

## 6.0 POPULATION AND HUMAN HEALTH

### 6.1 INTRODUCTION

This Chapter examines the existing environment and addresses the potential impacts on population and human health arising from the proposed Oweninny Wind Farm Phase 3 development.

#### *6.1.1 Background*

The two environmental factors of population and human health are addressed under separate headings throughout this Chapter. The assessment on population considers the current land use of the proposed site, the current activities occurring within and in the vicinity of the site, local population information, employment profiles, tourism, visitor attractions and community gain opportunities. The assessment on human health includes a detailed literature review of studies and research carried out on the potential effects of wind farm developments on human health.

The study area for population and human health includes a review of relevant information on a county and national scale but is mainly concentrated on the Electoral Districts (ED) within which the proposed project is located.

The potential impacts of the proposed development on other environmental factors which may also have an impact on human beings, as set out in Chapter 9 (Soils and Geology, Geotechnics and Ground Stability); Chapter 10 (Hydrogeology); Chapter 11 (Hydrology and Water Quality); Chapter 12 (Air Quality and Climate); Chapter 13 (Noise and Vibration); Chapter 14 (Shadow Flicker); Chapter 15 (Landscape and Visual Impact); Chapter 16 (Aviation and Telecommunications and Electromagnetic Interference); Chapter 17 (Traffic and Transportation) and Chapter 18 (Archaeological, Architectural and Cultural Heritage) are addressed in this Chapter and discussed in more detail in the relevant Chapters of this EIAR. A separate section setting out the likely interactions between this assessment and other technical assessments is presented in Chapter 19 (Interaction of Effects).

This assessment has been carried out in accordance with the following guidelines:

- Department of Housing, Planning and Local Government (DoHPLG), *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* (2018);
- Environmental Protection Agency (EPA), *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (2022);

- European Commission (EC), *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report* (2017);
- Department of the Environment, Heritage and Local Government, *Wind Energy Development Guidelines* (WEDGs) (2006);
- DoHPLG, *Draft Revised Wind Energy Development Guidelines* (WEDGs) (2019);
- Wind Energy Ireland, *IWEA Best Practice Principles in Community Engagement & Community Commitment* (2013);
- Department of the Environment, Climate and Communications, *Climate Action Plan, 2023(CAP23)* (2022).

### ***6.1.2 Proposed Development***

The proposed development will comprise 18 no. wind turbines and all associated infrastructure as described in Chapter 3 of this EIAR (Description of the Proposed Development).

### ***6.1.3 Statement of Authority***

This chapter was prepared by Serena Byrne, and Louise Byrne of TOBIN Consulting Engineers.

Louise Byrne is a Planner in TOBIN Consulting Engineers. Louise has 8 years' experience in development management for local government, semi-state and consultancy. Louise has contributed to the preparation EIA reports for a variety of renewable energy projects including Wind Energy, Gas Fired Peaker Plants, Green Hydrogen Production and Solar. Louise has a Masters in Regional and Urban Planning from University College Dublin and is a chartered member of the Royal Town Planning Institute.

Serena Byrne is a project scientist at TOBIN Consulting Engineers, with over 11 years' multidisciplinary experience in engineering and environmental consulting. She has recently completed a MSc in Environmental Sustainability in University College Dublin on a part time basis, including an EIA Procedures module.

## 6.2 METHODOLOGY

### 6.2.1 Population

A desktop study and a site visit were carried out in order to examine relevant information pertaining to this population impact assessment. The site visit was used to verify descriptions and information of the local area, and thus inform the impact assessment. Maps from Ordnance Survey Ireland (OSI) were used to identify current and historical land use in the area as well as relevant amenity facilities surrounding the proposed wind farm site and within the main settlement areas around the proposed project.

Information on population statistics, employment and social data for the areas surrounding the proposed project have been obtained from the Central Statistics Office (CSO) and predominantly from the 2016 and 2011 Census records. The first publication by the CSO providing insights into Ireland's 2022 Census of Population was published in June 2022. This publication of the preliminary results is the first release in a series of results that will be published of the Census 2022. The main results will be published over several months, which the CSO states will begin from April 2023.

Data has been captured on an ED basis as this is the most appropriate scale for collated census data and is commonly used for defining the existing population profile. The ED's within which the proposed project is located comprise the study area for this assessment.

Fáilte Ireland tourist literature for County Mayo was examined in relation to tourism amenity in conjunction with the websites of relevant tourism assets, locations and amenities in the area. County Mayo is located in the Wild Atlantic Way, a branding initiative developed by Fáilte Ireland with the overall aim for the area "to achieve greater visibility for the west coast of Ireland in overseas tourist markets through this long-distance touring route."

Information on other tourist attractions and initiatives in the area have been sourced from relevant websites, such as Discover Ireland, Visit Mayo, Tourism Ireland, those hosted by Mayo Tourism Board and published literature.

A consultation letter on the proposed development was sent to Fáilte Ireland on 3<sup>rd</sup> February 2021. In response, an acknowledgement letter was received on 24<sup>th</sup> February 2021 with an attachment that outlines Fáilte Ireland's *EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects*. The Fáilte Ireland Guidelines state that "the character of an area from a tourism perspective should be described and the principal types of tourism in the area. Where

*relevant, the specific environmental resources or attributes in the existing environment which each group uses or values should be stated and where relevant, indicate the time, duration or seasonality of any of those activities". The Guidelines also note that "Where possible the value of the contribution of such tourism assets and activities to the local economy should be provided".*

The Oweninny Wind Farm Phase 3 Community Benefit Proposal is set out in Section 3.2 of Chapter 3 of this EIAR and has been developed with reference to the current terms and conditions of the Government's Renewable Energy Support Scheme (RESS). The provisions of the Community Benefit Proposal which will have an impact on the local population are discussed in Section 6.3.1.

The following key information sources and guidance have been used in the completion of the population aspect of this Chapter:

- CSO – 2016 and 2011 Census and associated data;
- CSO – Census of the Population 2022 - Preliminary Results;
- Fáilte Ireland website – <https://www.failteireland.ie/>
- Fáilte Ireland, EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects (as received from Fáilte Ireland, 2021);
- Ireland's Wild Atlantic Way website - <https://www.thewildatlanticway.com/>
- Mayo County Development Plan (CDP) 2022-2028;
- Department of Housing, Local Government and Heritage – Ministerial Directions to Mayo – Mayo County Development Plan 2022-2028;
- OSI – Mapping and aerial photography; and
- Walking trails - <https://www.sportireland.ie/outdoors> and <http://trails.ie/index.php>

The effects of the proposed development on the human environment are assessed in compliance with the EIAR Guidelines as outlined in Chapter 1 (Introduction).

### ***6.2.2 Human Health***

This section has been compiled from a review of published literature on the effects of wind energy developments on human health. Aspects examined in this section primarily relate to impacts from the proposed development on socio-economic activities and on local community health. These two themes are discussed primarily in this chapter but may be further addressed in other technical chapters, where relevant.

The following specific guidance documents have been consulted in the completion of the human health impact aspect of this Chapter:

- Department of Health – Health in Ireland: Key Trends 2022;
- Institute of Environmental Management and Assessment (IEMA), *Health in Environmental Impact Assessment - A Primer for a Proportionate Approach* (2017);
- Institute of Public Health Ireland, *Health Impact Assessment* (2009);
- US Environmental Protection Agency, *Health Impact Assessment Resource and Tool Compilation* (September 2016);
- World Health Organisation (WHO), *Environmental Noise Guidelines for the European Region* (2018); and
- WHO, *Night-time Noise Guidelines for Europe* (2009);
- WHO, *Global Air Quality Guidelines* (2021).

### **EIA Directive**

The 2014 amendment to the 2011 EIA Directive (2014/52/EU) directs that population and human health factors be assessed in an EIAR. The EIA Directive does not define the term ‘human health’, however the 2017 EC Guidance on the preparation of the EIAR states that *“human health is a very broad factor that would be highly project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation and decommissioning of a Project in relation to workers on the Project and surrounding population”*.

### **EPA EIAR Guidelines (2022)**

The 2022 EIAR Guidelines published by the EPA state that *“while no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU, the same term was used in 3.3.6 the SEA Directive (2001/42/EC). The Commission’s SEA Implementation Guidance states ‘The notion of human health should be considered in the context of the other issues mentioned in paragraph (f)’”*. Paragraph (f) (of Annex I of the SEA Directive) lists the environmental factors including soils, water, landscape, air etc.).

The 2022 EPA Guidelines also state that the above health assessment approach is “*consistent with the approach set out in the 2002 EPA EIS Guidelines where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil.*”. The 2002 EPA Guidelines state “*The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment*”.

The 2022 EPA Guidelines also note that in an EIAR, “*the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil, etc.*” and that “*assessment of other health & safety issues are carried out under other EU Directives, as relevant. These may include reports prepared under the Integrated Pollution Prevention and Control, Industrial Emissions, Waste Framework, Landfill, Strategic Environmental Assessment, Seveso III, Floods or Nuclear Safety Directives. In keeping with the requirement of the amended Directive, an EIAR should take account of the results of such assessments without duplicating them*”.

### **IEMA Discussion Document (2017)**

The Institute for Environmental Management and Assessment (IEMA) in the UK issued a discussion document in 2017 (IEMA, 2017) which it describes as a primer for discussion on what a proportionate assessment of the impacts on health should be in EIA. It is a useful document when considering what can and should be assessed in the context of EIA. Regard has been given to the general approach advocated in this document when compiling this chapter.

One of the messages in the IEMA document in terms of assessing health in EIA, is that there should be a greater emphasis on health outcomes (i.e. the potential effects on human health), rather than simply the health determinants (i.e. the agents or emissions which could have the potential to have health effects). The IEMA document noted that in EIA, there has previously been a strong focus on just the agents or emission levels (e.g. dust) rather than focusing on the effects of these agents/emission levels on human health. This change in emphasis does not mean a complete change in practice.

The IEMA document notes that *“public health is defined as the science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society and has three domains of practice: health protection, health improvement and improving services”*. The IEMA document suggests that these three domains should be considered in the assessment of health in EIA. Examples of health protection issues to be considered could include issues such as chemicals, radiation, health hazards, emergency response and infectious diseases whilst health improvement issues could include lifestyles, inequalities, housing, community and employment. Examples of improving services issues could include service planning, equity and efficiencies.

The WHO defined health, in its broader sense, in its 1948 constitution as *“a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”*. Therefore, whilst the EPA EIAR Guidance is useful in terms of health protection, for a more holistic assessment, as per the IEMA document, it is also worthwhile to look at broader health effects in terms of opportunities for improvement of health and for improvement of access to services. While it is important to do this, it is also important not to attribute every conceivable event as being a health effect. To further rely on the WHO definition, a health effect would be something that would have a material impact on somebody’s physical, mental and social well-being, be that positive or negative.

#### **HSE Position Paper on Wind Turbines and Public Health (2017)**

The Public Health Medicine, Environment and Health Group of the HSE were tasked with investigating the potential public health issues involved with wind farm development, given the increase in wind farm development in Ireland in recent years. The issues often cited in terms of health impacts are considered, including noise, shadow flicker and electromagnetic frequency.

The paper has reviewed the scientific basis for reports on negative health impact resulting from wind farms. Its findings conclude that the evidence is “weak or absent”. The paper states that *“Published scientific evidence is inconsistent and does not support adverse effects of wind turbines on health”* and that *“adequate setback distances and meaningful engagement with local communities are recommended in order to address public concern”*. In respect of the proposed project, there is a minimum setback distance of 1000m from the proposed turbine locations to sensitive receptors which is in excess of the minimum setback requirements in the 2006 and Draft 2019 WEDGs.

The position paper states that *“Further research is required to investigate the effects of wind farms on public health. Large-scale prospective cohort studies would be most informative for identifying potential health effects of exposure to wind turbine noise; further cross-sectional studies are unlikely to contribute meaningfully to the current limited evidence base.”*

The paper recommends the use of relevant national planning guidelines (which would include the 2006 WEDGs) in order to determine applicable limits for noise, shadow flicker and setback distances from sensitive properties.

Therefore, health protection and health improvement are considered in this Chapter. The methodology for assessing health protection is considered further below.

#### **6.2.2.1 Health Impact Assessment and Environmental Impact Assessment**

The 2017 IEMA Discussion Document notes that Health Impact Assessment (HIA) and EIA are separate processes and that whilst a HIA can inform EIA practice in relation to human health, a HIA alone will not necessarily meet the EIA human health requirement. HIA is not routinely carried out for major infrastructure schemes in Ireland.

Guidance on HIA was issued by the Institute of Public Health in Ireland (IPHI) in 2009 (IPHI, 2009). There are, however, considerable difficulties in performing a HIA as outlined by the IPHI for infrastructural projects such as the proposed wind farm development. Not least of these is the difficulty of getting baseline health data. It is quite difficult due to patient confidentiality, and other reasons, to accurately determine levels of even relatively common medical conditions in a relatively defined population that might be affected by a proposed project. In the absence of an accurate baseline, it is very difficult to assess qualitative and quantitative changes that might occur. One could use more generalised data that might exist for larger areas such as a city or county, but these would be at most an estimate of the local baseline and not accurate enough to allow for meaningful interpretation.

The 2017 IEMA Discussion document also notes that the WHO provides an overview of health in different types of impact assessment (WHO, 2014) and presents the WHO perspective on the relationship of HIA to other types of impact assessment as follows:

*“The health sector, by crafting and promoting HIA, can be regarded as contributing to fragmentation among impact assessments. Given the value of impact assessments from a societal perspective, this is a risk not to be taken lightly...The need...and justification for separate HIA cannot automatically be derived from the universally accepted significance of health;*



*rather, it should be demonstrated whether and how HIA offers a comparative advantage in terms of societal benefits...Health issues can, and need to, be included [in impact assessment] irrespective of levels of integration. At the same time, from a civic society perspective, it would be unacceptable for HIA to weaken other impact assessments. A prudent attitude suggests optimizing the coverage of health along all three avenues:*

- *better consideration of health in existing impact assessments other than HIA;*
- *dedicated HIA; and*
- *integrated forms of impact assessment.”*

It is clear, therefore, that the WHO does not support a stand-alone HIA unless it could be demonstrated to be of advantage over an EIAR. It is for these reasons that this health assessment is part of the EIAR and there is no stand-alone HIA.

The HIA is defined as a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, programme or project on both the health of a population and the distribution of those effects within the population, whilst the health assessment in the context of EIA focuses the attention of the assessment on likely significant effects, i.e. on effects that are deemed likely to occur and, if they were to occur, would be expected to be significant (as per the requirements of the EIA Directive). Conducting a HIA will not necessarily meet the EIA Directive population and human health assessment requirement.

#### **6.2.2.2 Health Protection**

The assessment of human health for the proposed development, in terms of health protection, follows the approach set out in the 2017 EIAR Draft Guidelines and in the EC’s Guidance on the preparation of the EIAR. It is also similar in nature to the US Environmental Protection Agency (USEPA) Guidance, entitled *Health Impact Assessment Resource and Tool Compilation* (USEPA, 2016). Human health protection is considered through the assessment of the environmental factors (pathways) through which health could be affected such as air, noise, water and soils. The USEPA Guidance includes a four-step approach which is represented graphically below.

## The 4 Step Risk Assessment Process

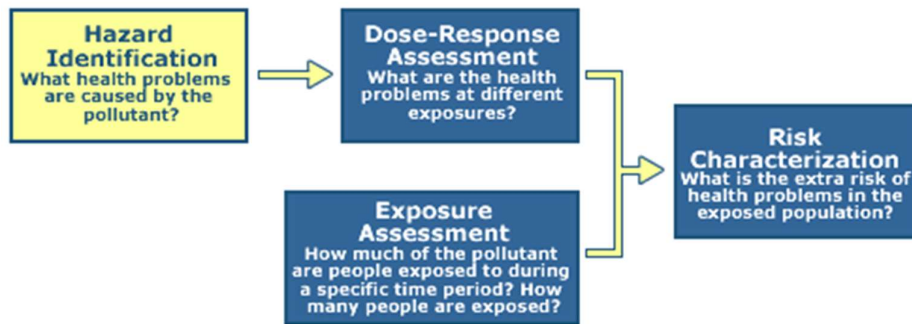


Figure 6.1: Four-step Risk Assessment Process (Source: USEPA, 2016)

This USEPA risk assessment process is similar to the Irish 2022 EIAR Draft Guidelines in that the potential noise, air, soils and water impacts which could affect human health are identified (Hazard Identification), the scale of these potential impacts (Dose-Response Assessment) and their duration (Exposure Assessment) are assessed and the significance of the potential impact on human health is determined (Risk Characterisation).

It should be noted that the identification of individual environmental hazards and the associated potential impacts and duration are undertaken in other chapters of this EIAR namely, Noise, Shadow Flicker, Material Assets, Hydrology, Air Quality and Climate. The associated significance in terms of the potential impact on human health is then considered in this chapter.

## 6.3 EXISTING ENVIRONMENT

### 6.3.1 Population

#### Land Use

The proposed wind farm site (see Figure 1-2 of this EIAR) is approximately 6km long in the north/south direction and is approximately 5km wide in an east/west direction at the widest point.

The proposed development will be located on the eastern part of Oweninny Bog, which is located in North Mayo, approximately 12km west of Crossmolina and 15km east of Bangor Erris, and just north of the N59 National Primary Road. The overall area of Oweninny Bog is approximately 5,090 hectares, while the site area of the proposed development is approximately 2,345 hectares.

The closest settlement to the site is Bellacorick village which is located approximately 2km from the southwestern extents of the proposed development. To the east of the site a local road (L5292) runs northwards from the N59 to the townlands of Shanvolahan and Formoyle.

The proposed development site is located within the townlands of Laghtanvack, Croaghaun (also known as Croaghaun West), Moneynieran, Corvoderry, Shanvolahan, Dooleeg More and Shanvodinnaun, Co. Mayo.

The proposed grid connection infrastructure is located within the townlands of Bellacorrick and Moneynierna, in County Mayo.

The proposed 110kV substation will be connected to the national grid at the existing 110kV Bellacorick substation via underground MV cables and will export power via the existing 110 kV overhead line infrastructure from Bellacorick substation, with further details on the proposed grid connection set out under section 3.4.7 of this report.

There are three potential large turbine component haul routes to the site. Each route will require temporary works such as surface modification at roundabouts, removal of street furniture and undergrounding of wires. These temporary works are assessed as part of the EIAR.

Further detail on the turbine delivery route is provided in Chapter 17 (Traffic and Transportation).

The area around Oweninny Bog is a relatively sparsely populated area. Within a buffer area of 2km from the proposed turbines, 9 sensitive receptors have been identified.

The local area historically consists of commercially harvested peat bog and forestry, some dispersed rural housing and farming activity. Oweninny Wind Farm Phase 1 is located immediately west / northwest of the proposed development site and was commissioned in 2019, while Oweninny Wind Farm Phase 2 has been consented further to the west and is currently under construction. In addition, since 1992, Ireland's first commercial wind farm, a 21-turbine development known as Bellacorick Wind Farm, which is owned and operated by Renewable Energy Ireland Limited, has been operating on the site.

The most significant features in the surrounding landscape are the Oweninny River valley and the upland areas of Sliabh Fíoch to the north west of the proposed development site.

The Western Way walking/hiking trail, running from Oughterard in County Galway to Bunnyconnellan in Co. Mayo runs south of the proposed development along the N59 before

turning northwards through Tawnaghmore. The trail, which is over 200km in length is a designated National Waymarked Trail by the National Trails Office of the Irish Sports Council and is jointly managed by Coillte, Galway County Council, Mayo County Council, South Mayo Development Company and Mayo North & East Development Company.

Other trails within the wider area of the proposed development site include the Bellacorick Bog Loop, which is located approximately 700m west of the site and the Bangor Trail, which is located approximately 12km west of the site.

The nearest primary school to the proposed development site is Eskeragh National School, located approximately 1.83km to the south east, while the nearest post-primary school is St. Tiernan's College located 10.64km to the south east.

The nearest third level campus is Galway Mayo Institute of Technology, located approximately 34km south east of the proposed development site in Castlebar. While the Mayo, Sligo and Leitrim Education and Training Board is located approximately 32km east in Ballina.

Public transportation is provided along the N59, south of the proposed development site. Bus Eireann runs bus service no. 446 from Ballina Bus Station to Black Sod Lighthouse. Busses are also available from Ballina to a number of destinations including Galway and Dublin. Irish rail provide services from Ballina and Westport to Dublin Heuston.

A number of community facilities and amenities are available in the locality, with Bangor Erris providing those nearest to the proposed development site. The village is home to an active GAA club (Kiltane GAA Club), shops, health centre, community hall and churches. Further amenities and services are available in Crossmolina.

The proposed 110kV substation will be connected to the national grid at the existing 110kV Bellacorick substation via underground MV cables and will export power via the existing 110 kV overhead line infrastructure from Bellacorick substation, with further details on the proposed grid connection set out under section 3.4.7 of this report.

The proposed development also provides for an on-site 110 kV electrical substation, which will be constructed within the ownership boundary of Bord na Móna. The electrical substation will have 2 no. control buildings and associated electrical plant and equipment. The output from the proposed wind farm will be connected to the national grid via underground cable to the existing substation at Bellacorick.

Further detailed description of the proposed development is provided in Chapter 3 (Description of the Proposed Development) of this EIAR.

### **Population Trends**

An examination of the existing population in the study area has been carried out to identify population trends, density and to define the properties/receptors surrounding the proposed wind farm site. Census data from the period 2006 – 2016 available from the CSO<sup>25</sup> has been summarised in Table 6.1 and Table 6.2. The proposed development works are located in the local authority area of Mayo County Council and within the ED's of Kilfian South, Derry and Deel

*Table 6.1: Population Trends 2006 – 2016 (Proposed Development Works)*

Area	Population 2006	Population 2011	Population 2016	% Change from 2006 - 2016
State	4,239,848	4,588,252	4,761,865	+12%
Mayo County	123,839	130,638	130,507	+5%
Kilfian South	246	259	254	+3%
Derry	216	195	175	-19%
Deel	511	532	487	-5%
<b>Study Area (total)</b>	<b>973</b>	<b>986</b>	<b>916</b>	<b>-6%</b>

During the period of 2006 to 2016, the population nationally increased by approximately 12% and the population of County Mayo increased by approximately 5% while the population of the ED's within which the proposed development is located decreased overall by approximately 6%. This illustrates a decline in local population which stands in contrast to increasing County and National level rates of increased population.

Population density measures the number of persons occupying a geographical area in proportion to the size of that area. It is a useful indicator of settlement patterns in the area surrounding the proposed development and Mayo County overall. Table 6.2 shows population density for the study area as well as Mayo County and shows a generally sparser population in the study area compared with the overall county. The 2016 census identified that the average rural population density in Ireland is 27 persons/km<sup>2</sup> showing that the population density in the area surrounding the proposed development is well below the national average.

<sup>25</sup> <https://www.cso.ie/en/census/> (Accessed on 17 August 2021)

*Table 6.2: Population Density 2016*

Area	Population Density 2016 (persons/km <sup>2</sup> )
Mayo County	23.3
Kilfian South	3.4
Derry	2.7
Deel	11.3
<b>Study Area (average)</b>	<b>5.8</b>

### Census 2022- Preliminary Results

The first publication by the Central Statistics Office (CSO) providing insights into Ireland’s Census of Population and housing figures for 2022 was published in June 2022. This publication of the preliminary results is the first release in a series of results that will be published of the Census 2022. The main results will be published over several months, which the CSO states will begin from April 2023.

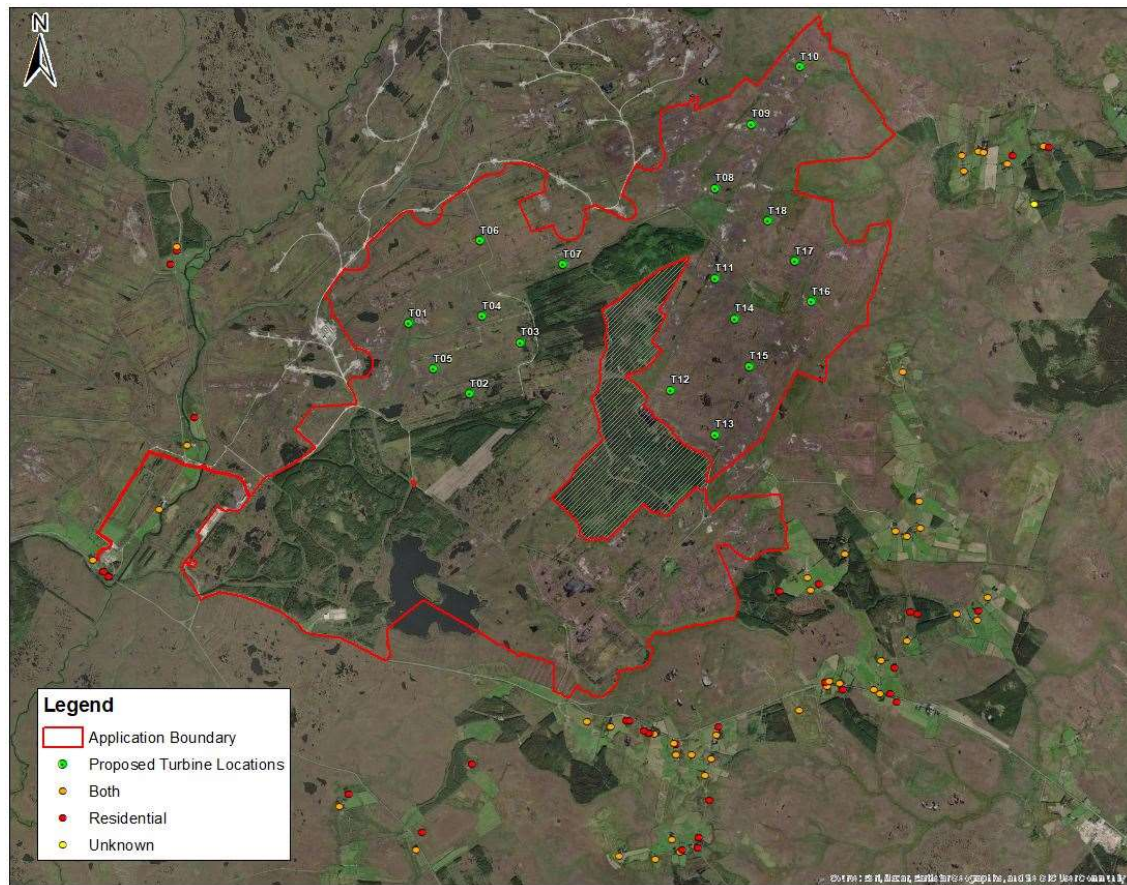
The preliminary results indicate that the population of Ireland as of Census Night 2022 (Sunday 3<sup>rd</sup> of April 2022) was 5,123,536 persons; this population result is the first time in over 170 years (since 1841) that a census has recorded a population in Ireland of over 5 million people. The population increased by 361,671 persons (8%) since the previous census (April 2016), with an average annual population increase of 1.2% a year since 2016. The key findings of the preliminary results in terms of population growth are:

- Between 2016 and 2022 population growth occurred in every county;
- The population increase (361,671 persons) comprises a natural increase of 171,338 persons and an estimated net inward migration of 190,333 persons;
- Between 2016 and 2022 Ireland’s housing stock increased by more than 120,000 units (6%) to over 2.1 million. This represents a marked increase compared to the intercensal period between 2011 and 2016 where housing stock increased by less than 1% (8,800);
- The number of occupied households increased by over 9% (150,000), while the number of vacant dwellings decreased by over 16,500 (-9%), from 183,312 in 2016 to 166,752 in 2022;
- In 2022, at a State level the census vacancy rate has decreased to less than 8%, down from over 9% in 2016, and 12% in 2011;
- The preliminary results indicate that the sex ratio has declined to the lowest level since 1871. A decline from 97.8 to 97.5 was experienced between 2016 and 2022.

**Property/Receptors**

All receptors within 2km of the proposed development site boundary have been identified by means of a desktop survey. The locations of properties and buildings (referred to as receptors) in the vicinity of the proposed wind farm site have been identified using address data from the GeoDirectory database which is used to populate Eircodes.

In excess of 78 no. receptors were identified. The locations of these receptors in relation to the proposed development are shown in Figure 6.2 with a summary of identified receptors presented in Table 6.3.



*Figure 6.2: Population & Human Health Study Area including identification of sensitive receptors located within a 2km buffer of the proposed development site*

Table 6.3 presents a summary of the identified receptors. The closest sensitive receptor is located more than 1,000m from the nearest proposed turbine location which is in excess of the minimum setback requirement of 500m set out in the 2006 WEDGs. The Draft 2019 WEDGs recommend a minimum setback distance from a turbine to the curtilage of a residential property equal to 4 times the turbine tip height or 500m, whichever is largest. The proposed development

includes for the installation of turbines with a height of up to 200m, therefore the minimum setback distance required in accordance with the 2019 Draft WEDGs is 800m . The proposed development exceeds this requirement.

*Table 6.3: Summary of Receptors Within 2km of Wind Farm Site Boundary*

Receptor Type	No. Within 2km of Wind Farm Site Boundary
Both	33
Commercial	2
Residential	34
Unknown	9
<b>Total</b>	<b>78</b>

As part of the community engagement process and public consultation, the sensitive receptors identified in Table 6.3, from the proposed development, were the main focus of initial project engagement to inform them of the proposed development and to gather their feedback on the project. Further information on the public consultation process is provided in Chapter 1 (Introduction) and in Appendix 1.3 (Oweninny Wind Farm Phase 3 Community Report).

### Property Values

In January 2023, the CSO published the Residential Property Price Index (RPPI) data for the 12-months to November 2022<sup>26</sup>. The latest RPPI data release shows that overall residential property prices rose by 8.6% in the 12-months to November 2022, a decrease from 9.7% in the year to October 2022 (previous CSO RPPI release). Beyond the Dublin region, the greatest increase in house prices was in the West Region (Galway, Mayo, Roscommon) at 15.6%, compared to the South-West region (Cork, Kerry) which experienced a 8.1% increase.

Data available from the CSO on property values is also presented in terms of Eircode Routing Key areas. The proposed development is located within Eircode Routing Key F26: Ballina. The CSO data for the year to November 2022<sup>27</sup> show that the median price of residential properties sold within the F26 area is €175,000.

<sup>26</sup><https://www.cso.ie/en/releasesandpublications/ep/p-rppi/residentialpropertypriceindexnovember2022/> (Accessed on 08 February 2023)

<sup>27</sup> <https://www.cso.ie/en/interactivezone/visualisationtools/housepricesbyeircode/> (Accessed on 08 February 2023)



Nationally, the lowest median price paid for a dwelling was in County Longford at €150,000, and the highest in Dún Laoghaire-Rathdown, County Dublin at €620,000. The RPPI currently shows that the national median price for a dwelling purchased in the 12-months to November 2022 was €300,000<sup>28</sup>. The CSO states the most expensive Eircode area over the 12-months to November 2022 according to the RPPI was A94 'Blackrock' (median price of €745,000), while F35 'Ballyhaunis' was the least expensive (median price of €125,000).

### **Employment/Economy**

Employment is an important indicator of the economic standing of an area. This section examines employment status and unemployment levels in the region of the proposed development. The Labour Force Survey undertaken by the CSO provides details of unemployment on a regional level. Mayo is located in the West Region (IE042)<sup>29</sup> which is a NUTS Level III statistical region of Ireland. Data for this region is used to illustrate unemployment in the area. Table 6.4 illustrates the findings from the Q3 2022 Labour Force Survey published by the CSO<sup>30</sup>.

*Table 6.4: Labour Force Survey (Q3 2022)*

Location	Unemployment Rate	Participation Rate
State	4.5%	64.8%
West Region (IE042)	4.5%	63.4%

The unemployment rate in Table 6.4 is the number of unemployed persons expressed as a percentage of the total labour force (aged 15 – 74). The unemployment rate for the State in Q3 2022 was 4.5% while the unemployment rate for the West Region (IE042) was 4.5% showing that unemployment in the region (in Q3 2022) was comparable to the State. The participation rate is the number of persons available to the labour force (i.e. persons from 15 – 74 years old either working or looking for work) expressed as a percentage of the total population. In Q3 2022, the participation rate in the State was 64.8% with a similar rate of 63.4% in the West Region (IE042).

<sup>28</sup> <https://visual.cso.ie/?body=entity/rppi> (Accessed on 8 February 2023)

<sup>29</sup> <https://www.cso.ie/en/methods/informationnotefordatausersrevisiontotheirishnuts2andnuts3regions/> (Accessed on 8 February 2023)

<sup>30</sup> <https://www.cso.ie/en/releasesandpublications/ep/p-lfs/labourforcesurveyquarter32022/> (Accessed on 08 February 2023)

The CSO also publishes figures relating to the Live Register.<sup>31</sup> These figures are not strictly a measure of unemployment as they include persons who are legitimately working part-time and signing on part-time. However, the Register can be used to provide an overall trend within an area.

The figures in Table 6.5 show that over the period of January 2022 – January 2023, there was an 14% increase in the number of persons on the Live Register in the State as a whole and a 20% increase in the number of persons on the Live Register in the West Region. The overall trend in Live Register Figures indicates a need for further employment in the West Region including County Mayo.

*Table 6.5: Live Register Figures (January 2022 – January 2023)*

Location	Jan 2022	Jan 2023	% Change
State	162,578	184,736	+14%
West Region	14,901	17,925	+20%
County Mayo	5,219	6,541	+25%

Section 2 of the Mayo CDP 2022-2028<sup>32</sup> sets out the Economic Development strategic aim for Mayo County, which is:

*“The strategic aim of this chapter is to promote and enhance Mayo’s economic development potential through increased resilience in the county’s enterprise, underpinned by talent and innovation, thereby ensuring that Mayo is best placed to excel in the long-term delivery of sustainable jobs and an enhanced standard of living for all.”*

The Plan provides a framework that encourages sustainable growth in the County, through the provision of services, access, appropriately zoned lands, infrastructure and clear sustainable policies and objectives to attract investment and people into the County.

Some of the relevant policies and objectives identified in the Mayo CDP in support of the above include:

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<sup>31</sup> <https://www.cso.ie/en/releasesandpublications/ep/p-lr/liveregisterjanuary2023/> (Accessed 08 February 2023)

<sup>32</sup> [https://www.mayo.ie/getmedia/5869fbe1-6229-4bed-9c95-bcdf1245feac/Vol-1-Mayo-CDP-ADOPTED\\_3.pdf](https://www.mayo.ie/getmedia/5869fbe1-6229-4bed-9c95-bcdf1245feac/Vol-1-Mayo-CDP-ADOPTED_3.pdf) (Accessed 10 February 2023)

- EDP 1: To support and promote economic opportunities identified in Mayo County Council's Economic Strategy – Mayo: Sustaining Jobs, Supporting Growth & Winning Investment or any amended or replacement strategy.
- EDO 1: To facilitate and support the continued growth of the economy in the county in a sustainable manner and in accordance with the National Planning Framework (NPF) and the Regional Spatial and Economic Strategy.
- EDO 2: To support and facilitate the economic development of the county in a manner which is consistent with the economic pillars identified in the Enterprise and Investment Units Economic Strategy.
- EDO 3: To continue to promote the county to attract enterprise and investment into Mayo through the Enterprise & Investment Unit and/or Local Enterprise Office, with a focus on a number of established and emerging sectors including tourism, manufacturing, marine, renewable energy, ICT, food and agri-food.
- EDO 6: To facilitate the economic development of Mayo to create a viable and favourable economic environment for business and enterprise, whilst delivering sustainable jobs, employment opportunities and an enriched standard of living for all.

The Mayo CDP Economic Development Strategy recognises the Council's role in supporting and promoting innovation in business; developing the Green Economy to assist in reducing costs; enhancing environmental protection; and providing infrastructure essential to support enterprise and employment.

### **Tourism**

In 2017<sup>33</sup>, Fáilte Ireland published the “*Topline Tourism Performance By Region*” report, which showed that County Mayo attracted 324,000 overseas visitors making the county the 7<sup>th</sup> most popular county for overseas visitors. The county supported 503,000 domestic trips in that year.

The National Tourism Development Authority (Fáilte Ireland) periodically collates statistics on overseas visitors to Ireland and regions within the country. Table 6.6 shows the most recent

<sup>33</sup>[http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3\\_Research\\_Insights/2\\_Regional\\_SurveysReports/2017-topline-regional-performance-\(003\).pdf?ext=.pdf](http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/2_Regional_SurveysReports/2017-topline-regional-performance-(003).pdf?ext=.pdf) (Accessed on 17 August 2022)

overseas tourism statistics from 2018<sup>34</sup> and 2019<sup>35</sup> (latest available data at the time of writing) for the country and the West region, which includes County Mayo.

*Table 6.6: Overseas Tourism Statistics 2018 & 2019*

Location Travelled To	Tourist No.'s	Revenue Generated
Ireland (2019)	9.7 million	€5.6 billion
West Region (2019)	1,943,000	€653 million
Ireland (2018)	9.6 million	€5.6 billion
West Region (2018)	1,963,000	€727 million

In relation to domestic tourism (tourism involving residents of one country traveling only within that country), the Fáilte Ireland 2019 data reports 11.6 million domestic trips in 2019, an increase of over 6.4% on 2018. The majority (40%) of these domestic trips were recorded as short (1-3 days) holiday trips with trips to visit friends/relatives reported at 33% of all domestic trips. Most of these trips are shown to occur in the late summer period (July – September) with the majority of domestic holidaymakers engaging in hiking/walking (46%), followed by visits to Houses/Castles (27%), National Parks (26%), and Gardens (23%) being the other top activities engaged in by domestic holidaymakers.

The latest Tourism Barometer published by Fáilte Ireland<sup>36</sup> (December 2022), based on industry surveys, has stated that visitor volumes to Ireland are not yet back to pre-Covid levels, particularly from overseas visitors. The tourism industry continues to rely on the domestic market following the easing of restrictions and re-opening; 68% of businesses who responded stated they have had more domestic visitors in 2022 compared to a 'normal' pre-Covid year, whereas 11% stated they have experienced the same level, and 21% of respondents noted a decrease.

At the same time, 47% of businesses state overseas visitor levels are down in 2022 compared to normal years, and 36% reported having more overseas visitors compared to pre-Covid levels

<sup>34</sup>[http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3\\_Research\\_Insights/Key-Tourism-Facts-2018.pdf?ext=.pdf](http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/Key-Tourism-Facts-2018.pdf?ext=.pdf) (Accessed on 17 August 2022)

<sup>35</sup>

[https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3\\_Research\\_Insights/4\\_Visitor\\_Insights/KeyTourismFacts\\_2019.pdf?ext=.pdf](https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/KeyTourismFacts_2019.pdf?ext=.pdf) (Accessed on 10 February 2022)

<sup>36</sup> <https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Publications/failte-ireland-tourism-barometer-december-2022.pdf?ext=.pdf> (Accessed 10 February 2023)

(Fáilte Ireland, 2022). In terms of the domestic market, operators indicate that this market is a key source of business, with 51% reporting short domestic breaks are up on a typical pre-Covid year, and 57% report that ‘domestic leisure individuals and couples’ are the top two sources of business.

Current challenges impacting the tourism industry include recruitment challenges, rising energy and operating costs, and war in Europe. Many businesses (37%) reported finding staff a concern regarding business, as recruitment remaining a challenge for many tourist operators. 82% of respondents reported concern over rising energy costs and 75% are concerned about operating costs other than energy. Lack of disposal income (62% respondents) is also a concern for operators.

In August 2022, Failte Ireland published its statistics for domestic trips and revenue by county for 2019 and 2021<sup>37</sup>. It is evident from the results that the Pandemic has had a significant impact on tourism activity in the county, with trips and spend down 52% and 50% respectively, and the number of night stays down by 50%.

*Table 6.7: Irish Resident Trips and Spend 2019 & 2021 in County Mayo*

Year	Trip's	Spend
County Mayo (2021)	319,000	€69 million
County Mayo (2019)	658,000	€137 million
2021 vs 2019 % change	-52%	-50%

*Table 6.8: Irish Resident Nights and Length of Stay 2019 & 2021 in County Mayo*

Year	Nights	Length of Stay
County Mayo (2021)	975,000	3.1
County Mayo (2019)	1,933,000	2.9
2021 vs 2019 % change	-50%	0.2

The Strategic Aim of the Mayo CDP in terms of Tourism and Recreation is:

*“The strategic aim of this chapter is to promote and facilitate a sustainable and well managed year-round, high-quality tourism industry that generates economic benefits to all areas of the county, thereby contributing to the wider tourism industry of the region.”*

<sup>37</sup><https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Publications/Domestic-Trips-and-Revenue-by-County-2019-and-2021.pdf?ext=.pdf> (Accessed 10 February 2023)

The Mayo CDP outlines policies and objectives to support and promote sustainable tourism as well as the ongoing development of walking trails and cycling routes, including:

- Policy TRP 2: To support and promote sustainable tourism development, accessible to all throughout the county and work in partnership with tourism organisations and adjoining Local Authorities, where necessary, in securing the development of tourism enterprises and infrastructure, subject to suitable locations where it can be demonstrated that the development will not have significant adverse effects on the environment, including the integrity of the Natura 2000 network, residential amenity or visual amenity.
- Policy TRP 4 (a): To co-operate with Fáilte Ireland, Tourism Ireland, and any other relevant bodies in the implementation of Destination Mayo 2016-2021 by: (a) Encouraging investment in the tourism industry in the county with specific reference to leisure activities (including walking, cycling, equestrian and family focused activities), including connectivity to the Great Western Greenway at Castlebar to Westport and to the Wild Atlantic Way.
- Policy TRP 11: To promote Mayo as a premier walking/cycling destination in the Country and support the further development of walking routes and trails within the county and the integration and linkage of these with other existing / proposed routes and trails both within and outside of County Mayo, in accordance with national walking strategy guidance and in conjunction with the Tourism Section of Mayo County Council, Fáilte Ireland and other relevant stakeholders. Opportunities to enhance ecological connectivity should be integrated as part of any linking of routes to strengthen and support green infrastructure.
- Policy TRP 17: To support developments which will enable and encourage countryside recreation in appropriate locations to foster an increased appreciation of, and access to, the natural environment.
- Objective TRO 9: To explore the development of community walks, off road trails/rural trail developments, parks, other outdoor amenities and recreational infrastructure, and work with relevant landholders and recreational/tourism agencies to increase access to the countryside and our coastal areas, subject to proper planning and sustainable development principles.
- Policy TRP 28: To support the implementation of the NWRA Regional Outdoor Recreation Strategy, through the extension of greenways, walking routes, tracks and trails within the county and the integration and linkage of them with other existing /

proposed greenways, walking routes, tracks and trails, both within and outside County Mayo.

Fáilte Ireland has launched a tourism initiative called The Wild Atlantic Way, which stretches from Donegal to West Cork and incorporates County Mayo. As Ireland's first long-distance touring route, the 2,500km route journeys through 6 regions and takes in the scenic coastline and many beaches of County Mayo<sup>38</sup>. The varying coastline allows for multiple recreational, and water-based activities such as fishing, sailing and water sports.

The nearest attraction to the proposed development is the Western Way walking/hiking trail, running from Oughterard in County Galway to Bunnyconnellan in Co. Mayo runs south of the proposed development site along the N59 before turning northwards through Tawnaghmore. The trail, which is over 200km in length is a designated National Waymarked Trail by the National Trails Office of the Irish Sports Council and is jointly managed by Coillte, Galway County Council, Mayo County Council, South Mayo Development Company and Mayo North & East Development Company.<sup>39</sup>

Wild Nephin Ballycroy National Park is Ireland's sixth National Park and located on the Western seaboard in northwest Mayo and located approximately 6km south of the proposed development site. It comprises of 11,000 hectares of Atlantic blanket bog and mountainous terrain, covering a vast uninhabited and unspoilt wilderness dominated by the Nephin Beg mountain range. To the west of the mountains is the Owenduff bog. This is one of the last intact active blanket bog systems in Ireland and Western Europe and is an important scientific and scenic feature of the National Park. Ballycroy National Park is part of the Natura 2000 Network, which protects rare and important habitats and species under the EU Habitats and Birds Directive.<sup>40</sup>

The park is also home to Ireland's first International Dark Sky Park showcasing some of the darkest, most pristine skies in the world. Nestled between the remote Nephin Mountain Range and the unspoiled Atlantic coastline, the Dark Sky Park extends across an area of 150km<sup>2</sup> with its borders encompassing both Ballycroy National Park and Wild Nephin. Formal responsibility

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<sup>38</sup>[https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/2\\_Develop\\_Your\\_Business/6\\_Funding/FI-Tourism-Investment-Strategy-Final-07-06-16.pdf](https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/2_Develop_Your_Business/6_Funding/FI-Tourism-Investment-Strategy-Final-07-06-16.pdf) (Accessed 17 August 2022)

<sup>39</sup> <http://thewesternway.ie/> (Accessed 9 February 2023)

<sup>40</sup> <https://www.wildnephinnationalpark.ie/> (Accessed 9 February 2023)

for Mayo Dark Sky Park is shared between the management of National Parks & Wildlife Service and Coillte with both parties responsible for a lighting plan for the Dark Sky Park.<sup>41</sup>

Beyond the immediate area, other attractions in Mayo County include the Great Western Greenway, Ireland's longest off-road walking and cycling trail. The 42km trail which stretches between Westport and Achill is traffic free by following the closed Westport to Achill railway line.<sup>42</sup> The following walks and cycle routes are available across the area:

- Bangor Trail;
- Burrishoole Loops;
- Crossmolina Loop Walks;
- Achill Spur;
- Enniscoie House Loop;
- Keenagh Loop;
- Letterkeen;
- Bothy;
- Lough Aroher Loops;
- Ceathrú Thaidhg Loop;
- Belleek Nature Trail;
- Sralagagh Loop Walk;
- Inishbiggle Loop Walks;
- Foxford Way;
- "Slí na Sláinte" walking routes;
- Carrowmore and Carrowmore Lake Cycle Loop;
- Pullathomas Cycle Loop;
- Glinsk & Rosspport Linear Cycling Route.
- Mayo County provides angling tourism attractions, notably the Rivers Moy and Owenmore. Each of these rivers provide good salmon and trout fishing.

With regards to Heritage, the Heritage Plan for County Mayo 2011 – 2016 was extended to 2019. A new plan, the County Mayo Heritage & Biodiversity Strategy 2023-2030<sup>43</sup>, is currently being prepared by the County Mayo Heritage Forum, facilitated by the Heritage Office of Mayo County Council. Public consultation currently underway (due to close 8<sup>th</sup> March 2023). Mayo

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<sup>41</sup> <http://www.mayodarkskypark.ie/> (Accessed 9 February 2023)

<sup>42</sup> <https://www.greenway.ie/> (Accessed 09 February 2023)

<sup>43</sup> <https://www.mayo.ie/heritage/plan> (Accessed 9 February 2023)



County is considered to be rich in heritage with the following visitor attractions available for local, national and overseas visitors:

- Ballintubber Abbey;
- Croagh Patrick Centre;
- Céide Fields;
- Westport House; and,
- The Jackie Clark Collection.

### *6.3.2 Human Health*

Evidence shows that different communities have varying susceptibilities to health impacts both positive and negative as a result of social and demographic structure, behaviour and relative economic circumstance. Whilst specific health data for individuals in the vicinity of the proposed development is confidential and difficult to establish, as has been detailed in Section 5.2.2, a community profile has been identified to establish the baseline health profile of the area and compare this profile to the rest of the country.

A group made up of the Health Services Executive (HSE) and the Irish Health Repository (IHP), known as Lenus, have published separate health profiles for all the Local Authorities areas in Ireland. The most recent County Health Profiles published are from 2015<sup>44</sup> (Lenus, 2015) and have been used to establish a community health profile for the County Mayo<sup>45</sup> area in which the proposed development is situated.

The key facts in the 2015 Health Profile relating to County Mayo are:

- Mayo has the third highest dependency ratio nationally of 55.9% (i.e. the number of those aged 0-14 and 65 and over as a percentage of the number of persons aged 15-64) national ratio 49.3%. and 14.9% of the population is aged over 65;
- The county has high levels of people who only completed primary education with the rate recorded as 20.5% in comparison with a national rate of 15.2%;
- The county experiences a high deprivation levels with 70% of the population being recorded as below average affluence or disadvantaged;
- The rate of mortality from heart disease and stroke, respiratory disease, and injuries and poisonings are recorded as higher than national averages;

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<sup>44</sup><https://www.hse.ie/eng/services/list/5/publichealth/publichealthdepts/pub/profiles.html> (Accessed 9 February 2023)

<sup>45</sup> <https://www.lenus.ie/bitstream/handle/10147/584019/Mayo.pdf?sequence=1> (Accessed 9 February 2023)

- The birth rate for the country is recorded to be lower than the national rate.

It is important to realise when viewing these figures that they relate to the entire administrative area of County Mayo and a population of 130,638 in the 2011 Census. While the published data can be taken as being correct, it may not necessarily accurately reflect the health profile of smaller areas which are within the study area and close to the proposed development.

The map of deprivation included in the County Health Profile shows that the area in which the proposed development is situated is marginally below average as shown in Figure 6.3:

It is therefore neither particularly affluent nor particularly deprived and is distinctly average in comparison with the county overall. There are, nevertheless, likely to be localised areas of deprivation where the county-level statistics simply do not apply. As outlined previously, it is not possible to get reliable baseline information on small scale populations. Nevertheless, the data in Figure 6.3, qualified in this manner, does give a valuable insight into the general area:

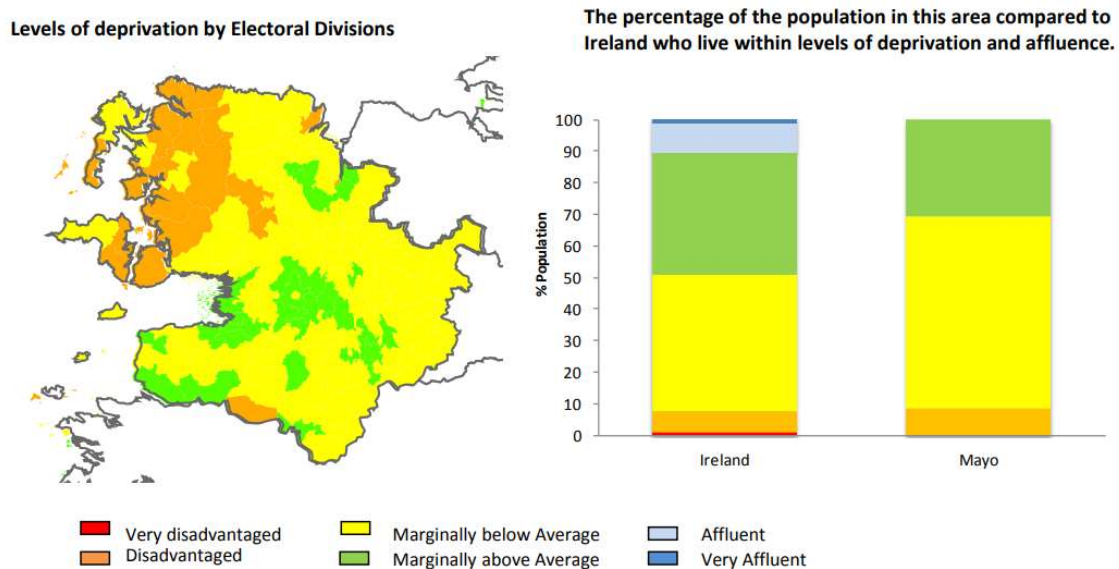


Figure 6.3: Map of Levels of Deprivation in County Mayo (Source: Extract from Lenus Health Profile 2015 for Mayo)

As outlined previously, it is not possible or necessary to identify every vulnerable individual. However, every human community contains vulnerable individuals; be those the old, the very young, or because they have conditions which may make them more susceptible. Examples are diverse and can include asthma, autism, and those with psychological illness. It is important to

note that the relevant guidelines and limit values are set for the vulnerable and not for the robust.

The emergence of the Covid-19 virus in Ireland in the early part of 2020 has presented a new human health risk and concern amongst the general public across the country and within the proposed development study area. Public health measures, including varying levels of restrictions and advice, have been implemented since 2020 and the medium to long term effects of the virus on national and local human health is not currently known. The existing environment in terms of Covid-19 impact is in flux. Cognisance of any updates to public health advice will be required, and appropriate measures (hygiene etc.) undertaken to prevent the spread of the disease.

### **CSO Irish Health Survey 2019-2020**

In 2020, the Central Statistics Office (CSO) published its second “Irish Health Survey”<sup>46</sup>, the data for which was collected in 2019 and early 2020. The first survey was collected for reference year 2015. This publication is part of an EU wide health survey and as other EU countries report on their data, it will be possible to compare how the Irish health experience compares to that of our EU neighbours. Some key findings of the survey included:

- *“Affluent people are more likely to feel their health status is Very good or good than people who are disadvantaged - 92% of Very affluent persons compared to 78% of persons who are Very disadvantaged;*
- *Over a quarter of persons aged 15 years and over report having a long lasting condition, with older persons reporting higher levels;*
- *Majority of persons (82%) report no limitations in everyday activities due to a health problem;*
- *Over a fifth (21%) of Unemployed persons report some form of mental ill-health compared to 9% of those In employment;*
- *Prevalence of hospital in-patient admissions rises with age and disadvantage level;*
- *In general, females and older people more likely to use a preventive health service;*
- *Physical activity declines with age and relative disadvantage level;*
- *Younger persons more likely to drink 6 or more units of alcohol in one sitting; and*

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<sup>46</sup><https://www.cso.ie/en/releasesandpublications/ep/p-ihsmr/irishhealthsurvey2019-mainresults/introductionandkeyfindings/> (Accessed 9 February 2023)

- *Over half of persons aged 15 years and over in the State are overweight or obese” (CSO 2020).*

The Census 2016<sup>47</sup> responses regarding general health<sup>48</sup> found that 87% of the Ireland’s population felt they had ‘Very Good’ or ‘Good’ health, down slightly from 2011 when it was 88.3%. Nearly six in ten or 59.5% of men felt their health was ‘Very Good’, compared with 59.3% of women. The census results also clearly show the decline in general health with age, with 79% of 15-19 year olds in ‘Very Good’ health, compared with those aged 40-44 (58.6%) and 65 to 69 (31.3%).

Census 2016 responses (130,507 respondents) for County Mayo indicated the percentage of persons who regarded themselves as being in ‘Very Good’ health was 56% (36,789 Females / 36,351 Males) and ‘Good’ health was 30% (19,625 Females / 19,786 Males), while 10% indicated they were in ‘Fair’ health (6,509 Females / 6,384 Males), and 1.5% (995 Females / 944 Males) and 0.28% (175 Females / 189 Males) indicated they were in ‘Bad’ to ‘Very Bad’ health respectively; 2% of the total respondents did not state the status of their general health. The 2016 census also indicated that there are 17,977 (9,208 Females / 8,769 Males) with disabilities living in Mayo, and that there are 6,129 (3,670 Females / 2,459 Males) carers in the County.

### **Health in Ireland: Key Trends 2022**

The Government of Ireland’s publication *Health in Ireland: Key Trends 2022*<sup>49</sup> provides summary statistics on health and health care within the State over the past ten years. The report touches on a number of areas including population health, demographics, hospital and primary care, as well as health sector employment and expenditure. The document provides context and background to the work of the Department of Health, which involves drafting legislation, policies and strategies to address vital issues.

The 2022 report is the 14<sup>th</sup> edition, and the second in the series since the pandemic that will chart the longer-term impacts of the pandemic on the health service and demographics. The report provides a reference guide to significant trends in health and health care over the

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<sup>47</sup> <https://www.cso.ie/en/csolatestnews/presspages/2017/census2016profile9-healthdisabilityandcarers/> (Accessed 9 February 2023)

<sup>48</sup> <https://www.cso.ie/en/statistics/health/> (Accessed 9 February 2023)

<sup>49</sup> <https://www.gov.ie/en/publication/fdc2a-health-in-ireland-key-trends-2022/> (Accessed 9 February 2023)

previous 10-year period, with reference to population and health statistics, as well as trends in provision of health services and care.

Key findings of the 2022 publication include:

- *Ireland has the highest self-perceived health status in the EU, with 82.1% of people rating their health as good or very good. Those in higher income brackets tend to report better health than those in lower income brackets;*
- *The numbers of live births in 2021 have declined by almost a fifth since 2012, with the birth rate per 1,000 population reducing by a quarter.*
- *The number of live births has increased in 2021 for the first time this decade by 4.4%, with 58,443 births being registered in the year;*
- *Despite reductions in the numbers of births over the last decade, the fertility rate in Ireland is the 6th highest in the EU;*
- *Ireland is now starting to catch up with other EU populations in terms of population ageing, with the population of those aged +65 years increasing by 36% since 2012 and at a faster rate than that of other EU countries.*
- *The numbers of people in this age group are expected to almost double in the next 20 years, with the greatest proportional increase in the 85+ age group;*
- *Over the past decade, Ireland has achieved an improvement in life expectancy. Life expectancy in Ireland has increased by almost two years since 2010, with male life expectancy consistently higher than the EU average throughout the last decade. Although shorter term trends indicate life expectancy has decreased between 2019-2020 in Ireland and across the EU;*
- *This increase in life expectancy is mainly due to significant reductions in major causes of death such as circulatory system diseases and cancer. Since 2012 there has been a reduction in mortality rates for most major causes. Over the 10-year period 2012-2021, age-standardised death rates for all causes fell by 15.8%;*
- *Since 2012, there has been a 15% reduction in the mortality rate from Cancer (including trachea, bronchus, lung), a 34% reduction in the mortality rate from circulatory system diseases, a 38% reduction in the mortality rate from ischaemic heart diseases, and a 32% reduction in the mortality rate from respiratory system diseases (including cancer of the trachea, bronchus, lung);*
- *While there has been a reduction in the mortality rate from respiratory diseases of almost 40% since 2012, the rate in Ireland is 25% higher than the average of a number*

*of similar European countries such as Belgium, Denmark, Netherlands, Norway, Portugal and Sweden;*

- *In 2021, 81.7% of males and 81.3% females rated their health as being good or very good. This is the highest in the EU and compares with an average of 71.1% and 67% for males and females respectively across the EU;*
- *In 2021, 48% of males and 48.1% of females aged +65 years reported suffering from a chronic illness or health problem 45.5% and 41.8% of +75 aged males and females respectively reported some or severe limitation in usual activities due to health problems;*
- *Among those aged +65 years diseases of the circulatory system accounted for 28.2% of all deaths registered in 2021. This compares with 18.4% of deaths of those aged less than 65 years;*
- *Ireland has had a lower infant mortality rate than the EU average over the last decade.*

## **Healthy Ireland Survey 2022**

In December 2022, the Government released its Healthy Ireland Survey Summary Report<sup>50</sup>. This is an interviewer-administered survey, commissioned by the Department of Health and carried out by Ipsos, of the health and health behaviours of people living in Ireland. The Survey has been undertaken since 2015, however, due to the COVID-19 pandemic it was not possible to complete the 2020 survey. The Survey is a key component of the 'Healthy Ireland Framework' and informs the Healthy Ireland Strategic Action Plan, by contributing to the research, monitoring and evaluation required to assess the impact of policy implementation. Approximately 7,500 individuals, representative of the population aged 15 and older are surveyed. The Survey covers a variety of health-related topics, including; general health, alcohol, smoking, weight, dental, female health, skin protection, and mental health.

In terms of General Health, respondents were asked to rate their there's on a 5-point scale from 'very good' to 'very bad'. Overall, 82% of respondents perceived their health as 'good' or 'very good', which is a 2-point decline since 2021. 83% of men and 81% of women rated their health as 'good' or 'very good'. Overall, 3% of respondents perceived their health as 'bad' or 'very bad'. General 'good' health decreases with age, with 92% of 15-24-year-olds rating their health as

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<sup>50</sup> <https://www.gov.ie/en/publication/f9e67-healthy-ireland-survey-2022/> (Accessed 9 February 2023)

'good' or 'very good', in contrast to 64% of respondents aged 65 and older. The Survey notes that those with Leaving Certificate education or higher are considerably more likely to report themselves as being in good health than those who did not attain a Leaving Certificate (87% and 69% respectively). Employment status is also stated as indicative of self-reported health, with those who are employed (90%) or students (91%) significantly more likely to report good health than those who are unemployed (76%).

With regard to the occurrence of health conditions, the Survey results indicate that 31% have a long-standing illness or health problem, lasting at least 6 months or longer; females are more likely than males to report long-standing health conditions (34% and 28% respectively); and respondents aged 65 and older (53%) are considerably more likely to report a long-standing illness or health problem than those aged under 45 (18%). Furthermore, based on a list of 25 of the most common conditions, respondents were asked to report whether they had been medically diagnosed with a long-term illness. Of the responses, high blood pressure (7%), diabetes (5%), arthritis (5%), asthma (4%), psychiatric diagnoses (such as anxiety or depression) (3%), and high cholesterol (3%) were the most common conditions reported by respondents.

### **Deprivation Index**

The map of deprivation included in the County Health Profile for Mayo (Lenus, 2015) shows that the area in which the proposed development is situated is disadvantaged as shown in Figure 6.3 above.

A review of latest deprivation indices (2016) by ED available from Pobal<sup>51</sup>, which ranges from 'very affluent' to 'extremely disadvantaged'<sup>52</sup>, shows that the EDs of Kilfian South, Derry, and Deel, in which the proposed development is situated are all considered 'marginally below average'. Therefore it can be inferred that the area is neither particularly affluent nor particularly deprived and is comparable with the county which is considered 'marginally below average' overall.

There are likely to be localised areas of deprivation where the county-level statistics simply do not apply. As outlined previously, it is not possible to get reliable baseline information on small scale populations, nor it is not possible or necessary to identify every vulnerable individual.

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<sup>51</sup> <https://maps.pobal.ie/WebApps/DeprivationIndices/index.html> - Pobal administers and manages Government and EU funding to address disadvantage and support social inclusion

<sup>52</sup> 'Very affluent', 'Affluent', 'Marginally above average', 'Marginally below average', 'Disadvantaged', 'Very disadvantaged', and 'Extremely disadvantaged'.

However, every human community contains vulnerable individuals; be those the old, the very young or because they have conditions which may make them more susceptible. Examples are as diverse as humans themselves but can include asthma, autism, and those with psychological illness. It is important to note that Health Standards are set for the vulnerable and not for the robust.

## **6.4 POTENTIAL IMPACTS**

### ***6.4.1 Do Nothing Effects***

This section outlines key potential impacts that would arise in a Do-Nothing scenario within the local environment, including effects on vegetation, agricultural activities, and the local population.

In the Do-Nothing Scenario, the existing cutaway/cutover peatland will continue to revegetate in-line with the current rehabilitation plan.

In addition, the land would continue to be utilised for sheep grazing, forestry purposes and unmanaged bog with little or no changes in the baseline at the site. Agricultural activities and periodic tree felling will continue with the movement of equipment and personnel associated with same.

The opportunities for local employment and additional economical spend from the proposed development will not be realised.

In the Do-Nothing Scenario, there will be no emissions generated from construction works and no potential for noise, shadow flicker or visual effects associated with wind turbines at this site.

The health benefits to the country associated with replacing fossil fuels with renewable wind energy from the proposed development will be lost and alternative candidate sites will need to be identified, either onshore or offshore, to ensure Ireland meets its commitments to reducing carbon emissions.



## **6.4.2 Population**

### **6.4.2.1 Construction Phase**

#### **Land Use**

The construction of the proposed development will involve short-term land use change primarily for the decommissioning of the existing Bellacorick wind farm, excavation of borrow pits and the construction of access roads, turbine hardstandings and foundations, site compounds and substation. This will result in a short-term, negative effect but the borrow pit areas will be backfilled and revegetated. The access roads and substation will remain in place indefinitely while the hardstandings and foundations will be covered over and revegetated after the operational phase.

#### **Population Trends**

A report by Pöyry in 2014 (*Value of Wind Energy to Ireland*) identified that the wind energy sector could support 12,390 (person-years) direct jobs during construction to deliver on Ireland's 2020 renewable target (at the time when the report was published). The effect of the proposed development is likely to result in a short-term increase in construction workers staying in local accommodation in the area over the construction period of c. 24 months. This will add value to the local economy and would be a positive direct effect as a result of the proposed development being constructed.

#### **Property/Receptors**

Access to the proposed wind farm site will be via the existing site entrance off the N59 road. The potential traffic impacts are discussed in detail in Chapter 17 (Traffic and Transportation).

Negative effects on residential properties and the local population as a result of the construction works, including traffic movements, could include noise and air quality as well as potential for the works to impact on local residents' enjoyment of their homes (i.e. residential amenity). The haul roads proposed are existing public roads which are already used by heavy goods vehicles (HGVs), however there will be a short-term increase in effects during the construction phase. The design of the proposed development has included a minimum set-back distance of 1000m from the nearest residential building to the proposed turbine locations which will reduce the potential for the wind turbine infrastructure to have a significant effect on residential amenity. The closest borrow pit location is c. 725m from a residential property and access road works will take place at a minimum distance of c. 250m from the nearest residential

building. These effects are assessed in detail in the Chapter 12 (Air Quality and Climate) and Chapter 13 (Noise and Vibration).

The construction phase will likely have a slight, negative effect on the local population and will be short-term in nature.

### **Property Value**

It is not anticipated that the construction works for the proposed development will have any significant impact on the local property values. A major UK study entitled *The Effect of Wind Farms on House Prices* carried out in March 2014, discussed in more detail in Section 6.4.1.2, noted that “*The econometric analysis established that construction of wind farms at the sites examined across England and Wales has not had a detectable negative impact on house price growth within a 5km radius of the sites*”.

Another study entitled *Impact of wind turbines on house prices in Scotland* carried out in 2016 found that there is no evidence of a consistent negative effect on house prices and that results vary across different regions of Scotland. This report presents the main findings of a research project estimating the impact on house prices from wind farm developments. It is based on analysis of over 500,000 property sales in Scotland between 1990 and 2014.<sup>53</sup>

Although there have been no similar studies carried out in Ireland regarding the effects of wind farm construction on property value, it is reasonable to make the above assumption, based on the available published studies presented in Section 6.4.1.2.

### **Employment/Economy**

The proposed development will create and support direct and indirect employment during the construction phase at local level, primarily through local construction workforce on site, and at a national level, through more specialised construction services and supply of building materials. It is anticipated that the wind farm will have the following effects locally:

- Development activities such as site monitoring/surveys, site investigations, legal fees, consultancy studies during pre-construction and construction works, etc.;
- Spending locally by construction employees; and
- Accommodation and sustenance will be required in the locality for those workers on site.

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<sup>53</sup> [Impact of wind turbines on house prices in Scotland \(croaghwindfarm.ie\)](http://croaghwindfarm.ie) (Accessed 17 August 2022)

Guidance from a 2009 IWEA study<sup>54</sup> states “ *Our analysis has shown that the wind energy sector in Ireland can support 1.50 jobs per MW to be installed on the island*”. Based on the proposed development capacity of approximately 90MW, this equates to approximately 135 jobs across a number of different sectors. The study (from 2009) estimated that 68% of the Irish jobs created are in the construction industry. It is estimated that up to 100 persons will be directly employed during the peak construction period.

The area will experience a benefit from secondary investment associated with increased visitors and spend within the area. An ESRI report entitled *An Enterprising Wind: An Economic Analysis of the Job Creation Potential of the Wind Sector in Ireland*(2014) estimates the level of indirect job creation to be between 0.15 and 0.55 jobs per direct job created. Construction materials such as quarried products and concrete supplies can be sourced locally and will support local business. Throughout the construction phase, there is potential that plant, equipment and associated operatives can be sourced locally. Indirect employment opportunities will be created in the region through increased quarrying activity and off-site concrete batching as well as potential increased employment in the local hospitality and café/restaurant industries driven by use of the facilities by construction staff.

The *Value of Wind Energy to Ireland*(Pöyry, 2014) report states that “*the wind industry would make a valuable contribution to the Irish economy by meeting the 2020 renewable target and provide a good platform for continued growth during the 2020s compounding the benefit to the economy*”. It also states that wind farm developments in Ireland, such as the proposed development, have the combined potential to support 12,390 jobs (person-years) during construction to deliver the 2020 renewable target and a further 10,120 jobs (person-years) would be supported during construction through to 2030.

The Oweninny Wind Farm Phase 3 will also make a valuable contribution to Mayo County Council's economic aims for further development of its green economy.

The construction of Oweninny Wind Farm Phase 3 will have an estimated capital cost in the region of €140 million<sup>55</sup> and an estimated 15 -20% of the total capital cost will relate to site works<sup>56</sup> which has the potential to support local contractors and suppliers. The *Life-cycle of an*

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<sup>54</sup> IWEA and Deloitte, *Jobs and Investment in Irish Wind Energy: Powering Ireland's Economy* (2009)

<sup>55</sup> Using an average investment cost of €1.3 million per MW – SEAI, *A Macroeconomic Analysis of Onshore Wind Development to 2020*(2015)

<sup>56</sup> Irish Wind Farmers Association - FAQ | Meitheal na Gaoithe Irish Wind Farmers Association (mnag.ie)

*Onshore Wind Farm* published by IWEA in March 2019 stated that “One recent 169MW windfarm project estimated that €20 million was spent with local suppliers and contractors within 30 kilometres of the site during construction”.

As a result, the construction phase of the proposed development will have a short-term, slight and positive effect on employment and the economy in the local area and the West Region.

### **Tourism**

As set out in Section 6.3.1, there are a number of relevant tourism attractions and public amenities within the study area including the Western Way walking/hiking trail, which runs from Oughterard in County Galway to Bunnyconnellan in Co. Mayo, south of the proposed development site. It is considered that the construction works will not have a direct impact on the Western Way. No other direct or indirect impacts on tourist or recreational attractions are predicted. Measures to be employed by the appointed Contractor during the construction works to ensure the health and safety of tourists and the general public are outlined in the Construction Environmental Management Plan (CEMP) in Appendix 2-7.

The proposed development will not have a negative effect on tourism during construction.

#### ***6.4.2.2 Operational Phase***

### **Land Use**

The proposed development will involve permanent works on the existing land primarily including turbine foundations, hardstand areas at turbines, internal roads and an on-site substation. The proposed infrastructure will cover an area of 28.5 ha within the proposed wind farm site area of 2282 ha, which represents only 1.2% of the total. The proposed development will have a slight to moderate, long-term and negative effect on the existing land use at the site.

### **Population Trends**

It is not anticipated that the proposed development will have any significant impact on the current population trend in County Mayo or locally as there are no notable studies that support this. The improved facilities within the wind farm site and surrounding the proposed development which will be supported by the significant community benefit fund could make the local area attractive for people to move to.

A survey of the public perception of wind power in Scotland and Ireland carried out in 2003/2004 by researchers at the School of Geography & Geosciences, University of St.

Andrews, Fife and The Macaulay Institute, Aberdeen (2005) found that large majorities of people are strongly in favour of their local wind farm and that positive attitudes to wind power increase through time and with proximity to wind farms. Retrospective questioning regarding pre- and post-construction attitudes at existing wind farms noted that those who changed to a more positive attitude following construction of the wind farm, gave reasons that the wind farm is *“not unattractive (62%), that there was no noise (15%), that community funding had been forthcoming (15%) and that it could be a tourist attraction (8%)”*.

### **Property/Receptors**

The turbine layout at the proposed development has been designed with cognisance of the local population and receptor locations. In accordance with the 2006 WEDGs, there are no turbines located within 500m of a residential property. The draft 2019 WEDGs recommend a minimum setback distance of four times the tip height ( $200\text{m} \times 4 = 800\text{m}$ ) from a proposed turbine to the curtilage of any residential property and the proposed minimum setback of 1000m to the nearest sensitive receptor exceeds this recommendation.

Potential impacts on receptors with regard to noise, telecommunications and visual appearance are assessed in the relevant chapters of this EIAR; Chapter 13 (Noise and Vibration), Chapter 14 (Shadow Flicker), Chapter 15 (Landscape and Visual Impact Assessment), and Chapter 16 (Aviation and Telecommunication)

### **Shadow Flicker**

Chapter 14 (Shadow Flicker) discusses the shadow flicker phenomenon in detail and sets out the criteria which determine the occurrence of shadow flicker, which is summarised as:

- The presence of screening;
- The location and orientation of the property;
- The distance of the property from turbines;
- The presence of direct sunlight;
- The time of day and year;
- Wind speed;
- Direction of wind; and
- The presence of people.

Given the above requirements for the presence of a shadow flicker impact, it could be said that for the vast majority of the time at any given property, shadow flicker should not cause any issues from any given turbine.

Modelling of predicted shadow flicker occurrence is presented in Chapter 14 (Shadow Flicker) and assessed against the current 2006 WEDGs. Bord na Mona Powergen Ltd. is committed to exceeding the current guidelines requirements and ensuring there is no shadow flicker occurrence at any sensitive receptor in the vicinity of the site. This will be ensured through the design stage considerations and mitigation measures set out in Chapter 14 (Shadow Flicker).

On this basis, following the implementation of the mitigation measures, there will be no shadow flicker occurrence at any sensitive receptor and, therefore, there will be no potential for an effect on residential amenity due to shadow flicker.

### **Property Value**

A UK study, entitled *The effect of wind farms on house prices*, was carried out by the Centre of Economics and Business Research (Cebr) in March 2014. The key findings of the study were:

- Overall, the analysis found that country-wide property market drives local house prices, not the presence or absence of wind farms; and
- The econometric analysis established that construction of wind farms at the sites examined across England and Wales has not had a detectable negative impact on house price growth within a 5km radius of the sites.

However, a similar study published in April 2014 by the London School of Economics (LSE) Spatial Economic Research Centre found an average reduction in the value of houses (based on 125,000 house sales between 2000 and 2012) of between 5% and 6% within 2km of very large wind farms.

These contradicting studies led to further research in Scotland in 2016<sup>57</sup> which was based on analysis of over 500,000 property sales in Scotland between 1990 and 2014. This study, again, found no evidence of a negative impact from wind turbines on house prices and suggests that *“generally speaking the effect is either positive...or not distinguishable from zero”*.

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<sup>57</sup> ClimateXChange, *The impact of wind turbines on house prices in Scotland* (October 2016)

The authors of the report tried to explain why the research carried out in Scotland found a very different result to that carried out in England even though the approach was very similar to that used in the LSE study. The suggested a number of possibilities including:

- Attitudes towards wind farms may be different in Scotland than in other parts of the UK;
- In Scotland, a much higher proportion of turbines are likely to be located on moors and mountains and in more remote areas than in England and Wales; and
- Some wind farms, especially in Scotland, enhance the local area by providing tracks for walkers, cyclists, horse riders and other members of the community, as well as substantial community benefit funds.

It is considered that given the remote location of the proposed development and location within an existing setting of operational wind farms (Oweninny Wind Farm Phase 1 and Phase 2), that the proposed development is comparable to Scottish setting as described above. In addition, the proposed development will enhance the local area by providing a public amenity track, with further detail on this set out in Chapter 3 (Proposed Development).

It should be noted that, the proposed development will include for the creation of recreational amenities within the wind farm site, connection to existing amenity facilities and will provide a significant community benefit fund for the local area.

Large scale studies in United States have indicated that there is no conclusive evidence of any effect on property values located in close proximity to wind farms. A study entitled *A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States* by Lawrence Berkley National Laboratory in 2013, carried out sampling in over 51,000 homes across nine US states. The range of distances examined accounted for as far as 10 miles away (c. 16km), but also took into account 1,198 homes within 1 mile (c. 1.6km) of turbines.

Although there have been no similar studies carried out in Ireland regarding the effects of wind farms on property prices, it is a reasonable assumption, based on the available published studies, that the operation of a wind farm at the proposed location would not significantly impact on property values in the area.

The proposed development will have a neutral effect on property values during its operational phase.

## Employment/Economy

Economic benefits from operational activities will include ongoing purchases of local materials, services and equipment required for the operational phase of the wind farm as well as local spend generated from technical operational staff. The wind farm is expected to support 2-3 high quality technical full-time jobs in operation and maintenance as well as a number of jobs in ancillary functions. Some local employment or contract opportunities may develop over the lifetime of the wind farm from occasional less specialised activities.

According to the 2014 Pöyry Report, wind growth is expected to support €3.5 billion of direct investment to 2020, 1.2% of total Irish investment, and an additional €4.8 billion to 2030. The Pöyry Report was produced in 2014 and subsequent commitments in the Government's *Climate Action Plan*, published in 2019, suggest that the investment in renewable energies, including wind, will be in excess of the above estimates.

The findings in *An Enterprising Wind: An economic analysis of the job creation potential of the wind sector in Ireland* (IWEA, 2014) also suggests that “a major programme of investment in wind could have a sizable positive effect on the labour market, resulting in substantial growth in employment. It would add noticeably to the GDP [Gross Domestic Product] and produce a significant improvement in debt/GDP ratio by 2020”.

The impact of the community benefit scheme is likely to significantly enhance the local economy, with potential for substantial funding for local projects in support of relevant UN Sustainable Development Goals, clubs, charities and near neighbours, which will be invested in the local area. The Renewable Energy Support Scheme also proposes a community investment opportunity although this was not realised in the first RESS scheme. The community benefit associated with the proposed development is discussed in Chapter 3 Description of the Proposed Development).

Positive economic effects will also be felt in the wider area due to the ongoing benefits of renewable electricity generation. The energy generated will feed directly into the national electricity transmission system, providing a sustainable electricity source and an increasingly competitive, low impact, energy supply to the county's domestic and industrial consumers. This is a significant, positive long-term effect for electricity consumers.



## Tourism

The Fáilte Ireland Guidelines state that *“The impact upon tourism can be considered within this section through the sensitivities of hospitality, safety and pace of life. Changes in population can impact the perception of pace of life or safety in a particular location”*. The Guidelines also note that *“Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section”*.

In 2007, a collaboration between Fáilte Ireland and the Northern Ireland Tourist Board surveyed tourists’ perceptions in relation to wind farms in the Irish landscape. A follow up survey in 2012, *Visitor Attitudes on the Environment: Wind Farms – Update on 2007 Research*’ provided more recent information for the tourism and energy sectors. The results were positive, with 80% of tourists considering the presence of wind farms to have no impact or a positive impact on their sightseeing. In addition, when asked if further wind farm development in Ireland would influence their decision to holiday in Ireland again, over 70% of responses cited no impact or a positive impact on their return to Ireland.

Similarly, a 2016 study carried out by BiGGAR Economics ‘*Wind Farms and Tourist Trends in Scotland*’ examined the link, if any, between onshore wind energy development and the sustainable tourism sector in Scotland. The report did not find a direct relationship between tourism and the wind energy sector in itself, however it did conclude that the increase in wind farm development did not negatively impact employment in the sustainable tourism industry in Scotland.

As noted previously, there are a number of relevant tourism attractions and public amenities within the study area including the Western Way walking/hiking trail, which runs from Oughterard in County Galway to Bunnyconnellan in Co. Mayo, south of the proposed development site.

The proposed development will not have a negative effect on tourism during operation.

### *6.4.2.3 Oweninny Phase 3 Decommissioning Phase*

In terms of land use, the wind turbines proposed as part of the proposed development are expected to have a lifespan of 30 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site may be decommissioned fully, with the exception of the electricity substation.

Upon decommissioning of the proposed wind farm, the wind turbines would be disassembled in reverse order to how they were erected. All above ground turbine components would be separated and removed off-site for recycling or reuse. Turbine foundations would remain in place underground and would be covered with earth and allowed to revegetate or reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in potentially significant environment nuisances such as noise, dust and/or vibration. The majority of the site roadways will be in use for additional purposes to the operation of the wind farm (such as a mature amenity and recreational use) by the time the decommissioning of the project is to be considered, and therefore it will be more appropriate to leave the site roads in situ for future use. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed.

The on-site substation will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be decommissioned.

Works required for decommissioning the wind farm will have similar short-term benefits (for the duration of the decommissioning works) to the local economy in terms of employment opportunities for local contractors and an influx of construction workers to the area contributing to the local economy. The activities required to facilitate wind turbine decommissioning and removal from site will be similar to those outlined for the construction phase in terms of potential noise and air quality as well as increased construction traffic movements although these will be significantly lower than during the construction stage.

It is not anticipated that the decommissioning works will have any significant effect on local population trends, property value or tourism.

### ***6.4.3 Human Health***

This assessment of the potential impact of the proposed development on human health is based on a comprehensive review of the relevant published literature on the subject. In this regard, it is important to assess the quality of available information reviewed. In general, studies which are published in peer-reviewed journals are the most authoritative. Peer-reviewed means that only those with reasonable scientific substance which meets the scientific criteria of experts in the field are published. Even within peer-reviewed journals, there are different qualities of studies. Studies which are merely based on questionnaires or other reporting of symptoms are of less value but may be useful in identifying areas for further study, particularly if they are linked with scientific measurements. Occasionally, opinion is published, without necessarily strong back-up, to stimulate discussion.

Wind (and renewable) energy is a subject on which there is a lot of opinion available on the internet, with wide ranging and often contradictory information. The following sections provide a summary of some of the available material in relation to potential effects of wind turbines on human health and an analysis of its scientific robustness.

#### ***6.4.3.1 Construction Phase***

##### ***6.4.3.1.1 Air Quality and Dust Emissions***

The construction of the turbine infrastructure and erection of the turbines will take place away from residential properties with at least 1000m distance from the proposed turbines to all properties. Dust is predictable in its dispersion and studies show that the majority of dust deposition occurs close to its creation. The nature of dust creation and deposition depends on the type of works, ground conditions and weather conditions.

Good construction practice and mitigation measures in terms of dust control will minimise any potential effects and are discussed in more detail in Chapter 12 (Air Quality and Climate) and the Construction Environmental Management Plan (CEMP). While in a construction project of this scale it is inevitable that there will be occasional dust generated, this is likely to be very localised in place and time. As detailed in Chapter 12, it is extremely unlikely that the construction activities will result in air quality standards being exceeded over any significant period of time in the environment outside of the construction site. It can, therefore, be stated with confidence that there will be no significant human health effects arising from emissions to air including dust generation.

By replacing fossil fuel burning power generation stations with clean renewable energy such as from the proposed development, there will be a positive overall impact on air quality in the country as a whole, as compared to a Do-Nothing scenario (i.e. where the wind farm is not built).

#### **6.4.3.1.2 Health and Safety**

All activities carried out by the appointed Contractor on the proposed development will be in accordance with the requirements of the *Safety, Health and Welfare at Work Act 2005* as amended and Regulations made under this Act. The CEMP sets out the Health and Safety requirements for the project including the erection of fencing, signage and notification of commencement of works to the Health and Safety Authority (HSA).

#### **6.4.3.2 *Operational Phase***

##### **6.4.3.2.1 Wind Turbine Health Effects**

The term *Wind Turbine Syndrome* first appeared in 2009, when a New York Paediatrician, Dr Nina Pierpont (Pierpont, 2009), published a pamphlet she called *Wind Turbine Syndrome: A Report on a Natural Experiment*. The experiment comprised speaking on the telephone with 23 people who answered her advertisement asking if they lived near a wind turbine and if they ever felt sick. Fifteen of them said they had family members who would probably answer the question posed in the affirmative. Based on these personal assessments, Dr Pierpont claimed science proved her belief that wind turbines cause a vast array of maladies. This pamphlet was not published in a peer-reviewed journal and would be considered to more closely resemble a relatively unscientific opinion poll.

Entering the term *Wind Turbine Syndrome* into PubMed, a free resource providing access to life sciences and biomedical literature including a database which includes more than 30 million citations and abstracts of biomedical literature, there are only nine reported references<sup>58</sup>. Using key words *Wind Turbine Health* in the PubMed search engine, 243 results were found<sup>59</sup>. This is still a relatively small number, but it is clear an increased number of medics/academics have studied this particular topic rather than attributing the term *Wind Turbine Syndrome* to their studies. A large number of these articles are concentrated on the potential impacts of the sound/infrasound of the turbines which is discussed further in subsequent sections.

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<sup>58</sup> <https://pubmed.ncbi.nlm.nih.gov/?term=Wind+Turbine+Syndrome+> (Accessed on 9 February 2023)

<sup>59</sup> <https://pubmed.ncbi.nlm.nih.gov/?term=Wind+Turbine+Health> (Accessed on 9 February 2023)

In terms of research on the health effects of wind turbines generally, a review of the existing literature was performed in 2011 by Knopper (Knopper, 2011). The results of this study were stated as follows:

*“Conclusions of the peer reviewed literature differ in some ways from those in the popular literature. In peer reviewed studies wind turbine annoyance has been statistically associated with noise but found to be more strongly related to visual impact, attitude to wind turbines and sensitivity to noise. To date, no peer reviewed articles demonstrate a direct causal link between people living in proximity to modern wind turbines, the noise they emit and resulting physiological health effects. If anything, reported health effects are likely attributed to a number of environmental stressors that result in an annoyed/stressed state in a segment of the population. In the popular literature, self-reported health outcomes are related to distance from turbines and the claim is made that infrasound is the causative factor for the reported effects, even though sound pressure levels are not measured.”*

A further study was carried out by Knopper in 2014 (Knopper et al, 2014) which provides a *“bibliographic-like summary and analysis of the science around the issue [of wind turbines and human health] specifically in terms of noise (including audible, LFN [low frequency noise] and infrasound), EMF and shadow flicker”*. The study states that *“There is also a growing body of research that suggests that nocebo effects may play a role in a number of self-reported health impacts related to the presence of wind turbines. Negative attitudes and worries of individuals about perceived environmental risks have been shown to be associated with adverse health-related symptoms such as headache, nausea, dizziness, agitation, and depression, even in the absence of an identifiable cause.”* The study abstract states that *“Based on the findings and scientific merit of the available studies, the weight of evidence suggests that when sited properly, wind turbines are not related to adverse health.”*

The National Health and Medical Research Council (NHMRC) of Australia published *Wind Turbines and Health: A Rapid Review of the Evidence* in 2010 (NHMRC, 2010), which concluded that *“This review of the available evidence, including journal articles, surveys, literature reviews and government reports, supports the statement that: There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines.”*

Professor Simon Chapman (Chapman, 2012) writing in the New Scientist Magazine in October 2012 pointed out that if wind turbines did cause medical problems, we would expect to find a

relationship between prevalence of the syndrome and populations living near wind farms, however this is not the case.

A 2014 study by Health Canada on the impacts of wind turbine noise on health and well-being (Health Canada, 2014) had the following key findings:

- No evidence found to support a link between exposure to wind turbine noise and any of the self-reported illnesses (such as dizziness, tinnitus, migraines) and chronic conditions (such as heart disease, high blood pressure, diabetes);
- No association was found between the multiple measures of stress (such as hair cortisol, blood pressure, heart rate, self-reported stress) and exposure to wind turbine noise;
- The results of this study do not support an association between wind turbine noise and self-reported or measured sleep quality;
- An association was found between increasing levels of wind turbine noise and individuals reporting to be very or extremely annoyed. No association was found with any significant changes in reported quality of life, or with overall quality of life and satisfaction with health. This was assessed using the abbreviated version of the World Health Organization's Quality of Life Scale; and
- Calculated noise levels were found to be below levels that would be expected to directly affect health (World Health Organization— Community Noise Guidelines [1999]). This finding is consistent with self-reported and measured results of the study.

In 2015, the NHMRC in Australia published a systemic review of the health effects of wind farms (Merlin et al., 2015) which was performed by the University of Adelaide. This was an extremely thorough follow on to the *Rapid Review* referred to previously. It was completely independent with no relationship to either wind farm developers, anti-wind groups or objectors. It looked extensively at all the reported effects and systematically looked at all the evidence. The review concluded that *"The evidence considered does not support the conclusion that wind turbines have direct adverse effects on human health, as the criteria for causation have not been fulfilled"*.

There was a commentary on *Wind Turbine Noise* published in the British Medical Journal (The BMJ) in March 2012 (Hanning and Evans, 2008) which was not an evidence-based study but merely an opinion piece. The piece identified that wind turbine noise seems to affect sleep and that an independent review of evidence is necessary. Professor Simon Chapman responded in a letter published in a subsequent issue of The BMJ (Chapman, 2012) stating *"Hanning and Evans, who declare histories of anti-wind farm activity, say that a large body of evidence now exists*

*that wind turbines within permissible distances from housing disturb sleep and impair health. They are correct about a large body of evidence, but not in their interpretation of its conclusions. There are 17 reviews of the evidence, nearly all with an “independent” provenance. None are referenced in the editorial. These reviews strongly state that the evidence that wind turbines themselves cause problems is poor. They conclude that:*

- *Small minorities of exposed people claim to be adversely affected by turbines.*
- *Negative attitudes to turbines are more predictive of reported adverse health effects and annoyance than are objective measures of exposure.*
- *Deriving income from hosting wind turbines may have a “protective effect” against annoyance and health symptoms. Opponents claim that turbine hosts sign “gag” clauses that prevent them from complaining. I have seen contracts from different Australian firms and none say anything about gags. No contract could preclude citizens from pursuing negligence claims in common law.”*

Furthermore, a critical review of the scientific literature published in the Journal of Occupational and Environmental Medicine (JOEM) in 2014 (McCunney, 2014) concluded that:

1. *“Infrasound sound near wind turbines does not exceed audibility thresholds.*
2. *Epidemiological studies have shown associations between living near wind turbines and annoyance.*
3. *Infrasound and low-frequency sound do not present unique health risks.*
4. *Annoyance seems more strongly related to individual characteristics than noise from turbines.”*

A recent study published in Environment International Journal (Bräuner et. al, 2018) examined the association between long-term exposure to wind turbine noise and the incidence of myocardial infraction (MI). The study concluded that *“the results of this comprehensive cohort study lend little support to a causal association between outdoor long-term wind-turbine noise exposure and MI. However, there were only few cases in the highest exposure groups and our findings need reproduction.”*

A more recent study published in the Journal of American Heart Association (Bräuner et. al, 2019) investigated the association between long-term exposure to wind turbine noise and the risk of stroke and concluded that *“this comprehensive cohort study lends no support to an association between long-term WTN[wind turbine noise] exposure and stroke risk”.*

Another recent article published in the Environmental Research Journal (Poulsen et. al, 2018) examined the potential link between wind turbine noise and adverse birth outcomes and found no associations between the two.

In conclusion, there appears little scientific evidence of effects of *Wind Turbine Syndrome* and so significant health effects in this regard are not anticipated.

#### 6.4.3.2.2 Noise Induced Hearing Loss

During the construction, operational and decommissioning phases of the proposed development, environmental noise levels sufficient to cause noise induced hearing loss will not occur. The detailed assessment presented in Chapter 13 (Noise and Vibration) assesses the potential for noise impacts from the proposed development and concludes that the greatest potential noise impact from the operation of the wind farm is moderate in terms of its significance and also notes that the impact is variable. It is therefore concluded that there is no risk of noise induced hearing loss due to noise from environmental exposure as a result of the proposed development.

#### 6.4.3.2.3 Sleep Disturbance

In 2009, the WHO issued *Night-time Noise Guidelines for Europe* (WHO, 2009). The report stated that in two European countries studied (Switzerland and The Netherlands) almost 50% of the population are exposed to night-time noise in excess of 45dB L<sub>night</sub>. It quotes some impacts at quite low night-time levels and proposed an ideal noise level of 40dB L<sub>night</sub> outside residences. This, however, is a yearly average. It does accept that this is essentially unachievable and suggests an interim value of 45dB L<sub>night</sub> outside, again a yearly average.

The current Irish WEDGs (2006) state that *“A fixed limit of 43dB(A) will protect sleep inside properties during the night”*. The Draft 2019 WEDGs (Ireland) propose a change to the approach in applying limits on noise from wind turbines, including during night-time. This is currently the subject of consultation and is discussed in further detail in Chapter 12 (Noise and Vibration).

The WHO also carried out a review on environmental noise in 2018 (Basner and McGuire, 2018). While the review mainly concentrated on road, rail and aircraft noise, it did briefly discuss wind turbine noise and concluded that *“The results of the six identified studies that measured self-reported sleep disturbance are consistent, four of the studies found an association between wind turbine noise levels and increased sleep disturbance. However, the evidence that wind turbine noise affects sleep is still limited. This finding is supported by other recent reviews on*



*wind turbine noise and sleep disturbance. Three of the studies referred to noise specifically in the questions which could have led to a bias in the results. Also, while the results from four out of the six studies suggest that sleep disturbance due to wind turbine may occur when noise levels are above 40 or 45 dBA, for two of the studies less than ten percent of the participants were exposed to these higher noise levels. Therefore, it is difficult to make conclusions on populations exposed to these higher levels. In addition, noise levels were calculated using different methods and different noise metrics were reported in the studies.”*

In October 2018, the WHO published the *Environmental Noise Guidelines for the European Region* (WHO, 2018) as a follow on from the above and noted the following:

*“For the relationship between wind turbine noise and prevalence of hypertension, three cross-sectional studies were identified, with a total of 1830 participants (van den Berg et al., 2008; Pedersen, 2011; Pedersen & Larsman, 2008; Pedersen & Persson Waye, 2004; 2007). The number of cases was not reported. All studies found a positive association between exposure to wind turbine noise and the prevalence of hypertension, but none was statistically significant. The lowest levels in studies were either <30 or <32.5 L<sub>den</sub>. No meta-analysis was performed, since too many parameters were unknown and/or unclear. Due to very serious risk of bias and imprecision in the results, this evidence was rated very low quality”.*

*“The same studies also looked at exposure to wind turbine noise and self-reported cardiovascular disease, but none found an association. No evidence was available for other measures of cardiovascular disease. As a result, only evidence rated very low quality was available for no considerable effect of audible noise (greater than 20 Hz) from wind turbines or wind farms on self-reported cardiovascular disease”.*

The Guidelines also state that *“For average noise exposure, the GDG [Guideline Development Group] conditionally recommends reducing noise levels produced by wind turbines below 45 dB L<sub>den</sub> as wind turbine noise above this level is associated with adverse health effects”.* The GDG do note however that aside from a potential for annoyance, the evidence relating to any health effects associated with wind turbine noise is either absent or of poor quality. There is therefore a possibility that the effects caused by attitudes towards wind farms may be difficult to tell apart from any potential effects from wind turbine noise. The GDG also note that there are more people exposed to noise from sources such as road traffic than from wind turbines and any benefits associated with reducing exposure to wind turbine noise may be unclear. Taking account of the above, the GDG recommends that the development of any policies for wind energy development ensure that noise exposure is kept below guideline values. They note that

this can be achieved via multiple methods, but they don't specify that any particular methods should be used.

Further discussion regarding noise impacts is presented in Chapter 12 (Noise and Vibration).

#### 6.4.3.2.4 Infra-sound

Infra-sound is sound below the audible human frequency which is normally taken as being 20 Hz or less. Human ears cannot respond to this, however it can be associated with vibration and is sometimes an issue discussed with, for example, large tunnelling projects. Infra-sound is also an everyday event with everyday sources.

Many of the people who cite human health problems with wind turbines relate these to infra-sound and reported symptoms can include nausea, disturbance of sleep, tinnitus (ringing in the ear) as well as others. Two professionals that have studied and expressed concerns about infra-sound in relation to wind turbines are Dr Alec Salt of the Washington School of Medicine and Dr Marianna Alves Pereira, Associate Professor at Lusófona University, Portugal.

In a 2013 study by the South Australian Environment Protection Authority entitled *Infrasound levels near wind farms and in other environments*, the authors objectively measured infra-sound in a number of the different environments including urban and rural as well as in houses adjacent to windfarms and those further away. Among its conclusions were that *"Infrasound levels of between 60 and 70dB(G) commonly occur in the urban environment"* and that *"Noise generated by people and associated activities within a space was one of the most significant contributors to measured infrasound levels, with measured infrasound levels typically 10 to 15dB(G) higher when a space was occupied. Infrasound levels up to approximately 70dB(G) were measured in occupied spaces"*.

When discussing the specific locations that were tested, the report stated *"At two locations, the EPA [South Australian Environment Protection Authority] offices and an office with a low frequency noise complaint, building air conditioning systems were identified as significant sources of infrasound. These locations exhibited some of the highest levels of infrasound measured during the study"*. For rural environments, the report concluded that while infra-sound levels were lower than urban areas, that *"Infrasound levels at houses adjacent to wind farms are no higher than those at houses located a considerable distance from wind farms"*.

Another relatively recent publication from Ministry of the Environment in the Federal State of Baden Wuerttemberg, Germany (Ratzel, 2016) states in the conclusion that *"Infrasound is*

*caused by a large number of different natural and technical sources. It is an everyday part of our environment that can be found everywhere. Wind turbines make no considerable contribution to it. The infrasound levels generated by them lie clearly below the limits of human perception. There is no scientifically proven evidence of adverse effects in this level range.*

*The measurement results of wind turbines also show no acoustic abnormalities for the frequency range of audible sound. Wind turbines can thus be assessed like other installations according to the specifications of the TA Lärm [noise prevention regulations]. It can be concluded that, given the respective compliance with legal and professional technical requirements for planning and approval, harmful effects of noise from wind turbines cannot be deduced”.*

The referenced publications and studies above outline that windfarms are not a significant source of infra-sound and that traffic and everyday human activity are likely to be more relevant. It is therefore concluded that there will be no significant adverse effect on human health as a result of infra-sound.

Further discussion on infra-sound is presented in Chapter 12 (Noise and Vibration).

#### **6.4.3.2.5 Electromagnetic Interference**

When electric current flows, both electric and magnetic fields are produced. The electromagnetic fields (EMF) from electricity are in the extremely low frequency end of the electro-magnetic spectrum. EMF occurs in the home, in the workplace or anywhere that electricity is used. EMF is also naturally generated from earth's geomagnetic field and electric fields from storm clouds.

Guidance from the WHO states that EMF is sometimes cited for potential health effects (WHO, 2007). Concerns expressed in the past include childhood leukaemia, brain tumours and other cancers. Laboratory experiments have provided no reliable evidence that EMF are capable of producing cancer, nor do human epidemiological studies suggest that they cause cancer in general.

Some non-cancerous adverse health effects are also claimed to be associated with EMF. These include miscarriages, reproductive and developmental abnormalities, depression and suicide, allergy and neurological disease. However, the Health Promotion Agency in the UK stated, in November 2007, that *“there is little scientific evidence to support these claims and the current*

*body of evidence does not show that exposure to EMF below guideline levels presents a human health hazard”.*

The aforementioned Australian NHMRC study (Merlin, 2015) concluded in relation to EMF that *“There is no direct evidence on whether there is an association between electromagnetic radiation produced by wind farms and health outcomes. Extremely low-frequency electromagnetic radiation is the only potentially important electromagnetic emission from wind turbines. Limited evidence suggests that the level of extremely low-frequency electromagnetic radiation close to wind farms is less than average levels measured inside and outside Australian suburban homes. There is no consistent evidence of human health effects from exposure to extremely low-frequency electromagnetic radiation at much higher levels than is present near wind farms.”*

EirGrid produced a publication entitled *EMF and You* in July 2014 which provides more information on EMF and electricity. This publication states that *“Recent studies conducted in the UK, France, Denmark and the US have not established associations between a home near transmission lines and childhood leukaemia”* and that *“Based on this history and its own review of research, the World Health Organization states there is no evidence to conclude that exposure to low-level EMFs is harmful to human health”*.

The proposed underground electrical cables will adhere to the international guidelines for ELF-EMF which are described by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This is a formal advisory agency to the World Health Organisation. The proposed project will also adhere to the EU guidelines for human exposure to EMF. As the ICNIRP guidelines will not be exceeded, even directly above the underground cables, there will be no associated operational effects on Human Health.

The on-site substation to be built as part of the proposed development will be located as shown in Figure 2-1 of this EIAR. The distance from the nearest sensitive receptor to this on-site substation is approximately 2.4km. It is noted that a considerable number of existing electrical substations are located much closer than 2.4km from nearby sensitive receptors. The proposed substation will be constructed in accordance with national standards for electrical infrastructure and as set out in the EirGrid publication referred above, no health agency has concluded that exposure to EMF from power lines and other electrical sources is a cause of any long-term adverse effects on human, plant or animal health.

For these reasons, this assessment concludes that there will be no significant human health effects as a result of electromagnetic radiation.

#### 6.4.3.2.6 Shadow Flicker

‘Shadow flicker’ is an effect that occurs when the rotating blades of a wind turbine cast a moving shadow over an observer or a building. The effect is predominantly experienced indoors where a moving shadow passes over a window in a nearby property and results in a rapid change or flicker in the incoming sunlight. Shadow flicker is predominantly an annoyance, but concerns have been raised that the flicker can trigger seizures in persons with photosensitive epilepsy.

The Wind Energy Guidance Note prepared in the UK for the Renewables Advisory Board and Department for Business, Enterprise and Regulatory Reform (BERR) in 2007 states that *“The operating frequency of a wind turbine will be relevant in determining whether or not shadow flicker can cause health effects in human beings. The National Society for Epilepsy advises that only 3.5 % of the 1 in 200 people in the UK who have epilepsy suffer from photosensitive epilepsy. The frequency at which photosensitive epilepsy may be triggered varies from person to person but generally it is between 2.5 and 30 flashes per second (hertz). Most commercial wind turbines in the UK rotate much more slowly than this, at between 0.3 and 1.0 hertz. Therefore, health effects arising from shadow flicker will not have the potential to occur unless the operating frequency of a particular turbine is between 2.5 and 30 hertz and all other pre-conditions for shadow flicker effects to occur exist.”* The note also states that *“Shadow flicker is therefore more likely to be relevant in considering the potential effects on residential amenity [than human health]”*.

Similarly, the aforementioned Australian NHMRC study (Merlin, 2015) discusses shadow flicker and states that *“The Environment Protection and Heritage Council of Australia (EPHC; 2010) notes that the risk of seizures from modern wind turbines is negligible, given that less than 0.5% of the population are subject to epilepsy at any point in time and, of this proportion, 5% are vulnerable to strobe lighting (light flashes). In the majority of circumstances (>95% of the time), the frequency threshold for individuals susceptible to strobe lighting is >8 Hz, with the remainder affected by frequencies >2.5 Hz. The EPHC estimates that the probability of conventional horizontal-axis wind turbines causing an epileptic seizure for an individual experiencing shadow flicker is <1 in 10 million in the general population.”*

With technological advances, where individual turbines will be automatically shutdown in

conditions that might cause shadow flicker, it will be significantly curtailed and this is the case in this project

Following the above information and with the implementation of the proposed mitigation measures, there will be no discernible shadow flicker and therefore no adverse health effects.

#### **6.4.3.2.7 Psychological Effects**

The potential for adverse effects on psychological health, such as anxiety and stress, caused by concern in relation to visual appearance, noise emissions, shadow flicker and other issues, is often highlighted in relation to wind farms. The community may also experience annoyance arising from increased traffic or noise from the construction works.

The potential effects on a person's overall psychological well-being is difficult to assess as there are no direct measurements that can be used. While it is possible to predict noise emissions and shadow flicker, for example, the same scientific certainty cannot be used in predicting psychological impacts. The 2014 Health Canada report referenced in Section 5.4.2.2.1 looked at a number of measures of stress (such as hair cortisol, blood pressure, heart rate, self-reported stress) and noted no association with exposure to wind turbine noise.

The potential degree of psychological impact can be both positive and negative. There can be a positive impact, whereby people may look forward to better employment opportunities generated by a major infrastructure project in a rural area or the benefits that may be gained from the Community Benefit Funds. In terms of negative impacts, this can be where somebody is annoyed by for example, the visual appearance of the wind turbines. This annoyance is not a medical health impact, as such. If a person were to develop a psychological illness, such as anxiety or depression, this would be a medical health impact.

In this case, it is useful to look at experience from other operational windfarms to determine if significant psychological effects are reported and published. If this was the case, it would be expected to find recorded evidence of increased levels of depression or anxiety in the vicinity of other windfarms, however there are no such findings in the peer-reviewed literature referenced above.

On that basis, it is considered that no significant adverse effects on psychological health will occur as a result of the proposed development.

#### 6.4.3.2.8 Health Benefits

Aside from the potential socio-economic benefits previously discussed, there are significant environmental benefits to the proposed development. The current and historical practice of fossil fuel combustion with the associated release of a range of pollutants including particulate matter, oxides of nitrogen, sulphur dioxide, carbon dioxide and many others is well documented. The release of these pollutants from the power generation sector is also a major contributor to global warming and the resulting changing effects on our climate.

The phasing out of coal, gas and peat burning power stations in Ireland is a key step in achieving Ireland's 2030 decarbonisation ambition as set out in the CAP23 and the placement of fossil fuels in electricity generation by clean renewable wind energy will have significant benefits for air quality and slowing down global warming.

The contribution of the proposed development to a decrease in reliance on fossil fuel combustion will have a moderate to significant positive long-term effect on the health and well-being of the general population.

#### 6.4.3.2.9 Residential Amenity

Residential amenity relates to the human experience of a person's home, derived from the general environment and atmosphere associated with the residence. The quality of residential amenity is influenced by a combination of factors, including site setting and local character, land-use activities in the area and the relative degree of peace and tranquillity experienced at the residence.

The land use/activities on the site are primarily commercial forestry, with some areas of pastoral agriculture. The surrounding landscape is a mixture of agricultural land and forestry. The nearest residential receptors are over 1000m from the proposed turbine locations. The nearest large settlements are located approximately 25km away with Ballina located to the east and Newport located approximately 26km to the south. The smaller settlement of Bangor-Erris is located approximately 11.5km to the west.

Extensive consideration has been given to the layout of the site and the positions of the turbines in ensuring sufficient set-back distances from sensitive receptors and adjustment for noise, shadow flicker, visual impact and telecommunication impacts. These considerations during the design, planning and EIA phase, in accordance with the relevant guidelines, are designed to minimise the potential effects on residential amenity from the proposed development. The

potential effects on human beings at their residences are assessed in the following chapters; Chapter 14 (Shadow Flicker), Chapter 16 (Aviation and Telecommunication), Chapter 13 (Noise and Vibration), Chapter 15 (Landscape and Visual Impact Assessment), Chapter 12 (Air Quality and Climate) and Chapter 17 (Traffic and Transportation).

Based on a combined consideration of the above factors in determining the potential impacts on residential amenity, it is considered that there will be a slight negative effect on residential amenity which will be short-term for the construction phase and long-term for the operational phase. For the small number of the nearest noise sensitive locations, as described in Chapter 13 (Noise and Vibration), the significance of the effect may be considered as moderate and variable in the worst-case noise conditions.

#### ***6.4.4 Major Accidents/Disasters***

The vulnerability of the project to risk of major accidents and/or disasters, such as extreme flooding or peat/soil instability, is discussed primarily in Chapter 9 (Soils and Geology), Chapter 10 (Hydrogeology) and Chapter 11 (Hydrology and Water Quality). The potential for climate change to impact future flood events is considered as part of the site-specific Flood Risk Assessment (FRA) in Chapter 11 and in Appendix 11.1.

In the context of potential human health risk from major accidents/disasters, potential risks as set out in Chapter 3 (Description of the Proposed Development) are presented by turbine/substation fires or turbine collapse. There are no dwellings located within 1000m of the proposed turbine or substation locations, therefore the risk to residential receptors from fires or turbine collapse is not considered significant. The proposed tip height of the turbines is 200m, therefore all residential dwellings are significantly removed from area of a potential turbine collapse.

The draft 2019 WEDGs refer to the very remote possibility of injury to people (or animals) from flying fragments of ice or from a damaged blade but note that most blades are composite structures with no bolts or separate components and that most turbines are fitted with anti-vibration sensors, which will detect any imbalance caused by icing of the blades and prevent start-up. Neither the draft 2019 WEDGs or the current 2006 WEDGs refer to the likelihood of fires from turbines and it is considered that the potential risk of a fire is very low. Similarly, the risk of turbine collapse is very low on the basis of comprehensive turbine base design considerations, safety checks throughout the turbine installation process and turbine suppliers many years of experience in developing and innovating safety in the wind energy industry.



The proposed development will not come under the *Control of Major Accident Hazards (COMAH) Regulations*, therefore there is no potential human health risk from activities associated with COMAH sites. Additionally, there are no COMAH sites located in proximity to the proposed wind farm.

It is therefore considered that the potential for an impact on the local population and human health from a major accident or disaster is low.

#### ***6.4.5 Cumulative Effect***

In the assessment of cumulative impacts, any other existing, permitted or proposed developments in the surrounding area have been considered where they have the potential to generate in-combination or cumulative impacts with the proposed development. Please refer to Tables 5-1 and 5-2 within Chapter 5 of this EIAR for a list of relevant applications within a 10km zone of influence. The potential for cumulative impacts on the local population and human health, in particular noise, shadow flicker, traffic and visual impacts are discussed in the relevant chapters; Chapter 9 (Soils and Geology), Chapter 10 (Hydrogeology), Chapter 11 (Hydrology and Water Quality), Chapter 12 (Air Quality and Climate), Chapter 13 (Noise and Vibration), Chapter 14 (Shadow Flicker), Chapter 15 (Landscape and Visual Impact Assessment), Chapter 16 (Aviation and Telecommunication) and Chapter 17 (Traffic and Transportation).

Bord na Móna made an application to An Bord Pleanála for leave to apply for Substitute Consent (ABP Ref. LS16.311862) in respect of the historical peat extraction on the Oweninny Bog, which ceased in 2003. The substitute consent application is expected to be submitted in 2023. Given the fact that there is no potential overlap between the historical peat extraction and this proposed development, there is no potential for a negative cumulative effect in respect of the subject matter of that application for substitute consent.

There is potential for an operational phase cumulative effect on noise, shadow flicker and visual impacts associated with two existing operational phases of the Oweninny Wind Farm are located to the West of the proposed Oweninny Phase 3 Wind Farm turbines as described in Chapter 5 (Policy, Planning and Development Context) of this EIAR. The permitted wind farms are referred to as Oweninny Phase 1 and Phase 2 which comprise a total of 61 no. wind turbines. There is another operational wind farm on the Oweninny Phase 3 site, this is referred to as Bellacorrick Wind Farm and comprises of 21 no. wind turbines, it is intended to decommission this wind farm prior to the completion of the construction phase of Oweninny Phase 3.

An additional wind farm was granted permission, central to the Oweninny Wind Farm Phase 3 site boundary, referred to as Corvoderry Wind Farm and comprising of 10 no. wind turbines. The Mayo County Council planning reference for this application is 11/838, however, it is noted that the permission for Corvoderry Wind Farm expired on 15<sup>th</sup> October 2022.

Another wind farm development, Sheskin Wind Farm, was granted approval in 2015 by Mayo County Council. This wind farm comprises of 8 no. Wind Turbines with an overall max height of 150 metres. The application reference for this development is 15/825.

A recent application was lodged with An Bord Pleanala (ABP Ref. 315933) on the 1<sup>st</sup> of March 2023 for a 21 no. wind turbine development (max blade tip height 200m) and associated infrastructure. The proposed development is located within the townland of Sheskin, Co Mayo, south-east of Slieve Fyagh, c. 6.7 km northeast of Bangor Erris and c. 11km south of the Atlantic Coastline. A decision is to be made by 28<sup>th</sup> August 2023.

Lastly, a wind development situated at Dooleeg More, Crossmolina, was granted approval in 2021 by Mayo County Council. The development comprises of Single wind turbine generator and 20kV grid connection to Bellacorick 110kV substation. The application reference for this development is 20467.

In terms of traffic, the potential for cumulative effects will occur primarily during the construction phase where construction traffic associated with the proposed development could overlap with construction or operations of other projects, which are currently permitted but not yet constructed, as identified in Chapter 17 (Traffic and Transportation).

#### ***6.4.6 Effect of Covid-19***

The emergence of Covid-19 requires cognisance to be taken of potential restrictions and their impact on the proposed development as well as measures amongst the population to prevent the spread of the disease. Public health guidance, such as sanitising, social distancing and assessment of workers health as well as any future measures advised by the authorities, will be implemented during construction and operational phases, as required. All measures will be in line with relevant government guidelines at the time, but it is anticipated that the following guidelines, at a minimum, would apply should Covid-19 restrictions still be in place:

- All persons are required to complete Construction Industry Federation (CIF) Covid-19 Online Induction prior to working on site;
- All staff are required to notify management if they are experiencing any of the Covid-19 symptoms, and self-isolate without coming to site;

- On-site facilities should allow for adherence to the social distancing guidance at the time of construction. Staff management (e.g. staggering of lunch breaks, eating alone) should also support social distancing;
- Hand sanitiser, disinfecting wipes and appropriate PPE should be made available to staff in all site compounds. Hand sanitiser should be carried by all staff, and PPE such as face masks used as required;
- Staff temperatures should be non-invasively checked regularly (as per CIF guidance);
- All staff to comply with government advice for minimising personal contacts and keep note of any close contacts; and
- Staff should use the Covid Tracker phone app.

## 6.5 MITIGATION MEASURES

### *6.5.1 Construction Phase*

Best practice construction methodology and measures to minimise impacts from excavation works, as described in Chapter 9 (Soils and Geology), will keep the development area to a minimum and reduce land use changes. Bellacorick wind farm will be decommissioned and dismantled in accordance with the Environmental Management measures outlined in decommissioning plan (Appendix 3.2 – Bellacorick Wind Farm Decommissioning Plan).

The proposed development is not anticipated to have a significant effect on the local or regional population, therefore no mitigation measures in respect of population trend impacts are required.

From an economic perspective, the proposed development will provide employment opportunities to the local community and wider region during construction, operations and decommissioning. The project, primarily at construction stage, is also likely to increase spend in local businesses as persons involved in the project stay locally or purchase goods. Overall, there will be a positive impact on the local economy and no mitigation measures are required.

### *6.5.2 Operational Phase*

Fáilte Ireland has been consulted to identify any potential concerns for adverse tourism impacts. Fáilte Ireland has provided a guidance document for considering the potential impacts of projects on tourism and this guidance document has been considered in the completion of this assessment. A map of the proposed Amenity pathway at the site has been developed and is included in Appendix 6-3. The internal access roads within the windfarm will also be made available for amenity use. The Community Benefit Fund will provide an opportunity for the local

community to invest in local facilities and infrastructure and support local clubs/societies and near neighbours.

Where required, specific mitigation measures for other environmental factors discussed previously which may interact with human health, such as landscape and visual effects, shadow flicker, air quality, water quality, noise & vibration and transport, are discussed in the relevant chapters of this EIAR. A cross reference of environmental factors is also presented in Chapter 19 (Interactions of the Foregoing).

### ***6.5.3 Decommissioning Phase***

Internal access roads, substation and wind turbine bases will be retained in place after decommissioning of the wind turbines to maintain access for recreation, minimise disruption to the electricity grid infrastructure and reduce the impact of construction activities (such as noise, air quality and traffic movements) on the local population associated with their removal. Turbine hardstandings and foundations will be covered with topsoil and revegetated.

No mitigation is proposed for the decommissioning phase in respect of effects on population trends, property value or tourism.

## **6.6 RESIDUAL IMPACTS**

### ***6.6.1 Construction Phase***

The Oweninny Wind Farm Phase 3 will have a slight positive residual impact on the local population through an influx of construction workers in the short-term. This influx is likely to cause a slight increase in local population over a short period of time resulting in a boost to the local economy through accommodation and spend in local shops and restaurants. There will be a short term slight negative effect as a result of the construction phase traffic and associated noise. There will be a long-term slight to moderate neutral effect on land use.

### ***6.6.2 Operational Phase***

The proposed development will provide clean energy from a renewable resource and help to achieve targets in national energy and climate change policies. This is a direct positive long-term residual effect for the country which will benefit the local population and communities.

The establishment of a Community Benefit Fund is considered to be a long-term positive effect on the local community in general. This in turn would have a positive effect on the individuals living in this community and have a positive effect on their individual psychological health

through the development of community led projects and maximising the level of local involvement in terms of influencing how the funds are spent.

Based on the cumulative impact assessments carried out for shadow flicker, noise, traffic and visual impact, it is considered that there will not be any significant effects on the local population or human health during the operational phase of the proposed development following the implementation of the mitigation measures as set out in the relevant chapters; in Chapter 9 (Soils and Geology), Chapter 10 (Hydrogeology), Chapter 11 (Hydrology and Water Quality), Chapter 12 (Air Quality and Climate), Chapter 13 (Noise and Vibration), Chapter 14 (Shadow Flicker), Chapter 15 (Landscape and Visual Impact Assessment), Chapter 16 (Aviation and Telecommunication) and Chapter 17 (Traffic and Transportation). Please refer to Section 6.4.2.2.1 of this chapter for a detailed review of impacts on population and human health as a result of the proposed development.

Overall, it is considered likely that there will be a long-term, slight, positive impact on the local population and human health as a result of the proposed development.

### *6.6.3 Decommissioning Phase*

It is considered that there will be a short-term, imperceptible, negative effect associated with the works required to decommission the wind turbines at the end of their operational lifetime.

The in-situ site roads constructed for the operation of the wind farm could also remain for future use as they may have additional purposes within the local community by the time of decommissioning of the wind farm such as, mature amenity and recreational use. It is proposed that these roads will remain or be removed as per the need arises in the future.

## **6.7 SUMMARY**

The proposed development will be located on the eastern part of Oweninny Bog, on a site of approximately 2,345 hectares where the closest settlement to the site is Bellacorick village which is located approximately 2km from the southwestern extents of the proposed development.

The population of the ED's within which the proposed development is located decreased overall by approximately 6% between 2006-2016 as per Census data. This illustrates a decline in local population which stands in contrast to increasing County and National level rates of increased population. Similarly, the 2016 census identified that the average rural population density in

Ireland is 27 persons/km<sup>2</sup> showing that the population density in the area surrounding the proposed development is well below the national average.

In relation to sensitive receptors identified, there are 78 no. receptors located within 2km from the proposed development of which the majority are residential and residential with commercial use.

There is currently no credible evidence to link wind turbines to adverse human health impacts. Emission limits, such as for noise or dust, are set to protect the most vulnerable in a community rather than the robust. Compliance with the limits set out in best practice guidelines (described in the relevant chapters on noise and vibration, air quality, shadow flicker) will ensure that individuals and communities are protected. Design stage considerations, such as turbine locations, and the mitigation measures outlined in Section 6.5 and in specific technical chapters will be put in place to ensure that the emissions and effects from the proposed development are in compliance with the standards to ensure that there will be no significant adverse effects on health, even amongst the most vulnerable.

Following consideration of the residual impacts as set out in Section 6.6, it is considered that that proposed development will not result in a significant negative impact on population and human health in the local and regional area.

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