10. AIR & CLIMATE

10.1 Introduction

10.1.1 Background

The site of the Proposed Development is located approximately 2.4 kilometres north of Coole village and approximately 6.7 kilometres to the southeast of the town of Castlepollard. The townlands in which the Proposed Development is located, are listed in Table 1-1 in Chapter 1 of this EIAR.

Where the Proposed Development is referenced this includes all elements of the project (15 no. turbines, access roads, onsite substation, borrow pit, temporary construction compound, forestry felling, 26km long underground grid connection route running from the wind farm site to Mullingar substation where upgrade works are proposed, and all associated works) and is shown in Figure 4-1.

The land-use on the proposed wind farm site is commercial peat harvesting, forestry, and low-intensity pastoral agriculture. The peat harvesting process comprises of four main operations, including breaking up of the surface layer with a tractor and harrow, turning of the loosened peat to facilitate drying, ridging and drawing, followed by stockpiling on site for subsequent transport offsite for processing. This EIAR assesses the potential for peat extraction works on the site to continue as a worst-case scenario. The Proposed Development has been designed to operate on this site both in conjunction with and independent of any peat extraction activities. Should peat extraction cease, a site rehabilitation plan will be required which would be likely to encourage revegetation of bare peat areas, with targeted active management being used to enhance re-vegetation and the creation of small wetland areas. Due to the small footprint of the Proposed Development in the context of the entirety of the commercial peat extraction area, a rehabilitation plan where required would take account of the wind farm infrastructure.

The land-use along the proposed underground grid connection route comprises public road, with a short section of underground cabling (approximately 660m) across commercial forestry at the northernmost end.

The existing land uses can continue in conjunction with this proposed use of the site.

The production of energy from wind turbines has no direct emissions as is expected from fossil fuel-based power stations. Harnessing more energy by means of wind farms 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.

10.1.2 Statement of Authority

This section of the EIAR has been prepared by Ellen Costello and reviewed by Eoin O'Sullivan and Michael Watson, of MKO. Ellen is an Environmental Scientist who joined the company in 2019 and has been involved in a number of wind energy EIAR applications. Ellen holds a BSc. in Earth Science and a MSc. in Climate Change: Integrated Environmental and Social Science Aspects where she focused on renewable energy development in Ireland and its implications on environment and society. Eoin is an experienced geo-environmental scientist and has over ten years' experience in the assessment of a wide range of energy and infrastructure related projects and working in the fields of environmental and human health risk assessment, waste management, waste policy and permitting. Eoin holds an MSc in Environmental Engineering and is a Chartered Member of the Chartered Institute of Water and Environmental Management (CWEM) and Chartered Environmentalist (CEnv) with the Society of Environment. Michael has over 19 years' experience in the environmental sector and had worked for

the Geological Survey of Ireland and then a prominent private environmental & hydrogeological consultancy prior to joining MKO in 2014. Michael completed an MA in Environmental Management at NUI, Maynooth in 1999. Michael is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv) and also has extensive experience in the preparation of air and climate assessments and reports for EIAs, particularly relating to wind energy.

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).
- A 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.

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), 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 $PM_{2.5}$ (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 PM_{10}) 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 PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ 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). 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: EPA)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	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
Nitrogen dioxide (NO_2)	Upper assessment threshold	1 hour	140	73	Not to be exceeded more than 18	1st Jan 2010

	for the protection of human health				times in a calendar year	
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 (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
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 for the protection of human health	24 hours	20	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 2.5 ($PM_{2.5}$)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020

Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	-	1st Jan 2005
Benzene (C_6H_6)	Protection of human health	Calendar Year	5	1.5	-	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	AOT_{40} 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	-

AOT40 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 Environmental Protection Agency (EPA) report '*Air Quality in Ireland 2019'* noted that in Ireland, the premature deaths attributable to poor air quality are estimated at 1,300 people per annum. A more recent European Environmental Agency (EEA) Report, '*Air Quality in Europe – 2019 Report'* highlights the negative effects of air pollution on human health. The report assessed that poor air quality accounted for premature deaths of approximately 412,000 people in Europe in 2016, 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 2016 were around 71,000 and 15,100 premature deaths per year, respectively. From this, 1,100 Irish deaths were attributable to fine particulate matter ($PM_{2.5}$), 50 Irish deaths were attributable to nitrogen oxides (NO_2) and 30 Irish deaths were attributable to Ozone (O_3) (Source: *Air Quality in Europe – 2019 Report',* EEA, 2019).

These emissions, along with others including sulphur oxides, carbon monoxide, benzene and lead are produced during fossil fuel-based electricity generation and traffic in various amounts, depending on the fuel and technology used. Whilst there is the potential of such emissions to be generated from the site operations, a number of mitigation measures will be implemented at this site to reduce the impact from dust and vehicle emissions, which are discussed in Sections 10.2.4 below.

10.2.2 Air Quality Zones

The Environmental Protection Agency (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 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 EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The ambient air quality monitoring carried out closest to the Proposed Development is at Mullingar, Co. Westmeath, located approximately 22 kilometres south of the proposed wind farm site. EPA air quality data is available for Mullingar in the report *'Ambient Air Monitoring at Mullingar, Co. Westmeath 16th October 2012 – 17th June 2014'*, as detailed below. This monitoring location lies within Zone C. Lower measurement values for all air quality parameters would be expected for the Proposed Development as it lies in a rural location, within Zone D.

The proposed replanting lands at Magheraboy, Ballaghdereen Co. Roscommon are also located within Zone D and are fully described in the Assessment of Replanting Lands report included as Appendix 4-6 of this EIAR. The report also assesses the potential effects of replanting on air quality and climate within the vicinity of the replanting land.

10.2.3.1 Sulphur Dioxide (SO_2)

Sulphur dioxide data for the 2012/2014 monitoring period in Mullingar is presented in Table 10-3. Neither the hourly limit value nor lower assessment threshold set out in the CAFE Directive were exceeded during the monitoring period. It would be expected that SO_2 values at the Proposed Development (Zone D) would be significantly lower than those recorded at the Mullingar monitoring site (Zone C).

Table 10-3 Sulphur Dioxide Data Mullingar October 2013 to June 2014

Parameter	Measurement
No. of hours	14,360
No. of measured values	14,117
Percentage Coverage	98%
Maximum hourly value	51.1 µg/m^3
98 percentile for hourly values	8.5 µg/m^3
Mean hourly value	2.5 µg/m^3
Maximum 24-hour value	31.7 µg/m^3
98 percentile for 24-hour value	6.8 µg/m^3

10.2.3.2 Particulate Matter (PM_{10})

Particulate matter (PM_{10}) data for the 2012/2014 monitoring period in Mullingar is presented in Table 10-4. The 24-hour limit value for the protection of human health (50 µg/m^3) was not exceeded during the measurement period. The upper assessment threshold (35 µg/m^3) was exceeded on fifteen days and the lower assessment threshold (25 µg/m^3) was exceeded on 48 days. The CAFE Directive

stipulates that these assessment thresholds should not be exceeded more than 35 times in a calendar year. The mean of the daily values during the measurement period is below the annual limit value for the protection of human health (40 µg/m^3). It would be expected that PM_{10} values at the Proposed Development (Zone D) would be significantly lower than those recorded at the Mullingar monitoring site (Zone C).

Table 10-4 Particulate Matter (PM10) Data Mullingar October 2013 to June 2014

Parameter	Measurement
No. of days	464
No. of measured values	464
Percentage Coverage	74.8%
Maximum daily value	47.7 µg/m^3
Mean daily value	13.6 µg/m^3

10.2.3.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide and oxides of nitrogen data for the 2012/2014 monitoring period in Mullingar are presented in Table 10-5. The CAFE Directive stipulates that this threshold should not be exceeded more than 18 times in a calendar year. The mean hourly value for the measurement period (5.6 µg/m^3) is below the annual average limit of 40 µg/m^3 and the lower assessment threshold of 26 µg/m^3. No exceedances of the assessment thresholds or limit values occurred during the monitoring programme.

Table 10-5 Nitrogen Dioxide and Oxides of Nitrogen, Mullingar October 2013 - May 2014

Parameter	Measurement
No. of hours	11,488
No. of measured values	8,133
Percentage Coverage	71%
Maximum hourly value (NO2)	67.9 µg/m^3
99.7 percentile for hourly values (NO2)	40.2 µg/m^3
Mean hourly value (NO2)	5.6 µg/m^3
Mean hourly value (NOx)	11.1 µg/m^3 NO2

10.2.3.4 Carbon Monoxide (CO)

Carbon monoxide data for the 2012/2014 monitoring period in Mullingar is presented in Table 10-6. The mean hourly concentration of carbon monoxide recorded was 0.3 mg/m^3. On no occasions were values in excess of the 10 mg/m^3 limit value set out in the CAFE Directive recorded.

Table 10-6 Carbon Monoxide Data Mullingar October 2013 to May 2014

Hourly Values	Result
No. of hours	14,222
No. of measured values	14,158
Percentage Coverage	100%
Maximum hourly value	2.5 mg/m^3
98 percentile for hourly values	0.7 mg/m^3
Mean hourly value	0.3 mg/m^3
Maximum 8-hour mean	0.3 mg/m^3
98 percentile for 8-hour mean	0.7 mg/m^3

10.2.3.5 Ozone (O_3)

The EPA air quality data that is available for Mullingar as detailed above does not contain monitoring data on ozone concentrations. The ozone monitoring carried out closest to the Proposed Development site is at Emo Court, Co. Laois, located approximately 70 kilometres south of the proposed wind farm

site. EPA air quality data is available for Emo Court in the report *'Air Quality in Ireland - 2019'*, as detailed below. This monitoring location lies within Zone D which is in line with the location of the Proposed Development. Ozone (O_3) data for the 2019 monitoring period in Emo Court is presented in Table 10-7 below. The annual mean hourly concentration of ozone recorded was 51.3 µg/m^3 and on no occasions were values in excess of the 180 µg/m^3 information threshold value set for the protection of the general population. The site of the Proposed Development, situated approximately 70 kilometres from the monitoring site and in rural zone, can be expected to be similar to the monitoring site in terms of ozone.

Table 10-7 Ozone Data Emo Court, Co. Laois January 2019 to December 2019

Parameter	Measurement
No. of measured values	8,760
Percentage Coverage	95%
Maximum hourly value	141.2 µg/m^3
98 percentile for hourly values	85.8 µg/m^3
Mean hourly value	51.3 µg/m^3

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[1] 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 10.2.4.2.2 and 10.2.4.3.3 below.

10.2.4 Likely Significant Effects and Associated Mitigation Measures

10.2.4.1 'Do-Nothing' Effect

If the Proposed Development were not to proceed, the opportunity to capture an additional part of Westmeath's valuable renewable energy resource would be lost, as would the opportunity to reduce emissions of carbon dioxide, oxides of nitrogen (NOx), and sulphur dioxide (SO_2) to the atmosphere due to the continued dependence on electricity derived from fossil fuel, rather than renewable energy

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

sources such as the proposed wind farm. This would result in an indirect negative impact on air quality nationally, regionally and locally.

10.2.4.2 Construction Phase

10.2.4.2.1 *Exhaust Emissions*

1. Turbines and Other Infrastructure

The construction of turbines, site roads and other onsite infrastructure will require the operation of construction vehicles and plant on site. Exhaust emissions associated with vehicles and plant 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 locations. Therefore, this is considered a short-term slight negative impact. Mitigation measures to reduce this impact are presented below.

2. Borrow Pit

The proposed borrow pit will also require the use of construction machinery and plant, thereby giving rise to exhaust emissions. This is also a short-term slight negative impact, which will be reduced through use of the best practice mitigation measures as presented below.

3. Substation and Grid Connection

The construction of the proposed substation and underground grid connection route 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.

4. Transport to Site

The junction accommodation works along the proposed turbine delivery route will encompass hardsurfacing at the N4 in the vicinity of its junction with the L1927 Local road in the townland of Joanstown; Temporary removal of the existing hedgerow and hardsurfacing before the railway line level crossing on the L1927; hardsurfacing and widening of the L1927 and L5828 junction in the townland of Boherquill; clearing of existing verge and vegetation and hardsurfacing at the gentle right turn from the L5828 onto the R395; hardsurfacing including clearance of vegetation and road verge to provide access and egress at proposed link road; hardsurfacing including clearance of vegetation and road verge at site access points off the R396, and at four points along the L5755. The use of construction vehicles at these locations will give rise to exhaust emissions, creating a short-term slight negative impact in terms of air quality.

The transport of turbines and construction materials to the Proposed Development site, which will occur on specified routes only (see Section 4.5 of the EIAR), will also give rise to exhaust emissions associated with the transport vehicles. This constitutes a slight negative impact in terms of air quality. Mitigation measures in relation to exhaust emissions are presented below.

5. Waste Disposal

Construction waste will arise on the project mainly from excavation and unavoidable construction waste including material surpluses and damaged materials and packaging waste. Waste management will be carried out in accordance with *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects* (2006) produced by the Department of Environment, Community and Local Government (DoECLGs). The expected waste volumes generated on site are unlikely to be large enough to warrant source segregation at the Proposed Development site. Therefore, all wastes streams generated on site will be deposited into a single waste skip which will be covered. This waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a

fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal. The facility will be local to the Proposed Development site to reduce the amount of emissions associated with vehicle movements.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Turbines and construction materials will be transported to the site on specified routes only unless otherwise agreed with the Planning Authority.
- The aggregate materials for the construction of the Proposed Development will be obtained primarily from the proposed borrow pit located approximately 0.7 kilometres southeast of the nearest proposed turbine location (T14). This will significantly reduce the number of delivery vehicles accessing the site from longer distances, thereby reducing the amount of emissions associated with vehicle movements. The importing of aggregates to the site from other locations will be kept as minimal as possible.
- 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 site is Mulleady's Ltd. Civic Amenity/Bring Centre which is located approximately 22 km south of the Proposed Development.

Residual Impact

Short-term Imperceptible Negative impact.

Significance of Effects

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

10.2.4.2.2 *Dust Emissions*

1. Turbines and Other Infrastructure

The construction of turbines, site roads and other onsite infrastructure will give rise to dust emissions during the construction phase. This potential effect will not be significant and will be restricted to the duration of the construction phase. Therefore, this is a short-term slight negative impact. Dust suppression mitigation measures to reduce this impact are presented below.

An area of 16.36 hectares of coniferous forestry will be required to be felled as part of the Proposed Development. This felling will be carried out in accordance with Forest Service guidelines and in compliance with any Felling Licence granted by the Forest Service. The potential impacts associated with replanting are assessed in the Replanting Assessment included as Appendix 4-6 of this EIAR.

2. Borrow Pit

Development of the proposed borrow pit and the extraction of material from this location will give rise to localised dust emissions. This is a short-term moderate negative impact. Mitigation measures to reduce this impact are presented below.

3. Substation and Grid Connection

The construction of the proposed substation and underground grid connection route will give rise to localised dust emission during their construction. This is a short-term slight negative impact. Mitigation measures to reduce this impact are presented below.

4. Transport to Site

Temporary upgrade works along the turbine delivery route, and the transport of turbines and construction materials to the proposed wind farm site, will also give rise to some localised dust emissions during periods of dry weather. This is a short-term slight negative impact. Mitigation measures to reduce the significance of this effect are presented below.

Mitigation

- Sporadic wetting of loose stone surface will be carried out during the construction phase to minimise movement of dust particles to the air. In periods of extended dry weather, dust suppression may be necessary along haul roads and around the borrow pit area to ensure dust does not cause a nuisance. If necessary, 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, borrow pit and site compound to prevent the generation of dust where required. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- All plant and materials vehicles shall be stored in dedicated areas (on site).
- Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction.
- Turbines and construction materials will be transported to the site on specified haul routes only.
- The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness, and cleaned as necessary.
- The transport of construction materials to the site that have significant potential to cause dust, will be undertaken in tarpaulin or similar covered vehicles where necessary.
- Natural screening such as trees and shrubs will be retained where possible on the site of the Proposed Development (for example, trees are being retained around the proposed borrow pit location, and areas of forestry around the wind farm site) to aid in the containment of dust. The local roads are also lined with trees and hedgerow vegetation along much of their length.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-8). The CEMP includes dust suppression measures.

Dust Monitoring

Dust levels in the local area will be monitored prior to the construction phase to provide a background (baseline) level of dust deposition in the environment. Recommendations from the Department of the Environment, Health & Local Government[2] apply the Bergerhoff limit of 350 mg/m^2/day to the site boundary of quarries. This measurement will be carried out for the Proposed Development whereby dust jars will be placed at locations around the Proposed Development site boundary and left in situ for a period of 30 days.

Dust monitoring will also take place during the construction phase, with dust jars been placed at the same monitoring locations and left in situ for 30 days at a time. It is proposed to carry out this monitoring on a quarterly basis.

The dust monitoring locations around the Proposed Development site boundary will be selected with regard to the location of these nearest sensitive receptors.

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

Residual Impact

Following implementation of mitigation measures as outlined above, residual impacts of dust generation from the construction phase will have a Short-term Imperceptible Negative Impact.

Significance of Effects

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

10.2.4.3 Operational Phase

10.2.4.3.1 *Exhaust Emissions*

Exhaust emissions associated with the operational phase of the Proposed Development will arise from machinery and vehicles that are intermittently required onsite for maintenance. This will give rise to a long-term imperceptible negative effect.

Mitigation

Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.

Residual Impact

Long-term Imperceptible Negative Impact

Significance of Effects

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

10.2.4.3.2 *Air Quality*

The Proposed Development, by providing an alternative to electricity derived from coal, oil or gas-fired power stations, 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 below.

Residual Impact

Long-term Significant Positive Impact

Significance of Effects

Based on the assessment above there will be a significant positive effect.

Exposure to chemicals such as SO_2 and NOx are thought to be harmful to human health. The production of renewable energy from the Proposed Development will have a long-term slight positive impact on human health.

10.2.4.3.3 *Dust*

The potential for the production of dust during the operational phase will be limited almost entirely to the occasional movements of a small number of maintenance vehicles. This is not expected to pose a significant risk to local air quality due to the limited number of movements.

10.2.4.3.4 *Human Health*

Exposure to chemicals such as SO_2, NO_x, Pb, benzene and O_3 are thought 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 no significant effects.

10.2.4.4 Decommissioning Phase

The wind turbines proposed as part of the Proposed Development are expected to have a minimum lifespan of approximately 30 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the site may be decommissioned fully.

The works required during the decommissioning phase are described in Section 4.11 in Chapter 4: Description of the Proposed Development. The underground grid connection cable will be left in-situ and it is envisioned it will become a permanent part of the electricity transmission network. Any impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Development will be implemented during the decommissioning phase thereby minimising any potential impacts.

A decommissioning plan is included as Appendix 4-11 of this EIAR for the decommissioning of the Proposed Development, the detail of which will be agreed with the local authority prior to any decommissioning. The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the EIAR.

10.3 Climate

Climate legislation and policy is outlined in detail in Chapter 2 of this EIAR, however, a summary of the key information is provided in Section 10.3.1 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. 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.

10.3.1.1.1 *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 five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of Parties in the second commitment period is different from the first.

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).

10.3.1.1.2 *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.

10.3.1.1.3 COP25 Climate Change Conference

The 25th United Nations Climate Change conference COP25 was held in Madrid and ran from December 2nd to December 13th, 2019. The main outcome from the conference was the launch by the European Union (EU) of the '*The European Green New Deal'*. The deal sets out the EUs commitments to tackle climate and environmental related challenges and includes proposals to reduce emissions from the transport, agriculture and energy sectors. 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. The European Commission adopted a legislative proposal for a European Climate Law in March 2020 turning the political agreement of the new deal into a political commitment. This law has set the objective for the EU to become climate-neutral by 2050 and has established a framework for achieving that objective. An agreement on the law is expected by April 2021. Decisions regarding the global carbon market were postponed until the next Climate Conference (COP26) which will be held in Glasgow in November 2021.

10.3.1.1.4 United Nations Sustainable Development Summit 2015

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.

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 in 2018. 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 10-8.

Table 10-8 United Nations Sustainable Development Goals adopted in 2015. https://sustainabledevelopment.un.org/sdgs

SDG	Targets	International Progress to Date (2019)	National Relevant 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	The renewable energy share of total final energy consumption gradually increased from 16.6 per cent in 2010 to 17.5 per cent in 2016, though much faster change is required to meet climate goals. Global primary energy intensity (ratio of energy used per unit of GDP) improved from 5.9 in 2010 to 5.1 in 2016, a rate of improvement of 2.3 per cent, which is still short of the 2.7 per cent annual rate needed to reach	*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*

SDG	Targets	International Progress to Date (2019)	National Relevant Policy
	investment in energy infrastructure and clean energy technology 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	target 3 of Sustainable Development Goal 7.	*Plan for Ireland # 4 2017-2020* *Better Energy Programme* *One World, One Future* *The Global Island*
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*	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 mobilizing 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	In 2017, greenhouse gas concentrations reached new highs, with globally averaged mole fractions of CO2 at 405.5 parts per million (ppm), up from 400.1 ppm in 2015, and at 146 per cent of pre-industrial levels. Moving towards 2030 emission objectives compatible with the 2°C and 1.5°C pathways requires a peak to be achieved as soon as possible, followed by rapid reductions. During the period 1998–2017, direct economic losses from disasters were estimated at almost $3 trillion. Climate-related and geophysical disasters claimed an estimated 1.3 million lives. As of April 2019, 185 parties had ratified the Paris Agreement. Parties to the Paris Agreement are expected to prepare, communicate and maintain successive nationally determined contributions, and 183 parties had	*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 Action and Low Carbon Development*

SDG	Targets	International Progress to Date (2019)	National Relevant Policy
the primary international, intergovernmental forum for negotiating the global response to climate change.		communicated their first nationally determined contributions to the secretariat of the United Nations Framework Convention on Climate Change, while 1 party had communicated its second. Under the Agreement, all parties are required to submit new nationally determined contributions, containing revised and much more ambitious targets, by 2020. Global climate finance flows increased by 17 per cent in the period 2015–2016 compared with the period 2013–2014. As at 20 May 2019, 75 countries are seeking support from the Green Climate Fund for national adaptation plans and other adaptation planning processes, with a combined value of $191 million.	

10.3.1.1.5 *Emissions Projections*

Ireland's target is to achieve a 20% reduction of non-Emissions Trading Scheme (non-ETS) sector emissions, i.e. agriculture, transport, residential, commercial, non-energy intensive industry and waste, on 2005 levels, with annual binding limits set for each year over the period 2013 – 2020. 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 2019–2040'* was published in July 2020. The report includes an assessment of Ireland's progress towards achieving its emission reduction targets out to 2020, 2030 and 2040 set under the EU Effort Sharing Decision (Decision No 406/2009/EU) and Effort Sharing Regulation (Regulation (EU) 2018/842).

The 2020 emission projections report include the impact of new climate mitigation policies and measures which were outlined in the National Development Plan 2018 and the Climate Action Plan 2019. These projections see a greater impact from policies and measures and a greater reduction in emissions over the longer term, particularly in the "With Additional Measures" scenario.

Greenhouse gas emissions are projected to 2030 using two scenarios; 'With Existing Measures' and 'With Additional Measures'. The 'With Existing Measures' scenario assumes that no additional policies and measures, beyond those already in place by the end of 2018 are implemented. The 'With Additional Measures' scenario assumes implementation of the 'With Existing Measures' scenario in addition to full achievement of Government renewable and energy efficiency targets for 2020, as set out

in the National Renewable Energy Action Plan, the National Energy Efficiency Action Plan and the Climate Action Plan.

The EPA Emission Projections Update notes the following key trends:

- Total emissions are projected to decrease from the latest 2018 levels by 2% and 6% by 2030 under the "With Existing Measures" scenario.
- Under the "With Additional Measures" scenario, emissions are estimated to decrease by 23% by 2030.
- Ireland's non-Emissions Trading Scheme (ETS) emissions are projected to be 5% and 6% below 2005 levels in 2020 under the 'With Existing Measures' and 'With Additional Measures' scenarios, respectively. The target for Ireland is a 20% reduction.
- Ireland exceeded its annual binding limits in 2016,2017and 2018..
- Over the period 2013 – 2020, Ireland is projected to cumulatively exceed its compliance obligations by 13.4 Mt CO_2 (metric tonnes of Carbon Dioxide) equivalent under the 'With Existing Measures' scenario and 12.6 Mt CO_2 equivalent under the 'With Additional Measures' scenario. Reporting on Ireland's compliance obligations status for this period have not yet been published.

The report concludes:

- *"Projections indicate that Ireland will exceed the carbon budget over the period 2021-2030 by 51 Mt CO_2 equivalent assuming LULUCF flexibilities described in the Regulation are fully utilised."*
- *"To determine compliance under the Effort Sharing Decision, any overachievement of the binding emission limit in a particular year (between 2013 and 2020) can be banked and used towards compliance in a future year. However, even using this mechanism Ireland will still be in non-compliance according to the latest projections."*
- *"A significant reduction in emissions over the longer term is projected as a result of the expansion of renewables (e.g. wind), assumed to reach 55% by 2030 under the 'With Existing Measures' scenario and 70% by 2030 under the 'With Additional Measures' scenario"*
- *"The projects reflect plans to bring Ireland onto a lower carbon trajectory in the longer term. However, Ireland still faces significant challenges in meeting EU 2030 targets in the non-ETS sector and national 2050 reduction targets in the electricity generation, built environment and transport sectors. Progress in achieving targets is dependent on the level of implementation of current and future plans."*

In November 2020 the EPA also published '*Ireland's Provisional Greenhouse Gas Emissions 1990-2019*'. The provisional estimates of Ireland's greenhouse gas figures for the years 1990-2019 are based on the SEAI's final energy balances released in November 2020. The key findings from the report are as follows:

- *"In 2019, Ireland's total national greenhouse gas emissions are estimated to have declined by 4.5% on 2018 levels to 59.9 Mt CO2 equivalent"*
- *The Provisional estimates of greenhouse gas emissions for the period 1990- 2019 indicate that Ireland will exceed its 2019 annual limit set under the EU's Effort Sharing Decision (ESD) by 6.98 Mt CO2eq.*
- *Emissions in the Energy Industries sector show a decrease of 11.2% or 1.19 Mt CO2eq in 2019, which is attributable to a 69% decrease in coal and an 8% decrease in peat used in electricity generation. Electricity generated from wind increased by 16.0% in 2019.*

10.3.1.1.6 Progress to Date

The 'Europe 2020 Strategy' is the EU's agenda for growth and jobs for the 2010-2020 decade. The Europe 2020 Strategy targets on climate change and energy include:

- Reducing greenhouse gas (GHG) emissions by at least 20% compared with 1990 levels;
- Increasing the share of renewable energy in final energy consumption to 20%; and
- Moving towards a 20% increase in energy efficiency.

Further details on the Europe 2020 Strategy are included in Section 2.2.3.3 of this EIAR in Chapter 2: Background to the Proposed Development. Regarding progress on targets, the 'Europe 2020 indicators – climate change and energy' report provides a summary of recent statistics on climate change and energy in the EU.

In 2019, EU greenhouse gas emissions, including emissions from international aviation and indirect carbon dioxide (CO_2) emissions, were down by 24% when compared with 1990 levels which means that the Europe 2020 target of reducing GHG emissions has been reached. Reporting on EU's recorded greenhouse gas emissions for 2020 have not yet been published.

10.3.1.1.7 Climate Action Network Europe Off Target Report 2018

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

In March 2019, the Minister for Communications, Climate Action, and the Environment, Richard Bruton, announced a renewable electricity target of 70% by 2030 for Ireland. Furthermore, the release of the Climate Action Plan in June 2019 has noted a 30% reduction in greenhouse gases by 2030. Considering only renewable energy from electricity and as part of this plan and to meet the required level of emissions reduction by 2030, Ireland will:

- Reduce CO_2 eq. emissions from the sector by 50–55% relative to 2030 NDP projections;
- Deliver an early and complete phase-out of coal- and peat-fired electricity generation
- Increase electricity generated from renewable sources to 70%, indicatively comprised of:
    - at least 3.5 GW of offshore renewable energy;
    - up to 1.5 GW of grid-scale solar energy;
    - up to 8.2 GW total of increased onshore wind capacity
- Meet 15% of electricity demand by renewable sources contracted under Corporate PPAs

Achieving 70% renewable electricity by 2030 will involve phasing out coal- and peat-fired electricity generation plants, increasing our renewable electricity, reinforcing our grid (including greater interconnection to allow electricity to flow between Ireland and other countries), and putting systems in place to manage intermittent sources of power, especially from wind.

As detailed in Section 1.5.5 in Chapter 1 of this EIAR, the SEAI monthly electricity generation figures for December 2020 indicate that Ireland hit it's 40% renewable energy target for 2020 with a share of renewable electricity recorded at 40.2%. Reporting on Ireland's target status for 2020 has not yet been published and is due for publication in the coming months. With a renewable share of electricity generation at 70% in mind, it is now more critical than ever that we continue to progress renewable energy development in Ireland so as we are successful in meeting our 2030 target.

The Climate Action Plan noted specific sectors which are required to step-up in order to help Ireland achieve its EU targets. The renewable energy sector was cited alongside the country's commitment to increase onshore wind capacity by up to 8.2 GW. The Proposed Development will help contribute towards this target.

The Proposed Development is compatible with the relevant provisions as set out in the Climate Action Plan 2019, relating to the harnessing of renewable energy. In summary, the Proposed Development will contribute the following:

- Helping to meet the target that 70% of our electricity needs will come from renewable sources by 2030.
- Helping to reduce carbon emissions and improving Ireland's security of energy supply.
- Provision of grid connection infrastructure to support the renewable energy output from the Proposed Development.

Further detail on the EU 2030 targets in noted in Chapter 2 Section 2.2.

10.3.1.1.8 *Climate Action Plan 2019*

The *Climate Action Plan* (DCCAE, 2019) which features 183 action plans sets out how Ireland will meet its EU targets to reduce its carbon emissions by 30% between 2021 and 2030 and lay the foundations for achieving net zero carbon emissions by 2050. The CAP sets out an ambitious course of action over the coming years to address the impacts which climate may have on Irelands environment, society, economic and natural resources. This Plan clearly recognises that Ireland must significantly step up its commitments to tackle climate disruption.

Chapter 1 of the CAP sets out the nature of the challenge which Ireland faces over the coming years. The CAP notes that the evidence for warming of our climate system is beyond dispute with observations showing that global average temperatures have increased by more than 1°C since pre-industrial times. These changes will cause extensive direct and indirect harm to Ireland and its people, as well as to other countries more exposed and less able than we are to withstand the associated impacts, which are predicted to include:

- Rising sea-levels threatening habitable land and particularly coastal infrastructure,
- Extreme weather, including more intense storms and rainfall affecting our land, coastline and seas;
- Further pressure on our water resources and food production systems with associated impacts on fluvial and coastal ecosystems;
- Increased chance and scale of river and coastal flooding;
- Greater political and security instability;
- Displacement of population and climate refugees;
- Heightened risk of the arrival of new pests and diseases;
- Poorer water quality; and
- Changes in the distribution and time of lifecycle events of plant and animal species on land and in the oceans.

It is also recognised within the Plan that in addition to the above many of the pollutants associated with climate change are also damaging to human health.

It is the ambition of the CAP to deliver a step-change in our emissions performance over the coming decade, so that we will not only meet our EU targets for 2030, but will also be well placed to meet our mid-century decarbonisation objectives.

Chapter 7 of the CAP details the plans surrounding electricity. Within Ireland electricity accounting for 19.3% of Irelands greenhouse gases in 2017, the following is noted:

> *"It is important that we decarbonise the electricity that we consume by harnessing our significant renewable energy resources by doing this we will also become less dependent on imported fossil fuels."*

In 2019 within Ireland a total of 37.6% of electricity produced came from renewable sources, the target to be achieved by 2020 was set at 40%. As detailed in Section 1.5.5 in Chapter 1 of this EIAR, the SEAI monthly electricity generation figures for December 2020 indicate that Ireland hit it's 40% renewable energy target for 2020 with a share of renewable electricity recorded at 40.2%[3].

The CAP goes on to note that while decarbonising electricity is a key aspect of the strategy it is noted that this is against the background of rapid projected growth in electricity demand. It is expected that demand for electricity is forecast to increase by 50% above existing capacity in the next decade. Generation electricity builds of a renewable nature rather than fossil fuels has been marked as essential.

The CAP goes on to note that with regards to policy measures to date that they will not achieve the level of decarbonisation required in the electricity sector to meet the 2030 emissions reduction targets, as such it is listed that 'we must 'reduce our electricity sector emissions to 4-5 Mt in 2030'. In relation to emissions the following is noted:

> *"In 2017, emissions from electricity were 12 Mt and in 2030, despite implementation of Project Ireland 2040 measures, emissions are projected to be 8 Mt. This clearly demonstrates the need for a significant step-up in ambition over existing policy, not only to meet our 2030 targets, but to set us on course to deliver substantive decarbonisation of our economy and society by 2050."*

In the electricity sector, reaching a 70% share of renewable electricity would require 50-55% emissions reduction by 2030.

Accordingly, the CAP presents clear and unequivocal support for the provision of additional renewable energy generation, and presents yet further policy support for increased wind energy.

In 2019 within Ireland a total of 36.5% of electricity produced came from renewable sources, the target to be achieved by 2020 was set at 40%. The CAP notes that 'given our 40% target is based on a percentage of total energy demand, this rising demand makes meeting our 2020 target even more challenging and latest forecasts indicate we may miss this target by 3 to 4 percentage points'. Further to this while decarbonising electricity is a key aspect of the strategy it is noted that this is against the background of rapid projected growth in electricity demand. It is expected that demand for electricity is forecast to increase by 50% above existing capacity in the next decade. Generation electricity builds of a renewable nature rather than fossil fuels has been marked as essential.

One of the key targets in relation to forestry is the delivery of '*..an average of 8,000 ha per annum of newly planted forest, and sustainable forest management of existing forests (21 $MtCO_2eq$. cumulative abatement)'*. Ongoing and proposed measures to deliver the target include:

- The investment of nearly €3 billion in forestry, since the late 1980s, which through ongoing sustainable forest management will contribute to delivering abatement of 21 $MtCO_2eq$ over the period 2021 to 2030.
- Review of the current afforestation programme to enhance participation rates and inform land use policy to increase the benefits for climate, the environment, and rural communities.
- Commitment by Coillte to replant or restock a total of 34,770 hectares between 2016 and 2020.
- Bord na Móna's estate extends to a little under 80,000 ha. To date a little over 18,000 ha of the cut-away and cut-over peatland has been rehabilitated and the target for

[3] *https://www.seai.ie/data-and-insights/seai-statistics/monthly-energy-data/electricity/*

2019 is to complete a further 3,000 ha. By way of additional context, as much as 50,000ha of the overall estate is currently under consideration for a wide variety of commercial future uses of which renewable energy projects constitute the greatest proportion by far.

- Hedgerows are estimated to cover 3.9% of the Irish landscape or 660,000 km length. The total area of hedgerow and non-forest woodland patches across the landscape could possibly represent a significant carbon sink and could potentially be used as a mitigation option.

It is noted that areas cleared of forestry for the Proposed Development will be replaced by replanting both on site and at an alternative site in line with the Forest Service's published policy on granting felling licences for renewable energy developments. A total of 16.36 hectares of new forestry will be replanted at an alternative site.

10.3.1.1.9 *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 2021 CCPI was published in December 2020. While the CCPI 2021 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 41st in 2019, has climbed 2 places to 39th for 2020, and remains as a "low" performer in international performance. However, it remains at "very low" at a national performance level. The CCPI report states that while some improvements have been made, GHG per capita emissions are at a high level and "significant challenges lie ahead in closing Ireland's emission gap, meeting the current (2030) target and aligning Ireland's emission trajectory with a net zero goal for 2050. Ireland is one of the worst performing countries in the GHG Emissions category. Recognising Ireland's Climate Action Plan (2019), the CCPI states:

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

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 Mullingar, Co. Westmeath, is the nearest weather and climate monitoring station to the Proposed Development that has meteorological data recorded for the 30-year period from 1979 - 2008. The monitoring station is located approximately 22 kilometres south of the Wind Farm Site. Meteorological data recorded at Mullingar over the 30-year period from 1979 - 2008 is shown in Table 10-9 overleaf. The wettest months are October and December, and July is usually the driest. July is the warmest month with a mean daily temperature of 19.2° Celsius.

Table 10-9 Data from Met Éireann Weather Station at Mullingar, 1979 to 2008: 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	7.4	7.9	9.8	12.1	14.9	17.3	19.2	18.9	16.7	13.2	9.9	7.9	12.9
Mean daily min	1.5	1.5	2.8	4.1	6.3	9.2	11.1	10.8	8.9	6.2	3.5	2.2	5.7
Mean temperature	4.5	4.7	6.3	8.1	10.6	13.2	15.2	14.8	12.8	9.7	6.7	5	9.3
Absolute max.	13.8	15.4	19.1	21.6	25	28.3	29.7	29.1	25	20.1	17.3	14.6	29.7
Absolute Min.	-14.9	-6.6	-8.0	-4.4	-2.6	0.2	3.8	2.1	0.0	-4.4	-6.9	-12.4	-14.9
Mean No. of Days With Air Frost	9.9	8.9	5.5	3.1	0.4	0.0	0.0	0.0	0.0	1.5	5.4	8.2	43.0
Mean No. of Days With Ground Frost	17.9	16.2	14.0	10.8	5.1	0.8	0.0	0.1	1.7	6.3	12.1	15.4	100.4
RELATIVE HUMIDITY (%)													
Mean at 0900UTC	90.8	89.8	87.6	81.9	78.3	79.7	82.1	84.8	87.6	89.9	91.7	91.8	86.3
Mean at 1500UTC	83.4	77.8	72.8	68.1	67.1	69.1	69.9	70.6	72.1	77.0	82.2	85.9	74.7
SUNSHINE (hours)													
Mean daily duration	1.8	2.5	3.2	4.9	5.8	5.0	4.6	4.6	3.9	3.2	2.2	1.6	3.6
Greatest daily duration	8.2	9.9	10.9	13.6	15.4	15.9	15.3	14.4	12.2	10.1	8.6	7.3	15.9
Mean num. of days with no sun	10.3	7.2	5.3	2.9	1.9	2.2	1.8	1.9	3.3	5.7	8.4	11.0	62.0
RAINFALL (mm)													
Mean monthly total	91.7	72.0	78.3	62.1	68.7	70.5	61.8	80.8	73.8	102.1	82.4	97.1	941.3
Greatest daily total	30.3	24.7	29.5	27.6	26.1	52.9	26.6	58.2	42.1	48.8	43.7	38.8	58.2
Mean num. of days with >= 0.2mm	19	17	20	15	16	16	16	17	17	19	18	19	209

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean num. of days with >= 1.0mm	15	13	15	11	12	11	11	13	12	14	13	14	154
Mean num. of days with >= 5.0mm	6	5	5	4	5	4	3	5	4	6	6	7	60
WIND (knots)													
Mean monthly speed	9.0	9.1	9.1	7.7	7.3	6.7	6.4	6.3	6.7	7.5	7.8	8.3	7.6
Max. gust	67	71	59	56	58	48	48	50	51	59	62	73	58.5
Max. mean 10-minute speed	38	36	36	30	34	26	27	28	32	36	32	39	32.8
Mean num. of days with gales	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.8
WEATHER (mean no. of days with:)													
Snow or sleet	5.0	4.4	3.5	1.6	0.2	0.0	0.0	0.0	0.0	0.0	0.4	2.7	17.8
Hail	0.6	0.9	2.0	2.0	1.1	0.2	0.1	0.1	0.1	0.5	0.2	0.3	8.1
Thunder	0.1	0.2	0.2	0.3	0.9	0.9	1.2	0.8	0.1	0.1	0.1	0.1	4.9
Fog	3.4	3.0	2.4	2.0	1.8	1.3	1.9	2.9	4.0	4.1	4.1	4.3	35.1

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 partially situated on peat habitats although these are under active management and are therefore drained. However, the carbon balance between the use of a renewable energy and the loss of carbon stored in the peat is assessed in this section of the EIAR using a worst-case scenario.

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

The carbon balance of proposed wind farm developments in peatland habitats has attracted significant attention in recent years. When development 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, 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.

The peatland areas at the Wind Farm Site are being addressed as a worst-case scenario, that they are under active management and so the peat is already dried and so the potential CO_2 losses described above are considered an overestimate of the actual impact.

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 takes 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. However, the restoration proposal should demonstrate a high probability that the hydrological regime will be restored across the site, disturbance of the remaining peat will be minimised, and peat-forming vegetation will develop in areas from which peat was removed or drained. In the case of the Proposed Development, the model has been prepared on the basis of two scenarios, one where restoration of the Proposed Development areas will occur on decommissioning, and another where restoration will not occur.

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 Peat Stability Assessment in Appendix 8-1 of this EIAR. Therefore, this potentially large carbon loss pathway is omitted from the calculations.

Clear felling of existing forestry surrounding turbine locations may often be necessary to avoid reductions in the wind energy yield of the wind farm proposal. Forestry may be felled earlier than originally planned due to the Proposed 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, 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.

There will be minor releases of carbon dioxide from excavating peat which will also be captured in the carbon calculations below. 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 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 wind farm 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 allowable for input for the Irish electricity generation plant, and so the CO_2 emissions savings from the proposed wind farm development have been calculated separately from the worksheet.

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

Table 10-10 CO_2 losses from the Proposed Development

Origin of Losses	CO_2 Losses (tonnes CO_2 equivalent)	
	Expected	Maximum
Losses due to turbine life (e.g. manufacture, construction, decommissioning)	78,974	79,132
Losses due to backup	53,217	53,217
Losses due to reduced carbon fixing potential	3,572	6,205
Losses from soil organic matter	13,896	82,058
Losses due to felling forestry	6,479	6,736
Total	**156,138**	**227,348**

The worksheet model calculates that the Proposed Development will give rise to 156,138 tonnes of CO_2 equivalent losses over its 30-year life. Of this total figure, the proposed wind turbines directly account for 78,974 tonnes, or 51%. Losses due to backup account for 53,217 tonnes, or 34%. Losses from soil organic matter, reduced carbon fixing potential and the felling of forestry accounting for the remaining 15% or 23,947 tonnes. It should be noted that forestry on the Wind Farm Site forms part of a commercial crop, which would be felled in coming years whether the Proposed Development proceeds or not.

The figure of 23,947 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 drained bog (cutover), forestry and grassland rather than the acid bog assumed by the model that gives rise to the 23,947 tonnes CO_2 figure, and therefore the actual CO_2 losses are expected to be lower than this value.

The figures discussed above are based on the assumption that the hydrology of the site and habitats within the site are restored on decommissioning of the Proposed Development after its expected 30-year useful life. As a worst-case scenario, the model was also used to calculate the CO_2 losses from the Proposed Development if the hydrology and habitats of the site were not to be restored, as may be the case if the turbines were replaced with newer models, rather than decommissioned entirely and taking account of the future peat extraction activities. This worst-case scenario would increase the expected carbon losses by an additional 71,210 tonnes, or 45.6% to 227,348 tonnes. Any failure to restore the site habitats or hydrology for the reasons outlined above 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 156,138 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 rated capacity of the Proposed Development is assumed to be 90 MW (based on 15 No. 6 MW turbines).

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.

The most recent data for the carbon load of electricity generated in Ireland is for 2019, and was published in Sustainable Energy Authority Ireland's (SEAI) December 2018 report, '*Energy in Ireland, 2020 Report.'* The emission factor for electricity in Ireland in 2020 was 324 g CO_2/kWh.

The calculation for carbon savings is therefore as follows:

$$CO_2 \text{ (in tonnes)} = \frac{(90 \times 0.35 \times 8{,}760 \times 324)}{1000}$$

$$= 89{,}405 \text{ tonnes per annum}$$

Based on this calculation, 89,405 tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Development. Assuming a thirty-year lifetime for the Proposed Development, it is estimated that 2,682,150 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 offsite alternatives sites. A total of 16.36 hectares of new forestry will be replanted in offsite alternatives sites to compensate the loss of forestry at the Proposed Development site. Given that losses due to felling forestry account for 6,479 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.

In total, it is estimated that **2,688,629** tonnes of carbon dioxide will be displaced over the proposed thirty-year lifetime of the Proposed Development, and 89,405 tonnes of carbon dioxide will be displaced per annum.

Based on the Scottish Government carbon calculator as presented above, 156,138 tonnes of CO_2 will be lost to the atmosphere due to changes in the peat environment and due to the construction of the Proposed Development. This represents 5.81% of the total amount of carbon dioxide emissions that will be offset by the Proposed Development. The 156,138 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 21 months of operation.

10.3.4 Likely Significant Effects and Associated Mitigation Measures

10.3.4.1 Do-Nothing' Effect

As detailed in Section 2.5.1 in Chapter 2 of this EIAR, the permitted Coole Wind Farm makes up a majority of the Proposed Development site. If the Proposed Development were not to proceed, the opportunity to capture an additional part of Westmeath's valuable renewable energy resource would be lost. If the Proposed Development were not to proceed, the opportunity to further reduce emissions of carbon dioxide, oxides of nitrogen (NOx), and sulphur dioxide (SO_2) to the atmosphere would be lost due to the continued dependence on electricity derived from fossil fuel, rather than renewable energy sources such as the proposed wind farm. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol would also be lost. This would be a permanent slight negative impact.

10.3.4.2 Construction Phase

10.3.4.2.1 *Greenhouse Gas Emissions*

1. Turbines and Other Infrastructure

The construction of turbine bases and hardstands, site roads and all associated proposed infrastructure will require the operation of construction vehicles and plant on site. Greenhouse gas emissions, e.g. carbon dioxide (CO_2), associated with vehicles and plant will arise as a result of the construction activities. This potential impact will be slight only, 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.

2. Borrow Pit

Development of the proposed borrow pit will also require the use of construction machinery and plant, thereby giving rise to greenhouse gas emissions. This is also a short-term slight negative impact, which will be reduced through use of the best practice mitigation measures as presented below.

3. Substation and Grid Connection

The construction of the proposed substation and underground grid connection route will require the use of construction machinery, thereby giving rise to greenhouse emissions. This is a short-term slight negative impact, which will be reduced through use of the best practice mitigation measures as presented below.

4. Transport to Site

There are relatively minor works proposed at ten junctions on the proposed turbine haul route. The works comprise :hardsurfacing at the N4 in the vicinity of its junction with the L1927 Local road in the townland of Joanstown; Temporary removal of the existing hedgerow and hardsurfacing before the railway line level crossing on the L1927; hardsurfacing and widening of the L1927 and L5828 junction in the townland of Boherquill; clearing of existing verge and vegetation and hardsurfacing at the gentle right turn from the L5828 onto the R395; hardsurfacing including clearance of vegetation and road verge to provide access and egress at proposed link road; hardsurfacing including clearance of vegetation and road verge at site access points off the R396, and at four points along the L5755. . The

use of construction vehicles at these locations will give rise to greenhouse gas emissions, creating a short-term slight negative impact in terms of air quality.

The transport of turbines and construction materials to the site, which will occur on specified routes only (see Section 4.5 of the EIAR), will also give rise to greenhouse gas emissions associated with the transport vehicles. This constitutes a 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, thereby minimising any emissions that arise.
- Turbines and construction materials will be transported to the site on specified routes only unless otherwise agreed with the Planning Authority.
- Aggregate materials for the construction of the proposed wind farm will be obtained from the proposed borrow pit. This will significantly reduce the number of delivery vehicles accessing the site from significant distances, thereby reducing the amount of emissions associated with vehicle movements.

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 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. 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. As detailed in Table 10-10 above, the Proposed Development will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 30-year lifespan of the Proposed Development. The Proposed Development 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 significant positive effect.

Some potential long-term slight negative impacts that may occur during the operational phase of the Proposed Development are the release of small amounts of carbon dioxide to the atmosphere due to the potential alteration to the drainage of the site and the removal of carbon fixing vegetation. These impacts will be slight and will be nullified by the quantity of carbon dioxide that will be displaced by the Proposed Development.

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 be no significant effects.

10.3.4.4 Decommissioning Phase

The wind turbines proposed as part of the Proposed Development are expected to have a minimum lifespan of approximately 30 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the site may be decommissioned fully.

The works required during the decommissioning phase are described in Section 4.9 in Chapter 4: Description of the Proposed Development. The underground grid connection cable will be left in-situ and it is envisioned it will become a permanent part of the electricity transmission network. Any impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Development will be implemented during the decommissioning phase thereby minimising any potential impacts.

A decommissioning plan is included as Appendix 4-11 of this EIAR for the decommission of the Proposed Development, the detail of which will be agreed with the local authority prior to any decommissioning. The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the EIAR.

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 2.7 of this EIAR. The forestry works (felling/planting) associated with the Proposed Development will be carried out under the relevant guidance and under licence from the Forestry Service and full details are set out in Section 4.3.16 of this EIAR in conjunction with the Assessment of Forestry Replacement Lands included as Appendix 4-6. No projects or plans were identified that would be incompatible with the proposed replanting or give rise to significant cumulative impacts.

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 Proposed Development site that are yet to be constructed, there will be minor emissions from construction plant and machinery and potential dust emissions associated with the construction activities. However, once the mitigation proposals, as outlined in Sections 10.2.4 and 10.3.4 are implemented during the construction phase of the proposed development, there will be no cumulative negative effect on air and climate.

There will be no net carbon dioxide (CO_2) emissions from operation of the Proposed Development. Emissions of carbon dioxide (CO_2), oxides of nitrogen (NO_x), sulphur dioxide (SO2) or dust emissions during the operational phase of the Proposed Development will be minimal, relating to the use of operation and maintenance vehicles onsite, and therefore there will be no measurable cumulative effect with other developments 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.

The replanting lands are located in County Roscommon and therefore are not likely to contribute to potential cumulative impacts with the Proposed Development in terms of impacts on air and climate. The potential direct, indirect and cumulative impacts of replanting lands on air and climate has been assessed in the Section 10 of Appendix 4-6 Assessment of Forestry Replacement Lands.