10. AIR AND CLIMATE

10.1 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 Sheskin South Wind Farm (the "Proposed Development").

The site of the Proposed Development is located in North Mayo, approximately 6.7 km northeast of Bangor Erris and 11km south of the Atlantic Coastline, falling entirely within the townland of Sheskin and Tawghnamore. The townlands within which the Proposed Development site, ancillary works and grid connection cabling route are located can be found in Chapter 1 Table 1-1 of this EIAR.

The primary land-uses within and in the vicinity of the site comprises commercial forestry, cut-over peat bog and renewable energy development. Due to the non-industrial nature of the Proposed Development 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 would be expected renewable energy sources. 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.

10.1.1.1 Relevant Guidance

The air quality and climate section of this EIAR is carried out in accordance with the EIA Directive 2011/92/EU as amended by Directive 2014/52/EU and in accordance with the guidance contained in the Section 1.7.1 of this EIAR.

10.1.1.2 Statement of Authority

This section of the EIAR has been prepared by Jonathan Fearon, and reviewed by Eoin McCarthy, all of whom are Environmental Scientists with MKO. Jonathan is an Environmental Scientist with a B.Sc. (Hons) in Environmental Science and a M.Sc. in Environmental Leadership from NUI Galway, with previous experience in local government and environmental consultancy work. Eoin is a Senior Environmental Scientist, with over 11 years of experience in private consultancy. Eoin holds a B.Sc. (Hons) in Environmental Science from NUI, Galway. He has been involved in the project management of the production of EIARs for over 700MW worth of wind energy projects. Eoin has completed the Air and Climate section for numerous EIARs for wind energy projects.

10.2 Air Quality

10.2.1 Air Quality Standards

In 1996, the Air Quality Framework Directive (96/62/EC) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999. The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- The third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air and was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. No. 58 of 2009).

The Air Quality Framework Directive and the first three Daughter Directives have been replaced by the Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality) (as amended by Directive EU 2015/1480) which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for PM2.5 (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM10) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 10-1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre ($\mu g/m^3$) and parts per billion (ppb). The notation PM10 is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. PM2.5 represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016). These Regulations supersede 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 Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999).

Table 10-1 Limit values of Directive 2008/50.EC, 1999/30/EC and 2000/69/EC (Source: https://www.epa.ie/air/quality/standards/)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m^3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of human health	24 hours	75	28	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Lower assessment threshold for the protection of human health	24 hours	50	19	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010

Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m^3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Nitrogen dioxide (NO_2)	Upper assessment threshold for the protection of human health	1 hour	140	73	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection of human health	1 hour	100	52	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM10)	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 2.5 (PM2.5)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 (PM2.5) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 10 (PM_{10})	Upper assessment threshold for the protection of human health	24 hours	30	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 10 (PM_{10})	Lower assessment threshold	24 hours	20	-	Not to be exceeded more than 7	Based on the indicative

Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m^3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
	for the protection of human health				times in a calendar year	limit values for 1 January 2010
Particulate matter 2.5 (PM2.5) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead	Protection of human health	calendar year	0.5		Annual mean	1st Jan 2005
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded	1st Jan 2005
Benzene	Protection of human health	calendar year	5	1.5	Annual mean	1st Jan 2010

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 10-2 presents the limit and target values for ozone.

Table 10-2 Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Target Value for 2020
Protection of human health	Maximum daily 8-hour mean	120 mg/m^3 not to be exceeded more than 25 days per calendar year averaged over 3 years	120 mg/m^3
Protection of vegetation	AOT40* calculated from 1-hour values from May to July	18,000 mg/m^3.h averaged over 5 years	6,000 mg/m^3.h
Information Threshold	1-hour average	180 mg/m^3	-
Alert Threshold	1-hour average	240 mg/m^3	-

*AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 g/m^3 and is expressed as g/m^3 hours.

10.2.1.1 Air Quality and Health

The World Health Organisation (WHO) in 2016 estimated that ambient air pollution caused 4.2 million deaths worldwide in 2016 (WHO, 2018). A more recent European Environmental Agency (EEA) Report, '*Air Quality in Europe – 2021 Report'* highlights the negative effects of air pollution on human health. The report assessed that poor air quality accounted for premature deaths of approximately 307,000 people in Europe in 2019, with regards to deaths relating to $PM_{2.5}$. The estimated impacts on the population in Europe of exposure to NO_2 and O_3 concentrations in 2019 were around 40,400 and 16,800 premature deaths per year, respectively.

Of these numbers, 1,380 deaths due to poor air quality were estimated in Ireland in 2019 with 1,300 Irish deaths attributed to fine particulate matter ($PM_{2.5}$), 30 Irish deaths attributed to nitrogen oxides (NO_2) and 50 Irish deaths attributed to Ozone (O_3). These emissions, along with others including sulphur oxides (SO_x) are produced during fossil fuel-based electricity generation in various amounts, depending on the fuel and technology used, emissions from industry and power plants, vehicles emissions and transport fuels. The findings of this report were reproduced in the more recent report by the Environmental Protection Agency (EPA) '*Air Quality in Ireland 2021.'*[1] A 2016 EPA report 'Ireland's Environment – An Assessment' states that the pollutants of most concern are NOx, (the collective term for the gases nitric oxide and nitrogen dioxide, PM (particulate matter) and O3 (ozone). The EPA report goes on to state that:

> "Ireland has considerable renewable energy resources, only a fraction of which are utilised to address our energy requirements*".*

Whilst there is the potential of such emissions to be temporarily generated from the site construction work, mitigation measures discussed below in Sections 10.2.4 will be implemented to reduce the impact from these potential emissions.

10.2.2 Air Quality Zones

The EPA has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Cafe Directive, Framework Directive and Daughter Directives. The site of the Proposed Development lies within Zone D, which represents rural areas located away from large population centres.

10.2.3 Existing Air Quality

The air quality in the vicinity of the Proposed Development site is typical of that of rural areas in the West of Ireland, i.e., Zone D. Prevailing south-westerly winds carry clean, unpolluted air from the Atlantic Ocean onto the Irish mainland. The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, 'Air Quality in Ireland 2020' was published by the EPA in 2021. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D. Ozone is monitored in real time at the Castlebar monitoring station in Co. Mayo, 42km southeast of the Proposed Development site. Year to date exceedances is also available at this station.

[1] *Environmental Protection Agency: Air Quality in Ireland 2021. Available at:* https://www.epa.ie/publications/monitoring--assessment/air/EPA-Air_Quality_in-Ireland-Report_2021_-interactive-pdf.pdf

10.2.3.1 Sulphur Dioxide (SO2)

Sulphur dioxide data for Cork Harbour, Kilkitt, Askeaton and Letterkenny in 2020 is presented in Table 10-3.

Table 10-3 Average Sulphur Dioxide Data for Zone D in 2020.

Parameter	Measurement (ug/m^3)
Annual Mean	4.15
Hourly values > 350	0.5
Hourly max	135.18
Daily values > 125	0
Daily max	25.55

During the monitoring period there were no exceedances of the daily limit values for the protection of human health. As can observed from Table 10-3 the average maximum hourly value recorded during the assessment period was 135.18 μg/m3. In addition, there were no exceedances of the annual mean limit for the protection of ecosystems. It would be expected that SO2 values at the Proposed Development site would be similar or lower than those recorded for the Zone D sites above.

10.2.3.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, soil and road surfaces, construction works and industrial emissions. The EPA report[2] provide annual mean PM_{10} concentration for twelve Zone D towns, Tipperary Town, Carrick-on-Shannon, Enniscorthy, Birr, Askeaton, Macroom, Castlebar, Cobh, Claremorris, Kilkitt, Cavan and Roscommon Town. Particulate matter (PM_{10}) data for 2020 is presented in **Error! Reference source not found.**.

Table 10-4 Average Particulate Matter (PM_{10}) Data for Zone D Sites in 2020.

Parameter	Measurement (ug/m3)
Annual Mean	11.17
% Data Capture	75
Values > 50 ug/m3	Max 5
Daily Max	46.5

The daily limit of 50 μg/m^3 for the protection of human health was not exceeded more than 35 times during the monitoring period. It would be expected that PM_{10} values at the Proposed Development site would be similar or lower than those recorded for the Zone D sites above. An Osiris Monitor which measures local PM_{10} and $PM_{2.5}$ levels ($PM_{2.5}$ is a finer inhalable particle) was installed at Ballina, Co. Mayo in 2020. This local station provides real time data only. The real time data for PM_{10} and $PM_{2.5}$ at the time of writing indicates that the daily thresholds were not exceeded.

[2] *EPA (2021). Air Quality in Ireland 2020.*

10.2.3.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide data for Birr, Castlebar, Carrick-on-Shannon and Kilkitt in 2020 is presented in **Error! Reference source not found.**.

Nitrogen dioxide data for the Castlebar station in the period 19/10/2021 - 19/04/2022 shows that the average measurement for NO_2 for that 6-month period was 5.96 µg/m3 whilst the maximum reading was 20.85 µg/m3.

Table 10-5 Average Nitrogen Dioxide Data for Zone D Sites in 2020

Parameter	Measurement
Annual Mean	7.6
NO2 Values >200	0
Values > 140 (UAT)	0
Values >100 (LAT)	0
Hourly Max.	54

The annual NO_2 value was below the annual mean limit value for the protection of human health of 40 µg/m^3. Furthermore, the lower and upper assessment thresholds of 100 and 140 µg/m^3 was not exceeded during the monitoring period. The average hourly max. NO_2 value of 54 µg/m^3 measured during the monitoring period was below the hourly max threshold of 200 µg/m^3. It would be expected that NO_2 values at the Proposed Development site would be similar lower than those recorded for the Zone D sites above.

10.2.3.4 Carbon Monoxide (CO)

The EPA report[2] provide rolling 8-hour carbon monoxide concentrations for Birr a Zone D site. Carbon Monoxide data for 2020 is presented in **Error! Reference source not found.**.

Table 10-6 Carbon Monoxide Data for Birr – Zone D Site in 2020.

Parameter	Measurement
Annual Mean	0.4 mg/m3
Median	0.4 mg/m3
% Data Capture	4.2%
Values > 10	0
Max	1.2 mg/m3

The average concentration of carbon monoxide was 0.4 mg/m^3. The carbon monoxide limit value for the protection of human health is 10,000 µg/m^3 (or 10mg/m^3). On no occasions were values in excess of the 10 mg limit value set out in Directives 2000/69/EC or 2008/69/EC.

10.2.3.5 Ozone (O_3)

Real-time Ozone data can be obtained from the closest active air monitoring station at Castlebar, Co. Mayo, 42km southeast from the Proposed Development site. In the set of results for Ozone measured at Castlebar between 17/06/2022 – 16/12/2022 indicates that on no day was the 180 $\mu g/m^3$ was exceeded in the previous 6 months (peaking at 100.17 $\mu g/m^3$), however, a breakdown of hourly, daily, and annual Ozone levels is not provided. As indicated in Table 10-7, the maximum daily mean of less than 120µg/m3 is the standard from 2020 onwards. It sets a long-term objective that ground ozone levels, by 2020, should always have a maximum daily mean of less than 120µg/m3. Met Éireann has simplified the permitted values into Table 10-7 below. As can be seen, the peak levels recorded at Castlebar monitoring station falls within the 'Good' category for air quality.

Table 10-7 Met Éireann Air Quality Index Table for Ozone.

Air Quality Index O3 in:	µg/m3 (1 hour average)	ppb (1 hour average)
Very Good	0 – 39	0 – 19
Good	40 – 119	20 – 59
Fair	120 – 179	60 – 89
Poor	180 – 239	90 – 119
Very Poor	≥ 240	≥ 120

10.2.3.6 Dust

There are no statutory limits for dust deposition in Ireland. The German TA-Luft standard for dust deposition sets a maximum permissible emission level for dust deposition of 350 $mg/m^2/day$. Recommendations from the Department of the Environment, Health & Local Government[3]apply the Bergerhoff limit of 350 $mg/m^2/day$ to the site boundary of quarries. This limit value can also be implemented with regard to dust impacts from construction activities associated with the Proposed Development.

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, etc., 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.

The potential dust-related effects on local air quality and the relevant associated mitigation measures are presented in Sections 10.2.4.3 below.

[3] *DOEHLG (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities*

10.2.4 Likely and Significant Impacts and Associated Mitigation Measures

10.2.4.1 'Do-Nothing' Effect

If the Proposed Development were not to proceed, the opportunity to reduce emissions of carbon dioxide, oxides of nitrogen (NO_x), and sulphur dioxide (SO_2) to the atmosphere would be lost due to the continued dependence on electricity derived from coal, oil and gas-fired power stations, rather than renewable energy sources such as the Proposed Development. This would result in an indirect, slight, negative impact on air quality nationally.

10.2.4.2 Construction Phase

10.2.4.2.1 Exhaust Emissions

Proposed Development Infrastructure

The construction of turbines, the anemometry mast, substation, site roads and other onsite infrastructure (as outlined in Chapter 4 of this EIAR) and extraction of material from the proposed borrow pits will require the operation of construction vehicles and plant on site and the transport of workers to and from the site. Exhaust emissions associated with vehicles and plant such as NO_2, Benzene and PM_{10} will arise as a result of construction activities. This potential effect will not be significant and will be restricted to the duration of the construction phase and localised to works areas. Therefore, this is considered a short-term, slight, negative impact. Mitigation measures to reduce this impact are presented below.

The construction of the proposed substation, widening works along the local road and the grid connection cabling route to the Bellacorick 110kV substation 6.8km southeast of the Proposed Development will require the use of construction machinery, thereby giving rise to exhaust emissions. This is a short-term, slight, negative impact, which will be reduced through use of the best practice mitigation measures as presented below.

Transport to and from Site

The transport of turbine components, construction materials, waste and workers to and from the site, (see Section 14.1 of this EIAR), will also give rise to exhaust emissions associated with the transport vehicles. This constitutes a temporary moderate negative impact in terms of air quality. Mitigation measures in relation to exhaust emissions are presented below.

Mitigation

- All construction vehicles and plant used onsite during the construction phase will be maintained in good operational order. If a vehicle requires repairs this work will be caried out, thereby minimising any emissions that arise.
- Turbines components will be transported to the Site on specified routes only, unless otherwise agreed with the Planning Authority.
- All machinery will be switched off when not in use.
- Users of the Site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum.
- The majority of aggregate materials for the construction of the Proposed Development will be obtained from the borrow pits on site. This will significantly reduce the number of delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements.

- The MRF facility will be local to the Proposed Development site to reduce the amount of emissions associated with vehicle movements. The nearest licensed waste facility to the Wind Farm Site is located approximately 37km to the east of the Wind Farm Site.
- Waste associated with the construction of the Grid Connection underground electrical cabling route will be disposed of at the closest MRF to where waste is generated along the underground electrical cabling route. There closest licensed waste facilities in the vicinity of the underground electrical cabling route, is located approximately 37km to the east.

Residual Impact

The residual impact from the construction phase and the implementation of the above mitigation measures will result in a short-term, slight negative impact.

Significance of Effects

Based on the evaluation above there will be no significant direct or indirect effects on air quality due to the construction of the Proposed Development.

10.2.4.3 Dust Emissions

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 10-8 details the NRA 2011 assessment criteria[4] used for assessing the impact of dust from construction activities sites of varying scale.

Table 10-8 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}a	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

a Significance based on the 2005 standard, which allows 35 daily exceedances/year of 50 µg/m³

[4] NRA 2011 Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes Available at: 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

Turbines and Other Infrastructure

The construction of turbine foundations and hardstands, substation, anemometry mast, site roads, other onsite infrastructure and borrow pit extraction (as outlined in Chapter 4 of this EIAR) will give rise to dust emissions during the construction phase.

Using the NRA criteria, the Proposed Development is considered to be a Major construction activity with an estimated average dust soiling of 100m from the site, a PM_{10} deposition of 25m with potential effects on vegetation up to a distance of 25m from the site. However, the nearest sensitive receptor to any Proposed Development site infrastructure is located over 1.2km west of a proposed new site road. Furthermore, given the isolated, elevated nature of the site, its existing site type and land use, i.e. commercial forestry, the existing vegetation acts as a natural screen for dust emissions. Therefore, the potential for impacts on off-site receptors during the construction of the Proposed Development is considered a short term Imperceptible Negative Impact.

Haul Route

In order to accommodate the delivery of turbine components and other abnormal loads, road widening works will be required at the L52926 – N59 junction in the townland of Tawnaghmore and in the townland of Moneynieren, approximately 5.7km east of the Proposed Development site.

Excavation works within the verges along intermittent areas of these roads will give rise to localised dust emissions. It 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 no sensitive receptors within 50m of the required junction widening works in Taghnamore. Our Lady's Church Ballymunnelly is located 56m from these works but is screened by mature vegetation.

Upon completion of the construction phase of the Proposed Development, the boundary between the local road and the new hardstanding areas at these two locations will be reinstated using stockproof fencing. These works are considered to be temporary and slight negative impact. Mitigation measures to reduce this impact are discussed below.

Grid Connection Cable

The excavation of the grid connection cabling route trench will give rise to localised dust emissions. It is considered a minor construction site as it will result in soiling effects which have the potential to occur up to 25m from the source, with PM_{10} deposition and vegetation effects occurring up to 10m from the source. There are just 6 No. dwellings (of which 4 are occupied) and a church along the proposed 6.8km grid connection route. In the village of Bellacorick, there are two vacant properties located 28m and 56m to the east of the grid connection route. Some houses may experience soiling and deposition of vegetation effects depending on how close to the road corridor they are located. However, due to the nature of construction along the proposed grid connection as described in Chapter 4 of this EIAR which is termed a "rolling" construction site, meaning that these works will not be concentrated in any one area of the route for any considerable length of time Therefore, these effects are considered to be temporary and slight negative impact. Mitigation measures to reduce this impact are presented below.

Transport to Site

The transport construction materials to and waste from the wind farm site will give rise to some localised dust emissions during periods of dry weather. This is a temporary imperceptible negative impact. Please see Chapter 14 Traffic and Transport for details. Mitigation measures to reduce the significance of this effect are presented below.

Mitigation

- A wheel wash facility will be installed on the Proposed Development site and will be used by vehicles before leaving site.
- In periods of extended dry weather, dust suppression may be necessary along haul roads, site roads, grid route, road widening sections, substation, and construction compounds and around the borrow pit area to ensure dust does not cause a nuisance. If necessary, such as during periods of dry weather, de-silted water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads, turbine bases, borrow pit and site compounds to prevent the generation of dust where required. Water bowser movements will be carefully monitored by the Ecological Clerk of Woks to avoid, insofar as reasonably possible, increased runoff as outlined in the CEMP.
- Areas of excavation will be kept to a minimum and stockpiling of excavated material will be minimised by coordinating excavation, placement of material in peat placement areas and restoration of borrow pits.
- Turbines components and construction materials will be transported to the site on specified haul routes only, as agreed with the local authority.
- The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness and cleaned as deemed necessary by the construction Site Supervisor/Site Manager.
- The transport of construction materials may have the potential to generate dust in dry weather conditions. Roads will be watered down to suppress dust particles in the air as deemed necessary by the Site Supervisor/Manager.
- The transport of dry excavated material from the on-site borrow pits, which may have potential to generate dust will be minimised. If necessary, such as in periods of dry weather, excavated material will be dampened prior to transport from the borrow pits.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-3). The CEMP includes dust suppression measures.

Residual Impact

Short-term imperceptible negative impact.

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality due to dust emissions during the construction phase of the Proposed Development.

10.2.5 Operational Phase

10.2.5.1.1 Exhaust Emissions

Exhaust emissions associated with the operational phase of the Proposed Development will arise from occasional machinery and Light Goods Vehicles (LGV) that are intermittently required onsite for maintenance. This will give rise to a Long-term Imperceptible Negative Impact.

Mitigation

Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order.

Residual Impact

Long-term Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects on air quality from exhaust emissions during the operation of the Proposed Development.

10.2.5.1.2 Air Quality

By providing an alternative to electricity derived from coal, oil or gas-fired power stations, the Proposed Development will result in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide (SO_2). The production of renewable energy from the Proposed Development will have a long-term, significant, positive impact on air quality. Further details on the carbon dioxide savings associated with the Proposed Development are presented in Section 10.3.3.

Residual Impact

Long-term significant positive impact

Significance of Effects

Based on the assessment above there will be a significant positive effect on air quality due to the operation of the Proposed Development.

10.2.5.1.3 Human Health

Exposure to chemicals such as SO_2 and NO_x are known to be harmful to human health. The production of clean renewable energy from the Proposed Development will offset the emission of these harmful chemicals by fossil fuel-powered sources of electricity and, therefore, will have a long term slight positive impact on human health. Further information on the impact of the Proposed Development on Human Health is contained in Chapter 5: Population and Human Health.

Residual Impact

Long-term Slight Positive Impact

Significance of Effects

Based on the assessment above there will be a significant positive effect on human health due to the operation of the Proposed Development.

10.2.5.2 Decommissioning Phase

Any impact and consequential effects that occur during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The grid connection route will be left in situ in the public roadway; thus, no works will be required for this during the decommissioning phase. Likewise, the substation will remain on site resulting in no additional truck movements or requirement for demolitions and removal works for this piece of infrastructure. The mitigation measures prescribed for the construction phase of the Proposed Development will be implemented during the decommissioning phase thereby minimising any potential impacts.

10.3 Climate

All relevant legislation and policy in relation to climate is outlined below.

10.3.1 Climate Change and Greenhouse Gases

Although variation in climate is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing us today and is primarily the result of increased levels of greenhouse gases in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels in energy use. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

10.3.1.1 Greenhouse Gas Emission Targets

Ireland is a Party to the Kyoto Protocol, which is an international agreement that sets limitations and reduction targets for greenhouse gases for developed countries. It is a protocol to the United Nations Framework for the Convention on Climate Change. The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, are now binding.

Under the Kyoto Protocol, the EU agreed to achieve a significant reduction in total greenhouse gas emissions in the period 2008 to 2012. These EU emission targets are legally binding in Ireland. Ireland's contribution to the EU commitment for the period 2008 – 2012 was to limit its greenhouse gas emissions to no more than 13% above 1990 levels.

10.3.1.2 Doha Amendment to the Kyoto Protocol

In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialised countries and the European Community committed to reduce GHG emissions to an average of 5% below 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18% below 1990 levels in the eight-year period from 2013 to 2020. The composition of Parties in the second commitment period is different from the first; however, Ireland and the EU signed up to both the first and second commitment periods.

Under the protocol, countries must meet their targets primarily through national measures, although market-based mechanisms (such as international emissions trading) can also be utilised.

10.3.1.3 COP21 Paris Agreement

COP21 was the 21st session of the Conference of the Parties (COP) to the United Nations Convention. Every year since 1995, the COP has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments. COP21 was organised by the United Nations in Paris and held from 30th November to 12th December 2015.

COP21 closed on 12th December 2015 with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C. It is flexible and takes into account the needs and capacities of each country. It is balanced as regards adaptation and mitigation, and durable, with a periodical ratcheting-up of ambitions.

10.3.1.4 COP25 Climate Change Conference- Madrid

The 25th United Nations Climate Change conference COP25 was held in Madrid and ran from December 2nd to December 13th, 2019. While largely regarded as an unsuccessful conference, the European Union launched its most ambitious plan, 'The European Green New Deal' which aims to lower CO_2 emissions to zero by 2050. The deal includes proposals to reduce emissions from the transport, agriculture and energy sectors and will affect the technology chemicals, textiles, cement, and steel industries. Measures such as fines and pay-outs by member states who rely on coal power will be in place to encourage the switch to renewable clean energies such as wind. On the 4th of March 2020, the European Commission put forward the proposal for a European climate law. This aims to establish the framework for achieving EU climate neutrality. It aims to provide a direction by setting a pathway to climate neutrality and to this end, aims to set in legislation the EU's 2050 climate-neutrality objective.

10.3.1.5 COP27 Climate Change Conference - Sharm El-Sheikh

COP27 took place in Sharm el-Sheikh from the 6th of November 2022 to the 20th of November. The Conference of the Parties (COP) is a supreme decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC).

The three major topics of COP27 were:

a) Closing the emissions gap to keep 1.5°C alive
b) Loss and damage
c) Climate finance

The summit took place a year after its precedent COP26 summit in Glasgow, Scotland. In Glasgow, the final agreement was delayed due to the stance of China and India, among others, who were not comfortable with the 'phase out' of coal wording in the draft text. This led to the watering down of this commitment to a 'phase down' of coal use. The hope was that COP27 would work to include further language on coal and fossil fuel reduction efforts and be matched by increased ambition and action to meet agreed pledges. Initial texts represented more serious language than used at COP26 in Glasgow, however, the published final text retains the language of Glasgow, phase down, which does not use any binding language to reduce use and is still only applicable to coal, not oil and gas.

There has been the setting of a workplan for 2023 to help articulate the nature and components of a global collective goal on adaptation and resilience, however in order to achieve this, more work needs to be done by countries, cities and organisations as currently, the numbers on the NDCs don't add up. Currently, no country has an NDC in place that is able to meet Paris Agreement goals, making net zero by 2050 difficult to envision and 2030 commitments near impossible.

10.3.1.6 United Nations Sustainable Development Goals Report 2022

Transforming our World: the 2030 Agenda for Sustainable Development which includes 17 Sustainable Development Goals (SDGs) and 169 targets was adopted by all UN Member States at a UN summit held in New York in 2015. The agenda is universally applicable with all countries having a shared responsibility to achieve the goals and targets which came into effect on January 1st, 2016. The goals and targets are to be actions over the 15-year period, are integrated and indivisible i.e., all must be implemented together by each Member State. On 7th July 2022, The United Nations published '*The Sustainable Development Goals Report 2022'* using current data, highlighting how the COVID-19 pandemic, the war in Ukraine and subsequent refugee crisis have hindered the achievements of the Sustainable Development Goals, especially in terms of climate action. The report stipulates that due to these unprecedent events, the severity and magnitude before humankind demands sweeping change not yet seen in human history.

The Sustainable Development Goals National Implementation Plan 2018-2020 was published by the Department of Communications, Climate Action & Environment in partnerships with OSI, Esri Ireland and the Central Statistics Office. The Plan sets out how Ireland will work to achieve the goals and targets of the Agenda for Sustainable Development both domestically and internationally. Relevant SDGs and how they are implemented into Irish National plans and policies can be found in Table 10-9. It should be noted that the Department (now the Department of the Environment, Climate and Communications) published the draft of the Second National Implementation Plan for the SDG Goals 2022-2024 on the 13th May 2022. It will set out arrangements for interdepartmental coordination, stakeholder engagement and actions needed for further SDG Implementation.

Table 10-9 United Nations Sustainable Development Goals adopted in 2015. https://sustainabledevelopment.un.org/sdgs

SDG	Targets	International Progress/ downfalls to Date (2022)	Relevant National Policy
SDG 7 Affordable and Clean Energy: *Ensure access to affordable, reliable, sustainable and modern energy for all*	› By 2030, ensure universal access to affordable, reliable and modern energy services › By 2030, increase substantially the share of renewable energy in the global energy mix › By 2030, double the global rate of improvement in energy efficiency › By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	Total renewable energy consumption increased by a quarter between 2010 and 2019, but the share of renewables in total final energy consumption is only 17.7% (2019). International financial flows to developing countries for renewables declined for a second year in a row. Progress in energy efficiency needs to accelerate to achieve global climate goals. As annual energy-intensity improvement rates were 1.9% from 2010 to 2019 but an improvement of 3.2% is required by 2030.	*Ireland's Transition to a Low Carbon Energy Future 2015-2030* *Strategy to Combat Energy Poverty in Ireland* *Ireland's Transition to a Low Carbon Energy Future 2015- 2030* *National Mitigation Plan* *National Energy Efficiency Action Plan for Ireland # 4 2017-2020* *Better Energy Programme* *One World, One Future*

SDG	Targets	International Progress/ downfalls to Date (2022)	Relevant National Policy
	- By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support		*The Global Island* *Economic Recovery Plan* *Project Ireland 2040: National Planning Framework* *Project 2040: National Development Plan 2021-2030*
SDG 12 Responsible Consumption and production: *Ensure sustainable consumption and production patterns*	Unsustainable patterns of consumption and production are the root cause of triple planetary crisis: 1) Climate Change 2) Biodiversity Loss 3) Pollution By 2030, achieve the sustainable management and efficient use of natural resources. Promote public procurement practices that are sustainable, in accordance with national policies and priorities.	Reliance on natural resources increasing; rising over 65% globally from 2000 to 2019.	*Waste Action Plan for a Circular Economy*
SDG 13 Climate Action: *Take urgent action to combat climate change and its impacts** **Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the*	- Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries - Integrate climate change measures into national policies, strategies and planning - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of	As of March 2020, 189 parties had ratified the Paris Agreement. Parties to the Paris Agreement are expected to prepare, communicate and maintain successive nationally determined contributions, and 186 parties had communicated their first nationally determined contributions to the secretariat of the United Nations Framework Convention on Climate Change, while three parties had communicated its	*National Adaptation Framework* *Building on Recovery: Infrastructure and Capital Investment 2016-2021* *National Mitigation Plan* *National Biodiversity Action Plan 2017-2021* *National Policy Position on Climate*

SDG	Targets	International Progress/ downfalls to Date (2022)	Relevant National Policy
global response to climate change.	mobilising jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	second. Under the Agreement, all parties are required to submit new nationally determined contributions, containing revised and much more ambitious targets, by 2020. Climate finance falls short of $100 billion yearly commitment. Developed countries provided $79.6 billion in climate finance in 2019. Energy-related CO_2 emissions increased 6% in 2021, reaching highest level ever. In 2021, the global mean temperature was about 1.11 ± 0.13 °C above pre-industrial level (from 1850 to 1900), making it one of the seven warmest years on record (2015-2021). In 2020, concentrations of global greenhouse gases reached new highs, and real-time data point to continued increases. In 2020, social and economic disruptions caused by COVID-19 lowered energy demand around the world. As a result, global carbon dioxide (CO_2) emissions declined by 5.2 per cent in 2020 – the equivalent of almost 2 billion metric tons, the largest decline ever and almost five times greater than the 2009 drop following the global financial crisis. But it was only a temporary reprieve. With the phasing out of COVID-related restrictions, demand for coal, oil and gas increased.	*Action and Low Carbon Development* *Project 2040: National Development Plan 2021-2030*

SDG	Targets	International Progress/ downfalls to Date (2022)	Relevant National Policy
		Consequently, energy-related CO_2 emissions for 2021 rose by 6 per cent, reaching their highest level ever and completely wiping out the pandemic-related reduction seen in 2020. The Economic Co-Operation and Development (OECD)estimates that developed countries climate budget of $100 billion will not be met until 2023. While the $100 billion annual commitment is considered the bedrock of international climate finance, it is far below estimates put forth by the IPCC. The IPCC has estimated that $1.6 trillion to $3.8 trillion will be needed each year through 2050 for the world to transition to a low-carbon future and avoid warming exceeding 1.5 °C. As of December 2019, 81 countries are seeking support from the Green Climate Fund for national adaptation plans and other adaptation planning processes, with a combined value of $203.8 million.	

10.3.1.7 Climate Change Performance Index

Established in 2005, 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 2023 CCPI was published in November 2022. While the CCPI 2023 indicated signs of potential reductions in global emissions, no country achieved its Paris Climate targets and therefore the first three places of the ranking system remain unoccupied.

Ireland, ranked 46th in 2022, has climbed 9 places to 37th for 2023, however still remains as a "low" performer in international performance. Ireland still remains at "very low" on the Greenhouse Gas Emissions ratings at 47th in the world and is one of the only two EU countries, along with Poland, to receive a "very low" performance rating. However, in the Renewable Energy rating table, Ireland is placed 23rd in the rankings in the "Medium" category.

10.3.1.8 Programme for Government

The Programme for Government was published in October 2020 and last updated April 2021. In relation to climate change the programme recognises that the next ten years are a critical period in addressing the climate crisis. It is an ambition of the programme to more than halve carbon emissions over the course of the decade (2020-2030). The programme notes that the government are committed to reducing greenhouse gas emissions by an average 7% per annum over the next decade in a push to achieve a net zero emissions by the year 2050. The programme also recognises the severity of the climate challenge as it clarifies that:

> *"Climate change is the single greatest threat facing humanity"*

10.3.1.9 Climate Action and Low Carbon Development (Amendment) Act 2021

The Climate Action and Low Carbon (Amendment) Act 2021 is a piece of legislation which commits the country to move to a climate resilient and climate neutral economy by 2050. This was passed into law in July 2021.

The Programme for Government has committed to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieve net zero emissions by 2050. This Act will manage the implementation of a suite of policies to assist in achieving this target.

The Act includes the following key elements, among others:

- Places on a statutory basis a 'national climate objective', which commits to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy.
- Embeds the process of carbon budgeting into law, Government are required to adopt a series of economy-wide five-year carbon budgets, including sectoral targets for each relevant sector, on a rolling 15-year basis, starting in 2021.
- Actions for each sector will be detailed in the Climate Action Plan, updated annually.
- A National Long Term Climate Action Strategy will be prepared every five years.
- Government Ministers will be responsible for achieving the legally binding targets for their own sectoral area with each Minister accounting for their performance towards sectoral targets and actions before an Oireachtas Committee each year.
- Strengthens the role of the Climate Change Advisory Council, tasking it with proposing carbon budgets to the Minister.

Provides that the first two five-year carbon budgets proposed by the Climate Change Advisory Council should equate to a total reduction of 51% emissions over the period to 2030, in line with the Programme for Government commitment.

10.3.1.10 Climate Change Advisory Council 2022

The Climate Change Advisory Council (CCAC) was established on 18th January 2016 under the Climate Action and Low Carbon Development Act 2015. The CCAC aims to provide independent evidence-based advice and recommendations on policy to support Ireland's Just Transition to a biodiversity-rich, environmentally sustainable, climate-neutral, and resilient society. This annual review assesses the progress of Ireland's national climate goals in 2021- the first year of the Carbon Budget 2021-2025 and its structure reflects the delineation of the Carbon Budget 2021-2030 into sectoral ceilings. The report highlights that there is a need for significant increase of existing and planned actions and to identify, quantify, resource, and implement further measures to ensure Irelands on track with its carbon budgets.

In July 2022, the government agreed to a target of 75% emission reductions by 2030, relative to 2018, for the electricity sector. The reports main 2030 target for the electricity sector is to increase renewable electricity to up to 80%, encompassing up to 8GW onshore wind capacity, at least 5GW offshore wind capacity and between 1.5 and 2.5 GW solar PV capacity supported by a range of actions.

10.3.1.11 Carbon Budgets

The first national carbon budget programme proposed by the Climate Change Advisory Council, approved by Government and adopted by both Houses of the Oireachtas in April 2022 comprises three successive 5-year carbon budgets. The total emissions allowed under each budget are shown in Table 10-10.

Table 10-10 Proposed Carbon Budgets of the Climate Change Advisory Council

	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2	2031 – 2035 Provisional Carbon Budget 3
	All Gases		
Carbon Budget (Mt CO_2eq)	295	200	151
Annual Average Percentage Change in Emissions	-4.8%	-8.3%	-3.5%
The figures are consistent with emissions in 2018 of 68.3 Mt CO_2eq reducing to 33.5 Mt CO_2eq in 2030 thus allowing compliance with the 51% emissions reduction target by 2030			

10.3.1.12 Sectoral Emissions Ceilings

The Sectoral Emissions Ceilings were launched in September 2022. The objective of the initiative is to inform on the total amount of permitted greenhouse gas emissions that each sector of the Irish economy can produce during a specific time period. The Sectoral Emissions Ceilings alongside the annual published Climate Action Plan provide a detailed plan for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030.

Section C of the Climate Action and Low Carbon Development (Amendment) Act 2021 provides the minister with a method of preparing the Sectoral Emissions Ceiling within the bounds of the carbon budget. The Sectoral Emission Ceilings for each 5-year carbon budget period was approved by the government on the 28th July 2022 and are shown in Table 10-11 below.

Table 10-11 Sectoral Emission Ceilings 2022

	Sectoral Emission Ceilings for each 5-year carbon budget period (MtCO2eq.)	
Sector	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2
Electricity	40	20
Transport	54	37

	Sectoral Emission Ceilings for each 5-year carbon budget period (MtCO2eq.)	
Sector	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2
Built Environment-Residential	29	23
Built Environment-Commercial	7	5
Industry	30	24
Agriculture	106	96
LULUCF[1]	Yet to be determined	Yet to be determined
Other (F-Gases, Waste & Petroleum refining)	9	8
Unallocated Savings		*-26*
Total[2]	Yet to be determined	Yet to be determined
Legally binding Carbon budgets and 2030 Emission Reduction Targets	295	200

[1] Finalising the Sectoral Emissions Ceiling for the land-use, Land-use Change and Forestry (LULUCF) sector has been deferred for up to 18 months to allow for the completion of the Land-use Strategy
[2]Once LULUCF sector figures are finalised, total figures will be available.

10.3.1.13 Climate Action Plan 2023

The Climate Action Plan 2023 (CAP 2023) was launched in December 2022. Following on from Climate Action Plans 2019 and 2021, CAP 2023 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 following 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.* CAP 2023 sets out indicative ranges of emissions reductions for each sector of the economy.

There have been Six Vital High Impact Sectors identified within CAP 2023 and these are as follows:

Powering Renewables – 75% Reduction in emissions by 2030

We will facilitate a large-scale deployment of renewables that will be critical to decarbonising the power sector as well as enabling the electrification of other technologies.

- Accelerate the delivery of onshore wind, offshore wind, and solar.
- Dial up to 9 GW onshore wind, 8 GW solar, and at least 7 GW of offshore wind by 2030 (with 2 GW earmarked for green hydrogen production).
- Support at least 500 MW of local community-based renewable energy projects and increased levels of new micro-generation and small-scale generation.
- Phase out and end the use of coal and peat in electricity generation.
- 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.

Building Better – 45% (Commercial/Public) and 40% (Residential) Reduction in Emissions by 2030

We will increase the energy efficiency of existing buildings, put in place policies to deliver zero-emissions new builds and continue to ramp up our retrofitting programme.

- Ramp up retrofitting to 120,000 dwellings to BER B2 by 2025, jumping to 500,000 by 2030.
- Put heat pumps into 45,000 existing and 170,000 new dwellings by 2025, up to 400,000 existing and 280,000 new dwellings by 2030.
- Generation up to 0.8 TWh of district heating by 2025 and up to 2.5 TWh by 2030.

Turning Transport Around – 50% Reduction in Emissions by 2030

We will drive policies to reduce transport emissions by improving our town, cities and rural planning, and by adopting the Avoid-Shift-Improve approach: reducing or avoiding the need for travel, shifting to public transport, walking and cycling and improving the energy efficiency of vehicles.

- Change the way we use our road space.
- Reduce the total distance driven across all car journeys by 20%.
- Walking, cycling and public transport to account for 50% of our journeys.
- Nearly 1 in 3 private cars will be an Electric Vehicle.
- Increase walking and cycling networks.
- 70% of people in rural Ireland will have buses that provide at least 3 trips to the nearby town daily by 2030.

Making Family Farms More Sustainable – 25% Reduction in Emissions by 2030

We will support farmers to continue to produce world class, safe and nutritious food while also seeking to diversify income through tillage, energy generation and forestry.

- Significantly reduce our use of chemical nitrogen as a fertilizer.
- Increase uptake of protected urea on grassland farms to 90-100%.
- Increase organic farming to up to 450,000 hectares, the area of tillage to up to 400,000 ha.
- Expand the indigenous biomethane sector through anaerobic digestion, reaching up to 5.7TWh of biomethane.
- Contribute to delivery of the land use targets for afforestation and reduced management intensity of organic soils.

Greening Business and Enterprise – 35% Reduction in Emissions by 2030

We're changing how we produce, consume, and design our goods and services by breaking the link between fossil fuels and economic progress. Decarbonising industry and enterprise is key to Ireland's economy and future competitiveness.

- Reduce clinker content in cement and substitute products with lower carbon content for construction materials, ensuring 35% reduction in emissions by 2030 (against 2018).
- Reduce fossil fuel use from 64% of final consumption (2021) to 45% by 2025 and further by 2030.
- Increase total share of heating to carbon neutral to 50-55% by 2025, up to 70-75% by 2030.
- Significantly grow the circular economy and bioeconomy

Changing Our Land-Use - Exact reduction target for this sector is yet to be determined.

The first phase of the land use review will tell us how we are using our land now. Then, we can map, with evidence, how it can be used most effectively to capture and store carbon and to produce better, greener food and energy.

- Increase our annual afforestation rates to 8,000 hectares per annum from 2023 onwards.
- Rethink our Forestry Programme and Vision.

- Promote forest management initiatives in both public and private forests to increase carbon sinks and stores.
- Improve carbon sequestration of 450,000 ha of grasslands on mineral soils and reduce the management intensity of grasslands on 80,000 ha of drained organic soils.
- Rehabilitate 77,600 hectares of peatlands

10.3.1.14 Emissions Projections

In its approach to decarbonising, the EU has split greenhouse gas (GHG) emissions into two categories, the Emissions Trading System (ETS) and the non-ETS. Emissions from electricity generation and large industry in the ETS are subject to EU-wide targets which require that emissions from these sectors be reduced by 43% by 2030, relative to 2005 levels. Within the ETS, participants are required to purchase allowances for every tonne of emissions, with the amount of these allowances declining over time to ensure the required reduction of 43% in GHG emissions is achieved at EU-level[5].

Emissions from all other sectors, including agriculture, transport, buildings, and light industry are covered by the EU Effort Sharing Regulation (ERS[6]). This established binding annual GHG emission targets for Member States for the period 2021–2030. Ireland is required to reduce its emissions from these sectors by 30% by 2030, relative to 2005 levels. Under the EU Green Deal, the targets for the ETS and non-ETS sectors will be revised upwards in order to achieve the commitment, at EU level, to reach an economy-wide 2030 reduction in emissions of at least 55%, compared to 1990 levels[1].

The Environmental Protection Agency (EPA) publish Ireland's Greenhouse Gas Emission Projections and at the time of writing, the most recent report, *'Ireland's Greenhouse Gas Emissions Projections 2021–2040'* was published in June 2022. The report includes an assessment of Ireland's progress towards achieving its emission reduction targets out to 2030 set under the Effort Sharing Regulation (ESR).

The EPA has produced two scenarios in preparing these greenhouse gas emissions projections: a "With Existing Measures" (WEM) scenario and a "With Additional Measures" (WAM) scenario. These scenarios forecast Irelands greenhouse gas emissions in different ways. The WEM scenario assumes that no additional policies and measures, beyond those already in place by the end of 2020. This is the cut off point for which the latest national greenhouse gas emission inventory data is available, known as the 'base year' for projections. The WAM scenario has a higher level of ambition and includes government policies and measures to reduce emissions such as those in Ireland's Climate Action Plan 2021.

The EPA Emission Projections Update notes the following key trends:

- Under the With Existing Measures scenario, the projections indicate that Ireland will cumulatively exceed its ESR emissions allocation of 384.3 Mt CO2 eq by 78.3 Mt CO2 eq over the 2021-2030 period without the use of flexibilities. If both the LULUCF and ETS flexibilities are used the exceedance will reduce to 52.3 Mt CO2 eq.
- Under the With Additional Measures scenario, the projections indicate that Ireland will cumulatively exceed the ESR emissions allocation by 24.2 Mt CO2 eq over the 2021-2030 period.
- The projections show that Ireland can achieve compliance under the ESR (in the With Additional Measures scenario) – using both flexibilities but only with implementation of the Climate Action Plan 2021. Using both flexibilities gives a surplus under the ESR of only 1.6 Mt CO2 eq, this is a small amount of headroom and only highlights the need for full and rapid implementation of policies and measures in the Climate Action Plan 2021. (now Climate Action Plan 2023)

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[5] Government of Ireland (2023) - Climate Action Plan 2023 https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

[6] Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance)

10.3.2 Climate and Weather in the Existing Environment

Ireland has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Belmullet, Co. Mayo, is the nearest weather and climate monitoring station to the Proposed Development site that has meteorological data recorded for the 30-year period from 1981-2010. The monitoring station is located approximately 34.7 kilometres northwest of the site. Meteorological data recorded at Belmullet over the 30-year period from 1981 - 2010 is shown in Table 10-12 overleaf. The wettest months are October and December, and May is usually the driest. August is the warmest month with a mean daily temperature of 17.8° Celsius.

Recent monthly meteorological data recorded at Belmullet from January 2020 to January 2022 is available at: https://www.met.ie/climate/available-data/monthly-data. February 2020 was the wettest month in this time period, with 241.9 mm of rainfall recorded, while April 2020 was the driest month with 23.6 mm of rainfall. August 2022 was the warmest month in this time period, with a mean monthly temperature of 15.8° Celsius. January 2021 was the coldest month with a mean monthly temperature of 5.5° Celsius.

Table 10-12 Data from Met Éireann Weather Station at Belmullet, 1981 to 2010: Monthly and Annual Mean and Extreme Values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
Mean daily max	8.9	9.1	10.4	12.2	14.6	16.2	17.6	17.8	16.5	13.7	11.0	9.2	13.1
Mean daily min	3.7	3.6	4.7	5.8	7.9	10.4	12.2	12.2	10.7	8.4	6.0	4.2	7.5
Mean temperature	6.3	6.4	7.6	9.0	11.2	13.3	14.9	15.0	13.6	11.1	8.5	6.7	10.3
Absolute max.	13.9	15.1	19.5	24.4	26.6	27.0	29.9	27.7	25.4	20.1	16.3	14.9	29.9
Absolute Min.	-8.1	-5.4	-5.7	-2.1	0.2	1.4	5.1	3.1	0.8	-1.7	-4.5	-7.6	-8.1
Mean No. of Days with Air Frost	4.0	3.8	1.2	0.4	0.0	0.0	0.0	0.0	0.0	0.1	1.1	3.5	14.1
Mean No. of Days with Ground Frost	10.6	10.0	6.5	5.4	1.7	0.1	0.0	0.0	0.4	2.0	5.6	10.0	52.3
RELATIVE HUMIDITY (%)													
Mean at 0900UTC	86.0	85.8	84.1	81.1	78.7	81.4	84.9	85.1	84.5	85.7	86.1	86.8	84.2
Mean at 1500UTC	81.7	79.1	77.5	73.7	73.3	77.2	79.7	79.2	77.9	80.0	82.3	84.3	78.8
SUNSHINE (Hours)													
Mean daily duration	1.4	2.3	3.1	5.2	6.1	5.2	4.4	4.4	4.0	2.8	1.6	1.2	3.5
Greatest daily duration	8.3	9.6	11.6	14.1	15.5	15.9	15.1	13.9	12.1	10.4	8.2	7.2	15.9
Mean no. of days with no sun	10.3	6.0	5.9	2.7	2.0	2.8	3.5	3.2	3.7	5.5	8.3	10.8	64.8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
RAINFALL (mm)													
Mean monthly total	134.0	97.1	99.2	72.0	70.4	72.1	79.0	101.9	101.8	145.9	134.0	137.4	1244.8
Greatest daily total	44.7	31.3	25.6	25.9	42.2	38.9	33.2	49.5	62.6	79.6	43.0	41.7	79.6
Mean num. of days with >= 0.2mm	23	20	22	18	17	17	20	20	20	23	23	23	246
Mean num. of days with >= 1.0mm	19	16	17	13	13	12	14	15	15	19	20	19	192
Mean num. of days with >= 5.0mm	10	7	7	4	4	4	5	6	6	10	10	9	82
WIND (knots)													
Mean monthly speed	15.4	14.6	14.0	12.2	11.6	11.4	11.1	11.2	12.0	13.3	13.3	13.8	12.8
Max. gust	94	93	88	75	66	63	67	56	73	73	80	93	94
Max. mean 10-minute speed	55	60	58	43	42	45	45	40	50	52	47	59	60
Mean num. of days with gales	7.0	4.8	3.1	1.4	0.9	0.2	0.2	0.4	1.5	2.6	3.1	4.4	29.6
WEATHER (Mean No. of Days With:)													
Snow or sleet	4.5	4.2	3.1	1.4	0.1	0.0	0.0	0.0	0.0	0.0	0.9	3.0	17.3
Snow lying at 0900UTC	0.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	1.6
Hail	9.2	7.8	7.4	4.4	1.7	0.1	0.0	0.1	0.5	3.3	5.6	7.5	47.7
Thunder	1.1	0.7	0.6	0.4	0.5	0.5	0.6	0.6	0.3	0.6	0.5	0.9	7.2
Fog	1.0	0.4	0.9	1.4	1.4	1.7	2.9	1.9	1.2	0.7	0.9	0.7	15.1

10.3.3 Calculating Carbon Losses and Savings from the Proposed Development

10.3.3.1 Background

In addition to the combustion of fossil fuels, greenhouse gases are also released through natural processes such as the decomposition of organic material (which is composed of carbon). Bogs and peatlands are known to store large amounts of carbon. Due to the waterlogged nature of these habitats, stored carbon is not broken down and released into the atmosphere. The construction of wind farms on bog and peat habitats may affect the natural hydrological regime, thus exposing and drying out the peat and allowing the decomposition of carbon. It is necessary therefore to demonstrate that any wind farm constructed on such sites saves more carbon than is released. The site of the Proposed Development is situated on peatland with the majority of the site covered by commercial forestry plantation. For this reason, the carbon balance between the use of renewable energy and the loss of carbon stored in the peat is assessed in this section of the EIAR.

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 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 saves more CO_2 than is released.

10.3.3.2 Methodology for Calculating Losses

A methodology was published in June 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 transparent and easy to follow method for estimating the impacts of wind farms on the carbon dynamics of peatlands. 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.

Although the loss of carbon fixing potential from plants on peat land is not substantial, it is nonetheless calculated for areas from which peat is removed and the areas affected by drainage. This calculation can take account of the annual gains due to the carbon fixing potential of the peat land and the time required for any habitat restoration. The carbon sequestered in the peat itself represents a much more substantial potential source of carbon loss. During wind farm construction, carbon is lost as a result of peat excavation and peat drainage. The amount of carbon lost is estimated using default values from the Intergovernmental Panel on Climate Change (IPCC, 1997) as well as by more site-specific equations derived from the scientific literature. Carbon gains due to habitat improvement and site restoration are calculated in a similar fashion.

Peatlands are essentially unbalanced systems. When flooded, peat soils emit less carbon dioxide but more methane than when drained. In waterlogged soils, carbon dioxide emissions are usually exceeded by plant fixation, so the net exchange of carbon with the atmosphere is negative and soil carbon stocks increase. When soils are aerated, carbon emissions usually exceed plant fixation, so the net exchange of carbon with the atmosphere is positive. In order to calculate the carbon emissions resulting from the removal or drainage of the peat, the Macauley Institute method accounts for emissions occurring if the peat had been left in-situ and subtracts these from the emissions occurring after removal and drainage.

The Macauley Institute methodology states that the total volume of peat impacted by the construction of the wind farm is strongly correlated to the extent of the peatland affected by drainage at the site.

The drainage of peat soils leads to continual loss of soil carbon until a new steady state is reached, when inputs are approximately equal to losses. For peats, this steady state approximates 0% carbon, so 100% carbon loss from drained peats is assumed if the site is not restored after decommissioning of the wind farm. The amount of carbon lost is calculated on the basis of the annual emissions of methane and carbon dioxide, the area of drained peat, and the time until the site is restored. In the case of the Proposed Development site, the model has been prepared on the basis that restoration will not occur upon decommissioning of the wind farm (i.e. site roads and hardstands will be left in situ). Refer to Appendix 4-7 of the EIAR for details in relation to decommissioning.

The effects of drainage may also reduce dissolved and particulate organic carbon retention within the peat. Losses of carbon dioxide due to leaching of dissolved and particulate organic carbon are calculated as a proportion of the gaseous losses of carbon from the peat. The Macauley Institute method assumes that published good practice is employed in relation to avoiding the risk of peat landslides. This is certainly the case in respect of the Proposed Development, which has been the subject of a peat stability risk assessment, as described in the *Geotechnical and Peat Stability Assessment Report* in Appendix 8-1 of this EIAR.

Clear-felling of existing forestry surrounding turbine locations is necessary to allow for the construction of the Proposed Development footprint and the erection of the wind turbines, and to protect local bat populations. Forestry may be felled earlier than originally planned due to the wind farm development, so limiting the nature and longevity of the resulting timber produced. If a forestry plantation was due to be felled with no plan to replant, the effect of the land use change is not attributable to the wind farm development and is omitted from the calculation. If, however, the forestry is felled for the development as is the case for this project, the effects are judged to be attributable to the wind farm development. 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. Alterations in soil carbon levels following felling are calculated using the equations for drainage and site restoration already described.

10.3.3.3 Calculating Carbon Losses and Savings

10.3.3.3.1 Carbon Losses

The Scottish Government on-line carbon calculator as outlined in the sections above, was used to assess the impacts of the Proposed Development in terms of potential carbon losses and savings taking into account peat removal, drainage, habitat improvement, forestry felling and site restoration.

A copy of the outputs is provided as Appendix 10-1 of this EIAR. Where available and relevant, site-specific information was inserted into the worksheet. Otherwise, default values were used.

The worksheet was pre-loaded with information specific to the CO_2 emissions from the United Kingdom's electricity generation plant, which is used to calculate emissions savings from Proposed Development projects in the UK. Similar data to that used in the worksheet to calculate the CO_2 emissions from the

UK electricity generation plant, was not available for the Irish electricity generation plant, and so the CO_2 emissions savings from the Proposed Development were calculated separately from the worksheet.

The main CO_2 losses due to the Proposed Development are summarised in Table 10-13

Table 10-13 CO_2 losses from the Proposed Development

Origin of Losses	CO_2 Losses (tonnes CO_2 equivalent)
Losses due to turbine life (e.g. due to production, transportation, erection, operation and dismantling of the wind farm)	139,996
Losses due to backup (i.e. electricity obtained from fossil fuel source to stabilise electricity supply to the national grid)	104,305
Losses due to reduced carbon fixing potential	3,529
Losses from soil organic matter and due to leaching of dissolved and particulate organic carbon (CO2 loss from removed and drained peat)	91,374
Losses due to felling forestry	54,054
Total	**393,259**

The worksheet model calculates that the Proposed Development is expected give rise to 393,259 tonnes of CO_2 equivalent losses over its 35-year life. Of this total figure, the proposed wind turbines directly account for 139,996 tonnes, or 36%. Losses due to backup account for 104,305 tonnes, or 26.5%. Losses from soil organic matter, reduced carbon fixing potential and the felling of forestry accounting for the remaining 37.5% or 148,957 tonnes. The figure of 148,957 tonnes of CO_2 arising from ground activities associated with the Proposed Development is calculated based on the entire development footprint being "Acid Bog", as this is one of only two choices the model allows (the other being Fen). The habitat that will be impacted by the development footprint comprises predominantly commercial forestry rather than the acid bog assumed by the model that gives rise to the 148.957 tonnes and therefore the actual CO_2 losses are expected to be lower than this value.

The model was used to calculate the CO_2 losses from the wind farm on the basis that the hydrology and habitats of the site are not to be restored upon decommissioning. However, at the end of the 35 year lifespan of the Proposed Development, the turbines may be replaced with newer models and therefore the carbon losses associated with not restoring the site habitats or hydrology would be further offset by the carbon-neutral renewable energy that the new turbines would generate.

10.3.3.3.2 Carbon Savings

According to the model described above, the Proposed Development will give rise to total losses of 393,259 tonnes of carbon dioxide.

A simple formula can be used to calculate carbon dioxide emissions reductions resulting from the generation of electricity from wind power rather than from carbon-based fuels such as peat, coal, gas and oil. The formula is:

$$CO_2 \text{ (in tonnes)} = \frac{(A \times B \times C \times D)}{1000}$$

where: A = The rated capacity of the wind energy development in MW

B = The capacity or load factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc.

C = The number of hours in a year

D = Carbon load in grams per kWh (kilowatt hour) of electricity generated and distributed via the national grid.

For the purposes of this calculation, the maximum rated capacity of the Proposed Development is assumed to be approximately 189 MW. The minimum rated capacity of the Proposed Development is assumed to be approximately 126MW.

A load factor of 0.35 (or 35%) has been used for the Proposed Development.

The number of hours in a year is 8,760.

A conservative figure for the carbon load of electricity generated by natural gas in Ireland was source from Sustainable Energy Authority Ireland's (SEAI) February 2020 report, '*Energy-Related CO_2 Emissions in Ireland 2005-2018.*' The emission factor for electricity generated by natural gas in Ireland in 2018 was 366 g CO_2/kWh.

The calculation for carbon savings is therefore as follows:

$$CO2 \text{ (in tonnes)} = \frac{(189 \times 0.35 \times 8{,}760 \times 366)}{1000}$$

$$= 212{,}087 \text{ tonnes per annum}$$

Based on this calculation, approximately 212,087 tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Development. Over the proposed 35-year lifetime of the wind farm, therefore, **7,423,045** tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.

As noted previously areas cleared of forestry for the Proposed Development will be replaced by replanting at alternatives sites. A total of 117 hectares of new forestry will be replanted at alternative sites to compensate the loss of forestry at the development site. Given that losses due to felling forestry account for 54,054 tonnes of CO_2, it has been assumed for the purposes of this calculation that the same quantity of CO_2 can be saved by replanting forestry at alternative sites.

Based on the Scottish Government carbon calculator as presented above 393,259 tonnes of CO_2 will be lost to the atmosphere due to changes in the peat environment and due to the construction and operation of the Proposed Development. This represents 5.2% of the total amount of carbon dioxide emissions that will be offset by the Proposed Development project. The 393,259 tonnes of CO_2 that will be lost to the atmosphere due to changes in the peat environment and due to the construction and operation of the Proposed Development will be offset by the Proposed Development in approximately **22 months** of operation.

The above calculation is based on the proposed maximum output capacity of the Proposed Development, which is 189 MW. Should the export capacity of the Proposed Development be 126 MW (i.e. the proposed minimum output capacity) it is estimated that approximately 141,391 tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Development. Over the proposed 35-year lifetime of the wind farm, therefore, 4,948,685 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. In this scenario, the CO_2 that will be lost to the atmosphere due to changes in the peat environment and due to the construction and operation of the Proposed Development will be offset by the Proposed Development in approximately **33 months** of operation.

10.3.4 Likely Significant Effects and Associated Mitigation Measures

10.3.4.1 'Do-Nothing' Effect

If the Proposed Development were not to proceed, greenhouse gas emissions associated with construction vehicles and plant and the displacement of peat would not arise., carbon losses due to the construction of the Proposed Development would also not arise. However, the opportunity to significantly reduce greenhouse gas emissions such as carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2) to the atmosphere would be lost. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol and EU law would also be lost. This would be a long-term, moderate, negative impact.

10.3.4.2 Construction Phase

10.3.4.2.1 Greenhouse Gas Emissions

Turbines and Other Infrastructure

Microclimate

The construction of turbine foundations and hardstands, site roads, site entrances, anemometry mast and all associated infrastructure will require the operation of construction vehicles and plant on site. Greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with vehicles and plant will arise as a result of the construction activities. Small pockets of clear felling will be required across the site totalling approximately 117ha rather than one large single area. Therefore, there will be no direct or indirect impact on site temperature and microclimate due to this action. Furthermore, clear felling forms part of the cycle of commercial forestry and without the Proposed Development clear felling would occur as normal. The potential impact from the construction and felling activities will be slight, given the insignificant quantity of greenhouse gases that will be emitted, and will be restricted to the duration of the construction phase. Therefore, this is a short-term slight negative impact. Mitigation measures to reduce this impact are presented below.

Macroclimate

The construction of turbine foundations and all other wind farm associated infrastructure will require the operation of plant and machinery which will give rise to greenhouse gas emissions. Clear felling of forestry and the displacement of peat will also occur in the construction phase. Forestry clear felling would occur as normal if the Proposed Development were not to go ahead, as it forms part of the forestry management cycle. The construction phase and its associated activities will give rise to a short-term, slight, negative impact on the macroclimate.

Transport to and from Site

The transport of turbines to the site, which will occur on specified routes only (see Section 14.1 of this EIAR), and the transport of construction materials and workers will also give rise to greenhouse gas emissions associated with the transport vehicles. This constitutes a short-term slight negative impact in terms of air quality. Mitigation measures in relation to greenhouse gas emissions are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite. If a vehicle requires repairs this work will be caried out, thereby minimising any emissions that arise.
- Turbines components will be transported to the site on specified routes only, unless otherwise agreed with the Planning Authority.
- When stationary, delivery and on-site vehicles will be required to turn off engines.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum.
- The majority of aggregate materials for the construction of the Proposed Development will be obtained from the borrow pit on the site of the Proposed Development. This will significantly reduce the number of delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements.
- The Materials Recovery Facility (MRF) used during the construction of the Proposed Development will be located as close as practically possible to the site in order to reduce the amount of emissions associated with vehicle movements. Proposed Development

Residual Impact

Short-term Imperceptible Negative Impact on Climate as a result of greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects.

10.3.4.3 Operational Phase

10.3.4.3.1 Greenhouse Gas Emissions

The Proposed Development will generate energy from a renewable source. As demonstrated in Section 10.3.3 above, it is estimated that between 4,948,685 and 7,423,045 tonnes of carbon dioxide will be displaced over the proposed thirty-year lifetime of the wind farm. Thus, 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. This energy generated will offset energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a positive effect on climate. The Proposed Development will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Development. The proposed project will assist in reducing carbon dioxide (CO_2) emissions that would otherwise arise if the same energy that the Proposed Development will generate were otherwise to be generated by conventional fossil fuel plants. This is a Long-term moderate Positive impact.

Residual Impact

Long-term moderate positive impact on Climate as a result of reduced greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will long-term moderate positive effects.

10.3.4.4 Decommissioning Phase

Any impacts and consequential effects that occur during the decommissioning phase are similar to those which occur during the construction phase, albeit of less impact. The grid connection route will be left in the public roadway and the substation will remain in situ. The mitigation measures prescribed for the construction phase of the Proposed Development will be implemented during the decommissioning phase thereby minimising any potential impacts.

10.4 Cumulative Assessment

Potential cumulative effects on air quality and climate between the Proposed Development and other developments in the vicinity were also considered as part of this assessment. The developments considered as part of the cumulative effect assessment are described in Section 2.8 of this EIAR.

The nature of the Proposed Development is such that, once operational, it will have a long-term, moderate, positive impact on the air quality and climate.

During the construction phase of the Proposed Development and other developments within 20 kilometres of the wind farm site that are yet to be constructed, there will be minor emissions from construction plant and machinery, turbine components and construction material delivery vehicles and potential dust emissions associated with the construction activities. Should these developments be constructed simultaneously, there will be a short-term slight negative cumulative impact on air quality and climate due to vehicular and dust emissions.

Emissions of carbon dioxide (CO2), oxides of nitrogen (NOx), sulphur dioxide (SO2) or dust emissions during the operational phases of the Proposed Development and other developments, listed in Section 2.8 of Chapter 2, will be minimal, relating to the use of operation and maintenance vehicles onsite, and therefore there will be a long-term, imperceptible, negative cumulative impact on air quality and climate.

The nature of the Proposed Development and other wind 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.