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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BALLINAGREE WIND FARM

VOLUME 2 – MAIN EIAR

CHAPTER 6 – AIR AND CLIMATE

Prepared for: Ballinagree Wind DAC

Ballinagree Wind farm

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

Page

6. AIR AND CLIMATE

6.1 Introduction

This chapter identifies, describes and assesses the potential significant direct, indirect and cumulative effects on air quality and climate arising from the construction, operation and decommissioning of the proposed Ballinagree Wind Farm project.

The proposed wind farm site is located within the jurisdiction of Cork County Council, approximately 35km north west of Cork City. The nearest settlement is the village of Ballinagree which is located approximately 1.5km to the south of the wind farm site. Millstreet is located approximately 8km south east and approximately 10km north of Macroom.

The proposed wind farm site is located in a rural area. Settlement in the area is made up of one-off rural housing and farmyards generally located along the road network of the area (linear settlement pattern). The primary land-uses within and in the vicinity of the site comprise commercial forestry, sections of peat bog and agricultural lands. Due to the non-industrial nature of the proposed 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 generating 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. As discussed later in this chapter there will be some minor short term or temporary indirect emissions associated with the construction of the proposed project including vehicular and dust emissions.

A detailed description of the proposed project assessed in the EIAR is contained in Chapter 3.

The key elements of the proposed project as described in Chapter 3 are referred to as follows throughout this chapter:

- The wind farm site (also referred to in this EIAR as ‘the Site’);
- The grid connection;
- The turbine delivery route (also referred to in this EIAR as ‘the TDR’);
- Biodiversity enhancement and management plan lands (also referred to in this EIAR as ‘the BEMP lands’).

Replant lands associated with the proposed project are assessed cumulatively in Section 6.4.6 of this chapter.

The wind farm site includes the wind turbines, internal access tracks, hard standings, permanent meteorological masts, recreational amenity infrastructure and associated signage, onsite substation, internal electrical and communications cabling, temporary construction compound, drainage infrastructure, borrow pits and all associated works related to the construction of the wind farm.

6.1.1 Statement of Authority

This chapter of the EIAR was completed by Fehily Timoney and Company (FT). Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has c.70 members of staff, including engineers, scientists, planners and technical support staff. This chapter was written by Eoghan O'Sullivan. Eoghan is a civil engineer with Fehily Timoney & Company and holds a BE (Hons) in Civil, Structural and Environmental Engineering from UCC, Cork. Eoghan has 6 months experience preparing Air and Climate chapters for EIARs under the guidance of Trevor Byrne of Fehily Timoney and Company (FT). Trevor is a Principal Engineer at FT and a chartered member of Engineers Ireland. Trevor has extensive experience in the preparation of environmental impact assessments for large scale renewable energy projects in the Ireland and the UK. Trevor holds an MSc in Sustainable Energy Systems from the University of Edinburgh and a first-class honours degree in Civil and Environmental Engineering from Edinburgh Napier University as well as a BEng (Ord) in Civil Engineering from Munster Technological University.

6.1.2 Air Quality – Overview

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 (2002/69/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). Table 12.1 details the limit values for pollutants as per the CAFÉ Directive.

Table 6-1: 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
SO_2	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year
SO_2	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year
SO_2	Protection of vegetation	calendar year	20	7.5	Annual mean
SO_2	Protection of vegetation	1 Oct to 31 Mar	20	7.5	Winter mean
NO_2	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year
NO_2	Protection of human health	calendar year	40	21	Annual mean
NO + NO_2	Protection of ecosystems	calendar year	30	16	Annual mean
PM_{10}	Protection of human health	24 hours	50		Not to be exceeded more than 35 times in a calendar year
$PM_{2.5}$	Protection of human health	calendar year	40		Annual mean
$PM_{2.5}$ - stage 1	Protection of human health	calendar year	25		Annual mean
$PM_{2.5}$ - stage 2	Protection of human health	calendar year	20		Annual mean
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/m^2/day.

There are no limit values in relation to ozone, however, the Ozone Daughter Directive sets target values. These are detailed in Table 6.2 along with information threshold and alert threshold values.

Table 6-2: Target Values for Ozone

Objective	Calculation	Target Value for 2020
Protection of Human Health	Maximum daily 8-hour mean	120 µg/m^3
Protection of vegetation	AOT40*, calculated from 1-hour values from May to July	6000 µg/m^3-h
Information threshold	1-hour average	180 µg/m^3
Alert Threshold	1-hour average	240 µg/m^3
*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.

6.1.3 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 wind farm is constructed there will be no resultant negative impacts on climate change. The provision of the project will have a long-term positive impact by providing a sustainable energy source as discussed in Section 6.4.2 of this chapter. Should the project 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.

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

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. The commission has also indicated an intention to adopt the increased target of 55% at the EU's Nationally Determined Contribution (NDC) under the Paris Agreement by the end of 2020. As well as the target being given legislative force in the EU through the proposed EU Climate Law, it will oblige all EU institutions across all areas of competence, and the Member States, to work collectively to achieve the target of 55%[2].

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

- Sets a new, binding renewable energy target for the EU for 2030 of 32%, including a review clause by 2023 for an upward revision of the EU level target;
- 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 Irish government has recently published the Climate Action Plan 2021 (CAP) which sets out a plan of action to address climate change and sets decarbonisation targets. 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 8GW of onshore wind capacity and at least 5GW of installed offshore wind capacity.

Chapter 1 of the CAP sets out the nature of the challenge which Ireland faces over the coming years. The CAP notes that the evidence for warming of our climate system is beyond dispute with observations showing that global average temperatures have increased by more than 1°C since preindustrial times. These changes will cause extensive direct and indirect harm to Ireland and its people, as well as to other countries more exposed and less able than we are to withstand the associated environmental impacts such as extremes in weather, flooding, displacement of population by the creation of climate refugees, poorer water quality and poorer air quality.

[2] https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1599

The June 2018 'Off Target Report' published by the Climate Action Network (CAN) Europe which ranks EU countries ambition and progress in fighting climate change listed Ireland as the second worst performing EU member state in tackling climate change. It also stated that Ireland is set to miss its 2020 climate (20% reduction in greenhouse gases) and renewable (40% increase in overall energy from renewable electricity sources) energy targets. Additionally, it was noted that Ireland is also off course for its 2030 emissions target.

In July 2021 Ireland signed the Climate Action and Low Carbon Development (Amendment) Bill into law. This support Irelands transition to Net Zero by 2050 with sets legally binding commitments and targets. Actions for each sector will be detailed in the Climate Action Plan that is to be updated annually. The Climate Action Plan 2021 was recently published. It set the following targets for Ireland to achieve by 2030:

- Deliver an early and complete phase-out of coal- and peat-fired electricity generation.
- Increase electricity generated from renewable sources to up to 80%, indicatively comprised of:
- at least 5 GW of offshore renewable energy;
- between 1.5 – 2.5 GW of indicative solar PV capacity
- up to 8 GW total of onshore wind capacity.

Achieving up to 80% renewable electricity generation by 2030 will involve phasing out coal and peat-fired electricity generation plants, increasing our renewable electricity production, reinforcing our grid (including greater interconnection to allow electricity to flow between Ireland and other countries), and putting systems in place to manage intermittent sources of power, from renewable energy resources.

6.1.3.1 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 2021 CCPI was published in December 2020. While the 2021 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 climbed 2 places from 41st out of 58 globally ranked countries to 39th place and remains at "low" in international performance. Despite these gains however, it remains at "very low" at a national performance level. The 2020 CCPI report states that while some improvements have been made, GHG per capita emissions are at a high level and "significant challenges lie ahead in closing Ireland's emission gap, meeting the current (2030) target and aligning Ireland's emission trajectory with a net zero goal for 2050. Therefore, the country still ranks among the bottom ten performers in this indicator." Recognising Ireland's Climate Action Plan 2019, the CCPI states:

> *"the government must go much further in implementing policies across all sectors that drive sustained emissions reductions over the next decade. Near-term ambition needs to be ratcheted up quickly by specifying deep cuts in fossil fuel and reactive nitrogen usage to put Ireland on a net zero emissions pathway aligned with the Paris temperature goals".*

6.1.4 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 CO_2. It is essential therefore that any wind farm development in a peatland area displaces more CO_2 produced from fossil fuel sources than it releases during the construction, operation and restoration of the wind farm site.

The proposed project is situated in an area which has peat habitats. The site is not located on active bog or fen habitats. Peat is present at varying depths (0m - 3 m) throughout the site. Much of the site has been cultivated and forestry dominates the site. Afforested peatlands are present in approximately 15% of the site. These habitats have been found to have limited carbon storage value as a result of the draining of the lands (Jovani-Sancho, Cummins and Byrne, 2021). The proposed project has been sensitively situated within an upland environment of limited carbon storage habitat value.

The Scottish Carbon Calculator Tool[3] was used to calculate whole life carbon emissions and carbon savings as a result of the proposed wind farm. Input data used in the calculations is presented in Appendix 6.1.

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 (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

For 2019, the total national greenhouse gas emissions was estimated to be 59.78 million tonnes carbon dioxide equivalent (Mt CO_{2eq}) (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 33.2% of electricity generation was from renewable sources in 2018 (SEAI, 2020); Renewable Energy avoided 4.9 million tonnes of CO_2 emissions in 2018.. Over 358 MW of wind generation was installed during 2018, and an additional 461MW was installed in 2019. and wind generation now accounts for 28% of the electricity generated (SEAI, 2020).

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

The EPA's latest projections report, 'Ireland's Greenhouse Gas Emissions Projections 2019-2040' (July 2020[5]) 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.

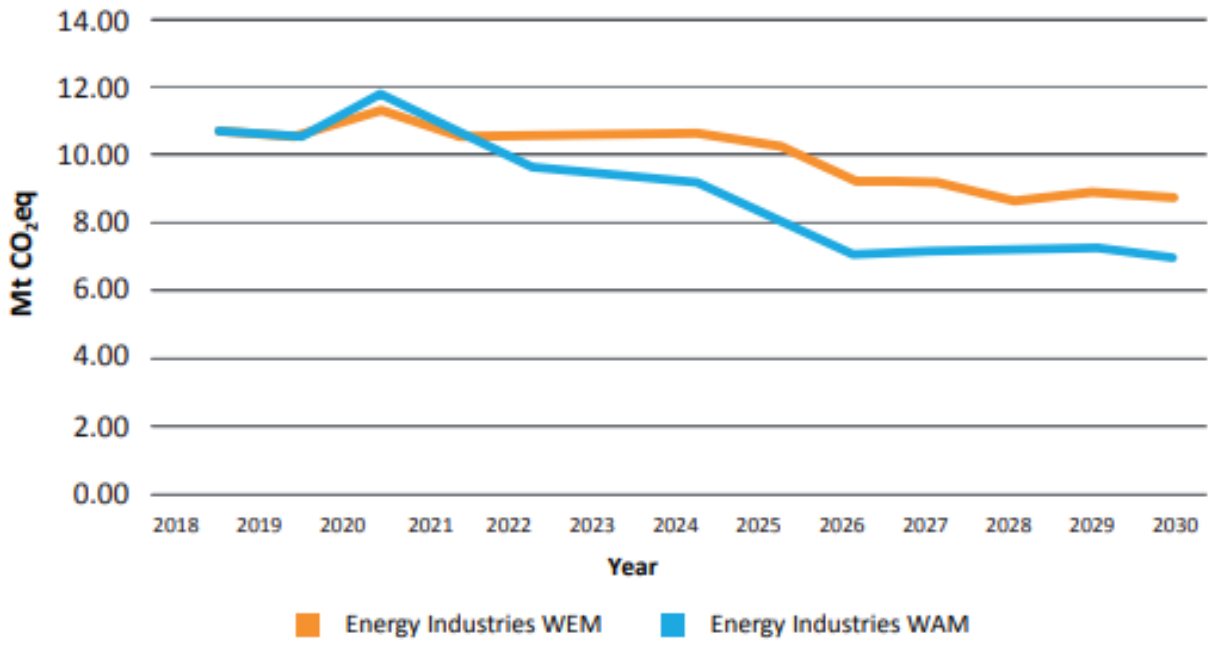

Plate 6-1: Greenhouse Gas Emissions Projections from the Energy Industries Sector under the WEM and WAM scenarios out to 2030

Ireland's 2020 target was to achieve a 20% reduction of non-Emission Trading Scheme (non-ETS) sector emissions i.e. agriculture, transport, residential, commercial, non-energy intensive industry and waste, on 2005 levels, with annual binding limits set for each year over the period 2013 – 2020. Ireland exceeded the binding targets in 2014-2016.

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 (CO_2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors.

[5] EPA '2020 Greenhouse Gas Emissions Projections' 2019-2040.

According to '*Ireland's Greenhouse Gas Emissions Projections 2019-2040*' (EPA, 2020), Ireland is projected to save 79 Mt CO_2 equivalent over the period 2021-2030 with the implementation of the 'With Additional Measures' scenario when compared to the With Existing Measures scenario. This represents an average annual reduction of 2.9% over that period.

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 CO_2 equivalent with full use of the ETS and LULUCF flexibilities (DoECC, 2020).

6.2 Methodology

As the operation of wind turbines does not give rise to emissions (with the exception of back-up generators which will 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 wind farm and associated grid connection.

The Scottish Windfarm Carbon Assessment Tool was also used to predict the carbon savings for the wind farm for an operational period of 35 years and includes all activities and associated potential impacts during the construction, operation and decommissioning phase.

6.2.1 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 wind farm and associated infrastructure to identify the potential for air emissions during construction and decommissioning.

To assess the impacts of construction dust emissions, the NRA's *Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation In Place* was used. This table is provided in Appendix 8 of the National Roads Authority (NRA) *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (NRA, 2011) and reproduced below in Table 6.3.

Table 6.4 details the definitions of impact magnitude for changes in ambient pollutant concentrations and Table 6.5 details the descriptors for changes in annual mean nitrogen dioxide, PM10 and PM2.5 at receptors.

Table 6-3: Assessment Criteria for the Impact of Dust Emissions from Construction Activities, with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	Description	Soiling	PM_{10}	Vegetation Effects
Major	Large construction sites, with high use of haul routes	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50m	15m	15m
Minor	Minor construction sites, with limited use of haul routes	25m	10m	10m

(source: NRA/TII, 2011)

Table 6-4: Definition of Impact Magnitude

Magnitude of Change	Annual Mean NO_2/PM_{10}	No. Days with PM_{10} conc. >50µg/m³	Annual Mean PM_{10}
Large	Increase/Decrease ≥4µg/m³	Increase/Decrease > 4 days	Increase/Decrease ≥2.5 µg/m³
Medium	Increase/Decrease 2-< 4µg/m³	Increase/Decrease 3 or 4 days	Increase/Decrease 1.25 - <2.5 µg/m³
Small	Increase/Decrease 0.4 - <2 µg/m³	Increase/Decrease 1 or 2 days	Increase/Decrease 0.25 - <1.25 µg/m³
Imperceptible	Increase/Decrease <0.4 µg/m³	Increase/Decrease <1 day	Increase/Decrease <0.25 µg/m³

(source: NRA/TII, 2011)

Table 6-5: Air Quality Impact Descriptors for Changes to Annual Mean Nitrogen Dioxide and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor

Absolute Concentration In relation to Objective/Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value with Scheme (≥40µg/m³ of NO_2 or MP_{10}) (≥25µg/m³ of $PM_{2.5}$)	Slight adverse	Moderate adverse	Substantial adverse
Just below objective /limit value with scheme (36- <40 µg/m³ of NO_2 or PM_{10}) (22.5 - <25 µg/m³ of $PM_{2.5}$)	Slight adverse	Moderate adverse	Moderate adverse

Absolute Concentration In relation to Objective/Limit Value	Change in Concentration		
	Small	Medium	Large
Below objective / limit value with scheme (30- <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - < 22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight adverse	Slight adverse
Well below objective /limit value (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight adverse
Decrease with Scheme			
Above objective/limit value without scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Substantial beneficial
Just below objective / limit value without scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Moderate beneficial
Below objective/limit value without scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight beneficial	Slight beneficial
Well below objective/limit value without scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight beneficial

(source: NRA/TII, 2011)

6.2.2 Climate

A desk-top study assessment was undertaken of available climatic information to characterise the existing environment. In terms of climatic impact, the appraisal considered the net impact that operating the proposed wind farm will have in terms of CO_2 and its displacement of CO_2 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 CO_2 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 wind farm will have on contributing to national targets for the reduction of greenhouse gas emissions. The results are described below and in summary the proposed project 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 (CO_2) 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, 2020) indicate that the net CO_2 displacement intensity by wind generation was 577 kilo tonnes of CO_2 in 2005, and this increased to 3.1 million tonnes CO_2 in 2018. 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 CO_2/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 wind turbine in Northwestern Europe was between 1.8 and 22.5 months with an average of 5.3 months.

The amount of CO_2 that could potentially be avoided on an annual basis due to the proposed wind farm 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 6.4.4 for details of the calculations for carbon saving as a result of the proposed wind farm.

Monthly meteorological data from Met Eireann was reviewed to gain an understand of the existing climatic condition of the site. The Scottish National Heritage carbon calculator which accounts for all stages of the project, was used to determine the long term effect of the project on climate. The impact assessment also involved a review of construction methodology for the construction, operational and decommissioning phases to determine impacts on both the micro and macro climates of the site.

6.2.3 Carbon Calculation

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 of peat 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. 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 backup source in order to calculate carbon savings and carbon payback times of a wind farm. A capacity factor is also required to provide a realistic payback time for a site. The capacity factor is a factor applied to the rated output of a wind turbine to give a more accurate indication of the amount of power a turbine will generate. It takes into account the intermittent nature of wind and for this project it is taken a 35% or 0.35.

An emission factor of 366gCO_2/kWh was used to calculate avoided CO_2 emissions associated with the proposed project. This accounts for the fact that wind energy in Ireland will mostly replace gas generation which according to the SEAI in 2020 was 366gCO_2/kWh.

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 regard to the windfarm characteristics the following presumptions for the proposed 20 turbine wind farm were made: the lifetime of the windfarm is 35 years and the MEC is between 118 - 132MW,the capacity factor is 35% and the fraction of output to back up of is between 5.9MW and 6.6MWMW (i.e. 5% of capacity). With regards to the characteristics of the 'peatland' before development, approximately half of the site has been cultivated and contains significant conifer plantation meaning that the carbon content of the peat present is much lower than that of an uncultivated peatland habitat, with carbon having been released during the drainage and cultivation of the site.

An average depth of peatland was provided for the development footprint of 0.6m, at borrow pits of 0.5m and turbine areas of 0.4m. Whilst the carbon content for dry peat, dry bulk density and extent of drainage around drainage features were unknown, worst case scenario figures were taken to ensure a conservative approach. Also, whilst 88 ha of forestry is to be clear felled, 88 ha of forestry will be replanted and the carbon calculator does not take this replanting elsewhere into account. Therefore the carbon loss figure for the proposed project will be slightly higher than the actual carbon loss for the project.

The Scottish Government on-line carbon calculator as outlined above, was used to assess the impacts of the proposed wind farm 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 6.1 of this EIAR. A summary of the main CO_2 losses due to the proposed wind farm project are summarised in Table 6.12.

6.3 Existing Environment

6.3.1 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 proposed wind farm and grid connection are located in Zone D. The majority of the Turbine delivery route is in Zone D. A very small section of it is in Zone C where the route takes the N18 in the south of Limerick city.

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 2019 – Indicators of Air Quality (EPA 2020 noted that Ireland's overall air quality was good, however there are localised issues across the country with multiple air pollutants. Ireland exceeded the EU limit value for NO_2 at one monitoring location in Dublin in 2019. This exceedance was due to high levels of traffic. Ireland is also above the WHO guidelines for PM2.5 at 33 monitoring stations and the EEA reference level for PAH, a toxic chemical at 4 monitoring locations due to the residential burning of solid fuels such as coal, peat and wood. . $PM_{2.5}$ 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 proposed wind farm, grid connection and turbine delivery route is classed as Good.

An assessment of air quality was carried out in Blackpool from 19th January 2000 to 31st May 2000[7]. The monitoring assessment at Blackpool, Cork City is the closest site to the application site and provides an environmental baseline of air quality conditions in the region. A summary of findings for Sulphur Dioxide(SO_2), Particulate Matter (PM_{10}), Nitrogen Dioxide (NO_2) and Carbon Monoxide (CO) is found in the following sections.

6.3.1.1 Sulphur Dioxide (SO_2)

Sulphur Dioxide for the period of January to May 2000 recorded at the Blackpool air monitoring station is presented in Table 6.6. Neither the hourly limit value nor the lower assessment threshold as set out in the CAFE Directive were exceeded during the monitoring period.

[6] EPA. Air Quality Zones
[7] EPA. Ambient Air Monitoring in Blackpool.

Table 6-6: Sulphur Dioxide Data for Blackpool January – May 2000

Parameter	Measurement
Number of Hours	3188
No. of measured values	1952
Percentage Coverage	61.2%
Maximum hourly value	161.3 µg.m^{-3}
98 percentile for hourly values	96.1 µg.m^{-3}
Mean hourly value	25.3 µg.m^{-3}
Maximum 24 hour mean	58.3 µg.m^{-3}
98 percentile for 24-hour mean	47.3 µg.m^{-3}

6.3.1.2 Particulate Matter (PM_{10})

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 PM_{10} and $PM_{2.5}$.

Particulate matter (PM_{10}) data for the 2000 monitoring period in Blackpool is presented in Table 6.7. The lower assessment threshold was exceeded on 46 occasions (39.2% of measured values) while the upper assessment threshold was exceeded on 88 occasions (75.2% of measured values). Blackpool is classified as being above the upper assessment threshold for PM_{10} as the directive stipulates that assessment thresholds can only be exceeded 7 times in a calendar year.

Table 6-7: Particular Matter (PM_{10}) data Blackpool

Parameter	Measurement
No. of Days	133
No of measure values	117
Percentage coverage	87.9%
Maximum daily value	239.4 µg.m^{-3}
Mean daily value	49.1 µg.m^{-3}

6.3.1.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide and oxides of nitrogen data for the 2000 monitoring period in Blackpool is presented in Table 6.8. The hourly limit values for the protection of human health were not exceeded during the assessment. The lower assessment threshold for the protection of human health was not exceeded. The mean hourly NO_2 value during the measurement period slightly exceeded the annual lower assessment threshold for the protection of human health, which is 26 $\mu g.m^{-3}$.

Table 6-8: Nitrogen Dioxide and Oxides of Nitrogen in Blackpool (2000)

Parameter	Measurement
No. of Hours	3188
No of measure values	1254
Percentage coverage	39.3%
Maximum hourly value (NO_2)	107.1 $\mu g.m^{-3}$
98 percentile for hourly rates (NO_2)	72.9 $\mu g.m^{-3}$
Mean hourly value (NO_2)	26.8 $\mu g.m^{-3}$
Mean hourly value (NO_x)	55.4 $\mu g.m^{-3}$

6.3.1.4 Carbon Monoxide (CO)

Carbon Monoxide data for the 2000 monitoring period in Blackpool is presented in Table 6.9. The mean hourly concentration of carbon monoxide recorded was 0.9 mg/m^3. The CO limit value for the protection of human health is 10 mg/m^3.

Table 6-9: Carbon Monoxide Data for Blackpool (2000)

Parameter	Measurement
No of hours	3188
No. of measured values	2587
Percentage coverage	18.8%
Maximum hourly value	21.8 $mg.m^{-3}$
98 percentile for hourly values	2.9 $mg.m^{-3}$
Mean hourly value	0.9 $mg.m^{-3}$
Maximum 8 hour mean	10.9 $mg.m^{-3}$
98 percentile for 8 hour mean	3.8 $mg.m^{-3}$

6.3.1.5 Dust

The WHO[8] 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/m^2/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m^2/day. The EPA recommends a maximum daily deposition level of 350 mg/m^2/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.

6.3.2 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*. [9]" There is scientific evidence[10] 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, the national meteorological service of Ireland. The nearest weather station to the proposed project is the Cork Airport weather station which is approximately 32km south east of the proposed wind farm and associated infrastructure. These meteorological conditions are presented in Table 6.6 for the period January 2018 – July 2021 (source www.met.ie/climate).

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

Table 6-10: Climate Records January 2018 - July 2021

Total rainfall in millimetres for CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	121.8	182.7	67.5	18.2	172.7	37.4	60.7					
2020	112.2	199.3	64.7	72.3	68.8	94.1	97.6	175.0	58.2	118.6	160.8	185.4
2019	74.3	81.5	128.6	135.8	41.0	110.5	43.9	107.6	91.1	179.2	145.0	125.6
2018	156.6	48.7	164.9	180.7	82.8	10.4	40.1	59.0	77.4	62.0	201.5	193.2
mean	131.4	97.8	97.6	76.5	82.3	80.9	78.8	96.8	94.6	138.2	120	133.1

Mean temperature in degrees Celsius for CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	4.7	5.6	7.3	7.7	9.5	13.7	16.6					
2020	6.2	6.0	6.1	9.6	11.4	13.6	14.8	15.5	13.5	9.7	8.3	5.5
2019	6.4	7.3	7.2	8.9	11.1	12.5	16.0	15.2	13.6	9.8	6.6	6.2
2018	6.2	4.1	4.4	8.4	11.8	15.8	17.4	15.1	12.3	9.9	8.0	8.3
mean	5.6	5.7	6.8	8.2	10.7	13.3	15.1	15.0	13.2	10.3	7.7	6.1

Mean 10cm soil temperature for CORK AIRPORT WEATHER STATION at 0900 UTC

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	3.4	4.8	6.3	8.0	10.4	14.6	17.2					
2020	5.1	5.0	4.9	9.1	11.9	14.1	14.9	15.3	13.2	9.2	7.7	4.7
2019	6.0	6.3	6.4	8.7	11.8	13.3	16.6	15.0	13.5	9.1	6.2	5.2
2018	5.0	3.1	3.7	8.0	12.0	16.9	18.2	15.5	12.4	9.2	7.1	7.5

mean	4.8	4.8	5.9	7.9	11.3	14.1	15.7	15.2	13.0	10.0	7.2	5.6

Potential Evapotranspiration (mm) for CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	11.4	13.0	32.7	61	72.4	91.4	95.5					
2020	10.7	19.6	36.1	57.4	83.9	78.4	85.3	70.0	47.5	28.2	11.9	11.0
2019	13.0	16.0	35.3	51.6	81.0	79.4	87.6	67.7	47.0	27.1	13.9	11.5
2018	11.3	19.0	26.9	41.6	73.5	102.6	103.6	68.9	46.3	29.0	14.1	9.7
mean	12.8	20.1	32.1	52.5	71.2	81.7	81.3	69.1	46.1	24.7	13.8	10.9

Evaporation (mm) for CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	13.7	19.6	49.7	90.3	115.2	126.4	129.8					
2020	14.3	30.0	55.5	86.2	127.8	117.7	124.8	101.6	68.9	41.8	16.7	13.3
2019	17.4	24.5	54.3	80.4	120.5	118.4	131.8	104.7	70.6	40.6	18.1	14.1
2018	16.3	27.8	43.0	66.3	108.3	143.7	140.4	97.0	68.2	40.7	19.8	13.8
mean	18.1	30.2	50.2	81.4	109.3	121.6	118.3	100.0	67.5	36.2	19.2	14.7

DEGREE DAYS BELOW 15.5 DEGREE CELSIUS FOR CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	335	271	253	235	187	72	29					
2020	290	276	290	181	132	74	50	38	78	181	215	310
2019	284	229	256	201	141	103	27	39	70	176	267	288
2018	289	320	344	213	129	39	24	50	105	175	226	224
Mean	306	278	269	219	153	81	46	48	82	161	234	292

MEAN WIND SPEED (KNOT) FOR CORK AIRPORT WEATHER STATION

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	9.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2019	8.3	12.3	10.9	11	8.7	8.9	8.5	9.8	9.2	9.9	10.6	10.7
2018	12.2	10.8	10.5	10.3	8	7.6	7.7	8.1	9.1	9.4	11.5	10.8
2017	8.9	12.2	10.8	8.1	8.6	10.1	8.2	8.1	9.6	10.4	8.7	10.2
Mean	9.8	8.8	8.1	7.4	6.3	6.7	6.1	6.5	7.0	7.4	7.7	7.9

6.4 Impact Assessment

6.4.1 Do-Nothing Impact

If the proposed wind farm 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.

6.4.2 Air Quality

6.4.2.1 Construction Phase Impacts

The principal sources of potential air emissions during the construction of the proposed project will be from the wind farm, grid connection route and turbine delivery route; 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 PM_{10} and $PM_{2.5}$ 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 6.11 details the NRA assessment criteria used for assessing the impact of dust from construction activities sites of varying scale.

Table 6-11: NRA Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	Description	Soiling	PM_{10}	Vegetation Effects
Major	Large construction sites, with high use of haul roads	100 m	25 m	25 m
Moderate	Moderate construction sites, with moderate use of haul roads	50 m	15 m	15 m
Minor	Minor construction sites, with limited use of haul roads	25 m	10 m	10 m

Source: NRA / TII, 2011[11]

[11] https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf

Applying the NRA criteria in Table 6.11, the overall construction of the proposed wind farm is considered a major construction site as it will result in soiling effects which have the potential to occur up to 100m from the source, with PM_{10} deposition and vegetation effects occurring up to 25m from the source due to the quantity of construction works which are involved in the development of a wind farm. The nearest receptor is c. 809m from the site boundary and therefore will not experience the soiling, deposition or vegetation effects. Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. Due to distance between the nearest receptor and source of emissions the impact from these emissions will be Imperceptible.

The construction of the proposed grid connection route 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 PM_{10} deposition and vegetation effects occurring up to 15m from the source. There are 20 residential dwellings located along the proposed 10.7 km grid connection route. Some houses may experience soiling and deposition of vegetation effects depending on how close to the road corridor they are located. Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. However, due to the nature of construction along the proposed grid connection as described in Chapter 3, 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, temporary and slight.

The construction of the proposed turbine delivery route 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 PM_{10} 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 tree trimming or street furniture removal. The main TDR works area is the turbine staging are at Drishane Castle described in Chapter 3. The impacts on air quality are due to air pollutants from plant and vehicles and the potential for dust when setting up the staging area. These impacts are considered to be short term and slight in significance.

It is not predicted that an air quality impact will occur due to traffic at the proposed wind farm 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 13 Traffic and Transportation, there will be an average daily increase of 79 HGV trips per day over a construction period of 18 months. This includes 7 average daily HGV trips for the construction of the grid connection over the course of the construction programme. LGV traffic generated by the construction of the project will average 44 daily trips per day.

The combined HGV and LGV average daily increase is 122 trips per day. None of the other criteria are met either. Therefore, the 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. Mitigation measures for this are described in Section 6.5.1.

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.

6.4.2.2 Operational Phase Impacts

Once the proposed wind farm and grid connection 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 proposed wind farm site during the operational period, however, due to the low traffic movements involved (See Chapter 13, Section 13.5.3), 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 grid connection route to address any issues during the operational period. However, given the low and infrequent traffic movements involved, the impact will be imperceptible. Non routine maintenance to turbines may also be required. A small team may be deployed to site in a crane and maintenance vehicles. Given the low and infrequent traffic movements involved, the impact will be imperceptible. The operational phase of the grid connection which connects to and operates the proposed wind farm will result in positive impacts on air quality due to the displacement of fossil fuels as an energy source.

6.4.2.3 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 proposed grid connection 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 project, and all internal access roads, turbine hardstandings will be left in situ, resulting in no additional truck movements and no impact from emissions from machinery along the grid connection route.

6.4.3 Climate

There is the potential for greenhouse gas emissions to the atmosphere during the construction, operation and decommissioning phases of the proposed wind farm and proposed grid connection 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 proposed wind farm 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 3% 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 88 ha of conifer plantation within the site, clear felling will be dispersed over several areas and will not consist of a single clear fell area and 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 project clear felling would occur as normal.

Macroclimate

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 'greenhouse effect' which can influence climate change. Section 6.4.4.1 details the carbon savings that have been calculated for the proposed wind farm.

Should the proposed wind farm and proposed grid connection (i.e. the Ballinagree Project) 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 wind farm project 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.

6.4.4 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, operation and decommissioning of the wind farm. The assumptions are located in Section 6.2.3 and Appendix 6.1 details the inputs to the model.

Carbon Losses

Based on the Scottish Windfarm Carbon Assessment Tool, the total expected losses due to the project will be between 220,298 and 243,036 tonnes of CO_2.This represents 3.9 to 4.7 % of the total amount of CO_2 emissions that will be offset by the proposed wind farm project. Losses include the manufacture, construction and decommissioning of turbines, use of back up generators, losses due to reduced carbon fixing potential, losses from soil organic matter and losses due to felling forestry. Values for these figures are presented in Table 6-12.

Carbon Gain through Avoided Emissions

In total, it is estimated that between 4,634,490 and 5,184,375 tonnes of CO_2 emissions will be displaced over the proposed thirty five-year lifetime of the wind farm i.e. between 132,414 and 148,125 tonnes of CO_2 per annum, which assists in realising the ambitious goals of the Climate Action Plan 2021. From an operational perspective, the proposed wind farm project will displace the emission of CO_2 from other less clean forms of energy generation, predominantly gas, 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 wind farm project with 20 no. turbines assuming a turbine power rating of 5.9MW – 6.6MW, and operational period of 35 years, the payback time for the manufacture, construction and decommissioning phases (including carbon losses from soil, felling of forestry etc.) of the Ballinagree Project is calculated to be between 1.6 and 1.7 years.

As discussed in Section 6.1.3, the carbon calculator was created to calculate carbon loss from acid bog and fen habitats. The site has been cultivated and drained in the past and is mainly covered in conifer plantation which will have resulted in much of the carbon content of the peat already being lost. The site does not function as acid bog or fen habitat and therefore does not contain the same high levels of carbon. The calculator is therefore an over-estimate of impact.

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 project 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 project are overestimated.

Areas cleared of forestry for the proposed project at Ballinagree will be replaced by replanting at alternative sites. The total area identified for replanting is 88 ha, matching the total area to be felled. A total of 88 hectares of new forestry will be replanted at alternative sites to compensate the loss of forestry at the project site which will offset a significant quantum of the 40,656 tonnes of CO_2 lost due to the felling of forestry.

Table 6-12: Carbon Balance Results

Origin of Losses	Total CO_2 Losses (tonnes $C0_2$ equivalent)	
	Lower Range Output	Higher Range Output
Turbine manufacture, construction and decommissioning	105,717	118,798
Losses due to Backup	81,402	91,060
Felling of Forestry	40,656	40,656
Losses due to reduced carbon fixing potential	1395	1395

Origin of Losses	Total CO_2 Losses (tonnes CO_2 equivalent)	
	Lower Range Output	Higher Range Output
Losses from soil organic matter	-8873	-8873
Total Expected Losses	220,298	243,036
Emissions Savings	**Expected CO_2 emission savings (tonnes CO_2 per Annum)**	
Gas fuelled electricity generation	132,414	148,125
Energy output from windfarm	**MW**	
Estimated Annual Output	118MW	132MW
Carbon payback time	**Years**	
Fossil fuel mix of electricity generation	1.66	1.64

6.5 Mitigation Measures

6.5.1 Air Quality

6.5.1.1 Construction Phase

Construction Environmental Management Plan (CEMP) has been prepared and is included in Volume 3, Appendix 3.1. This includes for the following mitigation measures during the construction phase of the proposed wind farm 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 at the two main entrance/exit points of the proposed wind farm site as described in Chapter 3;

- The developer in association with the contractor will be required to implement the dust control plan as part of the CEMP (a CEMP is contained in Volume 3, Appendix 3.1). In the event the Planning Authority decides to grant permission for the proposed wind farm, 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 from local routes entering the site; and dwellings directly adjacent to the grid connection route 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.

6.5.1.2 Operational Phase

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

6.5.1.3 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 proposed wind farm 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, this will be left in situ and so no mitigation measures are proposed.

6.5.2 Climate

It is considered that the proposed wind farm project will have an overall positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting the new binding renewable energy target for the EU of 32% by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2021. In terms of renewable energy, an increase in electricity generated from renewable sources is to increase to up to80% by 2030, with up to 8GW 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 wind farm project will have a positive effect on climate due to the displacement of fossil fuels.

6.6 Residual Impacts

6.6.1 Air Quality

Following the implementation of the above mitigation measures, the proposed wind farm, proposed grid connection and turbine delivery route 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.

The development once constructed, will attract recreational walkers to the amenity trail constructed as part of the project. The traffic emissions associated with these walkers travelling to the trail will lead to a long term, imperceptible impact on air quality in the area.

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 wind farm will result in the avoidance of emissions from fossil fuel generators which is a positive effect on air quality.

6.6.2 Climate

There will be positive residual impacts from the operation of the proposed wind farm project in terms of the displacement of fossil fuel energy generation with renewable energy.

Section 6.4.3 assessed the potential impacts on climate as a result of the development of the proposed Ballinagree Wind Farm Project through microclimate and macroclimate. At the microclimate level, the proposed development encompasses approximately 3% of the entire site area with hardstanding surfaces (hardstandings, access tracks, structures). The assessment found that a 3% 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[12] of between 118MW - 132MW for the proposed wind farm development will result in the net displacement of between 132,414 and 148,125 tonnes of CO_2 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 generation (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 proposed Ballinagree Wind Farm Project due to the location of the site which is predominately an upland commercial forestry location with the exception of existing public road ways and internal track ways.

[12] Per Scottish Wind Farm Calculation Tool

There are no potential direct or indirect impacts on air temperature, microclimate and macroclimate associated with the proposed grid connection. Due to the nature of construction along the proposed grid route 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 Ballinagree Wind Farm will not have a significant impact on climate.

Should the Ballinagree Project 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.

It is therefore considered that there will be a net positive residual impact on climate as a result of the development of the proposed Ballinagree Project due to the displacement of between 132,414 and 148,125 tonnes of CO_2 per annum.

6.7 Cumulative Impacts

In terms of cumulative impacts, negative cumulative impacts in relation to air quality would only occur if a large development was located in the vicinity of the site and was in the process of construction at the same time. There are a large number of existing and approved projects and developments in the planning system within the vicinity of the site as listed in Appendix 1.2 of Chapter 1 of this EIAR including housing developments, agricultural developments. These developments are small in nature and will not act cumulatively with the wind farm.

There are a number of projects and activities which are consented, ongoing or operational within the vicinity of the Ballinagree Wind Farm Project. These are

Name	Distance and Direction from proposed site	Status
Boggeragh Wind Farm I+II	**c. 0.86km east and north**	**Operational**
An operational wind farm of 44 no. turbines located 0.86km east and north. Negative or adverse effects on the receiving environment in terms of emissions associated with the operation of the Boggeragh wind farm and the proposed Ballinagree project are considered to be short term in duration and slight in significance during the construction phase of the proposed Ballinagree project. Following the operational phase of both projects, the emissions of the proposed development in tandem with the Boggeragh wind farm will be low as there will only be operational maintenance vehicles servicing the proposed development. These effects are considered to be imperceptible in significance.		
Esk Wind Farm	**c. 5.5km northeast**	**Permitted**
A permitted wind farm of 14 no turbines located 5.5km northeast of the proposed Ballinagree project. Negative or adverse impacts on the receiving environment in terms of emissions associated with the operation of the Esk wind farm and the proposed Ballinagree project are considered to be short term in duration and slight in significance during the construction phase of the proposed Ballinagree project should the construction phase of both projects commence at the same time. Following the construction phase of both projects, the emissions of the proposed development in tandem with the Esk wind farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects. These effects are considered to be imperceptible in significance.		

Carraigcannon Wind Farm	**c. 4km north**	**Operational**
An operational wind farm of 10 no turbines located 4 km to the north of the proposed Ballinagree windfarm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Carraigcannon wind farm and the proposed Ballinagree wind farm are considered to be short term in duration and slight in significance during the construction phase of the Ballinagree Wind Farm Project due to the low level of maintenance vehicles servicing Carraigcannon Wind Farm. Following the construction phase of Ballinagree Wind Farm, emissions of the proposed development in tandem with the Carraigcannon wind farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Bawnmore Wind Farm 1 and 2	**c. 4km southwest**	**Operational**
An operational wind farm of 11 no turbines located 4km southwest of the proposed Ballinagree windfarm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Bawnmore wind farm and the proposed Ballinagree wind farm are considered to be short term in duration and slight in significance during the construction phase of the Ballinagree Wind Farm Project. Following the construction phase of Ballinagree Wind Farm, the emissions of the proposed development in tandem with the Bawnmore wind farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Coomacheo Wind Farm 1 and 2	**c. 10.2 km west**	**Operational**
An operational wind farm of 24 no turbines approximately 10km west of the proposed Ballinagree windfarm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Coomacheo wind farm and the proposed Ballinagree wind farm are considered to be short term in duration and slight in significance during the construction phase of the Ballinagree Wind Farm Project.		

Name	**Distance and Direction from proposed site**	**Status**
Following the operational phase of Ballinagree Wind Farm the emissions of the proposed development in tandem with the Coomacheo wind farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Crinnaloo South Battery Storage Facility	**c. 1.7km north**	**Operational**
An operational 110kV battery storage facility is located 1.7km north of the proposed Ballinagree windfarm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Crinnaloo Battery Storage facility and the proposed Ballinagree wind farm are considered to be short term in duration and slight in significance during the construction phase of the Ballinagree Wind Farm Project. Following the construction phase of both projects, the emissions of the proposed development in tandem with the Crinnaloo Battery Storage facility will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Carragraigue Solar Farm	**c. 5km north**	**Permitted**
A permitted solar farm is located 5km north of the proposed Ballinagree Wind Farm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Carragraigue solar farm and the proposed Ballinagree wind farm project are considered to be short term in duration and slight in significance should the construction phase of both projects commence at the same time. Following the construction phase of both projects, the emissions from the proposed development in tandem with the permitted Carragraigue solar farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		

Ballinagree Met Mast 1	**Immediately adjacent**	**Operational**
A met mast, servicing the northern area of the proposed Ballinagree Wind Farm site. The met mast is currently operational and has a 5 year operational life. There will be no overlap between the construction, operation or decommissioning of the met mast and the proposed development.		
Ballinagree Met Mast 2	**immediately adjacent**	**Operational**
A met mast, servicing the southern area of the proposed Ballinagree Wind Farm site. The met mast is currently operational and has a 5 year operational life. There will be no overlap between the construction, operation or decommissioning of the met mast and the proposed development.		
Bawnmore Battery Storage	**4km southwest**	**Permitted**
A permitted battery storage extension to the constructed Bawnmore substation, consisting of 4 no. battery storage units. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Bawnmore battery storage project and the proposed Ballinagree wind farm project are considered to be short term in duration and slight in significance should the construction phase of both projects commence at the same time. Following the construction phase of both projects, the emissions from the proposed development in tandem with the permitted Bawnmore battery storage project will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Knockglass Solar Farm	**5.3km south**	**Permitted**
A permitted solar farm is located 5.3 km south of the proposed Ballinagree Wind Farm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Knockglass solar farm and the proposed Ballinagree wind farm project are considered to be short term in duration and slight in significance should the construction phase of both projects commence at the same time. Following the construction phase of both projects, the emissions from the proposed development in tandem with the permitted Knockglass solar farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Name	**Distance and Direction from proposed site**	**Status**
Caherdowney Substation and Battery Storage	**8.7km west**	**Permitted**
A permitted battery storage compound, ancillary 110kV substation and ancillary works is located c. 8.7km west of the proposed Ballinagree Wind Farm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Caherdowney Substation and Battery Storage project and the proposed Ballinagree wind farm project are considered to be short term in duration and slight in significance should the construction phase of both projects commence at the same time. Following the construction phase of both projects, the emissions from the proposed development in tandem with the permitted Caherdowney Substation and Battery Storage will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Cloghmacow Solar Farm	**17.5km south**	**Permitted**
A permitted solar farm is located 17.5 km south of the proposed Ballinagree Wind Farm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Cloghmacow solar farm and the proposed Ballinagree wind farm project are considered to be short term in duration and slight in significance should the construction phase of both projects commence at the same time. Following the construction phase of both projects, the emissions from the proposed development in tandem with the permitted Cloghmacow solar farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		

Berrings Solar Farm	**16.8km southeast**	**Permitted**
A permitted solar farm is located 16.8 km southeast of the proposed Ballinagree Wind Farm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Berrings solar farm and the proposed Ballinagree wind farm project are considered to be short term in duration and slight in significance should the construction phase of both projects commence at the same time. Following the construction phase of both projects, the emissions from the proposed development in tandem with the permitted Berrings solar farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Carriganimmy Wind Farm	**5km west**	**Operational**
An operational wind farm of 6 no turbines located 5km west of the proposed Ballinagree windfarm. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Bawnmore wind farm and the proposed Ballinagree wind farm are considered to be short term in duration and slight in significance during the construction phase of the Ballinagree Wind Farm Project. Following the construction phase of Ballinagree Wind Farm, the emissions of the proposed development in tandem with the Carriganimmy wind farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Extension to substation	**1km north**	**Operational**
Construction of an extension to existing 110kv electricity substation 1km north of the wind farm. Negative or adverse effects on the receiving environment in terms of emissions associated with the operational substation extension and the construction phase of the proposed Ballinagree wind farm project are considered to be short term in duration and slight in significance. Following the construction of Ballinagree Wind Farm Project, the emissions from the proposed development in tandem with the operational Substation will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		
Currabeha Solar Farm	**13km south of Clashavoon Substation**	**Permitted**
A permitted solar farm is located 13 km south of the Clashavoon substation. Negative or adverse effects on the receiving environment in terms of emissions associated with the permitted Currabeha solar farm and the proposed Ballinagree wind farm project are considered to be short term in duration and slight in significance should the construction phase of both projects commence at the same time. Following the construction phase of both projects, the emissions from the proposed development in tandem with the permitted Currabeha solar farm will be low as there will only be operational maintenance vehicles servicing the proposed development. The decommissioning phases will not overlap for the two projects.		

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. Energy developments over 20km away are not considered to have cumulative impacts due to the large separation distance between developments.

6.7.1 Air Quality

Cumulative air impacts may arise if the construction, operational and maintenance period and decommissioning of these projects occurs simultaneously with the construction of the proposed wind farm, grid connection and turbine delivery route works This could result in slight increased traffic and dust emissions, however, provided the mitigation measures as detailed in Section 6.5 are implemented, there will be no significant cumulative effects on air quality due to dust or GHG emissions.

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 (NOx), 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.

6.7.2 Climate

Cumulative impacts on climate associated with the construction phase due to greenhouse gas emissions from plant and machinery will be short term and not significant.

In terms of climate and carbon, the proposed wind farm will act cumulatively with other renewable energy projects in reducing CO_2 emissions by displacing fossil fuel in the production of electricity, resulting in a long term slight-moderate positive impact on climate.

The cumulative impact on the climate during the decommissioning phase will be similar in nature to the construction phase but will be of reduced magnitude and temporary in duration.

6.8 Conclusion

There are no significant impacts expected on Air Quality or Climate as a result of the construction, operation and decommissioning of the proposed project.

There are no significant cumulative impacts expected on Air Quality and Climate as a result of other existing or proposed projects.

There will be a long term positive residual impact on air quality and climate as a result of the development due to the displacement of fossil fuels.

The mitigation measures identified in this Chapter will be adopted and implemented by the Contractor and have been incorporated into the construction stage CEMP included in Appendix 3.1.

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