FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COUMNAGAPPUL WIND FARM, CO. WATERFORD

## VOLUME 2 - MAIN EIAR

## CHAPTER 7 - AIR AND CLIMATE

Prepared for:
EMP Energy Limited (EMPower)

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Core House, Pouladuff Road, Cork, T12 D773, Ireland

T: +353 21 496 4133 | E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie

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# TABLE OF CONTENTS



## LIST OF APPENDICES (Volume III)

## LIST OF TABLES



## LIST OF IMAGE

# 7. AIR AND CLIMATE

## 7.1 Introduction

This chapter identifies, describes and assesses the potential significant direct and indirect effects on air quality and climate arising from the construction, operation and decommissioning of the Proposed Development.

The Site is wholly located in the jurisdiction of Waterford City and County Council, with the turbine array located approximately 15.8 km north of Dungarvan town centre and approximately 14.5 km south east of Clonmel town centre. The nearest settlement is Ballymacarbry, located approximately 5.5 km to the north west of the Site.

A detailed description of the Proposed Development assessed in the EIAR is contained in Chapter 2.

The Proposed Development assessed in this EIAR comprises the following key elements:

- The wind farm site (referred to in this EIAR as the 'Site');
- The grid connection (referred to in this EIAR as the ‘GCR’);
- The turbine delivery route (referred to in this EIAR as the ‘TDR’).

The proposed development for which consent is being sought by Coumnagappul Wind Farm Limited (the Applicant) is described in Chapter 2.

### 7.1.1 Statement of Authority

This chapter has been prepared by Ms. Sinéad Lynch of Fehily Timoney and Company.

Sinéad Lynch is a Civil Engineer with a MEng in Civil, Structural and Environmental Engineering from University College Cork. She is member of the Institution of Engineers of Ireland (MIEI). Sinéad has experience working on various renewable energy projects preparing chapters of the EIAR for wind farms including traffic and transport, air and climate, telecommunications and aviation chapters.

This chapter has been reviewed by Jim Hughes. Jim holds a BA in Public Administration (Development) from the University of Limerick, a Masters in Town Planning from Queens University Belfast and a Level 8 Diploma in EIA/SEA Management from University College Dublin. Jim has led major Irish projects in the planning, environmental assessment and permitting disciplines including numerous wind farm developments.

### 7.1.2 Air Quality

In order to protect our health, vegetation and ecosystems, EU Directives have set out air quality standards for Ireland and the other member states for a wide variety of pollutants. These Directives include how we should monitor, assess and manage ambient air quality. The European Commission set down the principles to this approach in 1996 with its Air Quality Framework Directive (96/62/EC). Four "daughter" directives lay down limits for specific pollutants:

- 1st Daughter Directive (99/30/EC): Sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead;
- 2nd Daughter Directive (2000/69/EC): Carbon monoxide and benzene;

- 3rd Daughter Directive (2002/3/EC): Ozone;
- 4th Daughter Directive (2001/107/EC): Polyaromatic hydrocarbons, arsenic, nickel, cadmium and mercury in ambient air.

The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC) was published in May 2008. It replaced the Framework Directive and the first, second and third Daughter Directives. The fourth Daughter Directive (2004/107/EC) will be included in CAFE at a later stage. The limit and target values for both Directives are outlined below.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Environmental Protection Agency Act, 1992 (Ambient Air Quality Assessment and Management) Regulations, 1999 (S.I. No. 33 of 1999). The fourth Daughter Directive was transposed into Irish legislation by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009) and the Air Quality Standards (Amendment) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air (Amendment) Regulations 2016 (S.I. No. 659 of 2016). Table 7-1 details the limit values for pollutants as per the CAFE Directive.

**Table 7-1: Limit Values of CAFE Directive 2008/50/EC**

| Pollutant | Limit Value Objective | Averaging Period | Limit Value (ug/m3) | Limit Value (ppb) | Basis of Application of the Limit Value |
|---|---|---|---|---|---|
| SO2 | Protection of human health | 1 hour | 350 | 132 | Not to be exceeded more than 24 times in a calendar year |
| SO2 | Protection of human health | 24 hours | 125 | 47 | Not to be exceeded more than 3 times in a calendar year |
| SO2 | Protection of vegetation | calendar year | 20 | 7.5 | Annual mean |
| SO2 | Protection of vegetation | 1 Oct to 31 Mar | 20 | 7.5 | Winter mean |
| NO2 | Protection of human health | 1 hour | 200 | 105 | Not to be exceeded more than 18 times in a calendar year |
| NO2 | Protection of human health | calendar year | 40 | 21 | Annual mean |
| NO + NO2 | Protection of ecosystems | calendar year | 30 | 16 | Annual mean |
| PM10 | Protection of human health | 24 hours | 50 | | Not to be exceeded more than 35 times in a calendar year |
| PM2.5 | Protection of human health | calendar year | 40 | | Annual mean |
| PM2.5 - stage 1 | Protection of human health | calendar year | 25 | | Annual mean |
| PM2.5 - stage 2 | Protection of human health | calendar year | 20 | | Annual mean |

| Pollutant | Limit Value Objective | Averaging Period | Limit Value (ug/m3) | Limit Value (ppb) | Basis of Application of the Limit Value |
|---|---|---|---|---|---|
| Lead | Protection of human health | calendar year | 0.5 | | Annual mean |
| Carbon Monoxide | Protection of human health | 8 hours | 10,000 | 8620 | Not to be exceeded |
| Benzene | Protection of human health | calendar year | 5 | 1.5 | Annual mean |

There are no statutory limits for dust deposition, however, the TA Luft (German Government 'Technical Instructions on Air Quality') state a guideline value of maximum 350 mg/m2/day.

There are no limit values in relation to ozone, however, the Ozone Daughter Directive sets target values. These are detailed in Table 7-2 along with information threshold and alert threshold values.

**Table 7-2: Target Values for Ozone**

| Objective | Calculation | Target Value for 2020 |
|---|---|---|
| Protection of Human Health | Maximum daily 8-hour mean | 120 µg/m3 |
| Protection of vegetation | AOT40*, calculated from 1-hour values from May to July | 6000 µg/m3-h |
| Information threshold | 1-hour average | 180 µg/m3 |
| Alert Threshold | 1-hour average | 240 µg/m3 |
| *The sum of the differences between hourly ozone concentration and 40 ppb for each hour when the concentration exceeds 40 ppb during a relevant growing season, e.g. for forest and crops. | | |

### *Air Quality and Health*

According to the EPA (Irelands Environment 2020 – Chapter 14 – Environment, Health and Wellbeing), the number of deaths directly linked to air pollution is estimated at 1,300 premature deaths in Ireland annually due to poor air quality (predominantly due to PM2.5), with a figure of 6 to 7 million premature deaths worldwide(UN Environment, 2019)[1].

Generally, air quality in Ireland is acceptable. However, in the short term, when compared with WHO guideline values and EEA reference level values; ozone, particulate matter and PHAs are of concern and NO2 is expected to increase as traffic on our roads increase.

The use of fossil fuel-based electricity generation leads to NOx and SOx emissions; however, wind generation does not produce any NOx or SOx emissions.

[1] EPA, 2020, cited in' Irelands Environment 2020 – Chapter 14 – Environment, Health and Wellbeing', p. 364.

### 7.1.3 Climate - Overview

Carbon dioxide ($CO_2$) is a greenhouse gas which, if released in excessive amounts, can lead to increases in global temperatures known as 'global warming' or the 'greenhouse effect' which can influence climate change. Once the proposed development is constructed there will be no resultant negative impacts on climate change. The provision of the Proposed Development will have a long-term positive impact by providing a sustainable energy source as discussed in this chapter. Should the Proposed Development not be developed, fossil fuel power stations will be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other emissions, and hinder Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions.

At the Paris climate conference (COP21) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C above pre-industrial levels and to limit the increase to 1.5°C. Under the agreement, Governments also agreed on the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries and to undertake rapid reductions thereafter in accordance with the best available science.

The International Panel on Climate Change (IPCC) has put forward its clear assessment that the window for action on climate change is rapidly closing and that renewable energy sources such as wind will have to grow from 30% of global electricity at present to 80% by 2050 if we are to limit global warming. In this regard the Government enacted the Climate Action and Low Carbon Development Act 2015 which provides for the approval of plans by the Government in relation to climate change for the purpose of pursuing the transition to a low carbon, climate resilient and environmentally sustainable economy.

Under the Kyoto Protocol and the Doha Amendment, during the first commitment period, 37 industrialized countries and the European Community committed to reduce GHG emissions to an average of five percent below 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020.

In December 2018, the revised Energy Efficiency Directive, the revised Renewable Energy Directive and the new Governance Regulation were formally adopted. The new regulatory framework includes a binding renewable energy target for the EU for 2030 of 32% with an upwards revision clause by 2023. This agreement will help the EU meet the Paris Agreement goals. In July 2021, the Commission proposed another revision of the directive, raising the target to 40% (up from 32%), as part of the 'Fit for 55' package to deliver on the European Green Deal. Less than a year later, in view of the Russian invasion of Ukraine and the need to further step up our energy independence from fossil fuels, the Commission proposed to further increase this target to 45% by 2030. On 30 March 2023, a provisional agreement was reached, for a binding target for 2030 of at least 42.5%, but aiming for 45%. Once this process is completed, the new legislation will be formally adopted and enter into force.

The main achievements of this agreement in terms of renewable energy production are:

- The agreement raises the EU's binding renewable target for 2030 to a minimum of 42.5%, up from the current 32% target and almost doubling the existing share of renewable energy in the EU.
- The agreement reaffirms the EU's determination to gain its energy independence through a faster deployment of home-grown renewable energy, and to meet the EU's 55% greenhouse gas emissions reduction target for 2030.
- A massive scaling-up and speeding-up of renewable energy across power generation, industry, buildings and transport will reduce energy prices over time and decrease the EU's dependence on imported fossil fuels.

- A financial framework for investors is to be established to facilitate investment in renewable energy projects;
- Increases competition and market integration of renewable electricity;
- Will reduce dependence on energy imports and increase energy security;
- Improves the design and stability of support schemes for renewables.

The Government published an updated Climate Action Plan 2023 (CAP23) in December 2022. This second updated action plan follows on from the inaugural plan of 2019 which was a result of the Irish Government declaring a climate and biodiversity emergency on 9th May 2019.

The CAP 23 provides a framework for delivering the Government's target of a 51% reduction (relative to 2018) in greenhouse gas (GHG) emissions by 2030. CAP23 follows the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a legally binding target of net zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030. The Act provides a governance framework for annual revisions of the Climate Action Plan and the development of a National Long-Term Climate Action Strategy at least once every ten years. As part of this plan, the Government is also committed to reducing emissions by an average 7% per annum by 2030. The Action Plan is underpinned by a series of sectoral emissions reduction ambitions and enabling actions, with a selection of relevant actions that are relevant to the Proposed Development outlined below.

CAP23 sets out an objective to more than double Ireland's onshore wind energy capacity to 9 GW by 2030 in order to meet new renewable energy targets and reduce emissions.

Key actions shown for the electricity sector include:

- The electricity system must achieve a 75% reduction in CO2, reaching 3MtCO2eq in the final year of 2026-20230 carbon budget period.
- Deliver up to 9 GW onshore wind (with 6GW by 2025), 8 GW solar, and at least 5 GW of offshore wind by 2030.
- Complete a revised version of Shaping our Electricity Future to define required new grid construction and reinforcements to achieve sectoral ceilings and carbon budgets.
- As an urgent priority, establish the investment framework and competitive market, arrangements needed to deliver zero carbon system services.
- Align the relevant constituent elements of the planning and permitting system to support accelerated renewable energy development and ensure renewables will be considered to be in the overriding public interest.
- New, dynamic Green Electricity Tariff will be developed by 2025 to incentivise people to use lower cost renewable electricity at times of high wind and solar generation.

The following actions relevant to electricity within CAP23 include:

- Action EL/23/1: Establish a taskforce to accelerate renewables.
- Action EL/23/2: Publish the Renewable Electricity Spatial Policy Framework
- Action EL/23/3: Publish a roadmap for the development and implementation of Regional Renewable Electricity Strategies
- Action EL/23/4: Prepare new draft Wind Energy Development Guidelines for onshore renewables.

- Action EL/23/5: Complete analysis to update Shaping Our Electricity Future to accommodate 80% renewables and align with carbon budgets and sectoral emissions ceilings for electricity.
- Action EL/23/6: Ensure electricity generation grid connection policies and regular rounds of connection offers which facilitate timely connecting of renewables, provides a locational signal and supports flexible technologies.
- Action EL/23/7: Publish an annual report setting out identifiable public benefits delivered by renewable energy sector including employment and skills/ training metrics, local investment and community benefits.
- Action EL/23/10: Deliver onshore and offshore RESS auctions as per the annual RESS auction calendar.
- Action EL/23/21: Carry out further studies to identify the investments and upgrades needed to facilitate 80% renewable electricity annual share.
- Action EL/23/22: Publish a policy framework for electricity storage based on electricity system needs.

The policies and objectives of the CAP 23 are reflected in the Draft National Energy & Climate Plan (NECP) 2021-2030, which was submitted to the European Commission in December 2018.

The NECP was prepared to incorporate all planned policies and measures that were identified up to the end of 2019 and will collectively deliver a 30% reduction by 2030 in non-ETS greenhouse gas emissions (from 2005 levels). The NECP was drafted in line with the current EU effort-sharing approach, before the Government committed to its higher level of ambition, and therefore does not reflect this higher commitment. Further interactions of the NECP will reflect the current government's stronger climate governance.

#### *7.1.3.1 Climate Change Performance Index*

The Climate Change Performance Index (CCPI) is an independent monitoring tool which tracks countries climate protection performance. It assesses individual countries based on climate policies, energy usage per capita, renewable energy implementation and Greenhouse Gas Emissions (GHG) and ranks their performance in each category and overall.

The 2022 CCPI was published in December 2021. While the 2022 CCPI indicated signs of potential reductions in global emissions, no country achieved a "very high" and therefore the first three places of the ranking system remain unoccupied.

Ireland has fallen 7 places from its 2021 rank to 46th out of 64 globally ranked countries and remains at "low" in international performance. Ireland is ranked as "very low" in Green House Gas Emissions and "low" in climate policy.

### 7.1.4 Carbon Emissions

$CO_2$ emissions occur naturally in addition to being released with the burning of fossil fuels. All organic material is composed of carbon, which is released as $CO_2$ when the material decomposes. Organic material acts as a store of carbon. Peatland habitats are significant stores of organic carbon. The vegetation on a peat bog slowly absorbs $CO_2$ from the atmosphere when it is alive and converts it to organic carbon. When the vegetation dies, in the acidic waterlogged conditions of bogs and peatlands, the organic material does not decompose fully and the organic carbon is retained in the ground.

The carbon balance of proposed wind farm developments in peatland habitats has attracted significant attention in recent years. When developments such as wind farms are proposed for peatland areas, there will be direct impacts and loss of peat in the area of the development footprint. There may also be indirect impacts where it is necessary to install drainage in certain areas to facilitate construction. The works can either directly or indirectly allow the peat to dry out, locally, which permits the full decomposition of the stored organic material with the associated release of the stored carbon as CO2. It is essential therefore that any wind farm development in a peatland area displaces more CO2 produced from fossil fuel sources than it releases during the construction, operation and restoration of the wind farm site.

There is approximately 0.0 m - 0.7 m of peat on site. The site is not located on active bog or fen habitats. Site walkovers found limited areas of shallow peat present with thickness of 0.0m – 0.25m. This is considered to be a highly organic Topsoil with Peaty appearance.  The Site currently comprise Moors and Heathland, Pasture Land and a small area of conifer forestry near the Site access. The Proposed Development has been sensitively situated within an upland environment of limited carbon storage habitat value.

The Scottish Carbon Calculator Tool[2] was used to calculate whole life carbon emissions and carbon savings as a result of the proposed development. Input data used in the calculations is presented in Appendix 7.1, Volume III of this EIAR.

## Ireland's Carbon Emissions

Ireland's greenhouse gas (GHG) emissions are tracked and projected by the EPA for submission to the EU UNFCCC annually. Carbon dioxide emissions are reported alongside methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6), and nitrogen trifluoride (NF3).

For 2019, the total national greenhouse gas emissions was estimated to be 59.78 million tonnes carbon dioxide equivalent (Mt CO2eq) (EPA, 2021). This is a 4.4% reduction on 2018 levels. Emissions reductions have been recorded in 6 of the last 10 years.

Emissions in the Energy Industries sector showed a decrease of 11.2% between 2018 and 2019 which is attributable to decreases in the consumption of coal and peat while there were increases in renewable electricity generation. In 2019, electricity generated from wind increased by 16% (EPA 2021)

SEAI estimate that 42% of electricity generation was from renewable sources in 2020 (SEAI, 2021). The estimated amount of CO2 avoided through the use of renewable energy sources reached 6.6 Mt CO2 in 2020. The use of renewables in electricity generation in 2017 reduced CO2 emissions by 3.3 Mt and avoided €278 million in fossil fuel imports. Over 180 MW of wind generation was installed during 2020 and wind generation now accounts for 36.1% of all electricity generated (SEAI, 2021).

[2] https://informatics.sepa.org.uk/CarbonCalculator/index.jsp

The EPA's latest projections report, 'Ireland's Greenhouse Gas Emissions Projections 2020-2040' (June 2021[3]) projected Ireland's greenhouse gas emissions under two scenarios: The With Existing Measures scenario and the With Additional Measures scenario. The With Existing Measures (WEM) scenario incorporates the anticipated impact of policies and measures that were in place (and legislatively provided for) by the end of 2018. The With Additional Measures (WAM) scenario is primarily based on SEAI's Advanced energy projection (which includes existing and planned policies and measures) and anticipated progress in the implementation of Government renewable and energy efficiency policies and measures including those set out in the National Renewable Energy Action Plan (NREAP), the National Energy Efficiency Action Plan (NEEAP) and Ireland's National Development Plan 2018 - 2027. Plate 6.1 illustrates the WEM and WAM projected emissions in relation to Energy Industries.

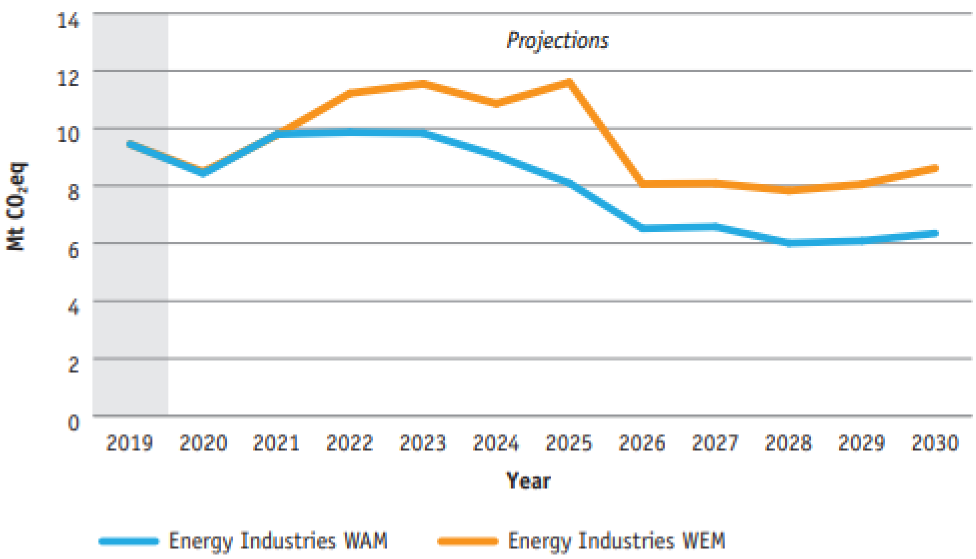


**Image 7-1: Greenhouse Gas Emissions Projections from the Energy Industries Sector under the WEM and WAM scenarios out to 2030**

A new Effort Sharing Regulation setting out 2030 targets for EU Member States has recently been adopted by the European Council. Irelands 2030 target is a 30% reduction of emissions compared to 2005 levels by 2030 with binding annual limits over the 2021-2030 period to meet that target. Over the longer-term, Ireland's National Policy Position on Climate change has set a target of an aggregate reduction in carbon dioxide (CO2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors.

According to 'Ireland's Greenhouse Gas Emissions Projections 2020-2040' (EPA, 2020), Ireland is projected to save 6.3 Mt CO2 equivalent over the period 2020-2030 with the implementation of the 'With Additional Measures' scenario when compared to the 'With Existing Measures' scenario. This represents a reduction of 24.8% over that period.

[3] EPA '2020 Greenhouse Gas Emissions Projections' 2020-2040.

On 14th May 2018, the European Council adopted a regulation on greenhouse gas emission reductions. The regulation sets out binding emission reduction targets for Member States in sectors falling outside the scope of the EU emissions trading system for the period 2021- 2030. In the National Energy and Climate Plan 2020, the results of the government projections show that, Ireland will exceed the carbon budget over the period 2021 – 2030 by approximately 32 Mt CO2 equivalent with full use of the ETS and LULUCF flexibilities (DoECC, 2020).

## 7.2 Methodology

The primary land-uses within and in the vicinity of the Site comprises agriculture, commercial forestry and sections of peat bog. Due to the non-industrial nature of the project and the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this EIAR. It is expected that air quality in the existing environment is good, since there are no major sources of air pollution (e.g. heavy industry) in the vicinity of the site.

The production of energy from wind turbines has no direct emissions as is expected from fossil fuel based power stations. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. Some minor short term or temporary indirect emissions associated with the construction of the Proposed Development include vehicular and dust emissions

As the operation of wind turbines does not give rise to emissions (with the exception of back-up generators which would not be in use regularly), in respect of air and climate, this chapter focuses on the potential emissions which may arise during the construction and decommissioning phases of the proposed development. The Scottish Windfarm Carbon Assessment Tool was used to predict the carbon savings for the wind farm for an operational period of 40 years.

### 7.2.1 Air Quality

A review of existing air quality monitoring data undertaken by the Environmental Protection Agency (EPA) was reviewed and used to characterise the existing environment.

The impact assessment methodology involved the review and assessment of the construction methods for the proposed development and associated infrastructure to identify the potential for air emissions during construction and decommissioning.

To assess the impacts of construction dust emissions, the Institute of Air Quality Management (IAQM) guidance document: 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM 2014)[4] was used, as is recommended in Transport Infrastructure Ireland's (TII) Air Quality Assessment of the NRA's Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation In Place[5] was used. This approach involves a number of "steps" to assess the potential impact of dust on nearby receptors.

The steps involved in the dust impact assessment, as prescribed by the IAQM, are as follows:

1. Screen the requirement for a dust impact assessment
2. Assess the risk of dust impacts by:
   2A The scale and nature of the works – the "magnitude" of the potential dust emission

[4] http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf
[5] https://www.tiipublications.ie/library/PE-ENV-01107-01.pdf

   2B The sensitivity of the surrounding area
   2C Combining 2A and 2B into a risk matrix to assess the risk of dust impacts
3. Identify site-specific mitigation measures
4. Examine the residual impacts and whether or not these are significant
5. Prepare a Dust Assessment Report

Step 1, the screening process, has been set out by the IAQM to be deliberately conservative. One of the threshold criteria which will trigger the requirement for a dust impact assessment, for example, is that a human receptor exists within 350 m of the site boundary. The nearest residential dwelling is located approximately 820m from the nearest turbine, however there are residential receptors along the local road on near the main entrance to the Site, the closest being 174m away. As this is the case for The Proposed Development, the screening process indicates that a dust impact assessment is required.

Step 2 of the process will be carried out in the Impact Assessment section of this chapter. Step 3 will be carried out in the Mitigation Measures section of this chapter. Step 4 will be covered by the Residual Impacts section and step 5 will therefore be addressed by writing the process and results of the dust impact assessment into this chapter.

### 7.2.2 Climate

A desk-top study assessment was undertaken of available climatic information to characterise the existing environment. The climatic conditions for the wider geographical area have been derived from historical meteorological measurements compiled by Met Éireann at Moore Park weather station which is approximately 42km west of the Site and associated infrastructure, this is the closest weather station to the Site. These meteorological measurements were accessed May 2022 (source www.met.ie/climate). In terms of climatic impact, the appraisal considered the net impact that operating the proposed development will have in terms of CO2 and its displacement of CO2 from other energy sources over the carbon losses caused by its manufacturing, transportation, construction and decommissioning using the Scottish Carbon Calculator tool.

In addition to the CO2 factored for emissions purposes, greenhouse gas (GHG) emissions are also factored into the overall carbon calculation. GHG are associated with the manufacture, transport, construction, operation (linked to backup generation) and decommissioning of wind turbines.

The impact assessment considered the positive impacts the proposed development will have on contributing to national targets for the reduction of greenhouse gas emissions. The results are described below and in summary the proposed development will result in the production of energy from a renewable source which, once fed into the National Grid, has the potential to avoid several thousand tonnes of carbon dioxide (CO2) annually that would have been released had the energy been generated by the average Irish power generation mix.

Figures from the Sustainable Energy Authority of Ireland (SEAI, 2021) indicate that the CO2 displacement by wind generation was 4.5Mt CO2 in 2020. It was estimated that in 2019, approximately €297 million in fossil fuel imports were avoided due to renewable electricity generation. (SEAI 2020)

The Intergovernmental Panel on Climate Change (IPCC) in 'Renewable Energy Sources and Climate Change Mitigation' (2014) state that 50 estimates from 20 studies indicate that emissions "are small compared to the energy generated and emissions avoided over the lifetime of wind power plants [farms]: the GHG [greenhouse gas] emissions intensity of wind energy is estimated to range from 8 to 20g CO2/kWh in most instances". The IPCC (2010) report that the energy payback time, based on lifecycle assessment procedures, per turbine vary between 0.25 years and 0.65 years for onshore developments. A more recent study in 2019 by Dammeier, Loriaux, Steinmann, Smits, Wijnant, van den Hurk and Huijbregts found the greenhouse gas payback time of a wind turbine in Northwestern Europe was between 1.8 and 22.5 months with an average of 5.3 months.

The amount of CO2 that could potentially be avoided on an annual basis due to the proposed development is estimated based on the expected output of the wind farm. The net displacement value may increase or decrease somewhat, as the generation mix in Ireland develops, under different fuel price scenarios and as demand changes over time, and as more storage, interconnection and demand side management (smart meters) come online. Refer to Section 7.4.4 for details of the calculations for carbon saving as a result of the proposed development.

Monthly meteorological data from Met Eireann was reviewed to gain an understanding of the existing climatic condition of the site. These meteorological measurements were accessed May 2022 (source www.met.ie/climate) and provided measurements of total rainfall, mean temperature, mean 10cm soil temperature, potential evapotranspiration (mm), evaporation (mm) and degree days below 15.5 degrees Celsius for Moore Park weather station.

The Scottish National Heritage carbon calculator which accounts for all stages of the Proposed Development, was used to determine the long term effect of the Proposed Development on climate. The impact assessment also involved a review of activities associated with the construction, operational and decommissioning phases to determine impacts on both the micro and macro climates of the site.

### 7.2.3 Carbon Emissions

Previously, guidance produced by Scottish Natural Heritage in 2003 had been widely employed to determine carbon payback in the absence of any more detailed methods. Concerns were raised about the methods of calculating carbon savings for large scale wind farms being developed in Scotland as many of the developments were located on peatlands and forestry which can contain large carbon stocks and which are poorly protected. The methodology for calculating carbon losses was created in 2008 by scientists at the University of Aberdeen and the Macauley Institute with support from the Rural and Environment Research and Analysis Directorate of the Scottish Government, Science Policy and Co-ordination Division. The document, 'Calculating Carbon Savings from Wind Farms on Scottish Peat Lands', was developed to calculate the impact of wind farm developments on the soil carbon stocks held in peat. This methodology was refined and updated in 2011 based on feedback from users of the initial methodology and further research in the area. The web-based version of the carbon calculator, which supersedes the excel based versions of the tool, was released in 2016. The tool provides a straightforward method for estimating the impacts of wind farms on the carbon dynamics of peatlands. The tool also provides guidance when figure inputs are unknown. The carbon calculator, whilst designed for Scottish wind farm developments is used for assessing Irish wind farm developments due to the similarity in development sites, i.e. high ground on peatlands which contain forestry in a similar climate.

The calculator was created to calculate the loss of carbon from acidic bog or fen habitat and defines peat soils as soils with a surface horizon greater than 50cm deep. The calculator takes into account the carbon fixing potential from peatland plants (which is small) and calculates the total area of peat excavation and the total area of peat affected by drainage, using the annual gains due to carbon fixing potential and the time required for any habitat restoration. Carbon stored within the peat itself represents a large potential source of carbon which can be lost during excavation and drainage. Forestry on proposed wind farm sites can affect wind energy yields and therefore clear felling is generally required. Carbon losses as a result of felling are calculated from the area to be felled, the average carbon sequestered annually, and the lifetime of the wind farm. The calculator also takes into account the carbon emissions from the life cycle analysis of the wind turbines and the back up source in order to calculate carbon savings and carbon payback times of a wind farm. Site specific capacity factor is also required to provide a realistic payback time for a site. The calculator also takes into account a grid mix emission factor. The calculator uses default values from the Intergovernmental Panel on Climate Change (IPPCC, 1997) as well as site specific equations from scientific literature to calculate carbon loss.

In keeping with guidance, specific figures have been inputted wherever possible and where this information was not available the guidance provided by the calculator was used. The assumption to use the fossil fuel generation emission factor was made based on the reality that additional wind generation will displace fossil fuel generation (Scot. Gov., 2018). With regards to the windfarm characteristics the following presumptions for the Site were made: the lifetime of the windfarm is 40 years, the capacity factor is 35% and the fraction of output to back up is 1.75% (i.e. 5% of capacity factor). With regards to the characteristics of the 'peatland' before development, the peat on the site does not meet the standards for peatland in that it is less than 0.5m in depth. Also, the site has been cultivated and is dominated by conifer plantation meaning that the carbon content of the peat is much lower than that of an actual peatland habitat, with carbon having been released during the drainage and cultivation of the site.

An average depth of peatland was provided for the entire site (0.16m) and turbine areas (0.15m). Whilst the carbon content for dry peat, dry bulk density and extent of drainage around drainage features was unknown and were likely to be below the figures provided in the accompanied guidance, guidance figures were used with a worst-case scenario of 0.5m taken for drainage, the average depth of peatland across the site is significantly less than 0.5m, therefore 0.5m is considered the maximum depth and therefore worst-case scenario. Also, whilst 25.7ha of forestry is to be clear felled, forestry will be replanted elsewhere, and the carbon calculator does not take this into account. It is therefore highly likely that the carbon loss figure for the Proposed Development will be slightly higher than the actual carbon loss for the site.

The Scottish Government on-line carbon calculator as outlined above, was used to assess the impacts of the proposed development in terms of potential carbon losses and savings taking into account the whole life of the wind farm development including materials manufacture, transport and installation and all construction activities including peat removal, drainage, and forestry felling. A copy of the outputs is provided as Appendix 7.1, Volume III of this EIAR. A summary of the main CO2 losses due to the proposed development are summarised in Table 7-9.

## 7.3 Existing Environment

### 7.3.1 Air Quality

European air quality legislation requires that each member state be defined in terms of Zones and Agglomerations for air quality, with Ireland divided into four zones. The EPA has designated four zones within Ireland[6]:

- Zone A: Dublin City and its environs
- Zone B: Cork City and its environs
- Zone C: 24 cities and towns (such as Galway, Limerick and Waterford cities and towns such as Naas, Newbridge, Celbridge, Leixlip) with a population of greater than 15,000
- Zone D covers the remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The Site, TDR and GCR are located in Zone D.

The air quality in each zone is monitored by the EPA and classified with respect to upper and lower assessment thresholds based on measurements over the previous five years. The number of monitoring locations required is dependent on population size and whether ambient air quality concentrations exceed the upper assessment threshold, are between the upper and lower assessment thresholds, or are below the lower assessment threshold. The Air Quality In Ireland Report 2021 (EPA 2022) noted that Ireland's overall air quality was good, however there are localised issues across the country impacting negatively on the air quality. The report showed that: particulate matter PM2.5, originating primarily from the domestic burning of solid fuels, and NO2, primarily an emission from road transport; are the main threats to good air quality in Ireland. Ireland is also above the WHO guidelines for PM2.5 at 65 monitoring stations in 2021 and the EEA reference level for PAH, a toxic chemical at 3 monitoring locations due to the residential burning of solid fuels such as coal, peat and wood. PM2.5 has been highlighted by the EEA as being predominantly responsible for most of the 1,300 estimated premature deaths. The Air Quality Index for Health map on the EPA website, shows that the current air quality within the Site, GCR and TDR is classed as Good.

The EPA undertakes continuous ambient air monitoring at various stations in Ireland. Although no data is available on air quality in the immediate vicinity of the study area, it is expected that the air quality data from the nearest stations to Coumnagappul are representative of the air quality at the Site. In the case of the proposed development, the closest EPA monitoring stations are Station 75. Clonmel, Co. Tipperary (15 km from the Site), Station 59. Paddy Browne's Road, Waterford [35km from the Site]) and Station 72, Cork Harbour [60 km from the Site]). PM10 and PM2.5 are measured at Station 75. Clonmel, Co. Tipperary; NO2, O3 PM2.5 and PM10 are measured at Station 59. Paddy Browne's Road, Waterford; and SO2 is measured at Station 72, Cork Harbour.

A summary of data collected at these monitoring stations is found in the following sections. The EPA allows a maximum of 6 months' of data to be exported to CSV files. Therefore, data for 9th September 2022 to 9th March 2023 has been used to create the summary tables below.

[6] EPA. Air Quality Zones

#### 7.3.1.1 Sulphur Dioxide (SO2)

Sulphur Dioxide for the period of 9th September 2022 to 9th March 2023 recorded at Station 72, Cork Harbour is presented in Table 7-3. Neither the hourly limit value nor the 24-hour limit value as set out in the CAFE Directive were exceeded during the monitoring period.

**Table 7-3: Sulphur Dioxide Data from Station 72, Cork Harbour 09/09/2022-09/03/2023**

| Parameter | Measurement |
|---|---|
| Number of Hours | 4315 |
| No. of measured values | 4288 |
| Percentage Coverage | 99% |
| Maximum hourly value | 61.4 µg.m-3 |
| 98 percentile for hourly values | 11.6 µg.m-3 |
| Mean hourly value | 1.71 µg.m-3 |
| Maximum 24 hour mean | 13.36 µg.m-3 |
| 98 percentile for 24-hour mean | 10.49 µg.m-3 |

#### 7.3.1.2 Particulate Matter (PM10)

Particulate matter are very small particles which can be either solid or liquid. Some of these particles occur naturally, while many are man-made. Particulate matter is referred to as PM. The number following the PM is used to show how small the PM is. The EPA monitors two types of PM and compare levels to limit values in the CAFE (Clean Air for Europe) Directive and WHO guidelines. These are PM10 and PM2.5.

Particulate matter (PM10) data for the 9th September 2022 to 9th March 2023 monitoring period in Clonmel is presented in Table 7-4. The maximum daily value of PM10 recorded during the period was 51.18 µg.m-3 which is above the threshold of 50 µg.m-3 which must not be exceeded any more than 35 times in a year. Of the 6 months of data examined, this threshold was exceeded once on December 16th 2022 which is representative of less than 35 exceedances per year. Therefore, it is assumed that the PM10 concentrations throughout the year are compliant with the CAFÉ Directive. The mean daily value recorded during the period was 11.24 µg.m-3 which does not exceed the threshold in the CAFÉ Directive of 40 µg.m-3 annual mean concentration.

**Table 7-4: Particular Matter (PM10) data from Station 75. Clonmel, Co. Tipperary 09/09/2022-09/03/2023**

| Parameter | Measurement |
|---|---|
| No. of Days | 182 |
| No of measure values | 182 |
| Percentage coverage | 100% |
| Maximum daily value | 51.18 µg.m-3 |
| Mean daily value | 11.24 µg.m-3 |

#### *7.3.1.3 Particulate Matter (PM2.5)*

Particulate matter (PM2.5) data for the 9th September 2022 to 9th March 2023 monitoring period in Clonmel is presented in Table 7-5. Both the Stage 1 and Stage 2 threshold values for PM2.5 were exceeded (annual mean concentration of 25 and 20 µg.m-3 respectively) throughout the 6 month period However, in general the PM2.5 concentration is below the threshold value (mean daily value of 7.66 µg.m-3).

**Table 7-5: Particular Matter (PM2.5) data from Station 75. Clonmel, Co. Tipperary 09/09/2022-09/03/2023**

| Parameter | Measurement |
|---|---|
| No. of Days | 182 |
| No of measure values | 182 |
| Percentage coverage | 100% |
| Maximum daily value | 47.63 µg.m-3 |
| Mean daily value | 7.66 µg.m-3 |

#### *7.3.1.4 Nitrogen Dioxide (NO2)*

Nitrogen dioxide for the 9th September 2022 to 9th March 2023 monitoring period in Waterford is presented in Table 7-6. The hourly limit values for the protection of human health were not exceeded during the assessment. Neither the hourly threshold (200 µg.m-3) nor the annual mean threshold (40 µg.m-3) values were exceeded during the monitoring period.

**Table 7-6: Nitrogen Dioxide data from Station 59. Paddy Browne's Road, Waterford 09/09/2022-09/03/2023**

| Parameter | Measurement |
|---|---|
| No. of Hours | 4277 |
| No of measure values | 4271 |
| Percentage coverage | 99.86% |
| Maximum hourly value (NO2) | 64.59 µg.m-3 |
| 98 percentile for hourly rates (NO2) | 40.04 µg.m-3 |
| Mean hourly value (NO2) | 9.30 µg.m-3 |

#### *7.3.1.5 Dust*

The WHO[7] defines dust as: "Airborne contaminants (which) occur in the gaseous form (gases and vapours) or as aerosols. In scientific terminology, an aerosol is defined as a system of particles suspended in a gaseous medium, usually air in the context of occupational hygiene, is usually air. Aerosols may exist in the form of airborne dusts, sprays, mists, smokes and fumes". In more general terms, dust is an airborne particulate matter ranging in diameter from 10 to 50 microns which is generated by organic and inorganic matter such as coal, grain, metal, ore, rock and wood. Dust can be generated by activities which process organic and inorganic matter. Dust can be stirred up from inert states through weather and wind conditions and deposit on all parts of the surrounding environment.

There are no statutory limits for dust deposition in Ireland. However, EPA guidance suggests that a deposition of 10 mg/m2/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m2/day. The EPA recommends a maximum daily deposition level of 350 mg/m2/day when measured according to the TA Luft Standard 2002.

Construction dust has the potential to be generated from on-site activities such as excavation and backfilling. The extent of dust generation at any site depends on the type of activity undertaken, the location, the nature of the dust, (i.e. soil, sand, peat)and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route.

### 7.3.2 Climate

Climate is defined by the EPA as "the average weather over a period of time". Climate change is a term that is used to describe a "significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period – decades or longer. [8]" There is scientific evidence[9] which suggests that the current climate is rapidly warming, having reached approximately 1°C above pre-industrial levels in 2017, increasing at a rate of 0.2 °C per decade. Warmer weather places pressure on flora and fauna which cannot adapt to a rapidly changing environment. In Ireland, the pressure on flora and fauna is mitigated due to the dominant influence of the Gulf Stream on Ireland's climate. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitudes.

The climatic conditions for the wider geographical area have been derived from historical meteorological measurements compiled by Met Éireann at Moore Park weather station which is approximately 42km west of the Site and associated infrastructure. These meteorological conditions are presented in Table 7-7 the period January 2020 – December 2022 (source www.met.ie/climate).

[7] https://www.who.int/occupational_health/publications/en/oehairbornedust3.pdf
[8] https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/
[9] IPCC Special Report "Global Warming of 1.5°C": https://www.ipcc.ch/sr15/download/#chapter

## Table 7-7: Climate Records January 2020- December 2022

Total rainfall in millimetres for MOORE PARK WEATHER STATION

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 43.5 | 96.9 | 83.1 | 69.3 | 43.6 | 73.4 | 33.5 | 27.6 | 139.9 | 230.4 | 167.8 | 90.1 | 1099.1 |
| 2021 | 72.7 | 189.9 | 52.7 | 22.5 | 130.8 | 26.9 | 62.9 | 58.3 | 102.3 | 125.3 | 33.4 | 134.8 | 1012.5 |
| 2020 | 89.7 | 152.8 | 47.9 | 64.8 | 37.2 | 72.9 | 75.7 | 145.1 | 43 | 101.5 | 118.9 | 152.6 | 1099.8 |
| LTA | 111.0 | 80.1 | 85.5 | 65.6 | 69.3 | 70.2 | 62.0 | 83.6 | 79.5 | 113.3 | 105.4 | 103.9 | |

Mean temperature in degrees Celsius for MOORE PARK WEATHER STATION

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 6.0 | 7.4 | 6.7 | 9.1 | 12.3 | 13.8 | 16.6 | 16.8 | 13.7 | 12.2 | 9.0 | 4.3 | 10.7 |
| 2021 | 4.4 | 6.3 | 7.5 | 7.4 | 9.8 | 14.4 | 17.2 | 15.6 | 14.9 | 11.8 | 8.4 | 7.7 | 10.5 |
| 2020 | 6.1 | 6.5 | 6.3 | 9.7 | 11.9 | 13.9 | 15.3 | 16.2 | 13.6 | 9.7 | 8.4 | 5.5 | 10.3 |
| LTA | 5.7 | 5.8 | 6.9 | 8.6 | 11.0 | 13.8 | 15.8 | 15.3 | 13.1 | 10.4 | 7.7 | 5.8 | 10.0 |

Mean 10cm soil temperature for MOORE PARK WEATHER STATION at 0900 UTC

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 5.4 | 6.3 | 5.4 | 8.8 | 13.3 | 15.1 | 17.5 | 17.3 | 14.6 | 12.1 | 8.3 | 4.3 | 10.7 |
| 2021 | 3.2 | 5.2 | 6.5 | 8.0 | 11.1 | 15.5 | 18.3 | 16.3 | 15.2 | 11.6 | 7.8 | 6.9 | 10.5 |
| 2020 | 5.3 | 5.4 | 5.4 | 9.5 | 13.0 | 15.0 | 15.8 | 16.5 | 13.8 | 9.4 | 7.9 | 5.0 | 10.2 |
| mean | 4.6 | 5.6 | 5.8 | 8.8 | 12.5 | 15.2 | 17.2 | 16.7 | 14.5 | 11.0 | 8.0 | 5.4 | 10.5 |

Potential Evapotranspiration (mm) for MOORE PARK WEATHER STATION

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 10.2 | 21.2 | 40.1 | 57.4 | 78.9 | 78.2 | n/a | 91.8 | 46.2 | 25.9 | 12.2 | 7.1 | 469.2 |
| 2021 | 8.2 | 19.2 | 31.5 | 56.3 | 71.2 | 84.8 | 92.3 | 68.3 | 41.4 | 24.4 | 11.6 | 10.2 | 519.4 |
| 2020 | 9.0 | 20.7 | 35.4 | 57.3 | 89.6 | 75.5 | 77.1 | 68.0 | 47.0 | 26.4 | 12.1 | 8.1 | 526.2 |
| mean | 9.1 | 20.4 | 35.7 | 57.0 | 79.9 | 79.5 | 84.7 | 76.0 | 44.9 | 25.6 | 12.0 | 8.5 | 533.2 |

Evaporation (mm) for MOORE PARK WEATHER STATION

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 14.2 | 29.3 | 57.8 | 81.3 | 110.3 | 107.4 | n/a | 122.8 | 63.6 | 35.6 | 16.6 | 9.5 | 648.4 |
| 2021 | 11.7 | 27.1 | 45.1 | 80.4 | 102.2 | 116.3 | 122.7 | 92.1 | 55.3 | 33.9 | 16.1 | 13.3 | 716.2 |
| 2020 | 12.8 | 29.2 | 50.8 | 80.2 | 126.1 | 104.0 | 105.1 | 92.2 | 64.1 | 36.8 | 16.7 | 10.7 | 728.7 |
| mean | 12.9 | 28.5 | 51.2 | 80.6 | 112.9 | 109.2 | 113.9 | 102.4 | 61.0 | 35.4 | 16.5 | 11.2 | 735.7 |

Degree Days Below 15.5 Degree Celsius for MOORE PARK WEATHER STATION

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 295 | 228 | 274 | 195 | 108 | 72 | 29 | 43 | 78 | 107 | 195 | 346 | 1969 |
| 2021 | 344 | 257 | 249 | 243 | 180 | 64 | 27 | 38 | 49 | 123 | 212 | 241 | 2028 |
| 2020 | 292 | 262 | 287 | 179 | 126 | 71 | 43 | 32 | 84 | 179 | 213 | 309 | 2077 |
| 2019 | 281 | 218 | 248 | 193 | 144 | 98 | 30 | 39 | 81 | 185 | 262 | 295 | 2074 |

## 7.4 Impact Assessment

### 7.4.1 Do-Nothing Impact

If the proposed development does not proceed, local air quality and the microclimate will remain unchanged. On a national scale, there will be an increase in greenhouse gas emissions if increasing future electricity needs are not met by alternative renewable sources which has the potential to contribute to air pollution and climate change. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol and to meet national targets as set out in the Climate Action Plan would also be lost.

### 7.4.2 Air Quality

#### *7.4.2.1 Construction Phase Impacts*

The principal sources of potential air emissions during the construction of the Proposed Development will be from the Site, GCR and TDR; from dust arising from earthworks, tree felling activities, trench excavation along cable routes, construction of the new access tracks, the temporary storage of excavated materials, the construction of the proposed substation, the movement of construction vehicles, loading and unloading of aggregates/materials and the movement of material around the site.

Dust emissions arise when particulate matter becomes airborne making it available to be carried downwind from the source. Dust emissions can lead to elevated PM10 and PM2.5 concentrations and may also cause dust soiling. The amount of dust generated and emitted from a working site and the potential impact on the surrounding areas varies according to:

- The type and quantity of material and working methods
- Distance between site activities and sensitive receptors
- Climate/local meteorology and topography

**Table 7-8: IAQM descriptions for the magnitude of an earthworks project**

| Source | |
|---|---|
| **Scale** | **Description** |
| Large | Total site area greater than 10,000m2, potentially dusty soil type, more than 10 heavy earth-moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved greater than 100,000 tonnes . |
| Medium | Total site area greater 2,500m2, moderately dusty soil type, 5-10 heavy earth-moving vehicles active at any one time, formation of bunds 4 to 8 m in height, total material moved 20,000 tonnes to 100,000 tonnes. |
| Small | Total site area less than 2,500m2, soil type with large grain size (e.g. sand), less than 5 heavy earth-moving vehicles active at any one time, formation of bunds less than 4 m in height, total material moved less than 20,000 tonnes, earthworks during wetter months. |

Source: IAQM, 2014[4]

Applying the IAQM criteria in Table 7-8, the overall construction of the Proposed Development is considered a large scale construction site as the site area is greater than 10,000m2 and potentially dusty soil types such as clays are present throughout much of the site. The "magnitude" of the potential emissions is therefore "large".

Due to the small number of receptors, and distance from the source of the dust emissions, with the closest residential dwelling being approximately 174 m from the main entrance of the Site, the "sensitivity" of the area is considered to be "low".

Combining the large magnitude of the earthworks with the low sensitivity, the IAQM guidance indicates that the Risk of Dust Impacts are "Low Risk" for the Proposed Development. This will apply during the construction stage. Dust emissions during the operational stage will be negligible, following the same guidance. As turbine foundations will be left in-situ following decommission, the Risk of Dust Impacts during the decommissioning stage would be considered "Low Risk" at worst, if not negligible.

Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO2, Benzene and PM10 in the receiving environment. Local receptors may be exposed to these emissions. This exposure would be slight and short duration (but also recurring) as the setting is rural and will allow for emissions to rapidly dilute in the open air.

It is not predicted that an air quality impact will occur due to traffic at the Site as the impacts will fall below the screening criteria set out in the UK DMRB guidance (UK Highways Agency 2007), on which the TII guidance is based. This UK DMRB guidance states that road links meeting one or more of the following criteria can be defined as being 'affected' by a Proposed Development and should be included in the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGVs flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

On the surrounding road network as detailed in Chapter 14 Traffic and Transportation, there will be an increase in traffic volumes over a construction period of 18 to 24 months. Traffic volumes in chapter 14 are described in terms of Light Goods Vehicles (LGVs) such as cars, 4x4s and vans used by the workers and supervisory staff involved in the construction works, and Heavy Goods Vehicles (HGVs) transporting materials to and from the site, including road making materials, concrete, building materials, drainage/ducting materials, cabling, electrical components and excavated material.

The construction phase for the Proposed Development will lead to 42,742 additional HGV trips (two-way) over the duration of the construction works. Calculations of HGV movements associated with the construction of the project indicate an average daily increase of 92 HGV trips per day over a construction period of 24 months. This increases to an average of 195 HGV trips per day during the peak month which occurs in month 6 of the programme for HGV traffic.

An average workforce of 30 persons is anticipated, increasing to 40 persons during peak periods. This is estimated to give rise to an increase of LGV traffic of 44 trips per day on average rising to 56 trips during peak construction periods which occur for LGV traffic during months 6 and 7.

The combined HGV and LGV average daily increase is 161 trips per day throughout the construction programme.

None of the criteria set out in the UK DMRB are met. Therefore, the air quality assessment model is not required in this instance.

Some receptors have the potential for dust soiling due to trucks travelling along local routes. This is a temporary, moderate impact.

Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the impacts of emissions from these units will be imperceptible.

##### 7.4.2.1.1 Grid Connection Route (GCR)

The construction of the GCR is considered a medium scale construction site under the IAQM guidance. Due to the number of residential dwellings located in close proximity to the GCR, some less than 10 m from GCR, the sensitivity of the surrounding area would be considered “medium”. Therefore, there would be a “medium risk” of dust impacts affecting the residential dwellings along the GCR. Some houses may experience soiling and deposition of vegetation effects if they are located close to the road corridor. Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO2, Benzene and PM10 in the receiving environment. However, due to the nature of construction along the GCR, which works as a “rolling” construction site, meaning that these works will not be concentrated in any one area of the route, these effects in relation to dust and air pollutants are considered to be short term, slight negative impacts on air quality.

##### 7.4.2.1.2 Turbine Delivery Route (TDR)

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR). A substation transformer unit will be transported to site which will be categorised as an abnormal load. As a result, an abnormal load permit will be sought for this movement. Multiple transformers have already been delivered to ESBN substations in the area without any impact on the structures along the road network. The proposed access route to site is as follows:

- Loads will depart the Port of Waterford (Belview) and travel along the N29, taking the third exit on the Slieverue Roundabout to continue on the N29;
- Loads will proceed to the Luffany Roundabout where they will take the first exit onto the N25;
- Loads will travel west on the N25;
- Loads will continue west onto the N72;
- Loads will depart the N72 and head north on the R672;
- Loads will depart the R672 right near Touraneena onto the L5119;
- Loads will continue north-east on the L5119 to the proposed site entrance.

The construction works associated with the TDR is considered a moderate construction site as it will result in soiling effects which have the potential to occur up to 50m from the source, with PM10 deposition and vegetation effects occurring up to 15m from the source. Many of the TDR work areas are very small and require minor works such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. The main TDR works areas are local road widening works on R672 and on a local road West of Blaentasour. The impacts on air quality are due to air pollutants from plant and vehicles and the potential for dust when excavating to formation level and placing the imported stone into the excavation. Compaction of the layers of stone may also result in some dust migration. These impacts are considered to be short term, and due to the road improvements being small relative to a typical road works project, the impacts are considered slight in magnitude. Therefore, these road improvement works will amount to a short term, slight negative impact on air quality.

#### *7.4.2.2 Operational Phase Impacts*

Once the Site and GCR are constructed there will be no significant direct emissions to atmosphere. A diesel generator will be located at the proposed wind farm substation; however, this will only be operated as a back-up/emergency power supply.

Emissions from the diesel generator will therefore be infrequent. During use, a diesel generator will emit carbon dioxide, nitrogen oxide and particulate matter, however, due to the low usage, the impact will be imperceptible.

Maintenance vehicles will access the Site during the operational period, however, due to the low traffic movements involved, the impact will be imperceptible. The operational phase of the wind farm will result in positive impacts on air quality due to the displacement of fossil fuels as an energy source.

Maintenance vehicles will also access the joint bays for periodic maintenance and carry out point works along the proposed GCR to address any issues during the operational period. However, given the low and infrequent traffic movements involved, the impact will be imperceptible. The operational phase of the GCR which connects to and operates the Site will result in positive impacts on air quality due to the displacement of fossil fuels as an energy source.

#### *7.4.2.3 Decommissioning Phase Impacts*

In terms of decommissioning, there will be truck movements associated with removing the wind turbines, earthmoving to cover foundations and landscaping resulting in vehicular emissions and also dust. However, the number of truck movements will be significantly less than the construction phase and will potentially result in a slight temporary impact. There will also be emissions from machinery on site including for the movement of soil to cover the foundations, however, this is not likely to result in significant impacts.

During the decommissioning phase, the GCR infrastructure including substations and ancillary electrical equipment will form part of the national grid and shall be left in situ. The internal ducts of the Proposed Development, all internal access roads, and turbine hardstandings will be left in situ, resulting in no additional truck movements and no impact from emissions from machinery along the GCR.

### 7.4.3 Climate

There is the potential for greenhouse gas emissions to the atmosphere during the construction, operation and decommissioning phases of the Site and GCR such as those arising from construction vehicles, the use of on-site generators, pumps, back-up generators and excavation works. The potential climatic impacts arising from these emissions are assessed hereunder with respect to micro and macro climates.

*Microclimate*

The significance of impacts associated with the conversion of vegetated surfaces to un-vegetated surfaces is assessed through the consideration of the area of the land experiencing such a change.

The Site is predominately an upland location with the exception of existing public road ways and internal track ways. The total area of proposed new permanent hardstanding surface is approximately 9% of the wind farm site and consequently there will be no direct or indirect impact on air temperature and microclimate because of the relatively small proportion of new permanent hardstanding surface.

There will also be the loss of 5.4 ha of conifer plantation within the Site. There will be no direct or indirect impact on site temperature and microclimate due to clear felling because clear felling forms part of the cycle of commercial forestry and without the Proposed Development clear felling would occur as normal.

*Macroclimate*

Carbon dioxide (CO2) is a greenhouse gas which if released in excessive amounts can lead to increases in global temperatures known as 'global warming' or 'greenhouse effect' which can influence climate change. Section 7.4.4 details the carbon savings that have been calculated for the proposed development.

Should the Site and GCR not be developed, fossil fuel power stations will be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other air pollutant emissions, as well as hindering Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions.

The proposed development offers Ireland an indigenous form of sustainable electricity and would provide for security of supply against our dependence on imports in addition to the positive impact on the macroclimate.

### 7.4.4 Carbon Balance

In terms of carbon losses and savings, the online Scottish Windfarm Carbon Assessment Tool (https://informatics.sepa.org.uk/CarbonCalculator/index.jsp) was used to estimate carbon savings as a result of the proposed construction and operation of the wind farm. The assumptions are located in Section 7.4.3 and Appendix 7.1, Volume III details the inputs to the model.

Based on the Scottish Windfarm Carbon Assessment Tool, during the manufacturing and transportation of turbines, and construction and decommissioning of the turbines 59,286 - 70,498 tonnes of CO2 will be lost to the atmosphere. This is based on the assessment of the Vestas (Model : V162 6.0 – 7.2MW), the lower range of 6.0MW and the upper range of 7.2MW were both considered for the assessment and the results for each presented. This represents 1.85 - 1.87 % of the total amount of CO2 emissions that will be offset by the proposed development. Losses during the construction and decommissioning phases will be due to reduced carbon fixing potential, losses from soil organic matter and losses due to felling forestry. Values for turbine life and felling of forestry are presented in Table 7-9.

In total, it is estimated that 3,176,680 - 3,814,600 tonnes of CO2 will be displaced over the proposed forty-year lifetime of the wind farm i.e. 79,417 - 95,365 tonnes of CO2 per annum, which assists in realising the ambitious goals of the Climate Action Plan 2023. From an operational perspective, the proposed development will displace the emission of CO2 from other less clean forms of energy generation and will assist Ireland in meeting its renewable energy targets and obligations. The burning of fossil fuels for energy creates greenhouse gases, which contributes significantly to climate change. These and other emissions also create acid rain and air pollution.

For the proposed development with 10 no. turbines assuming a turbine power rating of 6.0 - 7.2 MW, and operational period of 40 years, the payback time for the manufacture, construction and decommissioning phases (including carbon losses from soil, felling of forestry etc.) of the Proposed Development is estimated at approximately 1.1 years. Should further restoration measures be put in place, the total carbon emissions and carbon payback time would be reduced.

The carbon calculator was created to calculate carbon loss from acid bog and fen habitats and the Proposed Development site does not meet the 0.5m depth of peat required for it to be categorised as peatland. The site does not function as acid bog or fen habitat and therefore does not contain the same high levels of carbon.

In addition, the calculator only takes into account the loss of forestry on site from felling (carbon release) and the loss of forestry growth (carbon sequestration) on site for the lifetime of the Proposed Development and does not take into account the replanting of forestry outside of the site (there is no option of including external replant lands). Therefore, the carbon loss calculations for the Proposed Development are slightly overestimated.

Permanent felling of approximately 5.4 ha of coniferous forestry is required at the main entrance to the wind farm and along the internal access track to accommodate the construction of turbine hardstands, access tracks. It should be noted that the clear-felling of trees in the State requires a felling licence. A felling licence will include the provision of relevant replant lands (afforestation area) to be planted in lieu of the proposed tree felling on the site.

A total of 5.4 hectares of new forestry will be replanted in accordance with the Forestry Act, 2014 at the alternative site to compensate the loss of forestry at the Site which will offset a 2,851 tonnes of CO2 lost due to the felling of forestry.

**Table 7-9: Carbon Balance Results**

| | Lower Range 6MW | Higher Range 7.1MW |
|---|---|---|
| **Origin of Losses** | **Total CO2 Losses (tonnes C02 equivalent)** | |
| Turbine manufacture, construction and decommissioning | 59,286 | 70,498 |
| Losses due to Backup | 45,412 | 54,494 |
| Losses from soil organic matter | -24,189 | -24,189 |
| Felling of Forestry | 2,851 | 2,851 |
| Other | 1,028 | 1,028 |
| Total Expected Losses | 84,388 | 104,682 |
| **Emissions Savings** | **Expected C02 emission savings (tonnes CO2 per Annum)** | |
| fossil fuel mix electricity generation | 79,417 | 95,365 |
| **Energy output from windfarm** | **MWh** | |
| Estimated Annual Output | 183,960 | 220,752 |
| **Carbon payback time** | **Years** | |
| Fossil fuel mix of electricity generation | 1.1 | 1.1 |

### 7.4.5 Cumulative Impacts

The geographic extent of the cumulative assessment is considered on a case-by-case basis, in line with the Guidance on the preparation of the Environmental Impact Assessment Report(European Union, 2017).

Projects within 20km of the Site and GCR have been considered for cumulative impacts in relation to air quality and climate as the majority of impacts identified are relating to the construction phase dust and traffic emissions.

A 20km distance is considered a suitable zone of influence considering the emissions associated with proposed development will be focused on the construction site and significant emissions beyond the construction site are not envisaged. Emissions relating to the TDR have been considered, however, these have been screened out of the cumulative assessment as emissions associated with the transport of turbines and construction works relating to the upgrade of TDR nodes are non-significant.

There are a number of projects and activities which are applied for, consented, midst construction or operational within the vicinity of the Coumnagappul Wind Farm Project. Windfarms within 20km of the proposed Coumnagappul Windfarm are as set out in in Table 7-10 below.

**Table 7-10: Cumulative Impacts**

| Wind Farm Name | Number of turbines | Distance and Direction from proposed Site | Status |
|---|---|---|---|
| Tierney Single Turbine | 1 | 5.1km west of Site | Operational |
| Kilnagrance Single Turbine | 1 | 14km east of Site | Operational |
| Woodhouse Wind Farm | 8 | 17.2km west of Site | Operational |
| Knocknamona Wind Farm | 8 | 17.6 km west of Site | Permitted |
| Dyrick Hill Wind Farm | 12 | 7.9 km southwest of Site | Proposed (at planning) |

For the proposed wind farm development, Knocknamona Wind Farm and Dyrick Hill Wind Farm there will be no carbon dioxide or any other GHG emissions once the Wind Farms are operational, with the exception of occasional operational and maintenance vehicles exhausts. Therefore, there will be no measurable adverse cumulative effect with the this proposed developments. There will be no cumulative impact to air quality with ongoing forestry operations associated with the proposed wind farm developments as there is no emission to atmosphere.

Cumulative impacts may arise if the construction, operational, and decommissioning phase of these projects occurs simultaneously with the construction of the Site and GCR. This could result in slight increased traffic emissions, however, provided the mitigation measures are implemented and the mitigation measures proposed for other developments are implemented, there will be no significant cumulative effects on air quality.

There will be no net carbon dioxide ($CO_2$) emissions from operation of the proposed wind farm. Emissions of carbon dioxide ($CO_2$), oxides of nitrogen ($NO_x$), sulphur dioxide ($SO_2$) or dust emissions during the operational phase of the Proposed Development will be minimal, relating to the use of operation and maintenance vehicles onsite, and therefore there will be no measurable negative cumulative effect with other developments on air quality and climate.

The nature of the Proposed Development and other energy developments within 20 kilometres are such that, once operational, they will have a cumulative long-term, significant, positive effect on the air quality and climate.

In terms of climate and carbon, the proposed wind farm will act cumulatively with other renewable energy projects in reducing CO2 emissions by displacing fossil fuel in the production of electricity, resulting in a slight-moderate positive impact on climate.

## 7.5 Mitigation Measures

### 7.5.1 Air Quality

#### *7.5.1.1 Construction Phase*

Construction Environmental Management Plan (CEMP) has been prepared and is included in Volume III, Appendix 2.1. This includes for the following mitigation measures during the construction phase of the proposed development relevant to air quality:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate which compacts, preventing dust;
- A water bowser will be available to spray work areas (wind turbine area and grid connection route) and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable;
- The access and egress of construction vehicles will be controlled and directed to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;
- Wheel washing facilities will be provided within the site near the site entrance point of the Site as described in Chapter 2;
- The developer in association with the contractor will be required to implement the dust control plan as part of the CEMP. In the event the Planning Authority decides to grant permission for the proposed development, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority.
- Receptors which have the potential to receive dusting and soiling temporary works at TDR nodes located adjacent to dwellings; and dwellings directly adjacent to the GCR construction that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling occur;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

#### *7.5.1.2 Operational Phase*

As the operation of the proposed development will have positive impacts on air quality, mitigation measures are considered unnecessary.

#### *7.5.1.3 Decommissioning Phase*

Mitigation measures for the removal of wind turbines and all other site works from the proposed development site will be the same as the construction phase with respect to dust control and minimisation. The proposed access tracks across the Site will be left in situ and utilised as forest roads following decommissioning and no mitigation measures are proposed. In terms of the underground grid cable and substation, these will be left in situ and so no mitigation measures are proposed.

### 7.5.2 Climate

It is considered that the Proposed Development will have an overall positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting the provisional agreement that was reached on March 30 2023 , for a binding target for 2030 of at least 42.5%, but aiming for 45%. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2023. In terms of renewable energy, an increase in electricity generated from renewable sources is to increase to up to 80% by 2030, with up to 9GW of increased onshore wind capacity. This will be achieved by:

- Phasing out fossil fuels
- Harnessing renewable energy
- Micro-generation; and
- Other measures.

As no significant impacts on climate are predicted during construction, operation and decommissioning no mitigation measures are necessary or proposed. In terms of the operational phase, the operation of the proposed development will have a positive effect on climate due to the displacement of fossil fuels and will have a significant long-term positive impact on climate change, in line with policy and legislation at a local, regional, national and international level.

## 7.6 Residual Impacts

### 7.6.1 Air Quality

Following the implementation of the above mitigation measures, the Site, GCR and TDR work areas will result in slight to moderate residual impacts arising from fugitive dust emissions during construction activities involving excavations, felling or earthmoving. These will be localised in nature and as they will be associated with particular elements of the construction phase, they will be temporary in nature and will not result in any permanent residual impacts.

Impacts related to vehicle emissions will reduce significantly following construction and no significant impacts are anticipated. There will be a low level of maintenance traffic during the operational period, which will have an imperceptible impact.

Impacts on air quality due to vehicle emissions and dust during the decommissioning phase are expected to be similar in nature to the construction phase but of a smaller magnitude. They will be temporary in nature and result in slight to moderate residual impacts. There will be no permanent residual impacts due to the decommissioning phase.

During operations, the proposed development will result in the avoidance of emissions from fossil fuel generators which is a positive effect on air quality.

### 7.6.2 Climate

Section 7.4.3 assessed the potential impacts on climate as a result of the development of the Site through microclimate and macroclimate. At the microclimate level, the Proposed Development encompasses approximately 9 % of the entire site area with hardstanding surfaces (hardstandings, access tracks, structures). The assessment found that a 9 % increase in hardstanding are would not negatively impact the vegetation necessary to maintain a microclimate. In terms of macroclimate, it is estimated that an annual average output[10] of 60 MW - 72 MW for the proposed development will result in the net displacement of 79,417 - 95,365 tonnes of CO2 per annum. This results in a positive impact by removing the GHG emissions that would have otherwise been part of the output of traditional energy manufacturing (i.e. biomass, peat, etc). Potential impacts to climate can have the potential to affect human health and the environment. No direct or indirect impact on air temperature, microclimate or macroclimate has been associated with the development of the Site due to the location of the site which is predominately a rural agricultural location with the exception of existing public road ways.

There are no potential direct or indirect impacts on air temperature, microclimate and macroclimate associated with the GCR. Due to the nature of construction along the GCR which works as a “rolling” construction site, no works will be concentrated in any one area of the route. Therefore, the construction phase of the Coumnagappul Wind Farm will not have a significant impact on climate.

Should the Proposed Development not be developed, fossil fuel power stations will likely be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other air pollutant emissions, as well as hindering Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions.

There will be residual positive impacts from the operation of the Proposed Development in terms of the displacement of fossil fuel energy generation with renewable energy.

[10] Per Scottish Wind Farm Calculation Tool

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& PLANNING

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