion are expected to increase the complexity of acoustic environments, while technological and energy transitions introduce new and less well-characterised sources of noise.

At the same time, the persistence of governance fragmentation and implementation constraints suggests that institutional adaptation may lag behind these developments. Limited resources, uneven technical expertise and fragmented responsibilities may restrict the ability of existing systems to respond effectively, particularly within local authorities where many implementation and enforcement functions are concentrated.

The findings therefore suggest that future noise policy in Ireland may need to move beyond source-specific mitigation towards more integrated and cross-sectoral approaches that align housing, transport, energy and environmental objectives. In this context, strengthening institutional capacity, improving coordination across governance levels and enhancing the integration of noise considerations into strategic planning processes are likely to be as important as the development and implementation of effective mitigation measures and long-term noise management strategies themselves.

5. Conclusion

This study presents the first structured assessment of stakeholder perspectives on future environmental noise challenges in Ireland within the context of the Noise 2050 project. The findings suggest that environmental noise should be understood not as the cumulative effect of isolated source-specific problems, but as a systemic consequence of wider urban, technological, and infrastructural transformations. While transport noise remains the dominant concern, particularly road traffic, aircraft, and railway noise, stakeholders also emphasise a growing relevance of emerging sources such as drones, heat pumps, and energy-related infrastructure, reflecting an expanding and more diverse acoustic landscape towards 2050.

Across all thematic areas, respondents consistently highlighted that future environmental noise will be characterised by increased complexity, cumulative exposure, and the coexistence of both conventional and emerging sources. In parallel, the analysis identified governance and institutional factors as the primary barriers to effective noise management, including fragmented responsibilities, regulatory gaps, limited coordination, and constrained implementation capacity. These findings suggest that current approaches to environmental noise remain largely reactive and insufficiently integrated within broader planning and policy frameworks.

Looking towards 2050, the principal challenge identified by stakeholders is the development of governance structures and institutional capacities capable of addressing evolving acoustic environments shaped by urban growth, technological change, and energy transition. Overall, the results highlight the importance of integrating noise considerations earlier within spatial planning and sectoral decision-making across transport, energy, and urban development.

These insights provide a high-level evidence base to inform the ongoing development of the Noise 2050 project, particularly in relation to understanding emerging challenges, supporting future scenario thinking, and identifying relevant areas for further research.

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