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APPENDICES

APPENDIX 8.1 CARBON CALCULATOR VESTAS / SIEMANS & INPUT DATA

INTRODUCTION

8.1 This chapter identifies, describes, and assesses the potential significant direct, indirect, and cumulative effects on air quality and the impacts on the climate and the Proposed Development from climate during the construction, operation and decommissioning of the Proposed Development in accordance with Section 2 of Chapter 2 in this EIAR. Minimum and maximum hub height and rotor diameter parameters being proposed and all design permutations within that range as set out in Chapter 2 in this EIAR are being applied for.

Overview of the Local Environment

8.2 The Proposed Development is located c. 1 km southwest of the village of Clonmellon and c. 2.8 km northeast of Delvin, Co. Westmeath in a rural area with no major settlements nearby, with the district towns of Trim and Navan situated 19 km southeast and 20 km east of the Proposed Development respectively. The town of Kells is 15 km northeast, and the town of Mullingar is 20 km southwest of the Proposed Development. The landscape around the Proposed Development is relatively low lying with some small rolling hills formed in the more northern areas of the site, particularly in Co. Meath.

8.3 The site can be accessed directly from existing agricultural entrances and access tracks from the N52, a national primary road and local roads to west and northwest of the N52.

8.4 The western boundary of the site is immediately bound by the Westmeath / Meath County administrative boundary. The site borders the River Boyne and Blackwater cSAC (Site Code: 002299) to the north, northwest, west and southwest. The River Stonyford and it's tributary D'arcy Crossroad Streams form part of the western boundary of the site.

8.5 The site is in a predominantly agricultural area, with elevations within the site ranging from 80 m to 100 m above sea level, gently sloping west to east. The highest point of the site is located c. 780 m southeast of turbine 3 (T3) with an elevation of approximately 103 m AOD.

8.6 The lens cover is classified in Corine Landcover 2018 as predominately Pastures and Mixed Forest interspersed with Agro-forestry Areas.

Overview of the Proposed Development

8.7 All elements of the Proposed Development are described in Chapter 2 of this EIAR.

8.8 The Proposed Development is divided into two distinct areas, with the northern cluster featuring three turbines (T1, T2, and T3), while the southern cluster (T4 – T8) features the remaining five, in a staggered arrangement.

8.9 The production of energy from wind turbines has no direct emissions unlike fossil fuel-based power generating stations. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that are damaging to human health and the environment.

Statement of Authority

8.10 The air quality impact assessment presented in this Chapter was prepared by SLR Consulting Ireland. The lead consultants for the study were:

- Luke Moseley BSc. PGCert Environmental Management
- Aldona Binchy MSc. Eng. PIEMA Environmental Engineering
- Conor Hughes MSc (Hons) Energy Science

Limitations / Difficulties Encountered

8.11 This assessment is compiled based on published regional and local data, guidance documents. No difficulties were encountered in compiling the required information.

Consultations / Consultees

8.12 While preparing this EIAR, a pre-planning consultation meeting was held with Westmeath County Council and with An Bord Pleanála. During the first pre-application consultation with An Bord Pleanála, it was noted in Page 9 of the meeting minutes that:

'The Board's representatives advised that the Climate Chapter of the EIAR should adequately outline the carbon resources required to construct the proposed development and outline what the savings are by displacement of fossil fuel generated electricity.'

8.13 During the scoping period of the Proposed Development, several consultees were provided with a scoping report outlining the Proposed Development. While several responses were received, none of the responses received were of relevance to this chapter.

ASSESSMENT METHODOLOGY

Air Quality

8.14 The focus of this assessment is the potential impact on local residential amenity and ecological receptors of fugitive dust emissions and particulate matter generated by the Proposed Development. Dust emissions are likely to arise during the following activities:

- earthworks and topsoil stockpiling (site preparation works, new roads construction);
- construction operations;
- trafficking by heavy goods vehicles (HGVs) over paved / unpaved surfaces; and
- decommissioning and final landscaping activities.

8.15 This section of the chapter describes and assesses the existing air quality baseline characteristics of the area around the Proposed Development based on EPA data. Air emissions arising from the Proposed Development activities at the Site are then applied to these baseline conditions and the resulting air quality impacts assessed. Mitigation measures are identified where required, to eliminate or reduce these impacts insofar as practical.

8.16 The following sections of this Chapter describe the potential air quality impacts associated with the Proposed Development. The following issues are addressed separately:

- relevant legislation, standards, and guidance;
- baseline conditions pertaining to measured (or estimated) existing air quality levels around the various elements of the Project;
- methodology used to assess the potential impacts of the Proposed Development on air quality;
- assessment of the impacts;
- description of mitigation measures that are incorporated into the construction, design, operation and decommissioning of the Proposed Development to eliminate or reduce the potential for increased air quality impacts (if required);
- summary of any residual impacts and reinstatement; and
- summary of cumulative impacts.

8.17 The following air quality specific criteria have been used to assess the significance of air quality impacts.

8.18 To determine the significance of particulate matter effects associated with the Proposed Development, an evaluation of the sensitivity of the surrounding area is required. Receptors can demonstrate different sensitivities to changes in environment and are classified as per **Table 8-1** following the Institute of Air Quality Management (IAQM) Construction Dust Guidance[1].

Table 8-1 Methodology for Defining Sensitivity to Dust and PM_{10} Effects

Sensitivity of Area	Human Receptors	Ecological Receptors(A)
Very High	Very densely populated area More than 100 dwellings within 20 m Local annual mean PM_{10} concentrations exceed the Objective. Works continuing in one area of the site for more than 1-year	European Designated sites
High	Densely populated area. 10-100 dwellings within 20 m of site. Local annual mean PM_{10} concentrations close to the Objective (36 – 40 µg/m^3)	Nationally designated sites
Medium	Suburban or edge of town Less than 10 receptors within 20 m Local annual mean PM_{10} concentrations below the Objective (30 – 36 µg/m^3)	Locally designated sites
Low	Rural area; industrial area	No designations

[1] Institute of Air Quality Management (2018) "Guidance on Monitoring in the Vicinity of Demolition and Construction Sites" available at:https: //iaqm.co.uk/text/guidance/guidance_monitoring_dust_2018.pdf [Accessed 16/6/2023].

Sensitivity of Area	Human Receptors	Ecological Receptors(A)
	No receptors within 20 m Local annual mean PM_{10} concentrations well below the Objective (<30 µg/m^3) Wooded area between site and receptors	
Notes: (a) - Only applicable if ecological habitats are present which may be sensitive to dust effects.		

8.19 **Table 8-2** illustrates how the interaction of magnitude and sensitivity results in the significance of an environmental effect, with the application of mitigation measures.

Table 8-2 Impact Significance Matrix – Dust Effects (With Mitigation)

Sensitivity of Surrounding Area	Risk Of Site Giving Rise to Dust or PM_{10} Effects		
	HIGH	MEDIUM	LOW
Very High	Slight Adverse	Slight Adverse	Negligible
High	Slight Adverse	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

8.20 The Proposed Development has been assessed in accordance with IAQM guidance by considering the predicted change in conditions because of the Proposed Development. The risk category for potential effects arising from preparatory site works is divided into three potential activities:

- earthworks;
- new road construction activities; and
- trackout[2].

8.21 Based on the scale and nature of the works including areas, soils and operations at the site, a dust emission class is defined for each of the activities. These dust emission classes are then used to determine the risk categories presented below. These risk categories determine the potential risk of dust soiling effects assuming no mitigation measures are applied.

8.22 **Table 8-3** illustrates how the interaction of distance to the nearest receptor and the dust emission class results in the determination of risk category from earthworks activities.

Table 8-3 Determination of Risk Category from Earthworks Activities

Distance to Nearest Receptor		Dust Emission Class		
HUMAN (m)	ECOLOGICAL (m)	LARGE	MEDIUM	SMALL
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 – 50	-	High Risk Site	Medium Risk Site	Low Risk Site
50 – 100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100 – 200	20 – 40	Medium Risk Site	Low Risk Site	Negligible

[2] The term 'trackout' refers to the movement of dust and dirt from a construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

Distance to Nearest Receptor		Dust Emission Class		
200 – 350	40 – 100	Low Risk Site	Low Risk Site	Negligible

8.23 **Table 8-4** illustrates how the interaction of distance to the nearest receptor and the dust emission class results in the determination of risk category from construction activities.

Table 8-4 Determination of Risk Category from Construction Activities

Distance To Nearest Receptor		Dust Emission Class		
Human (m)	**Ecological (m)**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 – 50	-	High Risk Site	Medium Risk Site	Low Risk Site
50 – 100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100 – 200	20 – 40	Medium Risk Site	Low Risk Site	Negligible
200 – 350	40 – 100	Low Risk Site	Low Risk Site	Negligible

8.24 **Table 8-5** illustrates how the interaction of distance to the nearest receptor and the dust emission class results in the determination of risk category from trackout movements.

Table 8-5 Determination of Risk Category from Trackout Movements

Distance To Nearest Receptor		Dust Emission Class		
Human (m)	**Ecological (m)**	**Large**	**Medium**	**Small**
<20	-	High Risk Site	Medium Risk Site	Medium Risk Site
20 – 50	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
50 – 100	20 – 100	Low Risk Site	Low Risk Site	Negligible

8.25 Mitigation measures are recommended based on the evaluation of risk in accordance with the IAQM Dust and Air Emissions Mitigation Measures Guidance[3] (2012)- where relevant, these have been applied in Section 8.3.6 of this chapter.

8.26 To assess the impacts of construction dust emissions, the National Roads Authority's (NRA) Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place was used. This table is provided in Appendix 8 of the NRA Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes4 and reproduced below in **Table 8-6**.

Table 8-6 Assessment Criteria for the Impact of Dust Emissions from Construction Activities, with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from Source)		
Scale	Description	Soiling	PM_{10}	Vegetation Description

[3] Institute of Air Quality Management (2012) "Dust and Air Emissions Mitigation Measures" available at: http://www.iaqm.co.uk/text/guidance/iaqm_mitigation_measures_2012.pdf [Accessed 16/6/2023].

[4] National Roads Authority, (2006) "Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes" Dublin: NRA.

Source		Potential Distance for Significant Effects (Distance from Source)		
Major	Large construction sites, with high use of haul route	100 m	25 m	25 m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50 m	15 m	15 m
Minor	Minor construction sites with limited use of roads	25 m	10 m	10 m

Table 8-7 Definition of Impact Magnitude

Magnitude Of Change	Annual Mean NO_2/PM_{10}	No. Days with PM_{10} Conc. >50 µg/M^3	Annual Mean PM_{10}
Large	Increase / Decrease ≥4 µg/m^3	Increase / Decrease > 4 days	Increase / Decrease ≥2.5 - 4 µg/m^3
Medium	Increase / Decrease 2-< 4 µg/m^3	Increase / Decrease 3 or 4 days	Increase / Decrease 1.25 -<2.54 µg/m^3
Small	Increase / Decrease 0.4-<2 µg/m^3	Increase / Decrease 1 or 2 days	Increase / Decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase / Decrease <0.4 µg/m^3	Increase / Decrease <1 day	Increase / Decrease µg/m^3

Table 8-8 Air Quality Impact Descriptors for Change to Annual Mean Nitrogen Dioxide and PM_{10} and $PM_{2.5}$ Concentrations at Receptors

Absolute Concentration in Relation to Objective/Limit Value	Change In Concentration		
	Increase With Scheme		
	Small	Medium	Large
Above Objective / Limit Value with Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just below objective / Limit value with scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below objective / Limit value with scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse

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

8.27 Atmospheric emissions resulting from the proposed development mostly come from the exhaust emissions from heavy goods vehicles (HGVs). The decision as to whether an assessment of potential impact is required is based upon the criteria set out in the DMRB (Design Manual for Roads and Bridges).

8.28 The criterion for assessment of air quality contained within the LA105 Air Quality guidance[5] published by the UK Government of which is also valid for Ireland and focuses on roads with relatively high changes in flows or high proportion of HGV traffic. Affected roads are defined as those that meet any of the following criteria:

- road alignment will change by 5 m or more; or
- daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) movements or more; or
- HGV flows will change by 200 AADT or more; or
- daily average speed will change by 10 km/hr or more; or
- peak hour speed will change by 20 km/hr or more.

[5] Standards for Highways (2019) 'Design Manual for Roads and Bridges: Sustainability& Environment Appraisal LA105 Air quality' Available at: https://www.standardsforhighways.co.uk/tses/attachments/10191621-07df-44a3-892e-c1d5c7a28d90?inline=true. [Accessed 16/6/2023].

8.29 For Air Quality the key objective at Site is to manage activities to ensure that dust emissions are prevented where possible, and the effects of any residual releases are minimised.

Greenhouse Gas Assessment

Study Area and Scope

8.30 The primary GHG of concern with respect to this development is carbon dioxide (CO_2) which is emitted from the combustion sources. Other GHGs contribute to climate change and are accounted for based on their Global Warming Potential (GWP). The combined effect of these will be presented as carbon dioxide equivalent (CO_2e) this will account for all GHGs included in the United Nations Framework Convention on Climate Change's (UNFCCC) Kyoto Protocol specifically: Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF_6), and Nitrogen Trifluoride (NF_3).

8.31 The Scope of the assessment was defined by:

- Geographic Scope;
- Temporal Scope; and
- Activities Contributing to GHG emissions.

Geographic Scope

8.32 GHGs Contribute to climate change, which is a global environmental effect and as such the study area for the assessment is not limited by a specific geographical scope or defined by specific sensitive receptors.

8.33 The geographic scope was determined by identifying emission sources associated with the Proposed Development in respect of which the applicant has the ability to influence or control, in line with Institute of Environmental Management & Assessment (IEMA) guidance6.

Temporal Scope

8.34 The temporal scope was consistent with assessing the whole lifecycle GHG emissions from the Proposed Development.

8.35 The construction, operational and end-of-life phases of the Proposed Development was considered as follows:

- Construction Phase: Direct and indirect GHG emissions resulting from the Proposed Development over the construction period. For the purposes of this assessment, activities will be based on current day emission factors which will ensure a worst-case assessment, in order to estimate the biggest potential impacts.
- Operational Phase: Direct and indirect GHG emissions resulting from the operation of the complete development. The Proposed Development is unlikely to have noticeable emissions from the operational phase as it is a renewable energy project which will lead to avoided emissions from the energy grid.

[6] IEMA, (2022). Assessing Greenhouse Gas Emissions and Evaluating their Significance. 2nd Edition

- Decommissioning Phase: Direct and indirect GHG emissions resulting from the decommissioning of the Proposed Development at the end of its life including demolition of buildings, transport of waste, processing of waste and disposal. This will use current day emission factors which will present a worst-case assessment.

8.36 The whole life emissions are considered from the commencement of demolition and construction phase over the 35-year lifespan of the Proposed Development.

Do-Nothing Scenario

8.37 In establishing the Do-Nothing GHG emissions it has been assumed that there are currently no emissions from the site. However, there will be a comparison to the current grid average emission factor published by Sustainable Energy Authority of Ireland (SEAI) of 332 gCO_2/kWh[7] this will ensure a comparison of emissions avoided by the input of renewable energy to the grid.

Whole Life Carbon Assessment

8.38 The following assumptions have been used to assess the whole life carbon from the wind farm:

- The lifetime of the windfarm is 35 years;
- The maximum export capacity (MEC) is 52.8 MW to 57.6 MW; and
- The capacity factor is 33% and the fraction of output to back up is 1.65% (i.e., 5% of capacity factor[8]), in the case of residual load being required that cannot be covered by wind power.

Construction and Decommissioning Phases

8.39 Emissions from the embodied carbon across the construction, operational and decommissioning are estimated using the Scottish Government web-based carbon calculator tool for wind farms9.

8.40 The tool provides a method for estimating the impacts of wind farms accounting for emissions from land use change. The tool also provides guidance and assumption for unknown values. The carbon calculator, whilst designed for Scottish wind farm developments is useful for assessing Irish wind farm developments due to the similarity in development sites, i.e., high ground on peatlands which contain forestry in a similar climate.

8.41 The calculator considers the carbon emissions from the whole life cycle of the wind turbines and auxiliary buildings.

8.42 Emissions that may be included in the tool are as follows:

- Borrow pits

[7] SEAI (2022), "Conversion and Emission Factors" available at https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/ [Accessed: February 2024],

[8] The forestry input data is used to determine the capacity factor for the turbines at the site. This is dependent on tree height, forest width and distance of the forest from the turbine. The capacity factor, $pcap$ (%), is calculated from the ratio of calculated annual power output from the turbine, Pact (MWh turbine-1 yr-1), and the theoretical power output of the turbine, Pmax (MW turbine-1 yr-1), removing the specified value for estimated downtime for maintenance, tdown (%).

[9] SEPA (2023) "Carbon Calculator" available at:https://informatics.sepa.org.uk/CarbonCalculator/ [Accessed 6/6/23].

- Access Tracks
- Foundations for turbines and crane pads
- Construction of the substation and temporary compounds
- Cable trenches
- Forestry operations
- Restoration of site after decommissioning

8.43 The Scottish Government online carbon calculator as outlined above, was used to assess the impacts of the Proposed Development in terms of potential carbon emissions and removals considering drainage, and forestry felling. This has been provided as **Appendix 8.1**.

Land Use Change, Land Management and Forestry

8.44 The Proposed Development site consists of a mixture of primary grazing, agricultural, and forestry land. Some of the forestry has been grown on land that was previously extracted for peat, meaning that the carbon content of the soil is much lower than that of an actual peatland habitat with carbon having been released during the drainage and cultivation of the site previously.

8.45 The assessment considers the carbon removal potential from land and plants. This is based on the total area of land changed.

8.46 There is minimal peatland on the site of the Proposed Development, whilst the carbon content for dry peat and dry bulk density was unknown. The mean peat depth was calculated from **Appendix 6.1** at a value of 1.18m with a worst-case drainage scenario of 30m from drainage features.

8.47 Forestry on the site of the Proposed Development can affect wind energy yields and therefore clear felling is generally required. Carbon emissions due to felling are calculated from the area to be felled, the average carbon sequestered annually, and the lifetime of the wind farm. The calculator uses default values from the Intergovernmental Panel on Climate Change (IPPCC, 1997) as well as site specific equations from scientific literature to calculate carbon loss.

8.48 Forestry felling undertaken to facilitate bat buffers will be accounted for. The largest rotor diameter in the range of proposed turbines was assessed as it will require the largest area of clear felling, being up to 20.09 ha of largely coniferous forestry. This allows for the assessment of a worst-case scenario within the proposed range of the turbines as the effects would be no worse than those of the largest rotor diameter. Both the minimum rotor diameter turbine and MW output of 6.6 MW (Siemens Gamesa 155) and maximum rotor diameter and MW output of 7.2 MW (Vestas 162) have been assessed and the results are included in **Appendix 8.1**.

8.49 All forestry and hedges will be replanted at another location; however, this is not considered on the carbon calculator tool. It is therefore highly likely that the calculated carbon emissions and removals for the Proposed Development related to forestry have assumed to be neutral over its lifespan.

Operational Emissions and Avoided Emissions

8.50 Currently wind and renewable energy only makes up 28.3% of the total generation the remaining 71.7% is from fossil fuels and non-renewable sources[10] . This leads the grid to have a carbon intense energy production of 332 gCO_2/kWh. The increased capacity of wind and renewables will lead to avoided emissions as additional wind generation will displace fossil fuel generation within the Irish electricity grid.

Determining Likely Significant Effects and Effect Significance

8.51 The assessment considered the whole life GHG emissions of the Proposed Development. This included GHG emissions during the construction phase, operational phase and decommissioning phase.

8.52 For GHG emissions there are no recognised significance criteria and thresholds that relate to the quantity of GHG emissions released.

8.53 The approach to classify and define likely significant effects relies on IEMA guidance and applies expert judgement on the significance of the Proposed Developments lifecycle GHG emissions considering their context, compliance with policy and mitigation measures.

8.54 The IEMA guidance defines five distinct levels of significance (see **Table 8-9**) which are not solely based on whether a project emits GHG emissions alone, but the degree to which the project's GHG emissions are consistent with science-based 1.5°C aligned emission trajectories towards net zero. For the country these are effectively defined by carbon budgets, including any sectoral pathways that are designed to achieve the country's 2050 net zero target.

8.55 IEMA established three underlying principles, which informed its approach to significance as follows:

- The GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect.
- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA directive.
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be significant.

8.56 Based on these principles IEMA conclude:

'When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible.

Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages.

[10] SEAI, (2023) "Electricity" available at: https://www.seai.ie/data-and-insights/seai-statistics/key-statistics/electricity/ [Accessed: February 2024]

Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered'.

8.57 The significance of any net change of GHG resulting from the Proposed Development has been assessed by its ability to contribute to reducing GHG emissions consistent with a trajectory towards net zero by 2050.

8.58 To establish the significance of the GHG emissions from the Proposed Development, judgements were made on:

- The Proposed Developments consistency with policy requirements, since these are specific to ensure the economy decarbonises in line with the country's net zero target; and
- The degree to which the Proposed Development has sought to mitigate its emissions.

Table 8-9 GHG Significance Criteria (Based on IEMA Guidance)

Significance Rating	Description	Criteria to Determine Significance of net GHG Emissions
Major Adverse	A project with major adverse effects is locking in emissions and does not make a meaningful contribution the country's trajectory towards net zero	The project's net GHG impacts are: Not mitigated or are only compliant with do-minimum standards set through regulation. Do not provide further reductions required by existing local and national policy for projects of this type.
Moderate Adverse	A project with moderate adverse effects falls short of fully contributing to the country's trajectory towards net zero.	The project's net GHG impacts are: Partially mitigated. May partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type.
Minor Adverse	A project with minor adverse effects I fully in line with measures necessary to achieve the country's trajectory towards net zero.	The project's net GHG impacts are: Fully consistent with applicable existing and emerging policy requirements. In line with good practice design standards for projects of this type

Significance Rating	Description	Criteria to Determine Significance of net GHG Emissions
Negligible	A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.	The project's net GHG impacts are: Reduced through measures that go well beyond existing and emerging policy. Better than good practice design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050.
Beneficial	A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.	The project's net GHG impacts are: Below zero It causes reduction in atmospheric GHG concentrations, whether directly or indirectly compared to the without project baseline.

8.59 IEMA also advises that:

'Major adverse, moderate adverse and beneficial effects should be considered significant in the context of EIA. Negligible and minor adverse are considered not significant.

In the case of large-scale developments, irrespective of the level of mitigation if net GHG emissions exceed 5% of the country or devolved administrations carbon budget, that this is a level of change considered significant'.

8.60 The assessment of significance is established over two steps as follows:

- Step 1 Establish context of GHG Emissions: context for decision making is provided by comparing the net change in the whole life GHG emissions resulting from the Proposed Development with local, regional, and national GHG emission totals and carbon budgets.
- Step 2 Determine Significance of Effects: Significance of effects established through applying the criteria detailed in table 9.2 based on professional judgement. This considers the consistency of the Proposed Development with national targets to meet net zero targets and the robustness, timeliness and efficacy of mitigation measures proposed to avoid, reduce and compensate GHG emissions.

Cumulative Effects

8.61 Following IEMA guidance it is known that climate change is a large, interrelated, and cumulative environmental effect and emission impacts have resulting effects that are on a global scale.

8.62 In terms of this assessment the following are therefore relevant:

The assessment will consider the effects of the Proposed Development in the context of national and local cumulative totals. The national totals assume that other developments also contribute to GHGs and will consider their significance. The geographical location of emissions has no relevance to the assessment. Therefore, the effects of the Proposed Development are independent of any local cumulative emissions.

8.63 Following IEMA Guidance which states, “Effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed”. An assessment of the GHG emissions associated with cumulative developments was not undertaken as the cumulative GHG effects are the same as those for the current operations.

Receptor Sensitivity

8.64 The assessment of the impact on climate change only identifies a single receptor of atmospheric concentration of GHGs. This is because all global cumulative GHG sources are relevant to the effect on climate change. The sensitivity is categorised as high sensitivity in line with IEMA guidance.

Climate Resilience

8.65 This part of the chapter provides a qualitative assessment of the embedded mitigation and resilience of the Proposed Development to climate change. The assessment methodology considers the recommendations in the IEMA EIA guide to Climate Change Resilience and Adaption[11] and The Climate Change and Major Project guidelines 2014-2020[12] it describes the potential climate change impacts on the Proposed Development. Analysing the following:

- climate change legislative framework/policy context;
- analysis of evolving environmental baseline trends;
- identifying climate change concerns in relation to the Proposed Development;
- assessing effects (cumulative effects and uncertainty);
- identifying alternatives and mitigation measures; and
- identifying monitoring and adaptive management.

8.66 In recent years, there has been increasing public awareness about the implications of past, ongoing, and continued future emissions of greenhouse gases on the earth’s climate. The implications of such change will have significant impact on local communities and national populations across the world. The ever-increasing awareness and acceptance of this reality has, in recent years, prompted significant public policy development around emissions and climate change.

8.67 Climate change adaptation and mitigation are to be increasingly integrated in the preparation and approval of proposed developments. Adaptation seeks to ensure adequate resilience of a proposed development to the adverse impacts of climate change based on the Proposed Development vulnerability.

[11] IEMA, (2020). Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation

[12] European Commission (2016) “Climate Change and Major Projects” available at: https://climate.ec.europa.eu/system/files/2016-11/major_projects_en.pdf [Accessed January 2024].

8.68 The aim of the vulnerability assessment is to identify the relevant climate hazards foreseen at the development location. Main steps include identifying and combining the sensitivity and exposure of the Proposed Development which will describe the vulnerability, while the risk will be determined by likelihood and impact. Adaptation through the Proposed Development options, appraisal, and planning will depend on the assessed Proposed Development's vulnerability and risk.

Study Area and Scope

8.69 There are two areas to assessing climate change resilience issues within EIA, which need separate treatment:

- The risks of changes in the climate to the project (i.e., the resilience or vulnerability of a project to future climate changes). A climate risk assessment has been carried out to establish likely significant effects resulting from climate change on the Proposed Development; and
- The extent to which climate exacerbates the effects of the Proposed Development on the environment. This has been analysed in line with IEMA Guidance. The effects of the Proposed Development on various environmental receptors have been assessed, then these effects have been re-assessed considering climate change.

Geographical Scope

8.70 The study area for climate resilience focuses on the impact that the climate will have on the Proposed Development. The study area is therefore the footprint of the Proposed Development split into its receptors.

Temporal Scope

8.71 The Proposed Development is assumed to have a lifespan of 35 years. Climate projections from the New Climate Projections 2020[13] for the 2060s have been used (Representative Concentration Pathway (RCP) 8.5 – high emissions scenario). This is the latest time horizon for which projections are available and consistent with IEMA Guidance

Baseline Conditions

8.72 A desk-top assessment of available climatic information from Met Éireann[14] (see section Existing Environment) was undertaken for the Proposed Development to characterise the current impacts from climate.

Identifying Likely Significant Effects

8.73 The scale for assessing the likelihood of a climate hazard is presented in **Table 8-10.** The output of the likelihood analysis is an estimation of the likelihood for each of the essential climate variables and hazards is based on the Climate Change and Major Project guidelines 2014-2020.

[13] Met Eireann (2020) "New Climate Projections 2020" available at: https://www.met.ie/epa-climate-projections-2020 [Accessed: February 2024]

[14] Met Éireann Climate (2023) "Monthly Data" Available at: data: https://www.met.ie/climate/available-data/monthly-data [Accessed 16/6/2023].

Table 8-10 Scale of Likelihood of Climate Hazard

Term	Qualitative	Quantitative
Rare	Highly unlikely to occur	5%
Unlikely	Unlikely to occur	20%
Moderate	As likely to Occur	50%
Likely	Likely to Occur	80%
Almost certain	Very likely to occur	95%

8.74 The matrix for assessing the potential impact of a climate hazard is presented in **Table 8-11**. The impact analysis provides an assessment of the potential impact of each of the essential climate variables and hazards.

Table 8-11 Example Table for Climate Hazard Impact Analysis

Risk Areas	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational					
Safety and Health					
Environment					
Social					
Financial					
Reputation					

8.75 The matrix for assessing the sensitivity of Proposed Development to climate hazards is presented in **Table 8-12**. The sensitivity is summarised, along with the ranking of the relevant climate variables and hazards relating to the Proposed Development.

Table 8-12 Example Table for Sensitivity of Proposed Development to Climate Hazards

	Extreme Rainfall, Flash Flood	Food	Health	Drought	Wildlife Fires	Storms And Winds	Landslides	Cold Spells and Snow	Freeze –Thaw Damage	Rising Sea Levels
On site assets										
Inputs - Water										
Inputs - Energy										
Outputs - product										
Transport links										

8.76 The matrix for assessing exposure of a Proposed Development to climate hazards is presented in **Table 8-13**. The exposure analysis ranks climate variables and hazards as low, medium, or high based on current and future climate.

Table 8-13 Example Table of Exposure of the Proposed Development to Climate Hazards

	Extreme Rainfall, Flash Flood	Food	Health	Drought	Wildlife Fires	Storms And Winds	Landslides	Cold Spells and Snow	Freeze –Thaw Damage	Rising Sea Levels
Current Climate										
Future Climate										

8.77 An example of the vulnerability of a Proposed Development to climate hazards is presented in **Table 8-14**. The vulnerability combines the sensitivity and the exposure analysis.

Table 8-14 Example Table for Vulnerability Analysis of Proposed Development to Climate Hazards

Sensitivity	Exposure (Current & Future Climate)		
	Low	Medium	High
Low			
Medium			
High			

AIR QUALITY

Regulations

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

- 1st Daughter Directive (99/30/EC): Sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter, and lead;
- 2nd Daughter Directive (2000/69/EC): Carbon monoxide and benzene;
- 3rd Daughter Directive (2002/69/EC): Ozone; and
- 4th Daughter Directive (2004/107/EC): Polyaromatic hydrocarbons, arsenic, nickel, cadmium, and mercury in ambient air.

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

8.80 The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Environmental Protection Agency Act, 1992 (Ambient Air Quality Assessment and Management) Regulations, 1999 (S.I. No. 33 of 1999). The fourth Daughter Directive was transposed into Irish legislation by the Arsenic, Cadmium, Mercury, Nickel, and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009). **Table 8-15** details the limit values for pollutants as per the CAFE Directive.

Table 8-15 Relevant Air Quality Limit Values for Protection of Human Health

Human Health	Limit Or Target Value			Information And Alert Thresholds (Where Applicable)		Long Term Objective
Pollutant	Averaging Period	Value	Maximum Number Of Allowed Occurrences	Period	Threshold Value	
Nitrogen Dioxide (NO_2)	Hour Year	200 µg/m^3 40 µg/m^3	18 0	1 hour alert	400 µg/m^3 Exceeded for 3 consecutive hours	
Sulphur Dioxide (SO_2)	Hour Day	350 µg/m^3 125 µg/m^3	24 3	1 hour alert	500 µg/m^3 Exceeded for 3 consecutive hours	
Particulate matter with aerodynamic diameter of less than 10 µm (PM_{10})	Day Year	50 µg/m^3 40 µg/m^3	35 0			
Particulate matter with aerodynamic diameter of less than 2.5 µm ($PM_{2.5}$)	Year	25 µg/m^3 20 µg/m^3 (ECO)				0 8.5 to 18 µg/m^3
Lead	Year	0.5 µg/m^3				
Carbon Monoxide	8 Hours	10,000 µg/m^3				
Benzene	Year	5 µg/m^3				

Table 8-16 Summary of Air Quality Limit Values: Protection of Vegetation

Vegetation		Critical Level or Target Value	Long-Term Objective	
Pollutant	Averaging Period	Value	Value	Date
Nitrogen oxide (NOx)	Calendar year	30 µg/m^3		
Sulphur Dioxide (SO_2)	Calendar year and winter (October to March)	20 µg/m^3		

Specific Guidance Relating to Air Quality / Dust Nuisance

8.81 A range of monitoring techniques exist for dust deposition rates (i.e., Bergerhoff and Frisbee gauges). There is currently no Irish, European Union (EU) or World Health Organisation (WHO) statutory standards or limits appropriate for the assessment of deposited dust and its propensity to generate annoyance.

8.82 Industry standard criteria levels for the gravimetric assessment of dust deposition in Ireland recommend the use of the Bergerhoff method for measuring dust deposition, the TA Luft dust deposition limit value of 350 mg/m^2/day (total dust deposition averaged over a 30-day period), measured at development site boundaries.

8.83 When the rate of accumulation of the coarser fraction of dust (referred to as deposited dust) is sufficiently rapid to cause fouling or discolouration, then it is generally considered to introduce a nuisance. The point at which an individual perceives dust deposition as a nuisance and causes a complaint is highly subjective.

8.84 The action of wind over dry ground will carry dust particles into the air. Although large emissions of dust occur naturally, man-made dust events are caused by a range of activities including agriculture, road traffic, construction works (including the handling and storage of soils and particulate matter) and by vehicles using paved and unpaved haul roads.

8.85 For operations involving the mechanical break up of solids, the most common concern regarding dust emissions is the potential nuisance effect from the larger fractions of dust.

Ozone

8.86 In the CAFE Directive (2008/50/EC), the EU has set a target value and a long-term objective value for ozone (O_3) for the protection of human health. Target value: the maximum daily eight-hour mean may not exceed 120 micrograms per cubic metre (µg/m^3) on more than 25 days per calendar year averaged over three years. Long term objective value: the maximum daily eight-hour mean may not exceed 120 micrograms per cubic metre (µg/m^3) within a calendar year.

8.87 These are detailed in **Table 8-17** along with information threshold and alert threshold values.

Table 8-17 Target Values for Ozone

Objective	Calculation	Target Value
Protection of Human Health	Maximum daily 8-hour mean	120 µg/m^3

Objective	Calculation	Target Value
Protection of vegetation	AOT40*, calculated from 1-hour values from May to July	120 µg/m^3 -h
Information Threshold	1-hour average	180 µg/m^3
Alert Threshold	1-hr average	240 µg/m^3
*The sum of the differences between hourly ozone concentration and 40 ppb for each hour when the concentration exceeds 40 ppb during a relevant growing season, e.g., for forest and crops		

Air Quality and Health Effects

8.88 The recent EPA reports, Air Quality in Ireland 2022[15] detail the main air quality trends based on monitoring from the national ambient air quality network.

8.89 Ireland met all the EU legal requirements in 2021 but failed to meet the WHO guidance levels for health in 2021. Selected pollutants that failed the WHO AQG levels in 2021 were: PM_{10}, $PM_{2.5}$, NO_2, Ozone, SO_2, and PAHs.

8.90 Europe as part of the Green Deal and the EU's Zero pollution visions for 2050 is revising its air quality standards to align them closely with the lower WHO recommendations.

8.91 A summary of relevant Air Quality limit values in relation to human health was presented previously in **Table 8-14**.

Existing Environment

8.92 European air quality legislation requires that each member state be defined in terms of Zones and Agglomerations for air quality, with Ireland divided into four zones. The EPA has designated four zones within Ireland[16]:

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

8.93 These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives.

8.94 The Proposed Development and surrounding area are in Air Quality Zone D, categorised as rural Ireland. The location with the longest continuous PM_{10} air quality monitoring record within a similar Zone D area is located at Kilkitt, Co. Monaghan. Kilkitt monitoring station is also the closest and as such, the most appropriate dataset available for assessment of air quality baseline concentrations within the study area.

[15] EPA (2023) "Air Quality in Ireland" available at: https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2022.php [Accessed February 2024]
[16] EPA (2012) "Air Quality Zones" available at: https://airquality.ie/information/air-quality-zones [Accessed February 2024]

Sulphur Dioxide (SO_2)

8.95 Sulphur Dioxide for the period of 2016-2022 recorded at the Kilkitt air monitoring station is presented in **Table 8-18**. Neither the hourly limit value nor the lower assessment threshold as set out in the CAFE Directive were exceeded during the monitoring period.

Table 8-18 Sulphur Dioxide Data for Kilkitt (µg/m^3)

Year	Hourly Max	Daily Max	Annual Mean
2016	10.4	5.1	1.8
2017	6.1	2.7	1.6
2018	16	6	2.6
2019	6.7	1.3	0.7
2020	4.8	4	1.4
2021	7.7	6.6	1.7
2022	7.7	6.8	2.1

Particulate Matter (PM_{10})

8.96 Particulate matter are very small particles which can be either solid or liquid. Some of these particles occur naturally, while many are man-made. Particulate matter is referred to as PM. The number following the PM is used to show how small the PM is, which is measured in micrometre (µm). The EPA monitors two types of particulate matter (PM_{10} (10 µm) and $PM_{2.5}$ (2.5 µm)) and compare levels to limit values in the CAFE Directive and WHO guidelines.

8.97 Particulate matter (PM_{10}) data for the 2014-2022 monitoring period in Kilkitt is presented in **Table 8-19**.

Table 8-19 Particular Matter (PM_{10}) Data for Kilkitt (µg/m^3)

Year	Annual Mean (µg/M^3)	Number Of Days >50 µg/M^3
2014	9	2
2015	9	1
2016	8.1	0
2017	7.8	0
2018	9	0
2019	7	0
2020	8	0
2021	7.8	0
2022	8.5	0

Nitrogen Dioxide (NO_2)

8.98 Nitrogen dioxide data for the 2016-2022 monitoring period in Kilkitt is presented in **Table 8-20**.

Table 8-20 Nitrogen Dioxide (NO_2) for Kilkitt (µg/m^3)

Year	Hourly Max	Annual Mean
2016	80.2	3
2017	25.4	2.3
2018	37	3
2019	59	5
2020	18.3	2
2021	14.7	2.4
2022	19.3	2.0

Sensitive Receptors

8.99 In total, there are 281 potential residential receptors within the study area. The study areas have been informed by best practice. This can be separated as follows:

- Within 500 m of cable route and substation: 277 residences.
- Within 500 m of the development site area (excluding cable route): 4 residences.
- Within 500 m of both the proposed site boundary and cable route / substation: 281 residences.

8.100 The western boundary of the site extends across the Westmeath and Meath County administrative boundary, to include part of the River Boyne and Blackwater cSAC (Site Code: 002299). The River Stonyford and it's tributary D'Arcy Crossroad Streams form part of this cSAC.

Potential Impacts – Construction

Windfarm and TDR

8.101 The principal sources of potential dust emissions during the construction of the Proposed Development will be from the wind farm and turbine delivery route; from dust arising from earthworks, tree felling activities, construction of the new access tracks, the temporary storage of excavated materials, the construction of the proposed substation, the movement of construction vehicles, loading and unloading of aggregates/materials /movement of material around the site and turbines delivery.

8.102 Fugitives 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; and
- climate/local meteorology and topography.

8.103 An overview of the sources and processes associated with the preparatory site works and the construction / infrastructure installation activities, and their respective

potential for dust deposition (both dust and smaller particles), is presented below in **Table 8-21**.

Table 8-21 Site Activities: Sources of Dust Emissions

Activity	Source	Emission Potential	Comments
Road and Substation Construction, Earthworks and Trackout	Excavators / Dozers / HGVs	High - dry or fine materials during strong windy weather	Temporary, variable from day to day depending on prevailing meteorological conditions, level, and location of activity. Soils immediately used to construct berms, used in restoration works or placed in stockpiles.
		Low – coarse or wet materials during conditions of low wind speed	
TDR	HGV / Road vehicles	Low - on paved road surfaces	Dependant on the amount of loose material on road surface available for re-suspension and track out.

8.104 **Table 8-22** details the NRA assessment criteria used for assessing the impact of dust from construction activities of varying scale.

Table 8-22 NRA Assessment criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation Place

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

8.105 The overall construction of the proposed development is considered a major **construction** site as it will result in soiling effects which have the potential to occur up to 100 m from the source, with PM_{10} deposition and vegetation effects occurring up to 25 m from the source due to the quantity of construction works which are involved in the development of a wind farm. The nearest receptor is 722 m from any of the proposed turbine and therefore will not experience the soiling, deposition, or vegetation effects. Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. Due to distance between the nearest receptor and source of emissions the impact from these emissions will be Imperceptible. During the construction of the Proposed Development the preparatory and construction works will be completely confined within the proposed site.

8.106 Considering this, together with the separation distance to receptors and the screening provided by existing vegetation, the dust risk category for these construction activities is assessed as ‘low risk’ to ‘negligible’. A summary of the determined risk category for the various activities around the proposed site is presented in **Table 8-23** below.

Table 8-23 Site Activities: Risk of Dust Emissions

Source	Risk Of Dust Soiling Effects	Ecological Effects
Earthworks	Negligible	Negligible
Construction	Negligible	Negligible
Trackout	Negligible	Negligible

8.107 While the overall risk category has been assessed as 'negligible, if the soils stripping activities were not mitigated, the effects of dust during dry and windy conditions could possibly lead to occasional increases in nuisance dust immediately surrounding the Proposed Development site. However, these are not considered to be significant given the limited duration of such meteorological conditions and the limited change in the extent and scale of the proposed activities.

8.108 It is not predicted that an air quality impact will occur due to traffic at the proposed development as the impacts will fall below the screening criteria set out in the UK Design Manual for Roads and Bridges guidance. This UK DMRB guidance states that road links meeting one or more of the following criteria can be defined as being 'affected' by a Proposed Development and should be included in the local air quality assessment:

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

8.109 On the surrounding road network as detailed in Chapter Traffic and Transportation, there will be an average daily increase of 60 HGV trips per day for the construction of the Proposed Development over a construction period of 14 months and 16 HGV trips (32 two way) for the construction of the cable route. LGV traffic is expected to be 100 two-way movements per working day for the wind farm and substation and 25 trips per day (50 two way) for the cable route.

8.110 The combined HGV and LGV average daily increase are 120 trips per day. The combined HGV and LGV average daily increase are 240 two-way movements per day, which include the wind farm and cable route construction vehicles. This is based on the busiest day for both the wind farm construction and the cable route construction. Therefore, the model is not required in this instance.

8.111 On this basis, the impact of combustion emissions (primarily oxides of nitrogen) from vehicle exhaust emissions associated with the transfer and/or transportation of materials are screened out, and it is determined that there is no potential for emissions to contribute to local air pollution.

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

8.113 In terms of the TDR, there will be truck movements associated with delivering the wind turbines resulting in vehicular emissions and dust, however it will be done over

paved surfaces thus dust soiling potential is very low along the route. Once all wind turbines are delivered and other ground works are complete the truck movements will reduce and the vehicular emissions from HGVs will greatly decrease.

Cable Routes and Substation

8.114 The proposed cable route is considered a rolling construction site as it will result in soiling effects which have the potential to occur up to 50 m from the source, with PM_{10} deposition and vegetation effects occurring up to 15 m from the source. The cable route will exit the Proposed Development site heading east on the L5542, before entering the N52. From there, the route will head north along the N52 for approximately 2.5 km before heading west along the L6821 and entering private fields to the proposed offsite substation. Some houses along the route may experience soiling and deposition of vegetation effects depending on how close to the road corridor they are located. Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. However, due to the nature of construction along the proposed cable route as described in Chapter 3, which works as a "rolling" construction site, meaning that these works will not be concentrated in any one area of the route, these effects are short term, temporary and slight, irrespective of which option is progressed.

Potential Impacts – Operational

Windfarm and TDR

8.115 Once the proposed development has been constructed there will be no significant direct emissions to atmosphere. A diesel generator of sufficient power to operate critical functions of the substation will be located at the proposed substation; however, this will only be operated as a back-up/emergency power supply.

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

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

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

Cable Route and Substation

8.119 Once the proposed cable route and substation are constructed there will be no significant direct emissions to atmosphere.

Potential Impacts – Decommissioning

Windfarm and TDR

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

8.121 During the decommissioning phase, the proposed cable route infrastructure including substations and ancillary electrical equipment will form part of the national grid and shall be left in situ. Substation, internal ducts of the Proposed Development, and all internal access roads, turbine hard standings within the wind farm site will be left in situ, resulting in no additional truck movements and no impact from emissions from machinery along the cable route.

Cable Corridor and Substation

8.122 During the decommissioning phase, the proposed cable route infrastructure including substations and ancillary electrical equipment will form part of the national grid and shall be left in situ.

Mitigation Measures

Windfarm and TDR

Construction Phase

8.123 A Construction Environmental Management Plan (CEMP) has been prepared and is included in **Appendix 2-2**. This includes the following mitigation measures that will be implemented in full during the construction phase of the proposed development relevant to air quality:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate;
- A water bowser will be available to spray work areas (wind turbine area and cable route) and haul roads, especially during periods of excavation works coinciding with dry periods of weather, to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Gravel will be used at the site exit point to remove any dirt from tyres and tracks before travelling along public roads;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;

- Wheel washing facilities will be provided at the entrance/exit point of the Proposed Development site;
- The developer in association with the contractor will be required to implement a dust control plan as part of the CEMP. In the event the Planning Authority decides to grant permission for the Proposed Development, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority.
- Receptors which receive dusting and soiling from local routes entering the site; and dwellings directly adjacent to the cable route construction that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling have taken place;
- All vehicles will switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

Operational Phase

8.124 As the operation of the Proposed Development will have positive impacts on air quality, mitigation measures are considered unnecessary.

Decommissioning Phase

Proposed Development

8.125 Mitigation measures for the removal of wind turbines from the Proposed Development site would be similar as per the construction phase with respect to dust control and minimisation.

8.126 The proposed access tracks across the Proposed Development site and the 33 kV collector circuit cable connection between the two clusters will be left in situ. Leaving the access tracks and the collector cable in situ results in no decommissioning works required, therefore no dust emissions from construction vehicles will be emitted. No mitigation measures are proposed.

Cable Route and Substation

8.127 The substation and underground cable route will also be left in situ. Leaving the cable route in situ results in no decommissioning works required, therefore no dust emissions from construction vehicles will be emitted. No mitigation measures are proposed.

Residual Impacts

Windfarm and TDR

8.128 Following the implementation of the above mitigation measures, the Proposed Development, proposed cable route and proposed substation are predicted to give rise to slight residual impacts arising from fugitive dust emissions during certain construction activities and decommissioning. These will be localised in nature and as

they will be associated with elements of the construction phase and meteorological conditions, they will be temporary in nature and will not result in any permanent residual impacts.

8.129 Impacts related to vehicle emissions will practically cease following the operational phase and no significant impacts are anticipated, with minimal emissions expected during potential maintenance activities. There will be a low level of maintenance traffic during the operational period, which will have an imperceptible impact. During operations, the Proposed Development will result in the avoidance of emissions from fossil fuel generators which is a positive effect on air quality.

8.130 During operations, the Proposed Development will result in the avoidance of emissions from fossil fuel generators which is a significant positive effect on air quality. The effects in this section are not influenced by changes in the turbine range as set out in **Chapter 3** of this EIAR. As such, the same effects are predicted irrespective of the turbine within the range.

Cable Route and Substation

8.131 There will be no significant permanent residual impacts along the proposed cable route.

GREENHOUSE GAS ASSESSMENT

8.132 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 organic carbon stores. The vegetation on a peat bog slowly absorbs CO_2 from the atmosphere 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 greenhouse gas assessment of proposed wind farm developments in peatland habitats has attracted significant attention in recent years. When developments such as wind farms are proposed for peatland areas, there will be direct impacts and loss of peat in the development area. There may also be indirect impacts where it is necessary to install drainage in certain areas to facilitate construction. The works can either directly or indirectly allow the peat to dry out, locally, which permits the full decomposition of the stored organic material with the associated release of the stored carbon as CO_2. It is essential therefore that any wind farm development in a peatland area displaces more CO_2 produced from fossil fuel sources than it releases during the construction, operation, and restoration of the wind farm site. The Proposed Development is situated in an area which has limited peat habitats as most of the site has been cultivated and dominated by forestry. The majority of the site is sensitively situated in areas of limited habitat value and not located on acid bog or fen habitats. However, peat is present in a variety of depths within the vicinity of T1 and T3.

8.133 The Scottish Carbon Calculator Tool was used to calculate carbon emissions and carbon savings because of the Proposed Development - www.gov.scot. Input data used in the calculations is presented in **Appendix 8.1**.

Existing Environment

Study Area

8.134 Ireland's greenhouse gas (GHG) emissions are tracked and projected by the EPA for submission to the EU UNFCCC annually.

8.135 Ireland's GHG emissions value for 2022 was estimated to be 60.76 million tonnes carbon dioxide equivalent (Mt CO_2 eq) which is 1.9% lower (or 1.19 Mt CO_2 eq) than emissions in 2021. In 2021, Ireland's provisional GHG emissions are estimated to be 61.53 Mt CO_2eq, which is 4.7% higher (or 2.76 Mt CO_2 eq) than emissions in 2020 (58.77 Mt CO_2 eq). There was a decrease of 3.4% in emissions reported for 2020 compared to 2019. Emissions are over 1% higher than pre-pandemic 2019 figures.

8.136 In 2022 emissions in the stationary ETS sector decreased by 4.3% and emissions under the ESR (Effort Sharing Regulation) decreased by 1.1%. When Land Use, Land Use Change and Forestry (LULUCF) is included, total national emissions decreased by 1.8%. In 2021 national total emissions excluding LULUCF increased by 4.7%, emissions in the stationary ETS sector increased by 15.2% and emissions under the ESR (Effort Sharing Regulation) increased by 1.6%. When LULUCF is included, total national emissions increased by 5.5%.

8.137 Decreased emissions in 2022 compared to 2021 were observed in the largest sectors except for transport, waste, and commercial services. These 3 sectors showed increases in emissions (+6.0%, +4.9% and +0.2% respectively), shown highlighted red in the "Emissions change 2021-2022" table below. The greenhouse gas emission inventory for 2021 is the first of ten years over which compliance with targets set in the European Union's Effort Sharing Regulation (EU 2018/842) will be assessed. This Regulation sets 2030 targets for emissions outside of the Effort Sharing Regulation (known as ESR emissions) and annual binding national limits for the period 2021-2030. Ireland's target is to reduce ESR emissions by 30% by 2030 compared with 2005 levels, with several flexibilities available to assist in achieving this. The ESR was amended in April 2023 and Ireland must now limit its greenhouse gas emissions by at least 42% by 2030. The ESR includes the sectors outside the scope of the EU Emissions Trading System (ETS) (such as Transport, Residential, Public Services and Commercial Services and Waste).

Carbon Budgets

8.138 The current carbon budgets have been approved by the government and adopted. A carbon budget represents the total amount of emissions, measured in tonnes of CO_2 equivalent, that may be emitted by a country during a specific time.

8.139 The carbon budget for Ireland are as follows[17]:

- 2021-2025: 295 MtCO_2e
- 2026-2030: 200 MtCO_2e
- 2031-2035: 151 MtCO_2e

[17] DECC (2022) "Carbon Budgets" available at: https://www.gov.ie/en/publication/9af1b-carbon-budgets/ [Accessed February 2024]

8.140 Following the approval of the carbon budgets, the government has agreed on sectoral emission budgets the refer to the total amount permitted greenhouse gas emissions that each sector of the economy can produce during a specific time period.

8.141 The emission ceilings for electricity are as follows[18]:

- 2021-2025: 40 $MtCO_2e$
- 2026-2030: 20 $MtCO_2e$

Assessment of Effects

Construction and Decommissioning Phase GHG Emissions

Windfarm / TDR / Cable Corridor / Substation

8.142 The online Scottish Windfarm Carbon Assessment Tool[19] was used to estimate emissions from the construction phase of the wind farm. The assumptions are in the methodology section and **Appendix 8.1** (found in Volume III of this EIAR) details the inputs to the model.

8.143 The outputs of the tool included in the construction phase emissions are as follows.

- Emissions due to turbine life
- Construction of Turbines
- Construction of Substation
- Construction of Cable Route
- Losses due to reduced carbon fixing potential
- Losses from soil organic matter
- Losses due to DOC & POC leaching
- Losses due to felling forestry

8.144 There is the potential for greenhouse gas emissions to the atmosphere during the construction phase of the proposed development such as those arising from construction vehicles, the use of on-site generators, pumps and excavation works.

8.145 87% of the Proposed Development site does not meet the 0.5 m depth of peat required for it to be categorised as peatland. There is fen peat found in the proximity of Turbine 1 and 3 with varying depth. The calculator tool requires the input of mean peat depth across the Proposed Development. Values from the peat appendix have been used to calculate an average depth of 1.18m of fen peatland.

8.146 The calculator only considers the emissions of carbon from felling of forestry and land use change on site. As part of the Proposed Development there will be replanting of removed woodland to alternative sites this will ensure that over the lifetime of the Proposed Development emissions and removals will be neutral and not result in any net gains in carbon removals.

[18] DECC (2022) "Sectoral Emissions Ceilings" available at: https://www.gov.ie/en/publication/76864-sectoral-emissions-ceilings/ [Accessed February 2024]

[19] SEPA (2023) "Carbon Calculator Tool" available at: https://informatics.sepa.org.uk/CarbonCalculator/index.jsp [Accessed January 2024]

8.147 Emissions relating to the construction phase are provided in **Table 8-24**.

Table 8-24 GHG Emissions from the Construction and Decommissioning Phase of the Windfarm

Source	Vestas 7.2 MW (tCO_2e)	Siemens Gamesa 6.6 MW (tCO_2e)
Carbon Fixing Potential	734	682
Soil Organic Matter	18,902	18,228
DOC & POC Leaching	9,728	9,213
Felling of Forestry	8,778	8,778
Manufacture, Construction, Decommissioning	53,238	48,753
Total Emissions	**91,380**	**85,654**
Restoration of felled forestry	-8,778	-8,778
Removal of drainage from foundations and hardstanding	-11,502	-8,804
Total Removals	**-20,280**	**-17,582**
Net Emissions	**71,100**	**68,072**

8.148 Based on the Scottish Windfarm Carbon Assessment Tool, during the construction and decommissioning of the turbines. The wind farm for eight Vestas 7.2 MW will emit 71,100 tCO_2e a Siemens Gamesa 6.6 MW will emit 68,072 tCO_2e. Values for turbine life and felling of forestry are presented in **Appendix 8.1** found in Volume III of this EIAR.

Operational Phase GHG Emissions

Windfarm / TDR / Cable Route / Substation

8.149 The outputs of the tool included in the operational phase emissions are as follows.

- Losses due to backup power

8.150 Emissions savings have been manually calculated based on the energy generated using the Irish electricity grid average factor of 332 gCO_2/kWh. The emissions savings are shown in **Table 8-26.**

Table 8-25 GHG Emissions from the Operational Phase of the Proposed Development

Source	Vestas 7.2 MW Values	Seimens Gamesa 6.6 MW Values
Total Energy from Backup Power (MWh)	88,300	80,942
Annual Energy Generated (MWh/yr)	166,510	152,634

Source	Vestas 7.2 MW Values	Seimens Gamesa 6.6 MW Values
Total Energy Generated (MWh)	5,827,853	5,342,198
Total Emissions from Backup Power (tCO_2e)	29,315	26,873
Annual Emissions Avoided (tCO_2e/yr)	55,281	50,674
Total Emissions Avoided (tCO_2e)	1,934,847	1,773,610
Total Emissions (tCO_2e)	**-1,905,532**	**-1,746,737**

8.151 The turbine candidate with the maximum megawatt power rating at 7.2 MW (Vestas) is estimated that, 55,281 tCO_2e per annum will be displaced for the Proposed Development and 1,934,847 tCO_2e will be displaced over the proposed thirty five-year lifetime of the wind farm.

8.152 The alternative candidate with the minimum megawatt power rating at 6.6 MW (Siemens Gamesa) will displace 50,674 tCO_2e per annum or 1,773,610 tCO_2e over the 35-year lifetime of the wind farm.

Whole Life GHG Emissions

8.153 Total emissions from the whole life greenhouse gas assessment of the Proposed Development have been included in **Table 8-27** below.

Table 8-26 GHG Emissions from the Whole Life of the Proposed Development

Source	Vestas 7.2 MW (tCO_2e)	Seimens Gamesa 6.6 MW (tCO_2e)
Windfarm Construction Emissions	71,100	68,072
Windfarm Operational Emissions	-1,905,532	-1,746,737
Total Emissions	-1,834,432	-1,678,665

Emissions Payback Period

8.154 Using the data available from the whole life GHG emissions of the Proposed Development an assessment of the carbon payback period has been estimated and included in **Table 8-28.** The total lifetime emissions include emissions from:

- Construction and decommissioning of the windfarm and substation
- Backup energy required during the lifetime of the windfarm.

Table 8-27 GHG Emissions from the Whole Life of the Proposed Development

Source	Vestas 7.2 MW	Seimens Gamesa 6.6 MW
Total Lifetime Emissions (tCO_2e)	100,415	94,945
Annual Avoided Emissions (tCO_2e)	55,281	50,674

Source	Vestas 7.2 MW	Seimens Gamesa 6.6 MW
Carbon Payback Period (yrs)	**1.82**	**1.87**

8.155 All permutations within the range will therefore assist in realising the ambitious goals of the Climate Action Plan 2023. From an operational perspective, the proposed development will displace the emission of CO_2 from other less clean forms of energy generation and will assist Ireland in meeting its renewable energy targets and obligations. The burning of fossil fuels for energy creates greenhouse gases, which contributes significantly to climate change. These and other emissions also create acid rain and air pollution.

8.156 The carbon payback time for the manufacture, construction, and decommissioning phases (including carbon losses from soil, felling of forestry etc.) of the Proposed Development is estimated within 1.8 years with the use of turbines with the maximum MW power rating of 7.2 (Vestas) when compared with grid-mix electricity generation. This is a similar payback period for the use of turbines with MW power rating of 6.6 (Seimens Gamesa) of 1.9 years. Should further restoration measures be put in place, the total carbon emissions and carbon payback time would be reduced.

Determining Significance

Context

8.157 The GHG emissions from the Proposed Development are compared to the national and sectoral CO_2e targets to establish context.

8.158 The Proposed Development will result in the production of energy from a renewable source which will avoid emissions of carbon dioxide (CO_2) annually that would have been released had the energy been generated by the average Irish power generation mix.

8.159 RES-E forms the backbone of Ireland's strategy to achieve the overall renewable energy target for 2030. Ireland's National Energy and Climate Plan (NECP 2021-2030) includes a planned RES-E of 80% in 2030, while Ireland's Climate Action Plan 2023 (CAP 23) includes a target to increase the share of electricity generated from renewable sources where achievable and cost effective, without compromising security of electricity supply.

8.160 Ireland's Emissions Sharing Regulations (ESR) annual emissions limit for 2021 is 43.48 Mt CO_2eq. Ireland's provisional 2021 greenhouse gas ESR emissions are 46.19 Mt CO_2eq, this is 2.71 Mt CO_2eq more than the annual limit for 2021. This is the national total emissions value which excludes emissions generated by stationary combustion and aviation operators that are within the EU's emissions trading scheme. This indicates that Ireland is not in compliance with its 2021 Effort Sharing Regulation annual limit, exceeding the allocation by 0.80 Mt CO_2eq after using the ETS flexibility. Agriculture and Transport accounted for 73.4% of total ESR emissions in 2021.

8.161 The latest projections (March 2022) indicate that Ireland can achieve overall Effort Sharing Regulation (ESR) compliance over the period 2021 to 2030 assuming full implementation of the Climate Action Plan.

8.162 Figures from the Sustainable Energy Authority of Ireland (SEAI, 2021) indicate that in 2021 renewable energy contribution to gross electricity from wind was 85.4% share.

8.163 Using renewable energy displaces the use of fossil fuels thereby avoiding CO_2 emissions and reducing the amount of fossil fuels we need to import. We estimate the amount of CO_2 avoided and fossil fuel imports displaced using the primary energy equivalent approach. This estimates the quantity of fossil fuels that would have been required to replace renewable energy use. The estimated amount of CO_2 avoided using renewable energy reached a peak in 2020 before decreasing slightly to 6.2 Mt CO_2 in 2021, with 4.0 Mt CO_2 avoided by wind energy.

8.164 In addition to the CO_2 factored for emissions purposes, greenhouse gas (GHG) emissions are also factored into the overall carbon calculation. GHG are associated with the manufacture, transport, construction, operation (linked to backup generation) and decommissioning of wind turbines. The Intergovernmental Panel on Climate Change (IPCC) in 'Renewable Energy Sources and Climate Change Mitigation' (2014) state that 50 estimates from 20 studies indicate that emissions "are small compared to the energy generated and emissions avoided over the lifetime of wind power plants [farms]: the GHG [greenhouse gas] emissions intensity of wind energy is estimated to range from 8 to 20g CO_2/kWh in most instances". The IPCC (2010) report that the energy payback time, based on lifecycle assessment procedures, per turbine vary between 0.25 years and 0.65 years for onshore developments.

8.165 The carbon payback time has however increased for countries that have been taking an active role in reducing their generation of electricity from fossil fuels. This research considers LCA from studies dating back to 1980 and looks at an average fossil grid. Ireland has already begun to remove fossil fuels from its grid and as more renewables enter the grid the payback period becomes larger. Once the grid is fully saturated with renewable energy generation the payback would be difficult to achieve. Although it is likely the embodied carbon due to the manufacturing of wind turbines would be greatly reduced. Continued use of renewable energy generation from wind would ensure there is no future requirement for the use of fossil fuels within the grid.

National

8.166 The country has legislated a 2050 net zero target following recommendations and analysis completed by the government. To meet this target the government has set carbon budgets to define a pathway to net zero.

8.167 **Table 8-29** summarises the net change in GHG emissions from the Proposed Development as a percentage of the relevant carbon budget. Total emissions from the whole life of The Proposed Development have been divided by the lifespan to obtain average annual emissions.

Table 8-28 Net GHG from the Proposed Development as % of Carbon Budgets

Carbon Budget	Period	Budget Value ($mtCO_2e$)	Average per Annum ($mtCO_2e$)	Net Annual Change in GHG due to development ($mtCO_2e$)	% of Annual Carbon Budget
Vestas 7.2Mw					
2	2026-2030	200	40	-0.052	-0.13%
3	2031-2035	151	30.2	-0.052	-0.17%
Siemens Gamesa 6.6 Mw					
2	2026-2030	200	40	-0.048	-0.12%
3	2031-2035	151	30.2	-0.048	-0.16%

8.168 This shows that the net annual change in operational GHG emissions (-0.052 $mtCO_2e$) as a percentage of the carbon budget 2 is -0.13% and budget 2 -0.17% and therefore following the IEMA guidance is significant and beneficial as the Proposed Development actively reverses the risk of severe climate change by leading to avoided emissions.

Sectoral

8.169 The country has legislated a 2050 net zero target following recommendations and analysis completed by the government. To meet this target the government has set sectoral emissions ceilings to define a pathway to net zero.

8.170 **Table 8-30** summarises the net change in GHG emissions from the Proposed Development as a percentage of the relevant sectoral emissions ceiling. Total emissions from the whole life of The Proposed Development have been divided by the lifespan to obtain average annual emissions.

Table 8-29 Net GHG from the Proposed Development as % of Sectoral Emission Ceilings

Emission Ceiling	Period	Budget Value ($mtCO_2e$)	Average per Annum ($mtCO_2e$)	Net Annual Change in GHG due to development ($mtCO_2e$)	% of Annual Carbon Budget
2	2026-2030	20	4	-0.052	-1.32%
Siemens Gamesa 6.6 Mw					
2	2026-2030	20	4	-0.048	-1.30%

8.171 This shows that the net annual change in operational GHG emissions (-0.053 $mtCO_2e$) as a percentage of the sectoral emission ceiling is -1.32% and therefore following the IEMA guidance is significant and beneficial as the Proposed Development actively reverses the risk of severe climate change by leading to avoided emissions.

Mitigation Measures

8.172 The construction phase of the Proposed Development will likely have the most significant impact for carbon emissions, albeit short-term. Some mitigation measures that can be implemented into the construction phase of the project would be:

- Minimise travel;
- Using less fuel intensive machinery;
- The introduction of Biofuel and HVO run machinery;
- Minimising material transportation routes;
- Minimising waste materials; and
- Implementing best practices for environmental management.

8.173 In terms of the operational phase, the operation of the proposed development will have a positive effect on climate due to the displacement of fossil fuels.

8.174 Decommissioning phase emissions will likely be minimal due to national targets to reduce greenhouse gas emissions by 2050 and the lifespan of the Proposed Development expecting to be decommissioned within 35 years. This could be further mitigated using good land use management to maximise potential emissions removals.

Residual Impacts

8.175 The impacts from the Proposed Development are significant and beneficial as they will lead to the displacement of fossil fuel energy generation as such the residual impacts in terms of climate change are positive.

CLIMATE RESILIENCE

Regulations and Guidance

National Adaptation to Climate Change

8.176 The Irish National Policy Position establishes the fundamental national objective of achieving transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out the context for the objective; clarifies the level of GHG mitigation ambition envisaged; and establishes the process to pursue and achieve the overall objective. Specifically, the National Policy Position envisages that policy development will be guided by a long-term vision based on:

- an aggregate reduction in carbon dioxide (CO2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors;
- in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

8.177 The evolution of climate policy in Ireland will be an iterative process based on the adoption by Government of a series of national plans over the period to 2050. Greenhouse gas mitigation and adaptation to the impacts of climate change are to

be addressed in parallel national plans – respectively through National Mitigation Plans and National Climate Change Adaptation Frameworks. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals, and at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

8.178 The Climate Action Plan 2024[20] was published in 2023. The Act identified and provided for the development and submission to Government of national mitigation and adaptation plans. It also established the institutional and governance framework within which these plans can be developed and implemented on a cyclical basis. Implementation of the plan on a statutory basis via a 'national climate objective' which commits to pursue and achieve no later than 2050, the transition to climate resilient and climate-neutral economy.

8.179 The Department of the Environment, Climate and Communications (DECC) published a National Adaptation Framework (NAF) in January 2018[21]. The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts.

8.180 The NAF builds on the work already carried out under the National Climate Change Adaptation Network (NCCAF, 2012). Under the NAF several Government Departments will be required to prepare sectoral adaptation plans in relation to a priority area that they are responsible for. Local authorities are required to prepare local adaptation strategies NAF also aims to improve the enabling environment for adaptation through ongoing engagement with civil society, the private sector, and the research community.

Climate Action Plan 2023

8.181 The Climate Action Plan is integral to the National Development Plan 2021-2030. It shows how Ireland is putting climate solutions at the very heart of social and economic development. Climate Action Plan 2023 has a greater focus on system change. Specifically, the Climate Action Plan 2023 envisages that change will be based on the Six Vital High Impact Sectors:

Powering renewables: 75% reduction in emissions by 2030

- 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.

[20]DECC (2024) "Climate Action Plan available at: https://www.gov.ie/en/publication/79659-climate-action-plan-2024/ [Accessed January 2024].

[21] DECC (2018) "National Adaption Framework" available at https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/ [Accessed January 2024].

- 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: Commercial/public 45% residential 40% reduction in emissions by 2030

- The energy efficiency of existing buildings will be increased, put in place policies to deliver zero-emissions new builds will be put in place and continue to ramp up our retrofitting programme will continue to be ramped up.
- 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.

Transforming how we travel: 50% reduction in emissions by 2030

- Policies to reduce transport emissions by improving our town will be driven up, 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.
- 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

- Farmers will be supported 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%.
- Expand the indigenous biomethane sector through anaerobic digestion, reaching up to 5.7 TWh of biomethane.
- Increase organic farming to up to 450,000 hectares, the area of tillage to up to 400,000 ha.
- 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

- 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 are key to Ireland's economy and future competitiveness.
- Decrease embodied carbon in construction materials produced and used in Ireland by at least 30%.
- 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.

8.182 Other Actions included in The Climate Action Plan are as follows:

Research and Innovation:

- National Agricultural Soil Carbon Observatory to be fully operational.
- Publish Ireland's Five-Year Assessment Report on Climate Change.
- Implement the €65m National Challenge Fund.

Governance:

- All Climate Delivery Taskforces in operation.
- Government Departments to evaluate the climate implications of policy proposals.

Just transition:

- Implement Just Transition Framework through climate sectoral policies.
- Establish Just Transition Commission to advise government.
- Continue targeted work in the Midlands with €169m Just Transition Fund.

- Targeted social welfare measures to prevent fuel poverty.
- Decarbonisation of public and private local rural bus routes.

Citizen engagement:

- Ongoing inclusive programme of citizen and stakeholder engagement to inform climate policy, improve climate literacy, ensure transparency in decision-making, and empower people to take climate action.

Public sector:

- 51% reduction in GHG emissions and a 50% improvement in public sector energy efficiency by 2030.
- Delivery of Local Authority Climate Action Plans.
- Climate related training and upskilling for public sector employees.
- Full implementation of green public procurement
- Carbon pricing and cross cutting policies:
- Continuing to implement successive carbon tax increases to be used for retrofitting of low-income homes, fuel allowance and addressing fuel poverty.
- Continue to support private finance and EIB investment in climate projects.

The Marine Environment

- Establish the new Maritime Area Regulatory Authority.
- Progress the mapping of all Irish offshore waters to support all marine activities.
- Legislation for the identification, designation, and management of Marine Protected Areas.

The Circular Economy:

- Whole-of-Government Circular Economy Strategy.
- Introduction of single use cup levy moving to a ban on all single use plastics.
- Start deposit-return scheme for plastic bottles and cans.
- Food Waste Prevention Roadmap.
- International Climate Action
- Provide at least €225m per year in Climate Finance to developing countries by 2025.

Adaptation:

- Development of a new National Adaptation Framework (NAF) and Sectoral Adaptation Plans.
- Development of Ireland's first set of standardised climate projections that can be used across multiple sectors to assist with adaptation planning. Improved availability of climate services and climate information through implementation of the National Framework for Climate Services (NFCS).

- Continued mainstreaming of climate change into the OPW's Flood Risk management policies.
- Improvements in the climate resilience of Ireland's water supply infrastructure.

Local Level Adaptation

8.183 The National Adaptation Framework identifies the critical role to be played by local authorities in addressing climate change adaptation. This will effectively build on their existing expertise and experience as first responders in emergency planning scenarios. Under the NAF each local authority will also be developing their own adaptation strategies in line with guidelines developed for the sector.

8.184 The NAF explores how local authorities might adopt a joint or regional approach to adaptation planning. In January 2018 the DCCAE entered a five-year financial commitment of €10m to establish four Climate Action Regional Offices (CAROs). Building on a business case prepared by the local government sector itself, this commitment recognises the significant obligation which has been placed on local government to develop and implement its own climate action measures, as well as the need to build capacity within the sector to engage effectively with climate change – both in terms of mitigation and adaptation.

8.185 The Climate Action Regional Offices are being operated by a lead local authority in four different regions that have be grouped together based on a climate risk assessment with a focus on the predominant risk(s) in each geographical area. The establishment of these offices will enable a more coordinated engagement across the whole of government and will help build on the experience and expertise which exists across the sector.

8.186 **Table 8-31** summarises the adaptation actions to climate change in Ireland.

Table 8-30 Summary of Adaptation to Climate Change Actions in Ireland[22]

Item	Status	Programs
National Climate Adaptation Strategy	Legislation enacted. Statutory Framework adopted	Climate Action and Low Carbon Development Act 2021 (as amended) National Adaptation Framework
Action Plans	Sectoral Adaptation Plans in development. Local authority plans in development.	Local Authority Adaptation Strategy Development Guidelines (2016) Sectoral Planning Guidelines for Climate Change Adaptation Local Authority Adaptation Support Tool Climate Action Plan 2023
Impacts, Vulnerability and Adaptation Assessments	National Vulnerability Assessment	2012 National Climate Change Vulnerability Scoping Study Climate Change Impacts on Biodiversity in Ireland (2013) Climate change Impacts on Phenology in Ireland (2013) COCOADAPT (2013)

[22] Climate Adapt (2023) "Information on National Adaption Actions Reported under the Governance Regulation – Ireland" available at: http://climate-adapt.eea.europa.eu/countries-regions/countries/ireland [Accessed January 2024].

Item	Status	Programs
		2013 Hydro Detect Project Robust Adaptation to Climate Change in the Water Sector in Ireland (2013) Ensemble of Regional Climate Projections for Ireland (2015) Urb-ADAPT Sectoral Adaptation Plan for Flood Risk Management (OPW, 2015) Adaptation Planning - Developing Resilience to Climate Change in the Irish Agriculture and Forest Sector (DAFM, 2017) Adaptation Planning - Developing Resilience to Climate Change in the Irish Transport Sector (DTTAS, 2017) Adaptation Plan for the Electricity and Gas Networks Sector (DCCAE, 2017)
Research Programs	EPA Research Programme (Climate Pillar)	http://www.epa.ie
Climate services / Met Office	Established	http://www.met.ie
Web Portal	Established	http://www.climateireland.ie
Monitoring, Indicators, Methodologies	In development	
Training, Education	Ongoing / in development	http://www.climateireland.ie

Westmeath County Council Climate Adaption Strategy

8.187 The purpose of the adaption strategy is to form part of the National Adaption Framework (NAF) which was published in response to the provisions of the Climate Action and Low Carbon Development Act 2015. Westmeath County Council Climate Change Adaptation Strategy 2019-2024[23] features a range of actions across six thematic areas, including: Westmeath County Council Climate Change Adaptation Strategy 2019-2024 features a range of actions across six thematic areas, including: Local Adaptation Governance and Business Operations; Infrastructure and Built Environment; Land Use and Development; Drainage and Flood Management; Natural Resources and Cultural Infrastructure; and Community Health and Wellbeing. The Strategy sets out several 'Action Plans' including:

- To ensure that Climate Change adaptation considerations are mainstreamed and integrated successfully into all functions and activities of the local authority ensuring operational protocols, procedures and policies implement an

[23] WMCC (2019) "Westmeath County Council Climate Change Adaption Strategy 2019-2024" available at: https://www.westmeathcoco.ie/en/media/WestmeathClimateChangeAdaptationStrategy.pdf [Accessed February 2024]

appropriate response in addressing the diversity of impacts associated with climate change.

- Increased capacity for climate resilient structural infrastructure is centred around the effective management of climate risk, informed investment decisions and positive contribution towards a low carbon society.
- To devise and implement sustainable policies and measures to positively influence behavioural changes, support climate adaptation actions and endorse approaches for successful transition to low carbon and climate resilient society.
- To build capacity and resilience within Westmeath County Council to respond to climate change and climate change/severe weather events.
- To ensure and increase the resilience of infrastructural assets and the built environment, informing investment decisions.
- To integrate climate action considerations into land use planning policy and influence positive behaviour.
- To mitigate and manage the risk of flooding through a variety of responses.
- To provide for enhancement of natural environment to work positively towards climate action.
- To promote effective bio-diversity management and enhance protection of natural habitats and landscapes.
- To build capacity and resilience within communities.

8.188 Aligning with the National Policy Objectives of the NPF, the RSES sets out 16 Regional Strategic Outcomes (RSOs) which set the framework for City and County Development Plans to build climate resilience into their policies and objectives and to support the transition to a low carbon economy by 2050. The Strategy identifies the following RSOs in relation to climate action:

- RPO 6. Integrated Transport and Land Use;
- RPO 7. Sustainable Management of Water, Waste, and other Environmental Resources;
- RPO 8. Build Climate Resilience;
- RPO 9 Support the Transition to Low Carbon and Clean Energy;
- RPO 10. Enhanced Green Infrastructure;
- RPO 11. Biodiversity and Natural Heritage.

8.189 The Strategy support and facilitate European and national objectives for climate adaptation and mitigation as detailed in the following documents, taking into account other provisions of the Plan (including those relating to land use planning, energy, sustainable mobility, flood risk management and drainage):

- Climate Action Plan (2019 and any subsequent versions);
- National Mitigation Plan (2017 and any subsequent versions);
- National Climate Change Adaptation Framework (2018 and any subsequent versions);

- Any Regional Decarbonisation Plan prepared on foot of commitments included in the emerging Regional Spatial and Economic Strategy for the Eastern and Midland Region;
- Relevant provisions of any Sectoral Adaptation Plans prepared to comply the requirements of the Climate Action and Low Carbon Development Act 2015, including those seeking to contribute towards the National Transition Objective, to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050; and
- Westmeath Climate Change Adaptation Strategy 2019 – 2024.

Meath County Council Climate Adaption Strategy

8.190 Meath County Council Climate Change Adaptation Strategy 2019-2024 features a range of actions across six thematic areas, including: Local Adaptation Governance and Business Operations; Infrastructure and Built Environment; Land Use and Development; Drainage and Flood Management; Natural Resources and Cultural Infrastructure; and Community Health and Wellbeing. The Strategy sets out several 'Action Plans' including:

- To ensure that Climate Change adaptation considerations are mainstreamed and integrated successfully into all functions and activities of the local authority ensuring operational protocols, procedures and policies implement an appropriate response in addressing the diversity of impacts associated with climate change.
- Increased capacity for climate resilient structural infrastructure is centred around the effective management of climate risk, informed investment decisions and positive contribution towards a low carbon society.
- To devise and implement sustainable policies and measures to positively influence behavioural changes, support climate adaptation actions and endorse approaches for successful transition to low carbon and climate resilient society
- To build capacity and resilience within Westmeath County Council to respond to climate change and climate change/severe weather events.
- To ensure and increase the resilience of infrastructural assets and the built environment, informing investment decisions.
- To integrate climate action considerations into land use planning policy and influence positive behaviour.
- To mitigate and manage the risk of flooding through a variety of responses.
- To provide for enhancement of natural environment to work positively towards climate action.
- To promote effective bio-diversity management and enhance protection of natural habitats and landscapes.
- To build capacity and resilience within communities.

Future Management of Flood Risks

8.191 The Catchment Flood Risk Assessment and Management (CFRAM) Programme[24] is the mechanism established to facilitate future adaptation to climate change. It provides for long-term flood risk management in Ireland and the embedment of flood risk assessment in the future development of capital projects. The future scenario flood maps produced under the CFRAM Programme will facilitate this approach, inform other industrial sectors, and provide a valuable resource for local adaptation planning and sustainable land use management and planning.

EIA Directive 2014/52/EU

8.192 Directive 2014/52/EU[25] of the European parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment had to be transposed into national law by 16 May 2017, necessitating changes in laws, regulations, and administrative provisions across several legislative codes.

8.193 Key changes introduced in the 2014 Directive (in Annex IV - Information referred to in Article 5(1) – Information for the Environmental Impact Assessment Report) and the national transposing regulations (the European Union (Planning and Development)(Environmental Impact Assessment) Regulations, S.I. No. 296 of 2018) include a requirement for information on the impact of a Proposed Development on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the Proposed Development to climate change to be provided in the Environmental Impact Assessment Report.

Published Guidelines

Guidance on Integrating Climate Change and Biodiversity into EIA (EC, 2012)[26]

8.194 EU Guidelines provide recommendations on how to integrate climate change and biodiversity in Environmental Impact Assessment (EIA). The need for action on climate change and biodiversity loss is recognised across Europe and around the world. The guidelines include an explanation as to why climate change and biodiversity are so important in EIA, present the relevant EU-level policy background, provide advice on how to integrate climate change and biodiversity into selected stages of the EIA process. The annexes provide sources of further reading and links to other relevant information, data, and tools.

[24] Office of Public Works (2021) "CFRAM Programme" available at: https://www.gov.ie/en/policy-information/c04e0-cfram-programme/ [Accessed January 2024].
[25] European Parliament (2014) "Amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment" L 124/1.
[26] European Commission (2023 'Environmental Impact Assessment' available at: https://environment.ec.europa.eu/law-and-governance/environmental-assessments/environmental-impact-assessment_en [Accessed January 2024]

Climate Change and Major Projects[27]

8.195 This publication provides guidance for assessing vulnerability and risk from Climate Change for major projects funded by the European Regional Development Fund (ERDF) and the Cohesion Fund and listed in the concerned operational programmes.

Sectoral Planning Guidelines for Climate Change Adaptation[28]

8.196 The guidelines aim to ensure that a coherent and consistent approach to adaptation planning is adopted by the key sectors in Ireland. Sectors preparing sectoral adaptation plans under the NAF are required to prepare their plans in line with the process described in these guidelines while also being aware of the overall requirements regarding the development of sectoral adaptation plans.

Local Authority Adaptation Strategy Development Guidelines[29]

8.197 Guidance was produced to provide a consistent and coherent process for local authorities in helping them develop local adaptation strategies and contain information on the process of developing an adaptation strategy:

- provide background information on what adaptation entails and provides the rationale behind implementing a local scale adaptation strategy;
- outline the initial steps required in launching a strategy development process, describing key roles and who can fulfil them, and setting out important factors to consider in the early stages of strategy development;
- explains how to assess the role that weather extremes and periods of climate variability currently play within the local jurisdiction, and it describes why doing so is a fundamental element of working towards a more climate-resilient future;
- moves from the present to the identification of future climate risks, describing a staged risk assessment process and positioning the adaptation strategy within more detailed risk assessments undertaken during shorter term decision-making processes such as statutory plan-making;
- based on the risk assessment process undertaken determination of adaptation goals and objectives and the types of adaptation actions that are available and outlines how each might be identified, assessed, prioritised, and implemented is described;
- outlines the steps required to move from a phase of planning to one of implementation, and it explains the importance of monitoring and evaluation in ensuring that the strategy is achieving its anticipate d adaptation objectives.

[27] European Commission (2016) 'Climate Change and Major Projects' available at: https://climate.ec.europa.eu/system/files/2016-11/major_projects_en.pdf [Accessed January 2024].

[28] DECC (2018) 'Sectoral Planning Guidelines for Climate Change Adaptation available at: https://www.gov.ie/en/publication/10221107-sectoral-planning-guidelines-for-climate-change-adaptation/ [Accessed January 2024].

[29] DECC (2018) 'Local Authority Adaptation Strategy Development Guideline' available at: https://www.gov.ie/en/publication/41066-local-authority-adaptation-strategy-development-guidelines/ [Accessed June 2023]

Existing Environment

Regional Context

8.198 Climate is defined by the EPA as "the average weather over a period of time". Climate change is a term that is used to describe a "significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period – decades or longer.[30]" There is scientific evidence[31] which suggests that the current climate is rapidly warming, having reached approximately 1°C above pre-industrial levels in 2017, increasing at a rate of 0.2 °C per decade. Warmer weather places pressure on flora and fauna which cannot adapt to a rapidly changing environment. In Ireland, the pressure on flora and fauna is mitigated due to the dominant influence of the Gulf Stream on Ireland's climate. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitudes.

8.199 Ireland has a typical maritime climate, with relatively mild and moist winters and cool, cloudy summers. The prevailing winds are south-westerly in direction. The climate is influenced by warm maritime air associated with the Gulf Stream which has the effect of moderating the climate, and results in high average annual humidity across the country. The area of least precipitation is along the eastern seaboard of the country, in the rain shadow of the Leinster uplands.

8.200 Mean seasonal temperature will change across Ireland. Several studies have applied selected IPCC Special Reports on Emissions Scenarios (SRESs) to model climatic changes across Ireland at a regional scale. Despite the different methods and scenario combinations used, there is agreement in projected changes in temperature for Ireland. However, there are more disparities in the magnitude and sign (i.e., +/-) for the precipitation changes projected for the island.

8.201 **Table 8-32** summarises climate impact projections for Ireland, estimates of projections confidence are derived from published projection data from the Local Authority Adaptation Strategy Development Guidelines[1].

Table 8-31 Climate Impacts Projections: 30-Year Overview

Variable	Summary	Confidence	Projected Changes
Sea Levels Rise	Strong increase	High	Projections of sea level rise to 2100 suggest a global increase in the range of 0.09-0.88 m with a mean value of 0.48 m. For 2050, it is reasonable to assume a sea level rise in the region of 25 cm above present levels. It should be noted that due to a limited understanding of some important effects that contribute to rates of increase, these estimates of sea level rise may prove optimistic, and estimates of up to 4-6 m have been projected by some models.
Storm Surge	Strong increase	Medium	An increase in the number of intense cyclones and associated strong winds are expected over the north - east Atlantic. By the 2050s, storm surge heights in the range of 50-100 cm are expected to increase in frequency for all coastal areas with exception of the southern coast.

[30] EPA (2023) 'Climate Change' available at: https://www.epa.ie/environment-and-you/climate-change/ [Accessed January 2024]
[31] IPCC (2023) 'Global Warming of 1.5 °C an IPCC special report' available at: https://www.ipcc.ch/sr15/download/#chapter [Accessed January 2024].

Variable	Summary	Confidence	Projected Changes
Coastal Erosion	Moderate increase	Low	Currently approximately 20% of Ireland's coastline is at risk of coastal erosion, particularly areas of the south and east coast and also in isolated areas on the west coast. Rates of increase will be determined by local circumstances; however, it is expected that areas of the south-west are likely to experience the largest increase.
Cold Snaps / Frost	Moderate decrease (winter/night)	High	By mid-century, minimum temperatures during winter are projected to increase by ~2°C in the southeast and ~2.9°C in the north. This change will result in fewer frost days and milder night-time temperatures.
Heatwaves	Strong increase (summer)	High	Seven significant heatwaves (defined as 5+ days @ >25°C) have been recorded in Ireland over the past 30 years, resulting in approximately 300 excess deaths. By mid-century, a projected increase in summer maximum daily temperature of approximately 2°C will likely intensify heatwaves, with maximum temperatures increasing and heatwave duration lengthening.
Dry Spells	Strong increase (summer)	Medium	There have been eight periods of insignificant rainfall in Ireland in the past 40 years. Of these, the events of 1976, 1995 and 2018 were the most severe, averaging 52, 40 and 54 days in duration respectively across Irish rainfall stations. An approximate 20% decrease in summer precipitation in many areas is strongly indicated under a high emissions scenario. This decrease is likely to result in progressively longer periods without significant rainfall, posing potentially severe challenges to water sensitive sectors and regions.
Extreme Rainfall	Strong increase (winter)	Low	Heavy precipitation days (in which more than 20 mm of rain falls) are likely to increase in frequency in winter. By the 2050s an increase in the number of heavy precipitation days of around 20% above the level of 1981-2000 is projected under both low-medium and high emissions scenarios. This may have serious consequences for flood risk in sensitive catchments.
Flooding	Moderate increase (winter)	Low	An Irish Reference Network of hydrometric stations has been established to assess signals of climate charge in Irish hydrology. This network has detected an increasing trend in high river flows since 2000. Projections of future flows are beset by uncertainty at the catchment scale, but a broad signal of wetter winters and drier summers is evident across several independent studies.
Wind Speed	Minor increase (winter)	Medium	Observed wind speed over Ireland has not changed significantly in recent times, but it is anticipated that the distribution of wind will alter slightly in future, with winters marginally windier and summers marginally less so. Though the average wind speed is anticipated to change in only a minor way over the coming decades, the frequency of extreme windstorms is expected to increase due to alternations in the origin and track of tropical cyclones.

Local Context

8.202 The climatic conditions for the wider geographical area have been derived from historical meteorological measurements compiled by Met Éireann, the national meteorological service of Ireland. The nearest weather station to the Proposed

Development is the Mullingar weather station which is approximately 20 km southwest of the Proposed Development and associated infrastructure. These meteorological conditions are presented in tables for the period January 2020 – July 2023, with the long-term averages (LTA) from 1981 – 2010 also presented for some datasets (source www.met.ie/climate).

8.203 In 2022, the yearly total rate of precipitation was 840.6 mm at Mullingar meteorological station, with winter months receiving the heaviest amounts, refer to **Table 8-33**.

8.204 The moderating influence of the Atlantic Ocean is felt throughout Ireland. The annual mean temperature for different areas in Ireland varies between mountainous regions, lowlands, and the coast. Mean daily temperatures are typically between minimum 5.1°C in winter to maximum 16.2°C in summer for the area surrounding Mullingar in 2022, as can be seen in **Table 8-34**.

8.205 The east of Ireland, which is sheltered from Atlantic frontal systems, is sunnier than the west. The sunniest months being May and June.

Table 8-32 Total Rainfall for Mullingar

Total Rainfall (mm)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	81.1	29.8	141.4	82.8	36.4	53.3	36.7	-	-	-	-	-	461.5
2022	47.6	131.8	46.2	48.7	53.4	100.6	31.6	35.2	104.1	208.8	109.3	84.5	1001.8
2021	126.9	80.3	80.9	25.5	107.4	17.4	74.9	142.1	58.1	97.7	41.6	128	980.8
2020	54.4	197.5	61	41.9	10.1	96.6	126.3	114	68.3	131.8	87.7	89.3	1078.9
LTA	92.5	70.3	76.6	65.9	69.2	73.8	71.1	86.1	78.3	104.3	88.1	94.7	970.9

Table 8-33 Mean Temperature for Mullingar

Mean Temperature (C°)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	5.3	6.8	6.9	8.7	12.3	15.9	13.1	-	-	-	-	-	9.4
2022	5.1	6.2	6.6	8.1	12	13.5	16.2	15.5	12.9	11.3	8.2	3.4	9.9
2021	3.3	5.6	7.4	7	9.3	13.8	17.1	14.9	14.5	11.4	7.8	6.3	9.9
2020	5.5	5.2	6.1	9.5	11.7	13.6	14.1	14.9	12.7	9.4	7.6	4.5	9.6
LTA	4.6	4.7	6.3	8.1	10.6	13.2	15.0	14.6	12.6	9.5	6.6	4.7	9.2

Table 8-34 Mean Soil Temperature for Mullingar

Mean Soil Temperature (C°)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	5	6.3	6.4	9.2	13.9	16.9	-	-	-	-	-	-	9.6
2022	5.2	5.8	5.6	8.3	12.8	14.5	17	16.3	13.9	11.1	8	4.3	10.3
2021	3.6	4.7	6.8	7.8	10.5	15.1	17.7	15.8	15.2	11.7	8.2	6.3	10.3
2020	4.8	4.4	5.3	9.3	12.7	14.7	15.5	15.8	13.4	9.9	7.9	4.8	9.9

Mean Soil Temperature (C°)													
LTA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 8-35 Potential Evaporation for Mullingar

Potential Evaporation (mm)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	9.2	17.3	30.3	53.6	83.9	97.8	15.1	-	-	-	-	-	307.2
2022	8.8	18	41.1	54.4	76.4	78.3	84.2	82.9	44.3	25.9	13.1	6.2	533.6
2021	5.8	19.5	32.1	57	71.8	84.7	91.7	62.1	41.6	25.4	10.9	9.4	512
2020	10.9	17.5	36.1	63.2	94.6	72.8	68.6	59.4	42.4	24.5	10.7	6.7	507.4
2019	10.3	17.4	31	51.4	71.9	80.5	79.1	65	44	22.9	10.3	7.5	491.3

Table 8-36 Evaporation for Mullingar

Evaporation (mm)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	12.4	23.6	43.8	76.5	116.2	133.4	21.1	-	-	-	-	-	427
2022	12.1	25.1	58	78	107.1	108.2	111.8	111.5	60.5	35.3	16.9	8	732.5
2021	8.5	26.9	46.1	81.4	102.1	115.9	120.8	83.4	55.7	34.9	14.9	12.1	702.7
2020	14.7	25.1	51.9	89	131.6	99.4	94.3	80.3	58.3	34	14.6	8.8	702
LTA	13.8	25.2	46.1	75.5	103.7	113	109.2	89.4	61.4	32.3	14.2	9.7	693.5

Table 8-37 Days below 15.5 Degree Celsius for Mullingar

Degree Days Below 15.5 °C													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	317	242	268	207	114	45	-	-	-	-	-	-	-
2022	322	262	278	223	116	78	38	59	95	135	219	374	2199
2021	379	278	251	258	199	79	29	52	62	134	232	284	2235
2020	311	298	293	186	141	81	64	53	103	190	238	342	2299
Mean	339	306	286	228	161	91	54	62	102	188	268	335	2419

Table 8-38 Mean Wind Speed for Mullingar

Mean Wind Speed (m/s)													
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
2023	3.3	3.3	3.4	3.3	2.6	-	-	-	-	-	-	-	3.2
2022	2.9	4.5	3.1	3.3	3.2	3.0	2.5	2.4	2.5	3.6	3.9	2.8	3.1
2021	2.8	4.4	3.5	2.7	3.1	2.8	2.1	2.4	2.4	3.1	2.8	3.4	3.0
2020	3.7	4.8	3.7	3.1	3.1	3.0	2.9	2.8	2.9	3.5	3.5	3.4	3.4
LTA	4.6	4.7	4.7	4.0	3.8	3.4	3.3	3.2	3.4	3.9	4.0	4.3	3.9

Microclimate

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

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

8.208 The proposed development site is predominately a lowland location which is serviced by existing public roadways and forestry access tracks. The layout of the proposed wind farm has been designed to minimise the potential environmental effects of the wind farm on the surrounding area, while at the same time maximising the energy yield of the wind resource which passes over the site.

8.209 The total area of proposed new permanent hardstanding surface is approximately 1.77% of the Proposed Development site and consequently there will be no direct or indirect impact on air temperature and microclimate. Turbine 1 (T1) and T2 of the Northern Cluster are to be located within an existing agricultural field, while T3 of the Northern Cluster is located within a non-commercial forestry plantation with varying stages of maturity. T4, T5, and T7 of the Southern Cluster are arrayed within commercial plantations of varying stages of maturity, while T6 and T8 are to be located within existing agricultural land.

8.210 Some of the Proposed Development comprises coniferous forestry. The felling of 19.82 hectares of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstandings, crane pads, access tracks, and construction compounds. Clear felling will be dispersed over several areas and will not consist of a single clear fell area and there will be no direct or indirect impact on site temperature and microclimate due to clear felling. It is important to note that clear felling forms part of the cycle of commercial forestry and without the Proposed Development clear felling would occur as normal.

8.211 Carbon dioxide (CO_2) is a greenhouse gas which if released in excessive amounts can lead to increases in global temperatures known as ‘global warming’ or ‘greenhouse effect’ which can influence climate change. The greenhouse gas assessment section details the carbon savings that have been calculated for the Proposed Development.

8.212 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.

Adaptation against Expected Climate Change Effects

8.213 The aim of the vulnerability assessment is to identify the relevant climate hazards for the Proposed Development at the foreseen location. A development vulnerability assessment for the Proposed Development is presented below.

8.214 Based on the development vulnerability assessment, measures to improve the resilience of the Proposed Development to extreme rainfall, flood, flash flood, storms, and winds are required.

8.215 The likelihood analysis of the Proposed Development to climate hazards is presented in **Table 8-40**.

8.216 Based on the SLR methodology following *Climate Change and Major Projects (EC, 2016) Guidelines* the Proposed Development has been assessed to be moderately affected by extreme rainfall, flash (pluvial) flood, storms, and winds. The Proposed Development would be unlikely affected to cold spells, landslides and snow and wildfires. The Proposed Development would not be affected by heat, drought, and freeze –thaw damage. The Proposed Development will not be affected by rising sea level.

Table 8-39 Analysis of Likelihood of Climate Hazards

	Extreme Rainfall, Flash Flood	Flood	Health	Drought	Wildlife Fires	Storms And Winds	Landslides	Cold Spells and Snow	Freeze –Thaw Damage	Rising Sea Levels
Rare		✓	✓	✓	✓		✓		✓	✓
Unlikely								✓		
Moderate	✓					✓				
Likely										
Almost certain										

8.217 **Table 8-41** shows the climate hazard impact analysis of the Proposed Development. It was assessed that climate hazards will have major impacts on health and safety, the environment and financial areas, moderate impacts on asset damage and engineering, operational, social and reputation areas.

Table 8-40 Climate Hazard Impact Analysis

Risk Areas	nsignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational			✓		
Safety and Health				✓	
Environment				✓	
Social			✓		
Financial				✓	
Reputation			✓		

8.218 **Table 8-42** assesses the sensitivity of the Proposed Development to climate hazard. It was assessed that site assets, energy inputs and transport links are of high sensitivity to extreme rainfall, flood, flash floods, storms, and winds; water inputs will

be highly sensitive to droughts. On site assets will be medium sensitive to cold spells and snow and freeze – thaw damage. Transport links will be medium sensitive to cold spells and snow.

Table 8-41 Sensitivity of Proposed Development to Climate Hazards

	Extreme Rainfall, Flash Flood	Flood	Health	Drought	Wildlife Fires	Storms And Winds	Landslides	Cold Spells and Snow	Freeze – Thaw Damage	Rising Sea Levels
On site Assets	High	Low	Low	Low	Low	High	Low	Medium	Medium	Low
Inputs - Water	Low	Low	Low	High	Low	Low	Low	Low	Low	Low
Inputs - Energy	High	Low	Low	Low	Low	High	Low	Low	Low	Low
Transport Links	High	Low	Low	Low	Low	High	Low	Medium	Low	Low

8.219 In **Table 8-43** the exposure of the planned development to climate hazards was assessed. In the current climate, the exposure of the development to extreme rainfall, flood, flash flood, storms and winds has been assessed to be medium. In the future, the Proposed Development was assessed to have high exposure to rainfall, flash flood, storms, and winds.

Table 8-42 Exposure of the Development to Climate Hazards without Mitigation

	Extreme Rainfall, Flash Flood	Flood	Health	Drought	Wildlife Fires	Storms And Winds	Landslides	Cold Spells and Snow	Freeze – Thaw Damage	Rising Sea Levels
Current Climate	Medium	Low	Low	Low	Low	Medium	Low	Low	Low	Low
Future Climate	High	Low	Low	Low	Medium	High	Low	Low	Low	Low

8.220 **Table 8-44** shows the vulnerability analysis of the Proposed Development to climate hazards; it combines the sensitivity and the exposure analysis. The Proposed Development was assessed to be most sensitive to extreme rainfall, flash flood, storms, and winds.

Table 8-43 Vulnerability Analysis of Proposed Development to Climate Hazards

Sensitivity	Exposure (Current & Future Climate)		
	Low	**Medium**	**High**
Low	Rising sea levels, Flood, Landslides, Freeze –thaw damage, Drought, Heat,		
Medium		Cold Spells and Snow Wildlife Fires	
High			Extreme Rainfall, Flash Flood, Storms, and Winds

Potential Impacts – Construction

Proposed Development

8.221 In the current climate, the exposure of the development to extreme rainfall, flood, flash flood, storms and winds has been assessed to be medium, those climate hazards have the potential to impact the construction activities at the proposed site and the TDR. It was assessed that climate hazards will have major impacts on health and safety, the environment and financial areas, moderate impacts on asset damage and engineering, operational, social and reputation areas during the construction operations for windfarm and TDR.

Cable Route

8.222 In the current climate, the exposure of the development to extreme rainfall, flood, flash flood, storms and winds has been assessed to be medium, those climate hazards have the potential to impact the construction activities at the proposed cable route. It was assessed that climate hazards will have major impacts on health and safety, the environment and financial areas, moderate impacts on asset damage and engineering, operational, social and reputation areas during grid construction. While extreme weather conditions are predicted to continue, it is considered that the Proposed Development and its associated cable route linking the Proposed Development to the National Grid both play a part in the offset of CO_2 production, a known factor in the exacerbation of extreme weather and changing climate.

Potential Impact – Operational

Proposed Development

8.223 In the current climate, the exposure of the development to extreme rainfall, flood, flash flood, storms and winds has been assessed to be medium and of long-term duration.

8.224 The biggest severe weather challenge to wind farm operations is lightning and it is a constant severe weather threat. The next condition that makes severe weather and wind farms a dangerous combination is the wind speed, high wind speeds can be dangerous for both workers and equipment, with on-site maintenance crews will be alerted to ensure wind-farm employees are kept safe.

Cable Route

8.225 In the current climate, the exposure of the development to extreme rainfall, flood, flash flood, storms and winds has been assessed to be medium. The cable route options are planned to be underground therefore only floods/ flash flood will potentially affect it during operational phase, where it can be exposed by soil being washed out along the route. The significance of this is rated as medium. While extreme weather conditions are predicted to continue, it is considered that the Proposed Development and its associated cable route linking the Proposed Development to the National Grid both play a part in the offset of CO_2 production, a known factor in the exacerbation of extreme weather and changing climate.

8.226 Heavy or prolonged rainfall during construction and operation may lead to sediment transport or vegetation causing blockage to infrastructure drainage channels or any temporary watercourse crossing structures. Regular monitoring and prompt maintenance of these assets will ensure that the drainage system continues to function as designed.

Potential Impacts – Decommissioning

Proposed Development

8.227 In the current climate, the exposure of the development to extreme rainfall, flood, flash flood, storms and winds has been assessed to be medium, those climate hazards have the potential to impact the decommissioning activities at the proposed site and the TDR. During the decommissioning activities climate hazards will have major impacts on health and safety.

Cable Corridor

8.228 In the current climate, the exposure of the development to extreme rainfall, flood, flash flood, storms and winds has been assessed to be medium.

8.229 During the decommissioning phase, the proposed cable route infrastructure including substations and ancillary electrical equipment will form part of the national grid and shall be left in situ. The cable route is planned to be underground therefore only floods / flash flood will potentially affect it, where it can be exposed by soil being washed out along the route. Measures to minimise the risk of cable exposure will be included in an updated CEMP, which will be agreed in advance.

Mitigation Measures

8.230 Mitigation is designed to increase the resilience of the development, or wider environmental receptors, to climate change and focuses on increasing capacity to absorb climate related shocks.

8.231 In the context of climate change, measures to increase the adaptive capacity of the Proposed Development and disaster risk reduction strategies will be developed with a view to reducing vulnerability and increasing its resilience. Significant incidents related to the climate change that affect operation of the Proposed Development will be recorded for future analysis.

8.232 To minimize this severe weather risk at wind farms, The applicant will implement new lightning safety procedures that rely on early warning systems based on total lightning detection. Total lightning is the combination of all cloud-to-ground lightning strikes and in-cloud lightning strikes. It’s a best practice to rely on total lightning because

approximately 80% of all lightning strikes happen in the clouds. While these aren't immediately dangerous to workers or infrastructure, they are a precursor to deadly cloud-to-ground strikes and other forms of severe weather like wind gusts, tornadoes, and hail.

8.233 The applicant will use weather intelligence by monitoring real-time wind gust information and the forecast. An accurate wind forecast at altitude will be used to help decision-makers extend automatic shutoffs when more wind is in the near forecast.

8.234 Procedures undertaken prior to attending and on site during inclement weather are outlined below.

General Weather Conditions

8.235 The applicant will confirm wind speeds and forecasted weather conditions prior to site access. The Operational Controller will provide alerts if high winds are lightening are forecasted for the duration of any work or visit on site. This will be dynamically assessed on site by the working party of visitor. If a storm occurs, personnel will return to their vehicles, leave the wind farm without delay, and inform the Operational Controller.

8.236 If there is snow or ice forecast, the condition of the approach roads will be noted, and personnel will only proceed if safe to do so.

8.237 The approach roads may pass in proximity to wind turbines and ice may have accumulated on the blades. Vehicles will not be left for any reason and the Operational Controller will be advised if the vehicle becomes immobile in proximity to a wind turbine.

8.238 Good practice construction techniques will be adopted for the management of sediment and surface water run-off generated during the construction phase of the Proposed Development. Sustainable Drainage Systems (SuDS) will be used where applicable.

8.239 Drainage from the site will include elements of SuDS design. SuDS replicate natural drainage patterns and have several benefits:

- SuDS will attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream; and
- SuDS will treat run-off, which can reduce sediment and pollutant volumes in run-off before discharging back into the water environment; and
- SuDS measures, such as lagoons or retention ponds, where appropriate and correctly implemented would produce suitable environments for wildlife.
- In addition, a wet weather protocol would be implemented to manage activities during periods of heavy and prolonged precipitation to be approved by ABP.

Extreme Weather Conditions Procedure

8.240 The turbines have systems that will automatically halt operations when wind speeds exceed 24.5 m/s. This "survival mode" keeps the turbines standing upright because when the wind blows too fast through the turbines it can compromise the integrity of the foundation.

8.241 Therefore, the wind farm operator will have access to a weather forecast that indicates lightning strikes in real time. Furthermore, the capability to provide alerts to on-site maintenance crews is an effective way to keep wind-farm employees safe.

- At an average wind speed of 15 m/s, no work will be done outside the nacelle / No opening of nacelle hatch;
- Work in or over hub will be prohibited at 12 m/s;
- Work in nacelle will be prohibited at 20 m/s;
- At an average wind speed of 20 m/s, all climbing of turbines will be prohibited; and
- At an average wind speed of 25 m/s, the site will be evacuated following the Emergency Evacuation Procedure.

Snow and Ice Conditions

- If there is snow and ice forecast, before approaching a turbine. The turbine will be inspected from a safe distance.
- If ice build-up is evident on the wind turbine blades, the turbine will be stopped remotely, OMS will ask is it safe to go to the turbine. If not, they will keep a safe distance away and monitor the turbine. If ice build-up is still evident after 45 minutes, they will inform the Operational Controller and cancel works.
- If ice build-up has thawed or dislodged after 45 minutes, OMS will proceed with caution.
- Climbing is prohibited inside towers during mild ice and snow conditions, but no work will be carried out on the nacelle, in the hub, or on lattice met mast towers.
- Will not approach turbines during icy conditions until they have been stopped or paused. There is a risk of ice throw.
- Where roads are difficult to pass due to snow/ice, all works will be ceased until conditions improve.
- Where necessary, the site will be evacuated via marked roads.

Proposed Development

8.242 Based on a development vulnerability assessment, measures to improve the resilience of Proposed Development to extreme rainfall, flash flood, storms, and winds are required. **Table 8-45** details specific mitigation measures for the Proposed Development relating to climate change adaptation.

Table 8-44 Mitigation Measures Related to Climate Change Adaptation on the Proposed Development

Main Concerns Related to:	Mitigation Measures
Extreme Rainfall, Flood, Flash Flood	Consider changes / flexibility in design that provide for increased run-off across paved areas and possible increases in seasonal groundwater levels.

Main Concerns Related to:	Mitigation Measures
	Design / provide adequate surface water drainage / discharge to ground. As discussed in section 9.9.3.4 of Chapter 7: the drainage design will implement SuDs.
Storms and Winds	Activities / production will be ensured they can proceed safely during high winds and storms.
	Ensure the choice of equipment deployed on the Proposed Development is weather efficient.
Risk Reduction Mechanism	Insurance for damage of assets / site incidences will be secured.

Cable Route

8.243 Based on a development vulnerability assessment, measures to improve the resilience of the Proposed Development to extreme rainfall, flash flood, storms, and winds are required.Table 8- **Table 8-46** details specific mitigation measures for the Proposed Development relating to climate change adaptation.

Table 8-45 Mitigation Measures Related to Climate Change Adaptation Cable Route

Main Concerns Related to:	Proposed Alternatives or Mitigation Measures
Extreme Rainfall, Flood, Flash Flood	Consider changes / flexibility in design that provide for increased run-off and possible increases in seasonal groundwater levels. As discussed in section 9.9.3.4 of Chapter 9: there will be an implementation of a wet weather protocol
Risk Reduction Mechanism	Insurance for damage of assets / site incidences will be secured.

Residual Impacts

Proposed Development

8.244 There are no residual impacts from climate change on the proposed development. Designs used will ensure that the Proposed Development is resilient to extreme weather conditions.

Cable Corridor

8.245 There will be no significant impacts from the proposed cable route impacts in relation to climate hazards.

DO-NOTHING SCENARIO

8.246 If the Proposed Development does not proceed, local air quality and the impacts from extreme weather due to climate change will potentially lead to a high emissions scenario.

8.247 On a national scale, there will be an increase in greenhouse gas emissions. As the demand for energy increases with population growth. If increasing future electricity needs are not met by alternative renewable sources this will have to be met via fossil fuels which contribute to air pollution and climate change. This would make it difficult for Ireland to mee the requirements of its climate action plan which intends to reduce emissions from the energy sector by 75% by 2030. Ireland intends to meet this goal via the phase out and end the use of coal and peat generation and increase community-based renewable energy projects.

8.248 Without renewable energy projects it will not be possible for Ireland to meet its national targets. Ireland has published a Nationally Determined Contribution to the United Nations Framework Convention for Climate Change as a party to the Kyoto Protocol and Paris Agreement. Ireland's target is to reduce net greenhouse gas emissions by at least 55% compared to 1990 by 2030.

8.249 The European Commission has adopted the European Green Deal which will ensure no net emissions of greenhouse gases by 2050. As part of this the European Commission has adopted a set of proposals to make the EU's climate and energy policies fit for reducing net greenhouse gas emissions by at least 55%, This is through the increase of renewable capacity to a minimum of 42.5% and an ambition to reach 45%. A do-nothing scenario would make this difficult to achieve as continued use of fossil fuel generation would be required to meet energy demands.

8.250 Ireland has its own internal budgets and sectoral emission ceilings which will require it to reduce emissions related to electricity generation. The target is based on a baseline of 2018 where the energy sector was responsible for 10 mtCO2e the 2026-2030 budget it will be required to reduce this 60% to an annual average of 4 mtCO2e. To meet these targets the electricity sector will be required to decouple from the use of fossil fuels.

CUMULATIVE IMPACTS

8.251 Negative cumulative impacts in relation to air quality would only occur from other large development in the vicinity of the Proposed Development site during the construction phase. There other existing and approved projects and developments in the planning system within the vicinity of the Proposed Development site including housing developments, agricultural developments mainly. These developments are small in nature and will not impact cumulatively with the Proposed Development.

8.252 There are several large-scale projects and other renewable energy projects within 20 km of the Proposed Development, the closest of these are:

- Active Quarry 18.6 ha excluded from proposed site;
- Bracklyn Wind Farm ABP REF. PA25M.311565, 9 turbines (Permission granted) approximately 5 km south of Proposed Development;
- Bord na Móna Powergen Ltd., Ballivor Wind Farm ABP REF. PA25M.316212, SID - 26 no. Turbines, 4.8 km south of Proposed Development;
- Coole Wind Farm Limited ABP REF. PA25M.309770, SID 15 no. Turbines, <20 km northwest of Proposed Development;
- Reforce Energy Ltd, Dryderstown, Delvin. Registration Reference 12/2054; and
- Raymond Oliver, Corbetstown, Kilucan. Registration Reference 00/197.

8.253 Cumulative impacts may arise if the construction, or decommissioning period of these projects occurs simultaneously with the construction of the Proposed Development. This could result in slight increased traffic emissions. Provided the mitigation measures are implemented and the mitigation measures proposed for other developments are implemented, there will be no significant cumulative effects on air quality.

8.254 Following IEMA guidance it is known that climate change is a large, interrelated, and cumulative environmental effect and emission impacts have resulting effects that are on a global scale. As such it is not feasible to assess the cumulative impact on the climate of the Proposed Development. However, over the lifetime of the Proposed Development it will assist in mitigating the most severe consequences of Climate Change.

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

UNPLANNED EVENTS (ACCIDENTS)

8.256 Accidents, malfunctions, and unplanned events refer to events or upset conditions that are not part of any activity or normal operation of the Proposed Development planned by the Applicant. Even with the best planning and the implementation of preventative measures, the potential exists for accidents, malfunctions, or unplanned events to occur during the proposed construction, operation, and decommissioning activities.

8.257 Many accidents, malfunctions and unplanned events are, however, preventable and can be readily addressed or prevented by good planning, design, emergency response planning, and mitigation. In terms of air quality impact, the following unplanned events could influence the local area:

- equipment malfunction;
- vehicle collision;
- dry and windy weather conditions with loose material on road surface available for re-suspension and track out during vehicle movement;
- accidental material spillages during transport.

8.258 In relation to air quality, the impacts of any unplanned events are considered negligible. If unplanned events were not mitigated, the effects of dust during dry and windy conditions could possibly lead to occasional increases in nuisance dust and 24-hour mean PM_{10} concentration immediately surrounding the construction and decommissioning area. However, these are not considered to be significant given the limited duration of such meteorological conditions and the likely limited scale of any incident.

STATEMENT OF SIGNIFICANCE

8.259 Impacts from the Proposed Development on Air Quality are expected to be minimal and limited to the Construction and Decommissioning phases of the Proposed Development. These emissions will arise from the delivery of materials and construction of the Proposed Development. As such, taking into account mitigation measures proposed, the overall impact is **negligible** and **not significant**.

8.260 It is considered that the proposed development will have an overall **significant beneficial** impact on the climate. It will assist Ireland in meeting the new binding renewable energy target for the EU of 32% by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2023. In terms of renewable energy, an increase in electricity generated from renewable sources is to increase to 80% by 2030, with up to 9 GW of increased onshore wind capacity. This will be achieved by:

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

8.261 Based on the use of turbines with a power rating of 7.2MW The Proposed Development assists Ireland in meeting its carbon budgets. The expected impact on the Irish emissions budget is:

- A reduction of 0.13% on the second budget for the period 2026-2030
- A reduction of 0.17% on the third budget for the period of 2031-2035.

8.262 Based on the use of turbines with a power rating of 7.2MW The Proposed Development assists Ireland in meeting its sectoral emission ceilings for the period of 2026-2030. The expected impact on the energy emissions is a reduction of 1.31% for the energy sector As such, all attempts should be used to maximise power generation from the wind farm to further avoid emissions from fossil fuels in electrical generation.

8.263 The impacts of the climate on the Proposed Development are expected to be **negligible** and **not significant** as design measures and mitigation measures are to be implemented to ensure the resilience of the Proposed Development to projected extreme weather events following a high emission scenario RCP 8.5 over its 35 years lifespan.

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APPENDICES

Appendix 8-1: Carbon Calculator Vestas / Siemans & Input Data