7. Population and Human Health

7.1 Introduction

7.1.1 This chapter of the EIAR details the findings of an assessment of the likely effects on population and human health as a result of the proposed Relevant Action. This iteration of the chapter is a replacement for Chapter 7 in the 2021 EIAR, highlighting the revisions and updates made to account for changes since the 2021 EIAR. The appraisal of likely significant effects of the proposed Relevant Action on population and human health has been conducted by reviewing the Current State of the Environment in socio-economic terms and the anticipated Future Receiving Environment in the 2025 and 2035 Assessment Years.

7.1.2 This assessment will focus on impacts on:

- Amenity and local communities (effects on amenity uses of a site or of other areas in the vicinity); and
- Human health and well-being (to consider the impact of the proposed Relevant Action on the health and wellbeing of the communities).

7.1.3 This chapter describes the national and local policy and legislation context; the relevant literature on potential impacts on population and human health; assessment methods used; Current State of the Environment; potential direct and indirect population impacts during the operational phase of the proposed Relevant Action; potential human health and well-being impacts during the operational phase of the proposed Relevant Action; mitigation measures; and relevant residual effects for each of the Assessment Years.

7.1.4 The proposed Relevant Action will be an operational change, to remove the numerical cap on the number of flights permitted between the hours of 23:00 and 07:00 daily in the Permitted Scenario, replacing it with an annual night-time noise quota, and to allow flights to take off from and/or land on the North Runway (Runway 10L 28R) for an additional two hours i.e. 23:00 to 00:00 and 06:00 to 07:00

7.1.5 Overall, the Proposed Scenario would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00 in accordance with the annual night-time noise quota and this also results in a faster return to 32mppa than in the Permitted Scenario. Between 2022 and 2026 there would be more passengers using the airport in the Proposed Scenario, which reaches the 32mppa Cap in 2025. However, by 2026 the 32mppa Cap will also have been reached in the Permitted Scenario, meaning that the return to the pre-Covid-19 passenger throughput will take approximately two years longer than in the Proposed Scenario.

7.1.6 Further information of the economic impact of the Permitted Scenario, and the proposed Relevant Action is provided in *Chapter 3: Need for the Project*, and the updated InterVISTAS report Dublin Airport Economic Impact of Operating Restrictions[1] which is provided in Appendix 3A.

7.2 Legislation, Guidance and Planning Policy Context

National Guidance

7.2.1 The following national guidance is directly applicable to the proposed Relevant Action in terms of the assessment of population and human health effects:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports[2] (hereafter referred to as 'the EPA Guidelines');

[1] InterVISTAS (2023): Dublin Airport Economic Impact of Operating Restrictions, Update - September 2023
[2] Environmental Protection Agency, (2022); Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

- Draft Advice Notes for Preparing Environmental Impact Statements[3];
- Guidelines on the Information to be contained in Environmental Impact Statements[4]; and
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements[5].

National Planning Policy

National Planning Framework: Project Ireland 2040

7.2.2 The National Planning Framework: Project Ireland 2040 is the Government's high-level strategic plan for shaping the future growth and development of Ireland to the year 2040[6]. It is a framework to guide public and private investment, to create and promote opportunities for the people of Ireland, and to protect and enhance the environment.

7.2.3 Chapter 6: People, Homes and Communities of the National Planning Framework: Project Ireland 2040 sets out the following themes of relevance to Population and Human Health:

- 'Quality of Life and Place';
- 'Healthy Communities';
- 'Diverse and Inclusive Ireland';
- 'Age Friendly Communities';
- 'Childcare, Education and Life Long Learning'; and
- 'Housing'.

7.2.4 Within Section 6.2: 'Healthy Communities', it is noted how specific health risks, such as heart disease, respiratory disease, mental health, obesity and other injuries, can be influenced by spatial planning. It is also suggested that by taking a whole-system approach to addressing the many factors that impact on health and wellbeing and which contribute to health inequalities, and by empowering and enabling individuals and communities to make healthier choices, it will be possible to improve health outcomes, particularly for the next generation of citizens.

7.2.5 The following objectives are of relevance to this population and human health assessment:

- National Policy Objective 26: *"Support the objectives of public health policy including Healthy Ireland and the National Physical Activity Plan, though integrating such policies, where appropriate and at the applicable scale, with planning policy".*

Healthy Ireland Framework 2019 - 2025

7.2.6 The Healthy Ireland Framework sets out a vision to create *"A Healthy Ireland, where everyone can enjoy physical and mental health and wellbeing to their full potential, where wellbeing is valued and supported at every level of society and is everyone's responsibility".*

7.2.7 The Healthy Ireland Framework is designed to bring about real, measurable change and is based on an understanding of the determinants of health. Health and wellbeing are affected by all aspects of a person's life; economic status, education, housing, the physical environment in which people live and work.

7.2.8 The Healthy Ireland Framework was launched in 2013 and presents four central goals for improved health and well-being[7]:

- *"increase the proportion of people who are healthy at all stages of life;*
- *Reduce health inequalities;*
- *Protect the public from threats to health and well-being; and*

[3] Environmental Protection Agency, (2017); Draft Advice Notes for Preparing Environmental Impact Statements
[4] Environmental Protection Agency, (2002); Guidelines on the Information to be contained in Environmental Impact Statements.
[5] Environmental Protection Agency, (2002); Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.
[6] Government of Ireland, (2018), National Planning Framework: Project Ireland 2040.
[7] Department of Health, (2019); Healthy Ireland Framework 2019 – 2025.

- *Create an environment where every individual and sector of society can play their part in achieving a healthy Ireland."*

7.2.9 The Healthy Ireland Framework states that *"The area of environment and health, in its broadest sense, comprises those aspects of human health, disease, and injury that are determined or influenced by factors in the environment. This includes not only the study of the direct pathological effects of various chemical, physical, and biological agents, but also the effects on health of the broad physical and social environment, which includes housing, urban development, land use and transportation, industry, and agriculture".* As such, reaffirming the need for the proposed Relevant Action to be considered in respect of its impacts on health.

Healthy Ireland Strategic Action Plan 2021-2025

7.2.10 The Healthy Ireland Strategic Action Plan[8] builds on the work and progress made over the first seven years of the Healthy Ireland Framework and focuses on the remaining years of the Framework from 2021 to 2025. The Strategic Action Plan *"provides a clear roadmap of how we can continue to work together to bring about good health, access to services, healthy environments, and the promotion of resilience and to ensure that everyone can enjoy physical and mental, health and wellbeing, to their full potential".*

7.2.11 Significant progress has been made on implementation since the publication of the Healthy Ireland Framework in 2013. In order to progress further, the Health and Wellbeing Programme within the Department of Health developed this cross-sectoral and strategic Action Plan. The Framework has been split into two phases: 2013 – 2020, and 2021 – 2025.

7.2.12 The four central goals, as identified in the Framework, remain key to phase two:

- *"increase the proportion of people who are healthy at all stages of life;*
- *Reduce health inequalities;*
- *Protect the public from threats to health and well-being; and*
- *Create an environment where every individual and sector of society can play their part in achieving a healthy Ireland."*

7.2.13 Following extensive engagement with stakeholders at all levels, the message was that the six themes identified in the original Framework remain valid, however there is a pressing need to address healthy inequalities. Therefore, Themes 5 and 6 have been merged and the addition of 'Reducing Health Inequalities' has been added for the second phase of implementation.

Overall, this Action Plan *"sets out key actions by theme for the period 2021-2025, the specific implementation actions that will be achieved by end of 2023 and identifies the lead Department for each action".*

Local Planning Policy

Fingal Development Plan 2023 – 2029

7.2.14 FCC adopted the Fingal Development Plan 2023 – 2029 in April 20239; this publication supersedes the previous Development Plan 2017 – 2023. The plan sets out the policies and objectives to achieve the vision for the county over the plan period.

7.2.15 The strategic vision of the Plan has been prepared having regard to the National Strategic Outcomes of the National Planning Framework, the Regional Strategic Outcomes of the Regional Spatial and Economic Strategy, the UN Sustainable Development Goals, the Fingal Corporate Plan 2019–2024 and the aspirations of the people and stakeholders in Fingal. The Plan is underpinned by four key cross cutting themes; climate action, healthy place-making and sustainable development, social inclusion, and high-quality design.

7.2.16 It establishes 13 strategic objectives that aim to:

[8] Government of Ireland, Healthy Ireland, (2021); Strategic Action Plan 2021-2025.
[9] Fingal County Council (April 2023): Fingal Development Plan 2023 – 2029, Interim Publication

- Ensure sustainable use of natural resources;
- Enables Fingal to live within the area's environmental capacity;
- Enable and enhance resilience to climate change; and,
- Create a more open, diverse and inclusive society.

7.2.17 The Plan highlights Fingal's strategic location and major economic assets including specific reference to Dublin Airport. Chapter 8 of the Development Plan focuses on Dublin Airport and its importance to the Irish economy due to its significance as an international gateway of trade, inward investment, tourism, and skilled employment base due to the presence of established and evolving aviation related industries.

7.2.18 The Chapter highlights that the existing scale, function, location and the strength of Dublin Airport's catchment area and growing hub status provides significant opportunities for future growth and development at Dublin Airport, all of which is recognised in National, Regional, and local planning and ancillary policy documents.

Dublin Airport Local Area Plan

7.2.19 FCC adopted the Dublin Airport Local Area Plan[10] in December 2019. The Dublin Airport Local Area Plan identifies various issues of relevance and establishes the principles for future development in the area.

7.2.20 Within Chapter 9 Environment & Community, Figure 9.1 displays the updated Dublin Airport Noise Zones 2019. The accompanying text in Section 9.1 on noise details that these zones have been updated to allow for more effective land use planning within airport noise zones, using evidence on how aircraft noise can affect health and quality of life. Therefore, this text and map will be considered for the amenity and health and well-being assessments.

7.2.21 Appendix 1: Strategy for St. Margaret's Special Policy Area provides a plan and specific policies for the closest settlement to Dublin Airport. This strategy will be considered in the amenity and health and well-being assessment.

Other Legislation, International Policy, Standards and Guidance

Environmental Noise Directive 2002/49/EC

7.2.22 The Environmental Noise Directive (END) 2002/49/EC[11], published in June 2002, relates to the assessment and management of environmental noise within the EU.

7.2.23 The Directive states that it is necessary to establish a common assessment method for environmental noise and define limit values in terms of harmonised indicators for the determination of noise levels. Such limit values are to be determined by the Member States. The selected common noise indicators are L_{den}, to assess annoyance, and L_{night}, to assess sleep disturbance.

7.2.24 The harmful effects of environmental noise may be assessed by the means of dose-effects relations as set out in Annex III of END 2002/49/EC. Annex III states that dose-effect relations will concern the relation between annoyance and L_{den}, and relation between sleep disturbance and L_{night} for air traffic noise.

7.2.25 The END obliges the European Commission to adapt the END Annexes I-III to account for technical and scientific progress.

WHO Environmental Noise Guidelines for the European Region

7.2.26 The World Health Organisation (WHO) Regional Office for Europe published Environmental Noise Guideline for the European Region[12] in 2018. The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from

[10] Fingal County Council, (2019); Dublin Airport Local Area Plan. Available at: dublin-airport-lap-2020-1.pdf (fingalppn.ie)
[11] European Commission, (2002); Environmental Noise Directive 2002/49/EC. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0049&from=EN
[12] World Health Organisation Regional Office for Europe, (2018); Environmental Noise Guidelines for the European Region. Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

various sources including aircraft. The guidelines provide robust public health advice underpinned by evidence.

7.2.27 In respect of aircraft noise, the Environmental Noise Guidelines set out the following recommendations:

- For average daytime noise exposure, it is strongly recommended that daytime noise levels produced by aircraft are below 45 dB L_{den};
- For average night noise exposure, it is strongly recommended that noise levels that night noise levels produced by aircraft are below 40 dB L_{night}; and
- To reduce health effects, policy makers should implement suitable measures to reduce noise exposure where the population is exposed to levels above the guideline values for average daytime and night noise exposure.

EU Commission Directive 2020/367

7.2.28 EU Commission Directive 2020/367[13], published in March 2020, concerns the amendment of Annex III within END 2002/49/EC. At the time of adoption of END 2002/49/EC, the high quality and statistically significant information that could be used was that of the WHO Environmental Noise Guidelines for the European Region, presenting dose-effect relations for harmful effects induced by the exposure to environmental noise. Consequently, the dose-effect relations introduced in Annex III to Directive 2002/49/EC should be based on those guidelines. However, by 31st December 2021, all Member States are to bring into force the laws, regulations and administrative provisions necessary to comply with the updated Annex III to END 2002/49/EC as set out in EU Commission Directive 2020/367[14].

7.2.29 The update to Annex III sets out the assessment methods for harmful effects from environmental noise. The harmful effects to be considered include ischaemic heart disease (IHD) (corresponding to codes BA40 and BA6Z of the international classification ICD-11 established by the WHO), high annoyance, and high sleep disturbance. The update to Annex III identifies the formulae to be used which compute a value for the proportion of a population highly annoyed or highly sleep disturbed from noise from specific sources, including aircraft.

London Healthy Urban Development Unit: Rapid Health Impact Assessment Tool (Fourth Edition)

7.2.30 The London Health Urban Development Unit (HUDU) Rapid Health Impact Assessment Tool[15], published in October 2019, is designed to assess the likely health impacts of development plans, and planning applications. The toolkit helps to identify determinants of health which are likely to be influenced by a specific development proposal, as well as issues directly or indirectly influenced by planning decisions. The way in which the London HUDU Rapid Health Impact Assessment Tool has supported the assessment is detailed in Section 7.3 Methodology.

7.3 Assessment Methodology

Study Area

7.3.1 As there is no national guidance available on identifying an appropriate study area to focus the assessment of population and human health, the study area for the population and human health assessment has considered the area of land that may be affected by the proposed Relevant Action.

7.3.2 For amenity and land use effects, receptors have been identified within 500m of the proposed Relevant Action. It should be noted, however, that it is not always possible to determine the catchment area for community facilities. Residents of an area may utilise facilities located within different electoral divisions, counties or regions without regard for statutory boundaries. For this reason, some receptors beyond 500m have been identified, as relevant.

[13] European Commission, (2020); Commission Directive (EU) 2020/367 of 4 March 2020 amending Annex III to Directive 2002/49/EC of the European Parliament and of the Council as regards the establishment of assessment methods for harmful effects of environmental noise. Available at: https://eur-lex.europa.eu/eli/dir/2020/367/oj
[14] END Annex III has been considered in this assessment following RFI no. 83 from ANCA
[15] London Healthy Urban Development Unit, (2019); HUDU Planning for Health: Rapid Health Impact Assessment Tool (Fourth Edition, October 2019).

7.3.3 For human health and well-being, the study area comprises the two local electoral divisions, as well as the wider administrative geography of Fingal County.

Methodology for Determining the Current State of the Environment and Sensitive Receptors

7.3.4 A community profile helps to establish an in-depth understanding of the population affected by the proposed Relevant Action, identifying potentially vulnerable groups. In order to gather information pertaining to employment, demographics, human health and local amenities, a robust desktop study has been undertaken, drawing on information from the following sources:

- Central Statistics Office (CSO);
- FCC; and
- The 2016 Pobal HP Deprivation Index for Small Areas (SA).

7.3.5 The community profile for the population and human health assessment was supported by a site visit undertaken by AECOM in August 2019. The site visit helped to develop a broader understanding of the local context and land uses in the local area. Key receptors, such as residential areas, community facilities, leisure facilities and walking routes, in the local area were visited during the site visit.

7.3.6 Data collection for the population and human health assessment has therefore considered the communities and areas of land which may potentially be impacted by the proposed Relevant Action. The impact areas for certain impacts such as human health, amenities and community facilities, and local land uses have been informed by other assessments (replacement *Chapter 13: Aircraft Noise and Vibration,* replacement *Chapter 14: Ground Noise and Vibration, Chapter 10: Air Quality* and replacement *Chapter 11: Climate and Carbon*) during the assessment stage of the EIAR.

Methodology for Determining Operational Effects

7.3.7 Effects on amenity and local communities and human health are described using the criteria provided in EPA guidance, European Commission guidance[16] and the *London HUDU Rapid Health Impact Assessment Tool*[17], as detailed in the following sub-sections.

Amenity and Local Communities

7.3.8 The assessment on amenity and local communities is concerned with how the proposed Relevant Action potentially impacts on the ability of residents and users of community and recreational facilities to achieve enjoyment and/or quality of life.

7.3.9 Assessing the impact of the proposed Relevant Action on amenity and local communities has taken into account the combined residual significant effects from other assessment topics (replacement *Chapter 13: Aircraft Noise and Vibration,* replacement *Chapter 14: Ground Noise and Vibration, Chapter 10: Air Quality* and replacement *Chapter 11: Climate and Carbon*) which could affect people's enjoyment of a community facility, public space or residential property.

7.3.10 A descriptive approach has been used which gives an overall indication of the change i.e. positive, negative/adverse or neutral, in the amenity of the receptor. As set out in Table 7-4, the assessment is based on professional judgement and uses a four-point scale of high, medium, low and negligible in line with the EPA Guidelines as explained in Chapter 1: Introduction. Depending on the type of receptor being assessed, the magnitude of effect is based on the number of users and the extent to which these users experience impacts on their amenity.

7.3.11 The assessment aligns with the relevant aspects of the EPA Guidelines, as well as the European Commission's guidance document Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report[18].

[16] European Commission, (2017); Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report.
[17] London Healthy Urban Development Unit, (2019); HUDU Planning for Health: Rapid Health Impact Assessment Tool (Fourth Edition, October 2019).
[18] European Commission, (2017); Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report.

Human Health and Well-being

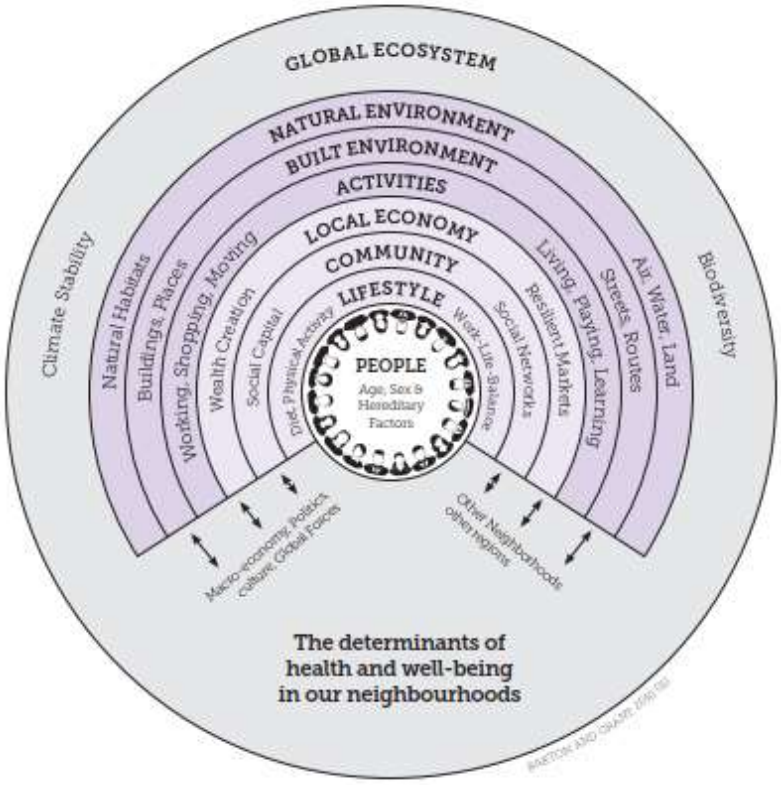
7.3.12 The scope of the human health and well-being assessment includes impacts on the health of residents of properties and users of community resources in the study area. Relevant guidance from the Institute of Public Health in Ireland (IPH), specifically the Health Impact Assessment Guidance, has been considered to inform the assessment. There is no consolidated methodology or practice for describing effects on human health in the EPA Guidelines[19]. The impacts of the proposed Relevant Action on human health will be assessed using the health and well-being determinants set out in the London HUDU Rapid Health Impact Assessment Tool. The human health and wellbeing assessment is informed by the quantitative assessment results from *Chapter 10: Air Quality,* replacement *Chapter 11: Climate and Carbon,* replacement *Chapter 13: Aircraft Noise and Vibration* and replacement *Chapter 14: Ground Noise and Vibration*. The London HUDU Rapid Health Impact Assessment Tool is a checklist approach which provides a broad overview of the potential health impacts and is applicable to a wide range of proposals that considers impacts on a range of health determinants. The checklist is split into 11 broad determinants and is based on the WHO publication 'Healthy Urban Planning'[20].

7.3.13 The WHO Europe defines health as *"a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity"*[21]. Consequently, public health encompasses general wellbeing, not just the absence of illness. Some effects are direct and obvious, others are indirect, while some may be synergistic, with different types of impact acting in combination. In keeping with this definition, this assessment considers the potential impacts of the proposed Relevant Action on physical, mental and social health.

7.3.14 Factors that have the most significant influence on the health of a population are called 'determinants of health'; these include an individual's genetics and their lifestyle, the surrounding environment, as well as political, cultural and societal issues. The interrelationship between these factors is shown in Plate 7-1.

[19] The World Health Organisation (WHO) are currently working on revised Community Noise Guidelines for Europe which are expected to present state of the art evidence on the health effects of noise and updated recommendations on acceptable exposures levels.
[20] Barton, H. and Tsourou, C, (2000), Healthy Urban Planning. World Health Organisation
[21] World Health Organisation, (2020), Constitution. [Online]. Available from: https://www.who.int/about/who-we-are/constitution

Plate 7-1: Social determinants of health



Source: Barton and Grant (2006)

7.3.15 An initial scoping exercise for this population and human health assessment was undertaken to determine the health determinants within the London HUDU Rapid Health Impact Assessment Tool which are relevant to this assessment. The following health determinants in the London HUDU Rapid Health Impact Assessment Tool are associated with construction activities or the provision of new physical infrastructure and were not deemed to be of relevance to the proposed Relevant Action and therefore are not assessed further:

- Housing design and affordability;
- Access to health and social care services and other social infrastructure;
- Accessibility and active travel;
- Crime reduction and community safety;
- Access to healthy food;
- Social cohesion and inclusive design; and
- Minimising the use of resources.

7.3.16 The health determinants which will be assessed as part of this chapter are listed below:

- Air quality, noise and neighbourhood amenity; and
- Climate change.
- Access to work and training

7.3.17 A literature review further considers existing scientific evidence in order to identify the determinants of relevance to the proposed Relevant Action. This literature review provides scientific evidence which supports assumptions made about the potential health impacts of the proposed Relevant Action.

7.3.18 HUDU advises that its tool is generic and should be adapted to local circumstances. This assessment of human health and well-being effects includes the likely direct, indirect and cumulative effects of the

proposed Relevant Action. Potential impacts on the health and well-being of the existing local community and residents has been considered, in particular for more vulnerable groups (such as children and the elderly). Health inequalities have also been considered. Mitigation and enhancement measures for the proposed Relevant Action (some of which may have already been considered through the development of the proposed Relevant Action) have been considered.

Annoyance and Sleep Disturbance

7.3.19 As stated in replacement *Chapter 13. Air and Noise Vibration: Appendix 13A* the number of people 'highly sleep disturbed' and 'highly annoyed' has been predicted in accordance with the approach recommended by the WHO Environmental Noise Guidelines 2018 as endorsed by the European Commission through Directive 2020/367. The methodology has taken into account the noise exposure from 45 dB L_{den} and 40 dB L_{night} as appropriate. It is aircraft noise above these levels that the WHO Regional Office for Europe states are associated with adverse health effects.

7.3.20 For the L_{den} and L_{night} noise indicators the significance of effect has been determined by separately rating both the absolute noise levels and the change in noise level as set out below. The individual ratings are then combined to determine the significance of any effects.

7.3.21 The absolute noise values and associated impact criteria for residential receptors that have been developed are given in Table 7-1. They commence with a negligible band which applies to noise levels that lie below a low threshold, specifically 45 dB L_{den} and 40 dB L_{night}, as the WHO Regional Office for Europe states that aircraft noise above these levels is associated with adverse health effects. The subsequent bands are defined by values that are required to be reported under Directive 2002/49/EC.

Table 7-1 Noise Impact Criteria (absolute) – Residential

Scale Description	Annual dB L_{den}	Annual dB L_{night}
Negligible	<45	<40
Very Low	45 – 49.9	40 – 44.9
Low	50 – 54.9	45 – 49.9
Medium	55 – 64.9	50 – 54.9
High	65 – 69.9	55 – 59.9
Very High	≥70	≥60

7.3.22 The scale to be used to assess the change in noise level is given in Table 7-2. The thresholds are derived from the different contour bands recommended in CAP1616a[22] (see replacement *Chapter 13: Aircraft Noise and Vibration* for more information). A semantic scale of this type, following the format of examples given in the Institute of Environmental Management and Assessment guidelines[23], has been applied in previous air noise assessments and accepted in Public Inquiries and Oral Hearings for airport developments in the UK and Ireland.

Table 7-2 Noise Impact Criteria (relative)

Scale Description	Change in noise level, dB(A)
Negligible	0 – 0.9
Very Low	1 – 1-9
Low	2 – 2.9
Medium	3 – 5.9
High	6 – 8.9

[22] Civil Aviation Authority, (2017); CAP1616: Airspace Design: Guidance on the regulatory process for changing airspace design including community engagement requirements. Available at: https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=8127
[23] Institute of Environmental Management and Assessment (2014). Guidelines for Environmental Noise Impact Assessment. London: IEMA.

Scale Description	Change in noise level, dB(A)
Very High	≥9

Classification of Effects and Significance Criteria

Amenity and Local Communities

7.3.23 For amenity and local communities, conclusions on the classification of effects have been made by assessing the magnitude of impact, combined with the sensitivity of resources and receptors to these impacts.

Table 7-3: Type of Effects

Type of Effects	*Description of Effect*
Beneficial	An impact that has a potential advantageous or beneficial effect on receptors within a specific geographical area, which may be minor, moderate, or major in effect.
Negligible	An impact that is expected to have imperceptible effects on receptors within a defined area.
Adverse	An impact that is expected to have a disadvantageous or adverse effect on receptors within a specific geographical area, which may be minor, moderate or major in effect.
No effect	An impact that is likely to have no effect on an area or local receptors.

7.3.24 Duration of effect is also considered, with more weight given to permanent changes than to temporary ones.

7.3.25 The impact assessment has been undertaken in accordance with the broad magnitude of impact and sensitivity of receptor definitions summarised in Table 7-4 and Table 7-5.

Table 7-4: Magnitude of Impact Criteria

Magnitude of Impact	*Magnitude of Effect*
High	An impact that is expected to have considerable adverse or beneficial effects on receptors. Such impacts will typically affect large numbers of residents, users, businesses or workers. High magnitude impacts will typically be long-term in nature, resulting in the permanent change of the study area's Current State of the Environment.
Medium	An impact that is expected to have a moderate effect on receptors. Such impacts will typically have a noticeable effect on a limited number of residents, users, businesses or workers, and will lead to a permanent (but not drastic) change to the study area's Current State of the Environment.
Low	An impact that is expected to affect a small number of residents, users, businesses or workers. Or an impact that may affect a larger number of receptors but without materially changing the study area's Current State of the Environment. Such impacts are likely to be temporary in nature.
Negligible	An impact that is likely to be temporary in nature, or which is anticipated to have a slight effect on the residents, users, businesses or workers.

Table 7-5: Sensitivity of Receptors

Sensitivity of Receptors	*Sensitivity of Receptors*
High	Receptor is likely to be directly affected. Receptor is well placed to take advantage of beneficial impacts, and/or is not well placed to deal with any adverse impacts.
Medium	Receptor is likely to be indirectly affected. Average ability to maximise beneficial impacts or cope with adverse impacts.
Low	Receptor is unlikely to benefit or be adversely affected. Receptor is not well placed to take advantage of beneficial impacts, and/or is well placed to deal with any adverse impacts.
Negligible	Receptor is very unlikely to benefit or be adversely affected. Receptor is not well placed to take advantage of any beneficial impacts, and/or is well placed to deal with any adverse impacts.

7.3.26 Once the magnitude of the effect has been identified, this can be cross-referenced with the importance of the sensitivity of the receptor to derive the overall significance of impact informed by the EPA Guidelines. By bringing together magnitude and sensitivity, the assessment considers the classification of the effects as outlined in Table 7-6. Profound, Very Significant and Significant effects are considered to be significant. Other effects are considered to be not significant.

Table 7-6: Significance Criteria

Description of Impact	*Sensitivity of Existing Environment*			
	High	**Medium**	**Low**	**Negligible**
High	Profound	Very Significant	Significant / Moderate	Moderate / Slight
Medium	Very Significant / Significant	Significant / Moderate	Moderate	Slight / Not Significant
Low	Significant / Moderate	Moderate / Slight	Slight / Not Significant	Not significant / Imperceptible
Negligible	Slight / Not Significant	Not significant	Not significant / Imperceptible	Imperceptible

Human Health and Well-being

7.3.27 Potential health impacts are described as outlined in Table 7-7, based on broad categories for the effects identified. Where an effect has been identified, actions have been recommended to mitigate negative impact on health, or opportunities to enhance health benefits. As detailed in replacement *Chapter 13. Aircraft Noise and Vibration* and replacement *Chapter 14. Ground Noise and Vibration*, embedded mitigation to reduce these effects or measures to enhance certain benefits already form part of the proposed Relevant Action and the assessment has considered these impacts as such.

Table 7-7: Human Health Impact Categories

Impact category	*Impact symbol*	*Description*
Positive	+	A beneficial impact is identified
Neutral	0	No discernible health impact is identified
Negative	-	An adverse impact is identified
Uncertain	?	Where uncertainty as to the overall impact

Limitations and Assumptions

7.3.28 This population and human health assessment is based on professional judgement and takes into account both the adverse and beneficial impacts that the proposed Relevant Action can have upon existing and surrounding receptors. It provides a broad, high-level indication of effects, reporting on the potential effects to people and the local community.

7.3.29 Community resources are mentioned expressly in the Current State of the Environment section only where they contribute to the local context or where they may be affected by the proposed Relevant Action. Consequently, not all community resources within the study area are mentioned.

7.3.30 Information in the Current State of the Environment related to demographics and the health profile of the population in the study area uses statistics from the census. The most recent Census was published in 2022. Within the baseline, data from the previous census (which was published in 2016) is sometimes to allow comparison between the two local Electoral Divisions and wider geographies. This is because Census 2022 data is not available at the time of writing at the small areas Electoral Division level.

7.3.31 Section 7.6 establishes the socio-economic context of the Future Receiving Environment for the 2035 assessment. This section is limited by the availability and accuracy of future socio-economic statistics, particularly at smaller geographies.

7.4 Literature Review

7.4.1 As set out by the Institute of Public Health in Ireland, “A literature review should be undertaken to find evidence which supports or refutes the assumptions made at the screening stage about the potential health impacts of the proposal”24. Therefore, a literature review which focuses on the potential impacts of the proposed Relevant Action on human health and well-being has been carried out.

7.4.2 Initially, this literature review has considered whether there is sufficient evidence from within the London HUDU Rapid Health Impact Assessment Tool to support an association between the activities associated with the proposed Relevant Action and the relevant determinant of health. The potential effects on health determinants have been summarised in Table 7-8.

[24] Institute of Public Health in Ireland, (2009). Health Impact Assessment Guidance.

Table 7-8: Potential Effects of Activities Associated with the Proposed Relevant Action on Health Determinants

Activity associated with the proposed Relevant Action	*Health determinant and potential impact*
Increased frequency of emissions and noise exposure from additional aircraft movements and associated operations	***Air quality, noise and neighbourhood amenity** – the quality of the local environment can have a significant impact on physical and mental health. Pollution caused by construction, traffic and commercial activity can result in poor air quality, noise nuisance and vibration. Poor air quality is linked to incidence of chronic lung disease (chronic bronchitis or emphysema) and heart conditions and asthma levels of among children and young people. Noise pollution can have a detrimental impact on health resulting in sleep disturbance, cardiovascular and psycho-physiological effects. Good design and the separation of land uses can lessen noise impacts.*
Increased frequency of emissions from additional aircraft movements and associated operations	***Climate change** – there is a clear link between climate change and health. Local areas should prioritise policies and interventions that 'reduce both health inequalities and mitigate climate change' because of the likelihood that people with the poorest health would be hit hardest by the impacts of climate change.*
Increased employment opportunities from additional operating hours	***Access to work and training –** Employment and income is a key determinant of health and wellbeing. Unemployment generally leads to poverty, illness, and a reduction in personal and social esteem. Works aids recovery from physical and mental illnesses.*

Source: London HUDU Rapid Health Impact Assessment Tool (2019)

7.4.3 Having identified the health determinants which have the potential to be impacted by the activities associated with the proposed Relevant Action, this literature review now provides additional evidence, based on existing scientific literature, to reaffirm such potential health impacts.

Air Quality, Noise and Vibration, and Neighbourhood Amenity

7.4.4 Based on the scientific literature reviewed and referenced throughout this chapter, there is strong evidence for the adverse effects of air pollution, specifically particulate matter (PM) and nitrogen dioxide (NO_2), on human health. Exposure to air pollution – induced *inter alia* by aircraft, airside plant and vehicle movements - over several years can reduce life-expectancy, mainly due to an increased risk of cardiovascular and respiratory illness such as chronic obstructive pulmonary disease[25] and lung cancer[26], while short-term exposure can aggravate respiratory and cardiovascular conditions, and trigger asthma attacks[27] and premature deaths. The evidence is strongest for cardiovascular and respiratory effects, particularly in younger[28] and older people[29]. The evidence for population level changes in health outcomes due to concentrations of fine PM and NO_2 below statutory levels (see *Chapter 10: Air Quality*) is more limited, but there is a general association of sufficient strength to warrant assessment and development of environmental measures to reduce emission levels to as low as reasonably practicable[30].

7.4.5 Based on the scientific literature reviewed in this section, the strength of evidence is strong for a direct causal relationship between noise disturbance and health outcomes and quality of life effects, although this is dependent on the level of disturbance. Emerging from the evidence base are a number of key

[25] Liu, Y., Yan, S., Poh, K., et al., (2016). Impact of air quality guidelines on COPD sufferers. Int J Chron Obstruct Pulmon Dis. 11. 839-872.
[26] Loomis, D., Grosse, Y., et al., (2013). IARC evaluation of the carcinogenicity of outdoor air pollution. Lancet Oncol. 14. 1262–1263.
[27] Orellano, P., Quaranta, N., Reynoso, J., et al., (2017). Effect of outdoor air pollution on asthma exacerbations in children and adults: Systematic review and multilevel metaanalysis. PLoS One, 12.
[28] Bell, M. L., Zanobetti, A. & Dominici, F., (2013). Evidence on vulnerability and susceptibility to health risks associated with short-term exposure to particulate matter: a systematic review and meta-analysis. Am J Epidemiol, 178, 865-76.
[29] Braubach, M., Jacobs, D. E. & Ormandy, D. (eds.), (2011). Environmental burden of disease associated with inadequate housing. A method guide to the quantification of health effects of selected housing risks in the WHO European Region, Copenhagen, Denmark: World Health Organization Europe.
[30] Bell, M. L., Zanobetti, A. & Dominici, F., (2013). Evidence on vulnerability and susceptibility to health risks associated with short-term exposure to particulate matter: a systematic review and meta-analysis. Am J Epidemiol, 178, 865-76.

health outcomes, including noise annoyance, sleep disturbance, cardiovascular health, mental health, and children's learning.

7.4.6 Noise annoyance, commonly used within European policy to measure the quality of life impacts of noise exposure on communities around airports, is defined as disturbance, irritation, dissatisfaction and nuisance from environmental noise[31]. Existing evidence displays a variation in the strength of the relationship between aircraft noise and annoyance which may be associated with differences in methodologies, operational factors (i.e. runway operations and night-flight operations) and non-acoustic factors. Studies of change in aircraft noise exposure, including studies of newly affected communities, have found that there is an excess-response in relation to the change in noise exposure, both for decreased and for increased aircraft noise exposure[32] [33]. Whilst there is a relationship between aircraft noise and annoyance, there is very little evidence evaluating the impact of operational interventions on annoyance[34].

7.4.7 Sleep disturbance, potentially induced by aircraft noise, can, in the short-term, impair mood and cognitive performance[35] [36]. The long-term effects of sleep disturbance can influence glucose metabolism, appetite regulation, memory immune response and endothelial dysfunction, which can act as precursors for high blood pressure, cardiovascular disease, diabetes and obesity[37]. Measuring sleep is challenging as there is no one physical, physiological or psychological measure that is considered reliable. As such, there is little evidence evaluating the relationship between aircraft noise and sleep disturbance. However, a study on the effects of aircraft noise on macro- and microstructure of sleep found that probabilities for sleep disruptions increased with increasing noise level[38]. Another recent study utilised meta-analysis (including a study of the London Docklands Light Railway (DLR)) to estimate exposure-response functions for the probability of sleep change as a result of aircraft noise and findings suggested that a relationship did exist[39].

7.4.8 Cardiovascular Disease (CVD), a term used to describe an umbrella of health conditions such as Coronary Heart Disease (CHD), Ischaemic Heart Disease (IHD), angina, heart failure, stroke, and Acute Myocardial Infarction (AMI), have been widely studied in relation to environmental noise. Many studies have found that it is biologically plausible that environmental noise exposure might influence CVD[40] [41] [42]. It is hypothesised that heightened noise exposure can cause physiological stress reactions, which in turn can increase CVD risk factors[43]. In regards to studies which have specifically assessed aircraft noise and cardiovascular outcomes, a number of studies have found small, but statistically significant

[31] Institute of Public Health in Ireland, (2005), Health Impacts of Transport: a review.
[32] Breugelmans, O., Houthuijs, D., van Kamp, I., Stellato, R., van Wiechen, C. and Doornbos, G., (2007). Longitudinal effects of a sudden change in aircraft noise exposure on annoyance and sleep disturbance around Amsterdam Airport. Paper presented at the International Congress on Acoustics, Madrid.
[33] Brown, A. L., and van Kamp, I., (2009). Response to a change in transport noise exposure: competing explanations of change effects. Journal of the Acoustical Society of America, 125, 905-914.
[34] White, K., Arntzen, M., Walker, F., Waiyaki, F. M., Meeter, M., and Bronkhorst, A. W., (2017). Nosie annoyance caused by continuous descent approaches compared to regular descent procedures. Applied Acoustics, 125, 194-198.
[35] Basner, M., & McGuire, S., (2018). WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep. Int J Environ Res Public Health. 14.
[36] Institute of Public Health in Ireland, (2005), Health Impacts of Transport: a review.
[37] Müller, U., Schreckenberg, D., Möehler, U., and Liepert, M., (2018). Maximum level as an additional criterion for the assessment of railway noise at night: derivation of a wake-up protection criterion for standards and regulations. Paper presented at the Euronoise, Crete
[38] Basner, M., Glatz, C., Griefahn, B., Penzel, T., & Samel, A. (2008). Aircraft noise: Effects on macro-and microstructure of sleep. Sleep medicine, 9(4), 382-387.
[39] Basner, M., & McGuire, S., (2018). WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep. Int J Environ Res Public Health. 14.
[40] Babisch, W., (2014). Updated exposure-response relationship between road traffic noise and coronary heart diseases: A metaanalysis. Noise and Health, 16(68), 1-9
[41] Munzel, T., and Daiber, A., (2018). Environmental Stressors and Their Impact on Health and Disease with Focus on Oxidative Stress. Antioxid Redox Signal, 28(9), 735-740
[42] Munzel, T., Sorensen, M., Schmidt, F., Schmidt, E., Steven, S.,Kroller-Schon, S., and Daiber, A., (2018). The Adverse Effects of Environmental Noise Exposure on Oxidative Stress and Cardiovascular Risk. Antioxid Redox Signal, 28(9), 873-908
[43] Institute of Public Health in Ireland, (2005), Health Impacts of Transport: a review.

effects, on a range of cardiovascular outcomes including AMI and CHD as well as risk factors including hypertensions and diabetes[44] [45] [46] [47].

7.4.9 Mental health and well-being is defined by the WHO as a "*state of well-being in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community*". Mental health and well-being is strongly influenced by socioeconomic status, age, gender, history of poor-mental health, and exposure to other life stressors[48] [49]. This said, noise is thought to be an environmental stressor influencing mental health and well-being[50] [51] [52]. In regard to studies relating to aircraft noise, a number of studies have found evidence to suggest aircraft noise can be linked to a number of mental health and well-being outcomes including anxiety and depressive disorders.

7.4.10 In addition, there is a reasonable body of scientific evidence indicating that both actual and perceived neighbourhood amenity plays an important role in physical and mental health[53]. Broadly, the literature indicates that environmental features of a neighbourhood, such as its attractiveness or pollution levels, affect the socio-economic position of residents, which in turn affects health and health inequalities[54].

Climate Change

7.4.11 There is an existing evidence base which suggests that climate change has a wide range of implications for human health, including increased mortality and morbidity from extreme weather events, infectious diseases (waterborne, foodborne and vector-borne), diseases resulting from degraded air pollution and mental health[55]. As climate change is multi-faceted, it is not possible for studies to attribute health outcomes to specific developments such as airports.

7.4.12 Various studies have assessed the likely future effects of climate change on various health outcomes induced by extreme weather events, including heat waves, storms, cyclone, fires and floods[56]. Evidence suggests that in temperate countries, as summers become increasingly hotter and heat waves more frequent and severe, additional heat-related deaths will progressively overwhelm the number of deaths averted as a result of milder winters[57] [58].

7.4.13 Evidence also suggests that rising temperatures also have implications on the formation and dispersal of various air pollutants. Ozone, a major urban pollutant, accumulates more readily from engine exhausts

[44] Basner, M., Babisch, W., Davis, A., Brink, M., Clark, C., Janssen, S., and Stansfeld, S., (2014). Auditory and non-auditory effects of noise on health. Lancet, 383(9925), 1325-1332
[45] Kempen, E. V., Casas, M., Pershagen, G., and Foraster, M., (2018). WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Cardiovascular and Metabolic Effects: A Summary. International Journal of Environmental Research and Public Health, 15(2)
[46] Vienneau, D., Schindler, C., Perez, L., Probst-Hensch, N., and Roosli,M., (2015). The relationship between transportation noise exposure and ischemic heart disease: a meta-analysis. Environmental Research, 138, 372-380
[47] Institute of Acoustics (2023) Research Links Plane Noise to Heart Health Hospitalisations. Available at: https://www.ioa.org.uk/news/research-links-plane-noise-heart-health-hospitalisations
[48] Gruebner, O., Rapp, M. A., Adli, M., Kluge, U., Galea, S., and Heinz, A., (2017). Cities and Mental Health. Dtsch Arztebl Int, 114(8), 121-127.
[49] Clark, C., Pike, C., McManus, S., Harris, J., Bebbington, P., Brugha, T., and Stansfeld, S. A., (2012). The contribution of work and non-work stressors to common mental disorders in the 2007 Adult Psychiatric Morbidity Survey. Psychological Medicine, 42(4), 829-842.
[50] Baudin, C., Lefevre, M., Champelovier, P., Lambert, J., Laumon, B., & Evrard, A. S. (2018). Aircraft Noise and Psychological Ill-Health: The Results of a Cross-Sectional Study in France. International Journal of Environmental Research and Public Health, 15(8)
[51] Beutel, M. E., Junger, C., Klein, E. M., Wild, P., Lackner, K., Blettner, M., and Munzel, T., (2016). Noise Annoyance Is Associated with Depression and Anxiety in the General Population- The Contribution of Aircraft Noise. PloS One, 11(5).
[52] Schreckenberg, D., Griefahn, B., and Meis, M., (2010). The associations between noise sensitivity, reported physical and mental health, perceived environmental quality, and noise annoyance. Noise & health, 12(46), 7-16
[53] Miller, W. D., Pollack, C. E. & Williams, D. R., (2011). Healthy homes and communities: putting the pieces together. Am J Prev Med, 40, S48-57.
[54] Egan, M., Tannahill, C., Petticrew, M., et al., (2008). Psychosocial risk factors in home and community settings and their associations with population health and health inequalities: a systematic meta-review. BMC Public Health, 8, 239.
[55] WHO, (2009). Protecting health from climate change: connecting science, policy and people. Geneva, World Health Organization.
[56] McMichael, A.J., and Lindgren, E., (2011). Climate change: present and future risks to health, and necessary responses. Journal of Internal Medicine. 270. (5).
[57] Knowlton. K., Lynn. B., and Goldberg. R.A., et al., (2007) Projecting heat-related mortality impacts under a changing climate in the New York City region. Am J Public Health; 97:2028-34.
[58] Bambrick. H., Dear. K., Woodruff. R., Hanigan. I., and McMichael. AJ., (2008) The impacts of climate change on three health outcomes: temperature-related mortality and hospitalisations, salmonellosis and other bacterial gastroenteritis, and population at risk from dengue. Garnaut Climate Change Review

at higher temperatures. Studies have found that the mortality rate caused by Europe's 2003 heat wave was exacerbated by high temperatures and ozone formation[59] [60].

7.4.14 Furthermore, extensions in the geographic range of several vector-borne infectious diseases or their vectors have been linked to rising temperatures induced by climate change. Evidence suggest that temperature, rainfall and humidity can influence the replication and viability of pathogens and vectors[61].

7.5 Current State of the Environment

7.5.1 This section establishes a comprehensive and coherent socio-economic profile of the area, including consideration of the labour market and health indicators. The conditions described in this section are considered applicable to the Future Receiving Environments in the 2025 Assessment Year, as this assessment year is in the near future and the socio-economic conditions of the environment are not anticipated to significantly change between the present day and 2025. A description of the Future Receiving Environment for the 2035 Assessment Year is presented in Section 7.6.

7.5.2 Dependent on the availability of data from the CSO, the Current State of the Environment section presents analysis of socio-economic indicators which provides the narrative and evidence base of the current status of Dublin Airport. Analysis in this section sets the context for the potential impacts of the proposed Relevant Action.

7.5.3 Dublin Airport intersects the two Electoral Divisions (ED) of Airport and Dubber. Both EDs are located within the county of Fingal, which itself, is situated in the wider jurisdictions of the Eastern & Midland Regional Assembly (see Figure 7.1 in *EIAR Volume 3: Figures*).

7.5.4 This section establishes the Current State of the Environment with regards to the following characteristics relevant to the potential impacts of Dublin Airport:

- Population;
- Labour market indicators; including:
  - Participation rate and unemployment
  - Education and skills
  - Occupational profile
  - Income profile
- Human health; and
- Local community facilities and land uses.

Population

Population

7.5.5 In 2022, at the time of the last Census, the population of Fingal County was 330,506, the population of the Dublin Region was 1,458,154, and the population of Ireland was 5,149,139. The resident population of the Airport ED was 5,018 whilst Dubber ED was 7,372 in 2016[62]. The resident population of the Airport ED was 6,152 whilst Dubber ED was 8,931[63].

7.5.6 Analysis of population by age profile assesses 2016 data as the latest available data. As shown in Table 7-9, Airport ED and Dubber ED had a higher proportion of working age residents and lower proportion of retirement age (65+ years) in comparison to Fingal County, Dublin Regional Authority, the Eastern & Midland Regional Assembly and the average for Ireland. In 2016, 3,823 (76.2%) of the residents in the

[59] McMichael, A.J., and Lindgren, E., (2011). Climate change: present and future risks to health, and necessary responses. Journal of Internal Medicine. 270. (5).
[60] Dear, K., Ranmuthugala, G., and Kjellström, T., et al. (2005). Effects of temperature and ozone on daily mortality during the August 2003 heat wave in France. Arch Environ Occup Health; 60: 205–12.
[61] McMichael, A.J., and Lindgren, E., (2011). Climate change: present and future risks to health, and necessary responses. Journal of Internal Medicine. 270. (5).
[62] Central Statistics Office (Ireland), (2016), Census 2016.
[63] Central Statistics Office (Ireland), (2022), Census 2022.

Airport ED were aged between 15 and 64 years. Dubber ED had 5,160 (70.0%) residents aged between 15 and 64 years in 2016.

7.5.7 The proportion of working aged residents in both the Airport ED and Dubber ED was noticeably higher than the average recorded for Fingal County (66.3%), Dublin Regional Authority (68.5%), the Eastern & Midland Regional Assembly (66.8%) and Ireland (65.5%) as a whole. In addition, the Airport ED had a smaller proportion of residents aged 14 years or under (15.0%) in comparison to Fingal County (24.5%), Dublin Regional Authority (19.3%), the Eastern & Midland Regional Assembly (21.1%) and Ireland (21.1%). Dubber ED (26.8%) had the largest proportion of residents aged 14 years or under. The proportion of residents aged 65 years or older in the Airport ED (8.8%) and Dubber ED (3.2%) was smaller than the average for Fingal County (9.1%), Dublin Regional Authority (12.2%), the Eastern & Midland Regional Assembly (12.0%) and Ireland (13.4%).

Table 7-9: Population by age, (2016).i

	Airport ED	*Dubber ED*	*Fingal County*	*Dublin Regional Authority*	*Eastern & Midland Regional Assembly*	*Ireland*
	%	*%*	*%*	*%*	*%*	*%*
Aged 14 years or under	15.0	26.8	24.5	19.3	21.1	21.1
Aged 15-64 years	76.2	70.0	66.3	68.5	66.8	65.5
Aged 65 years or over	8.8	3.2	9.1	12.2	12.0	13.4

Source: Central Statistics Office (Ireland) (2016), Census 2016.

Deprivation

7.5.8 The Podal HP Deprivation Index[64] is the primary source for deprivation in Ireland by combining three dimensions of affluence or disadvantage (demographic profile, social class composition and labour market situation) to provide a relative index score for every small area in Ireland. The relative index scores are normally distributed around a bell-shaped curve to display the current levels of deprivation compared to other areas, with most areas clustered around the mean and comparatively fewer areas exhibiting extreme levels of affluence or deprivation. The eight classifications for deprivation range from extremely affluent to extremely disadvantaged. According to the latest data, Fingal County is classified as 'marginally above average' (5th least deprived rank out of 8 classifications) in 2016 with a relative score of 5.3, whilst the Airport ED is considered 'affluent' (6th least deprived rank) with a relative score of 13.1.

7.5.9 As shown in Figure 7.2 (*EIAR Volume 3: Figures*), all small areas which make up the Airport ED are classified by the Irish Deprivation Index as 'affluent'. Several small areas surround Dublin Airport are classified as 'marginally below average' and 'disadvantaged', this includes the neighbouring settlement of St Margaret's.

7.5.10 North of Dublin airport is the settlement of Swords which contains four small areas which are classified as 'disadvantaged' and seventeen which are classified as 'marginally below average'. West of Dublin is the settlement of Malahide which is classified as a mix of 'marginally above average', 'affluent' and 'very affluent'.

[64] Haase, T., and Pratschke, J. (2017); The 2016 Pobal HP Deprivation Index for Small Areas (SA).

Labour Market Indicators

Participation Rate and Unemployment

7.5.11 The total size of the labour force across the Airport ED and Dubber ED in 2016 was 7,482. Within the labour force in this area, 711 (7.4%) people were unemployed having lost or given up a previous job. A further 78 people were looking for their first regular job. Of the labour force within this area, 6,693 (60.3%) were in employment.

7.5.12 The labour force participation rate (15-64 years) in the Airport ED (75.1%) and Dubber ED (79.3%) was significantly higher than the recorded rate in Fingal County (66.9%), Dublin Regional Authority (63.9%), the Eastern & Midland Regional Assembly (63.3%) and Ireland (61.4%) as a whole.

7.5.13 The unemployment rate (15-64 years) in the Airport ED (8.3%) was significantly lower than the recorded rate in the Dubber ED (12.2%), Fingal County (10.3%), Dublin Regional Authority (11.6%), the Eastern & Midland Regional Assembly (12.4%) and Ireland (12.9%) as a whole.

Table 7-10: Labour Force Participation Rate and Unemployment Rate, (2016).

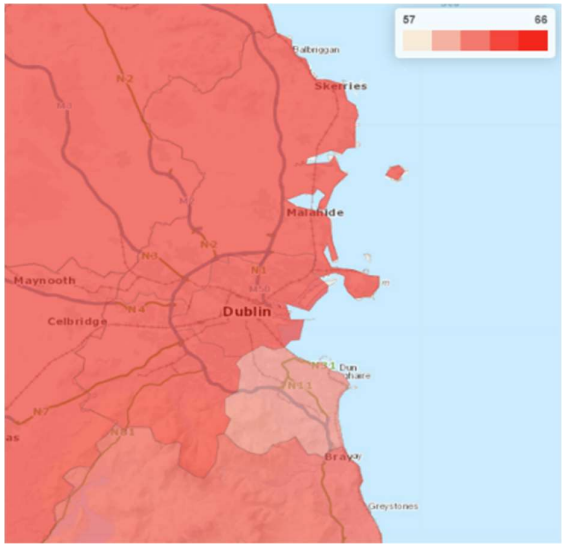
Indicator	*Airport ED*	*Dubber ED*	*Fingal County*	*Dublin Regional Authority*	*Eastern & Midland Regional Assembly*	*Ireland*
	%	*%*	*%*	*%*	*%*	*%*
Labour Force Participation Rate	75.1	79.3	66.9	63.9	63.3	61.4
Unemployment Rate	8.3	12.2	10.3	11.6	12.4	12.9

Source: Central Statistics Office (Ireland) (2017), Census 2016.

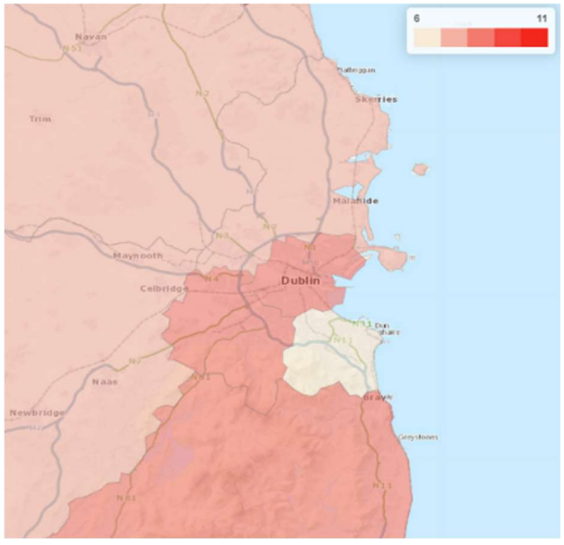
7.5.14 2022 data is available at county level regarding labour market participation and unemployment rate. The analysis below reflects the 2022 position.

Plate 7-2 Labour Force and Unemployment Rate

Labour Force Participation Rate by County (2022)



Unemployment Rate by County (2022)



Source: CSO, 2022

7.5.15 In Fingal County, labour force participation rate has decreased 1.3% from 66.9% in 2016, to 65.6% in 2022. In terms of unemployment rate, In Fingal County this has decreased from 10.3% to 7.8% between 2016 and 2022. In both instances, this is a higher rate of decline than Ireland as a whole, which indicates labour force participation has decreased 0.2% from 61.4 in 2016 to 61.2%, and unemployment rate has decreased 4.6% from 12.9% to 8.3% in 2022.

Indicator	Fingal County		Ireland	
	2016		2022	
	%	%	%	%
Labour Force Participation Rate	*66.9*	*65.6*	61.4	61.2
Unemployment Rate	*10.3*	*7.8*	12.9	8.3

Live Register

7.5.16 The Live Register is used to provide a monthly series of the numbers of people (with some exceptions) registering for Jobseekers Benefit (JB) or Jobseekers Allowance (JA) or for various other statutory entitlements at local offices of the Department of Social Protection.

7.5.17 Table 7-11 shows that the proportion of residents in Dublin (39%) and the Eastern & Midland Regional Assembly (38%) on the Live Register for twelve months or more is slightly higher than Ireland (36%) as a whole.

Table 7-11: Live register, (June 2023)

Indicator	Dublin		Eastern & Midland Regional Assembly		Ireland	
	Claimants	%	Claimants	%	Claimants	%
Over 1 Year	17,611	39%	31,308	38%	65,909	36%
Under 1 Year	27,490	61%	50,388	62%	118,970	64%
Total	**45,101**	-	**81,696**	-	**184,879**	-

Source: CSO, Live Register, (June 2023).

Education and Skills

7.5.18 The working-age residents within the Airport ED are well-qualified. Table 7-12 shows that 37.1% of residents within the Airport ED are qualified to Ordinary bachelor's degree / professional qualification and above, which is higher than the recorded rate in Fingal County (33.9%), Dublin Regional Authority (36.2%), the Eastern & Midland Regional Assembly (31.9%) and Ireland (28.5%) as a whole.

7.5.19 However, the proportion of working-age residents within the Dubber ED who hold an Ordinary bachelor's degree / professional qualification is just 27.1%, significant lower than all other areas presented in Table 7-12.

Table 7-12: Highest level of education completed, (2016)

	Airport ED	Dubber ED	Fingal County	Dublin Regional Authority	Eastern & Midland Regional Assembly	Ireland
	%	%	%	%	%	%
No formal education	0.5	0.7	1.1	1.3	1.5	1.7

	Airport ED	Dubber ED	Fingal County	Dublin Regional Authority	Eastern & Midland Regional Assembly	Ireland
	%	%	%	%	%	%
Primary education	2.9	5.0	6.6	9.2	9.8	10.8
Lower secondary	3.9	9.4	11.5	11.6	13.2	14.5
Upper secondary	12.3	17.8	19.6	17.0	18.0	18.5
Technical or vocational qualification	7.5	12.2	9.0	7.5	8.3	8.8
Advanced certificate / Completed apprenticeship	4.1	5.7	5.8	4.6	5.4	5.9
Higher certificate	5.4	5.8	5.7	4.6	4.9	5.0
Ordinary bachelor's degree	9.3	8.2	9.1	8.0	7.9	7.7
Honours bachelor's degree	12.7	10.9	12.6	13.4	12.0	10.7
Postgraduate diploma or degree	13.4	7.6	11.2	13.3	11.0	9.2
Doctorate (PhD)	1.7	0.4	1.0	1.4	1.1	0.9
Not stated	26.3	16.5	6.7	8.1	7.1	6.4

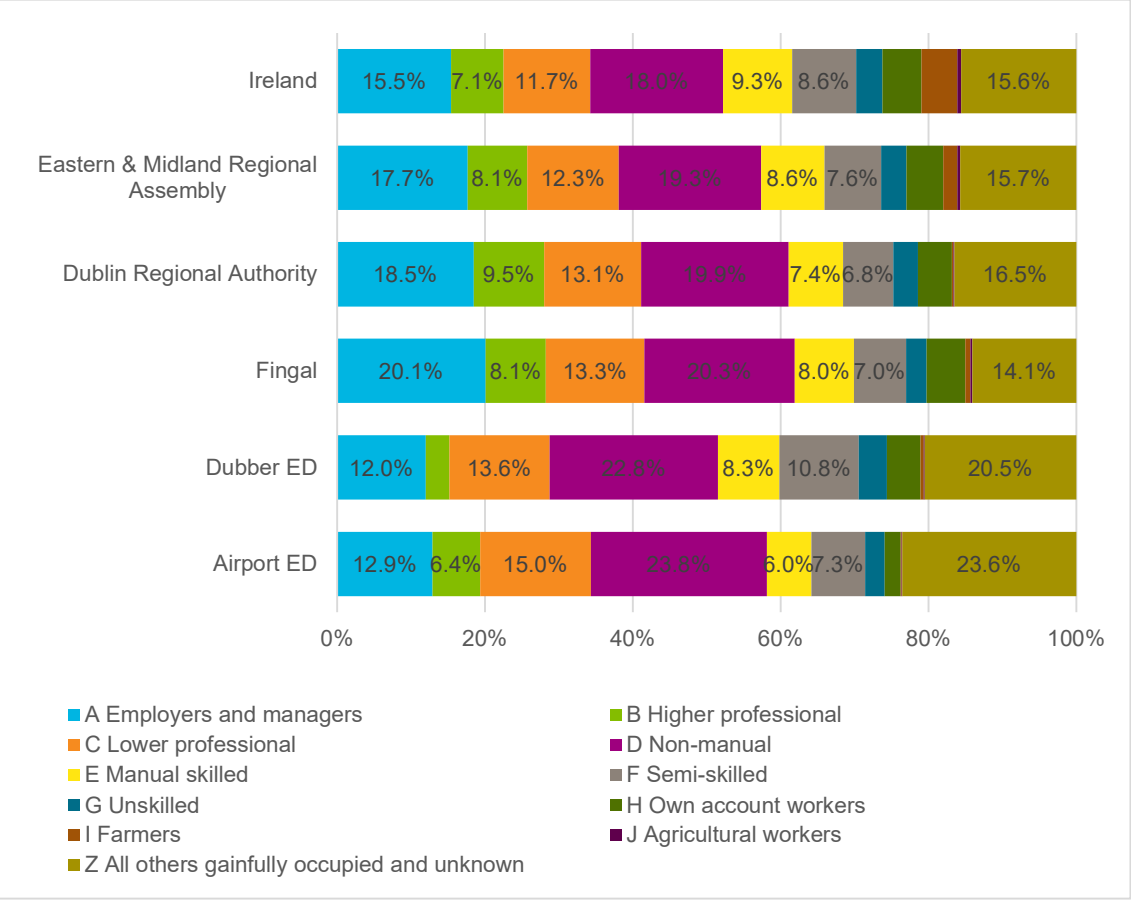
Source: Central Statistics Office (Ireland) (2017), Census 2016.

Occupational Profile

7.5.20 Socio-economic Group (SEG) classifies the entire population into one of eleven groups based on the level of skill and educational attainment of the occupation (of those at work, unemployed or retired) while all other persons are classified to the socio-economic group of the person in the family on whom they are deemed to be dependent.

7.5.21 Within the Airport ED and Dubber ED, a large proportion of workers are employed within the lower professions or non-manual occupations. Similarly, the Airport ED and Dubber ED have a lower proportion of employers and managers and higher professionals in comparison to the averages for Fingal County, the Dublin Regional Authority, the Eastern & Midland Regional Assembly and Ireland as a whole. This can be attributed to the large proportion of workers employed to support the operations of Dublin Airport.

Plate 7-3: Occupational profile by socio-economic group (15+ years) (%), (2016).



Source: Central Statistics Office (Ireland) (2017), Census 2016.

Income

7.5.22 Average household annual income in Fingal is substantially greater than across the country, likely helped by the high-level occupations that the residents in Fingal tend to hold. The median household annual income in Fingal in 2016 was €58,795, comfortably higher than the median rate for Ireland (€45,256). The median household weekly income within the Airport ED and Dubber ED is less than the average for Fingal County, but still greater than the average across Ireland as a whole – as displayed in Table 7-13.

Table 7-13: Household income, (2016)

Indicator	*Airport ED*	*Dubber ED*	*Fingal*	*Ireland*
Median household annual income (€)	52,482	52,108	58,795	45,256

Source: CSO, Geographical Profiles of Income in Ireland (2016).

Human Health

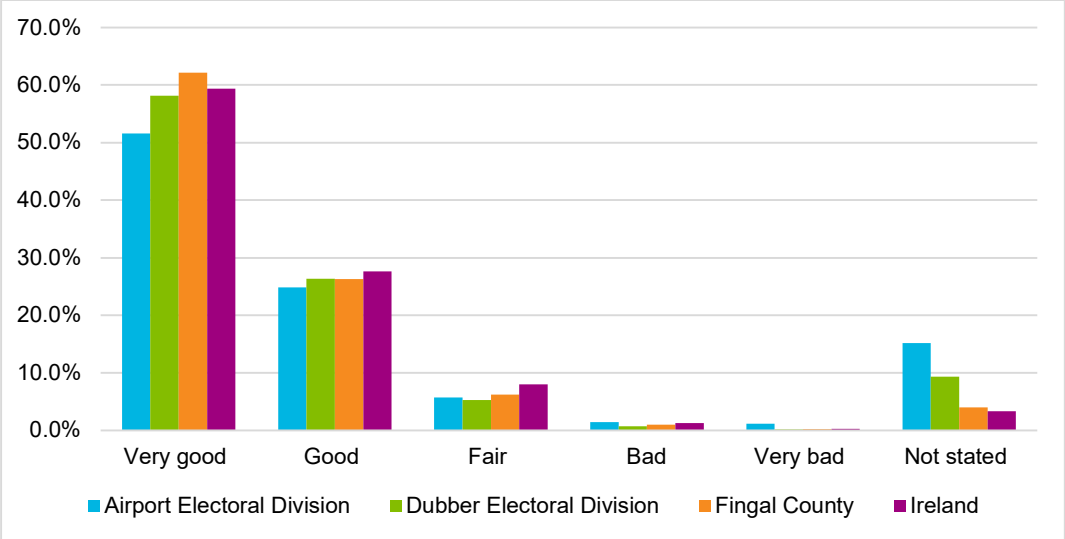
7.5.23 The life expectancies in Dublin and Ireland have been increasing in recent years creating an ageing population, a trend that is currently being experienced across most developed countries. In 2016, male residents in the Dublin Regional Authority were expected to live to 80.1 years whilst female residents were expected to live to 83.4 years, compared to 78.3 years and 82.7 years respectively in 2011[65]. The life expectancies in 2016 are broadly in line with the country's averages (79.6 years for males and 83.4 years for females).

[65] Central Statistics Office, (2019); Irish Life Tables: Period Life Expectancy by Sex, Age, Region and Year.

7.5.24 The health conditions in Dubber ED, Fingal County and across the country are positive, but they appear slightly worse within the Airport ED. In 2016, 89% of the population aged 15 years and over in Fingal County considered themselves to be in very good or good health, compared to Ireland's average of 88%[66]. In comparison, around 84% of residents in Dubber ED and 77% of residents in the Airport ED were in very good or good health[67].

7.5.25 It is worth noting that Ireland has the highest self-perceived health status of all EU countries, with 83% of people rating their health as good or very good, considerably above the EU average (69%)[68]. Only 1% of residents in Dubber ED and Fingal were in bad or very bad health, which is the fourth lowest proportion of the 31 counties and cities across Ireland[69]. However, this proportion increases to 3% for Airport ED, which is high for the country. Plate 7-4 presents the health conditions in the Airport ED, Dubber ED and Fingal County, compared to the conditions across Ireland.

Plate 7-4: Health conditions for all persons aged 15 years and over (2015)



Source: Central Statistics Office (Ireland) (2017), Census 2016.

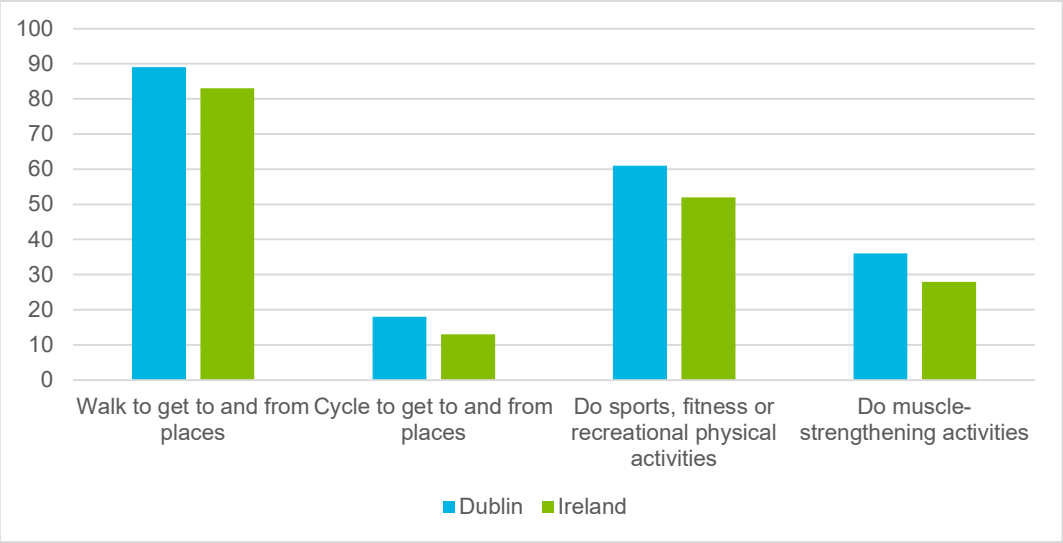
7.5.26 Fewer residents (as a percentage of total population) live with a disability in the Airport and Dubber EDs compared to Fingal County and Ireland as a whole. In the 2016 Census, of residents aged 15 and over, 8.3% stated they had a disability in the Airport ED and 7.7% stated this in Dubber ED. These proportions are considerably lower than the averages for Fingal (10.8%) and Ireland (13.5%).

7.5.27 The Census 2016 does not provide further information on health limitations or physical activity data by local area. However, the Irish Health Survey provides further detail on health profiles at a regional level[70].

7.5.28 Most residents aged 15 and over in Dublin (85%) are not limited at all in their daily activities, with 12% limited slightly and only 3% considered to be severely limited. This profile almost matches the national results exactly, where 82% are not limited at all, 13% are limited slightly and 5% are severely limited. However, the residents in the region of Dublin tend to engage in more physical activity than the country's average. Plate 7-5 displays the proportion of residents aged 15 and over undertaking physical activity in the Dublin Region and Ireland. This highlights that residents in Dublin are slightly more active across all metrics in comparison to the national averages.

[66] Central Statistics Office (Ireland), (2016), Census 2016.
[67] These statistics may not be wholly representative of the health conditions in the Electoral Divisions (ED), particularly the Airport ED, as 15% of respondents in the Airport ED and 9% of respondents in Dubber ED did not state an answer (country's average is 3%).
[68] Government of Ireland: Prepared by Department of Health, (2019); Health in Ireland: Key Trends 2019.
[69] Central Statistics Office (Ireland), (2016), Census 2016.
[70] Central Statistics Office, (2019); Irish Health Survey 2019.

Plate 7-5: Physical activity undertaken for all persons aged 15 years and over in Dublin and Ireland (2019)



Source: Centre Statistics Office (Ireland) (2019)

7.5.29 The Irish Health Survey reports the mental health status of residents (aged 15 and over). In 2019, 86% of residents stated they experience no or minimal depression in Dublin and Ireland as a whole. The full mental health statistics for Dublin and Ireland are shown in Table 7-14, which indicates on the whole residents in Dublin experience similar levels of depression as residents across the county.

Table 7-14: Mental health status for all persons aged 15 and over

Mental health indicator	*Dublin*	*Ireland*
None to minimal depression	86%	86%
Mild depression	9%	9%
Moderate depression	3%	3%
Moderately severe or severe depression	2%	2%

Source: Central Statistics Office (Ireland), Irish Health Survey 2019.

7.5.30 There are several healthcare facilities in the area surrounding Dublin Airport. The nearest of which is located within the Airport grounds, Medmark Dublin Airport Hospital, which provides occupational healthcare to residents in the area. Beaumont Hospital Dublin is the closest major hospital facility, located around 6 km south of the airport and easily accessible following the M1 South from the airport. The Beaumont Hospital is a large facility, with 669 available inpatient beds (the third most of any hospital in Ireland) and 159 available day beds (most of any hospital in Ireland)[71]. On average, across the Dublin Regional Authority, there are six general practitioner consultations per person per year; this is the same as the country's average.

Local Community Facilities and Land Uses

Local Community Facilities

7.5.31 The area surrounding Dublin Airport is made up of several local communities which include numerous residential areas and community and recreational facilities such as open spaces and parks. Within the immediate vicinity of the airport, there is a cluster of community facilities. This includes the ALSAA Sports Centre, Swords Rugby Club, Kealy's public house and The Coachman's Inn; all of which are located along the R132. Approximately 500 m to the south of these facilities is Dardistown Cemetery. North west

[71] Department of Health, (2019); Open Beds Report – June 2019.

of the airport is the St Margaret's Golf & Country Club and the St Margaret's GAA Club. North east of the airport, directly east of the E132 is the Halpenny Golf Driving Range. Immediately north of the airport is the Forrest Little Golf Club.

7.5.32 To the immediate west of the airport boundary, located on the R108, is the Boot Inn public house. Directly to the south of the airport beyond the Blue Long Stay Car Park is the Silloge Park Golf Club, Na Fianna GAA Club, Ballymun Kickhams GAA Club and Starlights GFC.

Land Uses

7.5.33 There are a number of residential properties located to the west of the airport along Dunbro Lane. Beyond these is the community of Saint Margaret's. In addition to numerous residential dwellings, the village is home to St Margaret's Church and St Margaret's National Primary School.

7.5.34 The largest town within the surrounding area is Swords which is located around 5 km north of airport. Swords contains numerous community facilities, businesses, leisure and residential assets.

7.5.35 There are several villages located further to the east of the airport towards the coast. This includes the suburbs of The Baskins (2.5 km) and Kinsealy (3.5 km). Further east towards the Irish Sea are the coastal towns of Malahide (5.5 km) and Portmarnock (6.5 km) which contain numerous community and recreational facilities. Several golf courses are located around Malahide and along the western coastline, including Malahide Golf Club (6.0 km) and Portmarnock Hotel and Golf Links (7.0 km).

Dublin Airport Community Fund

7.5.36 Dublin Airport, through the Dublin Airport Community Fund, provides support for sports and recreation, social inclusion and community development, health and well-being, culture and heritage, and environment and sustainability. Established in 2017, the €10 million Dublin Airport Community Fund has an annual investment of €400,000 over a 25-year period[72].

7.5.37 The Dublin Airport Community Fund supports community-led projects in 13 eligible areas[73] located in the immediate vicinity of Dublin Airport where communities are situated under flight paths[74]. The design of the Dublin Airport Community Fund, both in terms of geography and the type of activities which are being supported, was agreed following consideration of detailed feedback from the North Runway second public consultation process in 2016.

7.5.38 All applications are independently assessed by a panel based on the project's positive contribution to local communities. Dublin Airport's Community Fund has allocated over €1.8 million to local community initiatives since its launch. In 2022 alone, 75 local community projects shared €400,000 for sports, recreation, environmental, education and community development initiatives[75].

7.6 Future Receiving Environment

7.6.1 This section establishes the socio-economic context of the Future Receiving Environment for the 2035 Assessment Year, as far as is possible to do so due to the limitations of future years statistics in terms of their availability and accuracy.

7.6.2 Population projections in Ireland are only available at the regional and national level. Population projections produced by the CSO[76] are based upon several scenarios including differences in internal migration, specifically the rate of inflow and outflow of residents between Dublin and other Irish regions. Table 7-15 below presents the available mid-tier population projections under the Dublin inflow and outflow scenarios in 2035 and identifies the percentage change from the population recorded by the 2016 Irish Census.

[72] Dublin Airport, (2021); Dublin Airport's Community Fund Reopens for Applications. Available at: https://www.dublinairport.com/latest-news/2021/03/10/dublin-airport's-community-fund-reopens-for-applications
[73] Ballymun, Cloghran, Forrest Little, Greater Baskin, Hollystown, Malahide, Portmarnock, Rolestown, Santry, St. Margarets, Swords, The Ward, Tyrrelstown.
[74] Beutel, M. E., Junger, C., Klein, E. M., Wild, P., Lackner, K., Blettner, M., and Munzel, T., (2016). Noise Annoyance Is Associated with Depression and Anxiety in the General Population- The Contribution of Aircraft Noise. PloS One, 11(5).
[75] Dublin Airport Community Fund (2023) Available at: https://www.dublinairport.com/corporate/corporate-social-responsibility/community-fund
[76] Central Statistics Office, (2019); Regional Population Projections 2017 – 2036

Table 7-15 Mid-tier Population Projections (Dublin inflow and outflow)

Area	*2016 Population*	*Mid-tier population projection 2035 (Dublin outflow M2F2)*	*Population change*	*Mid-tier population projection 2035 (Dublin inflow M2F2)*	*Population change*
Dublin	1,335,900	1,488,100	+11.4%	1,741,800	+30.4%
Ireland	4,739,600	5,536,500	+16.8%	5,536,500	+16.8%

Source: CSO Ireland, (2019); Regional Population Projections 2017 – 2036. Projection M2F2.

7.6.3 Between 2016 and 2035, taking account of the mid-tier growth estimate, the population in Dublin is projected to increase by between 11.4% and 30.4% depending on internal migration in and out of the city, while the population of Ireland is projected to increase by 16.8%. Population projections are not available at smaller geographies; however, it is reasonable to assume that similar population trends will be experienced at the local level within Fingal County, and the Airport and Dubber EDs, given that these geographies fall within the wider region of Dublin.

7.6.4 With the exception of population statistics, no projections or future estimates are available for the other socio-economic indicators that have been analysed in the above Current State of the Environment. However, it is not anticipated that the socio-economic conditions of the study area will differ significantly between the present day and 2035, therefore the socio-economic context described in Section 7.5, Current State of the Environment, remains relevant to the future receiving environment in 2035.

7.6.5 The European Centre for the Development of Vocational Training's skills forecast for Ireland[77] identifies the key trends expected to occur in Ireland up to the year 2030 with regards to occupations and skills within the Irish labour force. The realisation of these predicted trends has relevance to the Future Receiving Environment in 2035. Some of these key trends are identified below:

- The labour force is expected to grow by 15% between 2020 and 2030 due to population growth and increased labour force participation across all age bands;
- Skilled occupations including "professionals" and "technicians" are expected to see the highest number of job openings over the forecast period 2018 to 2030, with over 514,00 job openings between them (accounting for one third of all job openings in Ireland);
- Between 2018 and 2030, the most job openings (taking both new/lost jobs and replacement needs together) are expected to be in "highly skilled non-manual occupations" (approximately 677,000 jobs in total);
- There is expected to be a significant downward trend in job openings across low qualification levels, with 98,000 jobs lost between 2018 and 2030;
- Most job openings between 2018 and 2030 are expected to be filled by high qualified workers, but it is projected that high-level graduates in Ireland will continue to be employed in jobs below their skill level; and
- The share of high-qualified persons in the labour force is expected to increase from 46% in 2018 to 53% by 2030, while those with low qualifications will decrease from 16% to 9%.

7.7 Environmental Design and Management

7.7.1 There are a number of measures already in place at Dublin Airport that reduce or mitigate the noise effects of aircraft operations. As described in Section 13.5 of replacement *Chapter 13. Aircraft Noise and Vibration* and Section 14.5 of replacement *Chapter 14. Ground Noise and Vibration*, these include:

- Reduction of noise at source;
- Land use planning and management (noise zones, residential sound insulation schemes, the schools sound insulation scheme, and the dwelling purchase scheme); and

[77] European Centre for the Development of Vocational Training (Cedefop), (2020); Skills forecast 2020: Ireland

- Operational procedures.

7.8 Assessment of Effects and Significance

Amenity and Local Communities

Air Quality

7.8.1 As set out in *Chapter 10: Air Quality*, for each Assessment Year (2025 and 2035) the proposed Relevant Action will not result in any significant change to the local air quality environment (NO_2, PM_{10} and $PM_{2.5}$) or odour when comparing the Permitted and Proposed Scenarios. More specifically, the proposed Relevant Action will not result in air quality at any receptors being in breach of European standards or the Irish air quality upper limits under any of the Assessment Years (2025 and 2035). Therefore, there is little risk of any exceedance of the relevant environmental air quality thresholds applicable for the protection of human health.

Air Noise and Vibration

7.8.2 With regards to air noise and vibration impacts associated with the proposed Relevant Action, a package of existing and proposed sound insulation schemes is offered and will continue to be offered as part of this application by Dublin Airport to deliver improvements in internal noise levels experienced by residential and community facilities. This section of the assessment considers the residual significant effects of air noise and vibration after allowing for the benefit of the existing and proposed sound insulation schemes.

7.8.3 Table 7-16 below presents the residual findings from replacement *Chapter 13: Aircraft Noise and Vibration*. It shows the number of people assessed to have a residual significant beneficial and residual significant adverse effect as a result of the implementation of the proposed Relevant Action for each assessment year (Proposed vs Permitted Scenario). This number is also shown as a proportion of the population in Fingal in 2022[78].

Table 7-16 Residual Air Noise and Vibration Significant Effects, Proposed vs Permitted

Year	*L_{den} 24-hour period metric*				*L_{night} Overnight Metric*			
	Significant Beneficial	*Percentage of population proportion*	*Significant Adverse*	*Percentage of population proportion*	*Significant Beneficial*	*Percentage of population proportion*	*Significant Adverse*	*Percentage of population proportion*
2025	7,047	2.1%	10	<0.01%	6,414	1.9%	8,970	2.7%
2035	102	0.0%	0	<0.01%	94	0.0%	8,301	2.5%

7.8.4 When assessing the impact of the Proposed Scenario using the overnight metric, the number of residents that will experience a significant adverse residual effect as a result of implementation of the proposed Relevant Action is higher than that in the daytime metric and increases for all Assessment Years.

7.8.5 Using the 24-hour period metric, residential receptors close to flight paths to the west of the existing South Runway or close to flight paths from the Crosswind Runway typically are forecast to see reductions in noise level, whereas the opposite is true for receptors closer to flight paths to the west of North Runway. Similarly, using the overnight metric, the majority of the residual significant adverse effects are expected to be experienced within close proximity to the flight paths from the North Runway.

7.8.6 The impact of noise and vibration on community facilities is also considered within replacement *Chapter 13: Aircraft Noise and Vibration*. The assessment considers, schools, residential healthcare facilities and places of worship as high sensitivity receptors. For both Assessment Years (2025 and 2035), under the overnight assessment metric, there is a significant residual air noise and vibration effect reported on

[78] The population of Fingal used to determine the proportion of the population highly sleep disturbed by air noise and vibration is the latest available (2022). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-23.

residential health care facilities[79] when comparing the Permitted and Proposed Scenarios. There is no significant effect for schools or places of worship in both assessment years and 24 hour and overnight metrics.

Ground Noise and Vibration

7.8.7 With regards to ground noise and vibration impacts associated with the proposed Relevant Action, a package of existing and proposed sound insulation schemes is offered and will continue to be offered as part of this application by Dublin Airport. In addition to this, there is a proposal to enhance the sound insulation scheme such that dwellings will be eligible for a grant to pay for sound insulation improvement works based on their night-time air noise level. This section of the assessment considers the residual significant effects of ground noise and vibration after allowing for the benefit of the existing and proposed sound insulation schemes.

7.8.8 Table 7-17 below presents the residual findings from replacement *Chapter 14. Ground Noise and Vibration*. It shows the number of people assessed to have a residual significant beneficial and residual significant adverse effect as a result of the implementation of the proposed Relevant Action for each Assessment Year (Proposed vs Permitted Scenario) using the 24-hour period metric and the overnight metric for residential receptors. This number is also shown as a proportion of the population in Fingal in 2022[80].

Table 7-17 Residual Ground Noise and Vibration Significant Effects, Proposed vs Permitted

Year	L_{den} 24-hour period metric				L_{night} Overnight Metric			
	Significant Beneficial	Percentage of population proportion	Significant Adverse	Percentage of population proportion	Significant Beneficial	Percentage of population proportion	Significant Adverse	Percentage of population proportion
2025	0	0.0%	0	0.0%	0	0.0%	6	<0.1%
2035	0	0.0%	0	0.0%	0	0.0%	6	<0.1%

7.8.9 Using the 24-hour period metric to assess residential receptors as set out in replacement *Chapter 14: Ground Noise and Vibration*, for all Assessment Years (2025 and 2035) no people are assessed as having a residual significant beneficial or residual significant adverse effect as a result of the implementation of the proposed Relevant Action.

7.8.10 Using the overnight metric to assess residential receptors as set out in replacement *Chapter 14: Ground Noise and Vibration*, for all Assessment Years (2025 and 2035) no people are assessed as having a significant beneficial effect as a result of the implementation of the proposed Relevant Action. However, in assessment year 2025 and 2035 a small number of people (six) will experience residual significant adverse effects.

7.8.11 The impact of noise and vibrations on community facilities is also considered within replacement *Chapter 14: Ground Noise and Vibration*. The assessment considers dwellings, schools, residential healthcare facilities and places of worship as high sensitivity receptors. Receptors with a lower sensitivity to noise, such as open spaces and recreation grounds, have not been considered as part of their assessment. For all Assessment Years (2025 and 2035), under both the 24-hour period and overnight assessment metrics, there are no significant residual air noise and vibration effects reported on schools, residential health care facilities[81] or places of worship when comparing the Permitted and Proposed Scenarios.

Cumulative Air and Ground Noise and Vibration

7.8.12 As stated in replacement *Chapter 14: Ground Noise and Vibration*, ground noise from aircraft and the noise from aircraft in the air have different characteristics. Consequently, it is standard practice to

[79] It should be noted that only residential healthcare facilities are highly sensitive to noise at night. Schools and places of worship are not expected to be used during the hours specified in the overnight metric.
[80] The population of Fingal used to determine the proportion of the population highly sleep disturbed by air noise and vibration is the latest available (2022). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-23.
[81] It should be noted that only residential healthcare facilities are highly sensitive to noise at night. Schools and places of worship are not expected to be used during the hours specified in the overnight metric.

consider the noise from each separately. This is consistent with the following statement in the European Commission Directive 2020/367:

"The exposure of the population shall be assessed independently for each noise source and harmful effect. Where the same people are simultaneously exposed to different noise sources, the harmful effects may -in general- not be cumulated. However, those effects may be compared to assess the relative importance of each noise."

7.8.13 Combining the noise levels can be undertaken, although there are no current standards or guidance available specific to the consideration of in-combination noise effects associated with the proposed Relevant Action. It is therefore not appropriate to determine the significance of cumulative effects, as the different sources should normally be considered independently. In addition, it is not expected that cumulative assessment would find any significant effects that are not already identified in the individual air and ground noise and vibration assessment.

7.8.14 To provide information on the relative contribution of the air and ground noise the L_{den} and L_{night} noise metrics have been used to represent the relative contributions in isolation and cumulatively under the Permitted Scenario and the Proposed Scenario. This has been undertaken for representative locations, with the L_{den} noise levels for the Assessment Years 2025 and 2035 presented in Table 7-19 and 7-20 respectively.

Table 7-18 2025 Ground, Road and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Aircraft	Road	Total	Aircraft	Road	Total	Total
Ridgewood	GR01	45	53	54	46	53	54	+0
The Baskins	GR02	35	60	60	36	60	60	+0
Mayeston Hall	GR03	40	73	73	42	73	73	+0
St Margret's	GR04	38	57	58	40	58	58	+0

Note – values rounded to the nearest whole number. Differences based on unrounded values.

Table 7-19 2035 Ground, Road and Air Noise Levels at Representative Locations (L_{den})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Aircraft	Road	Total	Aircraft	Road	Total	Total
Ridgewood	GR01	45	54	54	47	54	55	+0
The Baskins	GR02	35	60	60	36	60	60	+0
Mayeston Hall	GR03	40	73	73	42	73	73	+0
St Margret's	GR04	38	58	58	40	58	58	+0

Note – values rounded to the nearest whole number. Differences based on unrounded values.

7.8.15 The relative contribution from the noise sources is similar by scenario but varies by location. For all Assessment Years (2025 and 2035), when using the 24-hour period metric, the noise level remains the same as a result of the implementation of the proposed Relevant Action.

7.8.16 Table 7-21, Table 7-22 and Table 7-23 below present the cumulative air and ground noise and vibration results for representative locations when using the overnight (Lnight) metric, as replicated from replacement *Chapter 14: Ground Noise and Vibration.*

Table 7-20 2025 Ground, Road and Air Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{night})						
		Permitted Scenario			Proposed Scenario			Change
		Aircraft	Road	Total	Aircraft	Road	Total	Total
Ridgewood	GR01	33	46	46	38	46	46	+1
The Baskins	GR02	25	52	52	29	52	52	+0
Mayeston Hall	GR03	31	64	64	34	64	64	+0
St Margret's	GR04	29	50	50	32	50	50	+0

Note – values rounded to the nearest whole number. Differences based on unrounded values.

Table 7-21 2035 Ground, Road and Air Noise Levels at Representative Locations (L_{night})

Representative Location	Reference No.	Noise Level, dB (L_{den})						
		Permitted Scenario			Proposed Scenario			Change
		Aircraft	Road	Total	Aircraft	Road	Total	Total
Ridgewood	GR01	33	46	46	38	46	47	+0
The Baskins	GR02	25	52	52	29	52	52	+0
Mayeston Hall	GR03	31	65	65	34	65	65	+0
St Margret's	GR04	29	50	50	32	50	50	+0

Note – values rounded to the nearest whole number. Differences based on unrounded values.

7.8.17 The relative contribution from the noise sources is similar by scenario but varies by location. For all Assessment Years (2025 and 2035), when using the overnight metric, the noise level either remains the same or increases by up to 1dB as a result of the implementation of the proposed Relevant Action. The representative location of Ridgewood is the location that would be most impacted by the implementation of the proposed Relevant Action when assessing using the overnight metric.

Amenity and Local Communities Assessment

7.8.18 The amenity and local communities assessment considers the assessment findings from air quality, air noise and vibration, and the ground noise and vibration assessments. The sensitivity of affected local residents is assessed to be high while the impact is assessed as medium given the number of dwellings affected. Some residents will benefit from the proposed Relevant Action whilst others will experience significant effects from air and ground-borne noise and vibration.

7.8.19 On the basis of the number of residents that are assessed to experience residual significant adverse impacts by air noise and vibration, the post-mitigation effect on amenity and local communities from a population and human health perspective is assessed to be **permanent significant adverse (significant)** for all Assessment Years (2025 and 2035).

Human Health and Well-being

Air Quality

7.8.20 As set out in Section 7.4, the quality of the local environment can have a significant impact on physical and mental health. Pollution caused by aviation and commercial activity can result in poor air quality, noise nuisance and vibration. Poor air quality is linked to incidence of chronic lung disease (chronic bronchitis or emphysema), heart conditions and the prevalence of asthma among children and young people.

7.8.21 An assessment of the likely significant effects on air quality as a result of the proposed Relevant Action has been presented in *Chapter 10: Air Quality.* In regard to emissions, the proposed Relevant Action will not result in any significant change to the local air quality environment (NO_2, PM_{10} and $PM_{2.5}$) or odour as a result of the proposed change in aircraft movements for any of the Assessment Years (2025 and 2035). More specifically, the implementation of the proposed Relevant Action is not predicted to result in any breach of European standards or exceedance of Irish air quality upper thresholds for any receptor.

Therefore, there is little risk of any exceedance of the relevant environmental air quality thresholds applicable for the protection of human health.

Noise and Vibration

7.8.22 Noise pollution, both as a result of air noise and vibrations and ground noise and vibrations, can have a detrimental impact on health resulting in annoyance, sleep disturbance, cardiovascular and psycho-physiological effects[82].

Air Noise and Vibration

7.8.23 An assessment of the likely residual significant effects of air noise and vibrations as a result of the proposed Relevant Action is conducted within the replacement *Chapter 13: Aircraft Noise and Vibration* for each Assessment Year (2025 and 2035). Some residents benefit from lower noise levels whilst some residents will be impacted adversely by higher noise levels, however, when assessing using the overnight metric there is a trend that many more residents experience significant adverse air noise and vibration effects as a result of the implementation of the proposed Relevant Action. Of additional note for both Assessment Years (2025 and 2035), under the overnight assessment metric, replacement *Chapter 13: Aircraft Noise and Vibration* concludes that there is a significant residual air noise and vibration effect reported on residential health care facilities[83] when comparing the Permitted and Proposed Scenarios.

7.8.24 Replacement *Chapter 13: Aircraft Noise and Vibration* presents an assessment of the number of people who would be highly annoyed and highly sleep deprived as a result of the implementation of the proposed Relevant Action. The results of this assessment are presented in Table 7-22 and Table 7-23 below[84].

7.8.25 The number of people highly annoyed (during the daytime) by air noise and vibration for each assessment scenario is presented in Table 7-22 below. This number is also shown as a proportion of the population in Fingal in 2022[85]. In 2025, there is a decrease in the number of annoyed people as a result of the implementation of the proposed Relevant Action However, in assessment year 2035, there is an increase in the number of people highly annoyed as a result of the proposed Relevant Action.

Table 7-22 Number of people highly annoyed by air noise and vibration (Permitted vs Proposed scenarios)

Scenario	*Number of people highly annoyed*			
	Excluding consented developments	*Percentage of population highly annoyed*	*Including consented developments*	*Percentage of population highly annoyed*
2025 Permitted	55,041	16.7%	64,967	19.7%
2025 Proposed	53,854	16.3%	62,872	19.0%
2025 Permitted vs Proposed Change	-1,187 (-2%)		-2,095 (-3%)	
2035 Permitted	29,232	8.8%	36,826	11.1%

[82] The impact of the proposed Relevant Action on the incidence of IHD has not been assessed. As stated within EU Directive 2020/367, as well as replacement Chapter 13: Aircraft Noise and Vibration (section 13.3.44) and replacement Chapter 14: Ground Noise and Vibration, for IHD in the case of aircraft noise, the population exposed above adequate Lden levels is estimated as subject to an increased risk of IHD, while the exact number of cases of IHD cannot be calculated. For this reason, it has not been possible to assess the impact of the proposed relevant action on IHD.
[83] It should be noted that only residential healthcare facilities are highly sensitive to noise at night. Schools and places of worship are not expected to be used during the hours specified in the overnight metric.
[84] Replacement Chapter 13: Aircraft Noise and Vibration does not assign significance to these results as there is not published guidance regarding significance thresholds for a collective community-level assessment. On an individual level however, high annoyance and high sleep disturbance is considered harmful to health, as outlined in EU Directive 202/367.
[85] The population of Fingal used to determine the proportion of the population highly annoyed by air noise and vibration is the latest available (2022). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-22 Number of people highly annoyed by air noise and vibration (Permitted vs Proposed scenarios)

2035 Proposed	35,445	10.7%	43,669	13.2%
2035 Permitted vs Proposed Change	+6,213 (21%)		+6,843 (19%)	

7.8.26 The number of people highly sleep disturbed (during the night) by air noise and vibration for each assessment scenario is presented in Table 7-23 below. This number is also shown as a proportion of the population in Fingal in 2022[86]. For all Assessment Years (2025 and 2035) there is an increase in the number of highly sleep disturbed people as a result of the implementation of the Relevant Action This increase is much larger in assessment year 2035.

Table 7-23 Number of people highly sleep disturbed by air noise and vibration (Permitted vs Proposed scenarios)

Scenario	*Number of people highly sleep disturbed*			
	Excluding consented developments	*Percentage of population highly sleep disturbed*	*Including consented developments*	*Percentage of population highly sleep disturbed*
2025 Permitted	22,281	6.7%	27,474	8.3%
2025 Proposed	23,884	7.2%	29,589	9.0%
2025 Permitted vs Proposed Change	+1,603 (7%)		+2,115 (8%)	
2035 Permitted	9,430	2.9%	13,592	4.1%
2035 Proposed	16,026	4.8%	21,189	6.4%
2035 Permitted vs Proposed Change	+6,596 (70%)	-	+7,597 (+56%)	-

Ground Noise and Vibration

7.8.27 An assessment of the likely residual significant effects of ground noise and vibration as a result of the proposed Relevant Action for each Assessment Year (2025 and 2035) has been presented in replacement *Chapter 14: Ground Noise and Vibration* (as detailed in sections 7.8.7 to 7.8.11). For each Assessment Year (2025 and 2035), no residents benefit from lower noise levels whilst a small number of residents will be impacted adversely by higher noise levels as a result of the implementation of the proposed Relevant Action. Of additional note, there are no significant noise and vibration effects reported on schools or residential health care facilities for any Assessment Year (2025 and 2035).

7.8.28 Replacement *Chapter 14: Ground Noise and Vibration* presents as assessment of the number of people who would be highly annoyed and highly sleep deprived as a result of the implementation of the proposed Relevant Action. The results of this assessment are presented in Table 7-24 and Table 7-25 below.[87]

7.8.29 The number of people highly annoyed (during the daytime) by ground noise and vibration caused by road traffic noise for each assessment scenario is presented in Table 7-24 below. This number is also shown as a proportion of the population in Fingal in 2022[88]. For all assessment years (2025 and 2035)

[86] The population of Fingal used to determine the proportion of the population highly sleep disturbed by air noise and vibration is the latest available (2022). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-23.
[87] Replacement Chapter 14: Ground Noise and Vibration does not assign significance to these results as there is not published guidance regarding significance thresholds for a collective community-level assessment. On an individual level however, high annoyance and high sleep disturbance is considered harmful to health, as outlined in EU Directive 202/367.
[88] The population of Fingal used to determine the proportion of the population highly annoyed by air noise and vibration is the latest available (2022). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-22 Number of people highly annoyed by air noise and vibration (Permitted vs Proposed scenarios)

there is a very minor increase in the number of people highly annoyed by ground noise and vibrations as a result of the implementation of the Relevant Action.

Table 7-24 Number of people highly annoyed by ground noise and vibration (Permitted vs Proposed scenarios)

Scenario	Number of people highly annoyed			
	Excluding consented developments	Percentage of population highly annoyed	Including consented developments	Percentage of population highly annoyed
2025 Permitted	1,237	0.42%	1,394	0.47%
2025 Proposed	1,240	0.42%	1,399	0.47%
2025 Permitted vs Proposed Change	+3 (0.24%)		+5 (0.36%)	
2035 Permitted	1,274	0.43%	1,436	0.49%
2035 Proposed	1,275	0.43%	1,437	0.49%
2035 Permitted vs Proposed Change	+1 (0.08%)		+1 (0.07%)	

7.8.30 The number of people highly sleep disturbed (during the night) by ground noise and vibration for each assessment scenario is presented in Table 7-25 below. This number is also shown as a proportion of the population in Fingal in 2022[89]. For all assessment years (2025 and 2035) there is a very minor increase in the number of people highly sleep deprived by ground noise and vibrations as a result of the implementation of the Relevant Action.

Table 7-25 Number of people highly sleep disturbed by ground noise and vibration (Permitted vs Proposed scenarios)

Scenario	Number of people highly sleep disturbed			
	Excluding consented developments	Percentage of population highly sleep disturbed	Including consented developments	Percentage of population highly sleep disturbed
2025 Permitted	357	0.12%	411	0.14%
2025 Proposed	362	0.12%	417	0.14%
2025 Permitted vs Proposed Change	+5 (+1.4%)	-	+6 (+1.46%)	-
2035 Permitted	384	0.13%	440	0.15%
2035 Proposed	388	0.13%	445	0.15%
2035 Permitted vs Proposed Change	+4 (+1.04%)	-	+5 (+1.14%)	-

[89] The population of Fingal used to determine the proportion of the population highly sleep disturbed by air noise and vibration is the latest available (2022). Population projections are not available below the regional level in Ireland. It is recognised that the population of Fingal is likely to change (particularly by 2035) which would impact the percentages presented in Table 7-23.

Human Health Assessment of Air Quality, Noise and Vibration, and Neighbourhood Amenity

7.8.31 There are a number of people assessed as experiencing residual significant adverse effects within replacement *Chapter 13: Aircraft Noise and Vibration.* The chapter has also identified the number of people who would be highly annoyed, or highly sleep disturbed (as a result of the implementation of the proposed Relevant Action. Therefore, the impact of the proposed Relevant Action on air quality, noise and vibration and neighbourhood amenity as a determinant of human health and well-being is assessed as **negative (-)** for all assessment years (2025 and 2035).

Climate Change

7.8.32 No significant effects on climate change have been identified in replacement *Chapter 11: Climate and Carbon*. Therefore, no additional mitigation measures are required during the operation of the proposed Relevant Action.

7.8.33 An assessment of the likely significant effects on greenhouse gas (GHG) emissions as a result of the proposed Relevant Action has been presented in replacement *Chapter 11: Climate and Carbon* for each Assessment Year (2025 and 2035).

7.8.34 The GHG assessment study area considers all GHG emissions from fuel used by aircraft during the LTO cycle (i.e. approach/landing, taxiing, take-off and climb to 3,000 feet), CCD (climb, cruise and descent) and surface access passenger journeys. Table 7-26 below presents the changes in total annual GHG emissions (tCO_2) for each Assessment Year (2025 and 2035) between the Permitted and Proposed Scenarios.

Table 7-26 Total Annual GHG Emissions Projections – Permitted vs Proposed Scenarios

Year	*Total Annual GHG Emissions (tCO2e)*			
	Permitted	*Proposed*	*Variation*	*% Variation (permitted to proposed)*
2025	4,119,144	4,167,017	**47,873**	1.16%
2035	4,646,010	4,187,473	**-458,537**	-9.87%

7.8.35 For each Assessment Year (2025 and 2035) the impact of the proposed Relevant Action has been compared with Ireland's projected National Emissions Inventories (under the With Additional Measures scenario) to determine the level of significance. As the GHG emissions associated with the proposed Relevant Action do not represent ≥1% of the projected National Emissions Inventory for any of the Assessment Years (2025 and 2035), GHG emissions are considered to be of minor significance.

7.8.36 For all assessment years (2025 and 2035), the impact of the proposed Relevant Action on climate change as a determinant of human health and well-being is assessed to be **neutral (0).**

Access to Work and Training

7.8.37 The operating restrictions incorporated in the grant of permission for the North Runway are forecast to result in a forgone economic impact peaking at 3,130 jobs and €262 million in Gross Value Added (GVA) by 2024. The forgone economic impact is projected to decline in 2025 as the 32 mppa cap on passengers starts to reduce the gap between the forecast scenarios. By 2025, the forgone economic impact is estimated to be 1,510 jobs and €125 million in GVA[90] (Table 7-27).

[90] InterVISTAS (2023): Dublin Airport Economic Impact of Operating Restrictions, Update - September 2023

Table 7-27 Forgone Economic Impact Resulting from Operating Restrictions[91] [92]

Job Type	*Jobs*	*FTEs*	*Wages (€ Millions)*	*GVA (€ Millions)*
		2024		
Direct	440	390	20	40
Indirect	260	230	12	23
Induced	300	260	11	23
Catalytic	2,130	1,880	87	176
Total	**3,130**	**2,760**	**130**	**262**
		2025		
Direct	80	70	4	7
Indirect	40	40	2	4
Induced	50	40	2	3
Catalytic	1,340	1,180	55	111
Total	**1,510**	**1,330**	**62**	**125**

7.8.38 Therefore, the proposed Relevant Action will lead to employment opportunities in the local economy and the potential health impact during operation on access to employment and training opportunities is therefore assessed to be positive (+).

7.9 Mitigation and Monitoring

7.9.1 No additional mitigation measures related to Population and Human Health are proposed during the operation of the proposed Relevant Action, however mitigation for noise impacts is discussed in replacement *Chapter 13: Aircraft Noise and Vibration* and replacement *Chapter 14: Ground Noise and Vibration*. Details of noise monitoring measures at the airport are provided in replacement *Chapter 13: Aircraft Noise and Vibration*. No additional monitoring measures are proposed.

[91] All financial figures are in 2022 prices.
[92] Numbers may not add up due to rounding.

7.10 Residual Effects and Conclusions

7.10.1 As part of the assessment of impacts on population, the overall classification and significance of each effect has been assessed across the study area. A summary of the potential residual effects on population for each Assessment Year (2025 and 2035) is identified in Table 7-28.

Table 7-28: Population Summary of Potential Residual Effects

Description of Effect	*Sensitivity of Receptor*	*Nature of Effect / Geographic Scale*	*Magnitude of Impact*	*Initial Classification of Effect (with embedded mitigation)*	*Additional Mitigation*	*Residual Effect Classification and Significance*
Operation (2025)						
Amenity and Local Communities	High	Permanent / Local	Medium	Moderate Adverse (significant)	None	Moderate Adverse (significant)
Operation (2035)						
Amenity and Local Communities	High	Permanent / Local	Medium	Moderate Adverse (significant)	None	Moderate Adverse (significant)

7.10.2 As part of the assessment of impacts on human health, the overall classification for each health determinant has been assessed across the study area. A summary of the potential residual effects on human health for each assessment year is identified in Table 7-29.

Table 7-29: Human Health Summary of Potential Residual Effects

Health Determinant	*Potential Health Impact*	*Additional Mitigation*	*Residual Effect Classification*
Operation (2025)			
Air Quality, Noise and Vibration, and Neighbourhood Amenity	Negative (-)	None	Negative (-)
Climate Change	Neutral (0)	None	Neutral (0)
Access to Work and Training	Positive (+)	Ensure opportunities are provided to the local workforce, to increase the scheme's local impact.	Positive (+)
Operation (2035)			
Air Quality, Noise and Vibration, and Neighbourhood Amenity	Negative (-)	None	Negative (-)
Climate Change	Neutral (0)	None	Neutral (0)
Access to Work and Training	Positive (+)	Ensure opportunities are provided to the local workforce, to increase the scheme's local impact.	Positive (+)

What has changed since the EIAR was submitted in September 2021?

- Assessment year 2022 removed from analysis.
- The literature review has been updated
- The previous submission included an error in Table 7-25, that inaccurately presented the number of people highly sleep disturbed for the 2025 Proposed scenario, mirroring the 2022 Permitted scenario due to a transcription error. When considering the correct numbers this mistake did not affect the conclusion of a residual negative effect during operation in 2025. This error has been amended in the current submission and data tables replaced with updated figures.
- A modelling error was identified that resulted in higher predicted ground noise levels, impacting data in Chapter 14 of the EIAR. However, this correction has not altered the overall conclusions in Chapter 14 or the related findings in Chapter 7's Sections 7.8 and 7.10 concerning population health and residual effects. This error has been amended in the current submission and data tables replaced with updated figures.