14.0 AIR QUALITY AND CLIMATE

14.1 INTRODUCTION

14.1.1 Background

This chapter assesses the air quality and climate impacts as a result of the proposed project. The proposed wind farm site is located approximately 4 km northeast of Cappoquin and approximately 13 km northwest of Dungarvan.

14.1.2 Proposed Project

A full description of the proposed project is provided in Chapter 2 (Description of the Proposed Project) of the EIAR. It includes the proposed wind farm site itself; the proposed Grid Connection Route (GCR) and the proposed Turbine Delivery Route (TDR) works areas.

The proposed project includes 15 no. wind turbines with a power output of 5.7 – 7.2MW for each turbine. Total wind farm output is therefore anticipated to be 85.5MW at a minimum, and the maximum is anticipated to be 108MW.

14.1.3 Statement of Authority

This chapter was completed by Dr. Avril Challoner. She is a Principal Consultant in the Air Quality and Climate section of AWN Consulting. She holds a BEng (Hons) in Environmental Engineering from the National University of Ireland Galway, HDip in Statistics from Trinity College Dublin and has completed a PhD in Environmental Engineering (Air Quality) in Trinity College Dublin. She is a Chartered Scientist (CSci), Chartered Environmentalist (CEnv), Member of the Institute of Environmental Management and Assessment, Member of the Institute of Air Quality Management. Dr. Challoner has 12 years of experience in Air Quality and Climate Consultancy and specialises in EIA for infrastructure projects. Including MetroLink; DART+ West, the Water Supply Project and numerous Wind Farms.

14.1.4 Relevant Legislation & Guidance - Air Quality

14.1.4.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. The applicable legal standards in Ireland are outlined in the Ambient Air Quality Standards Regulations 2022 (the "Air Quality Regulations") (S.I. 739 of 2022), which incorporate the Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (as amended) also known as the CAFE Directive. The Air Quality Regulations set limit values for the pollutants nitrogen dioxide (NO_2) and nitrogen oxides (NO_X), particulate matter (PM) with an aerodynamic diameter of less than 10 microns (PM_{10}) and PM with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$) Table 14-1.

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland are set out in Directive 2024/2881/EC *of the European Parliament and of the Council of* (date to be confirmed) *on ambient air quality and cleaner air for Europe*. The EU formally adopted this directive on 14 October 2024. This directive supersedes EU Directive 2008/50/EC *of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe* and sets out new air quality standards for pollutants to be reached by 2030 which are more closely aligned with the World Health Organisation (WHO) air quality guidelines.

The Air Quality Standards Regulations 2022 (S.I. 739 of 2022) transposed EU Directive 2008/50/EC. With the adoption of Directive (EU) 2024/2881, Ireland must transpose this directive into national law (i.e. update the Air Quality Standards Regulations) before October 2026.

The ambient air quality standards applicable for nitrogen dioxide (NO_2) and particulate matter (as PM_{10} and $PM_{2.5}$) are outlined in Table 14-1. The limit values set out in Directive 2024/2881/EC will need to be achieved by 2030, with the limit values set out in the Air Quality Standards Regulations 2022 (and future updated regulations) applicable until 2030.

Table 14-1: Air Quality Regulations

Pollutant	2008/50/EC Limit Type	2008/50/EC Limit Value (applicable until 2030)	2024/xx/EC Limit Type	2024/xx/EC Limit Value (to be attained by 2030)
Nitrogen Dioxide (NO2)	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3	Hourly limit for protection of human health - not to be exceeded more than 3 times/year	200 µg/m^3
	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	50 µg/m^3
	Annual limit for protection of human health	40 µg/m^3	Annual limit for protection of human health	20 µg/m^3

NO_X	Annual limit for protection of vegetation	30 µg/m³	Annual limit for protection of vegetation	30 µg/m³
Particulate Matter (as PM_{10})	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m³	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	45 µg/m³
	Annual limit for protection of human health	40 µg/m³	Annual limit for protection of human health	20 µg/m³
Particulate Matter (as $PM_{2.5}$)	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	25 µg/m³
	Annual limit for protection of human health	25 µg/m³	Annual limit for protection of human health	10 µg/m³

In April 2023, the Government of Ireland published the *Clean Air Strategy for Ireland* (Government of Ireland 2023), which provides a high-level strategic policy framework needed to reduce air pollution. The strategy commits Ireland to achieving the 2021 WHO Air Quality Guidelines Interim Target 3 (IT3) by 2026 (shown in Table 14-2), the IT4 targets by 2030 and the final targets by 2040 (shown in Table 14-2). The strategy notes that a significant number of EPA monitoring stations observed air pollution levels in 2021 above the WHO targets; 80% of these stations would fail to meet the final $PM_{2.5}$ target of 5 µg/m³.

Annex II of Directive 2024/2881/EC gives assessment thresholds which align with the clean air strategy final 2040 WHO targets. Directive (EU) 2024/2881 states that *"Member States shall endeavour to achieve and preserve the best ambient air quality and a high level of protection of human health and the environment, with the aim of achieving a zero-pollution objective as referred to in Article 1(1), in line with WHO recommendations, and below the assessment thresholds laid down in Annex II."*

These assessment thresholds relate to monitoring of ambient air quality by Member States, where *"exceedances of the assessment thresholds specified in Annex II shall be determined on the basis of concentrations during the previous 5 years where sufficient data are available. An assessment threshold shall be deemed to have been exceeded if it has been exceeded during at least 3 separate years out of those previous 5 years.*"

The applicable air quality limit values for the purposes of this assessment are those set out in Table 14-1. The limit values stipulated under Directive 2008/50/EC and the Air Quality Standards Regulations 2022 are applicable prior to 2030. The limit values stipulated by Directive (EU) 2024/2881 are applicable for assessments after 2030.

*Table 14-2: WHO Guidelines**

Pollutant	Regulation	Limit Type	IT3 (2026)	IT4 (2030)	Final Target (2040)
NO_2	WHO Air Quality Guidelines	24-hour limit for protection of human health	50µg/m³ NO_2	50µg/m³ NO_2	25µg/m³ NO_2
		Annual limit for protection of human health	30µg/ m³ NO_2	20µg/ m³ NO_2	10µg/m³ NO_2
PM (as PM_{10})		24-hour limit for protection of human health	75µg/ m³ PM_{10}	50µg/m³ PM_{10}	45µg/m³ PM_{10}
		Annual limit for protection of human health	30µg/ m³ PM_{10}	20µg/m³ PM_{10}	15µg/m³ PM_{10}
PM (as $PM_{2.5}$)		24-hour limit for protection of human health	37.5µg/m³ $PM_{2.5}$	25µg/m³ $PM_{2.5}$	15µg/m³ $PM_{2.5}$
		Annual limit for protection of human health	15µg/m³ $PM_{2.5}$5	10µg/m³ $PM_{2.5}$	5µg/m³ $PM_{2.5}$

*Air Quality Guidelines - Global Update 2021 (WHO 2021)

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Dublin City Council (DCC) has published a guidance document titled *Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition* however this guidance does not specify a guideline value (DCC 2018). Applicable guidance from other county councils within Ireland is not available.

The German TA-Luft standard for dust deposition (Verein Deutscher Ingenieure (VDI) 2002) (non-hazardous dust) sets a maximum permissible emission level for dust deposition of 350mg/(m_2*day) averaged over a one-year period at any receptors outside a project's boundary. Recommendations from the Department of the Environment, Heritage and Local Government (DEHLG 2004) apply the Bergerhoff limit of 350mg/(m^2*day) to the site boundary of quarries. This guidance value can be implemented with regard to dust impacts from the construction of the project.

The appropriate limits for the construction and operational phase assessment of air quality impacts from the project are the Air Quality Regulations, which incorporate the CAFE Directive and Directive 2024/2881/EC.

14.1.4.2 Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for $PM_{2.5}$. In relation to Ireland, 2020 emission targets are 25 kt for SO_2 (65% below 2005 levels), 65 kt for NO_X (49% reduction), 43 kt for VOCs (25% reduction), 108 kt for NH_3 (1% reduction) and 10 kt for $PM_{2.5}$ (18% reduction).

Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (the "NECD") prescribes the same emission limits as the 1999 Gothenburg Protocol. A National EPA Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005. The data available from the EPA in 2021 indicated that Ireland complied with the emissions ceiling for SO_2 in recent years but failed to comply with the ceilings for NH_3, NO_X and NMVOCs. The Directive applied the 2010 NECD limits until 2020 and establishes new national emission reduction commitments which applies from 2020 and 2030 for SO_2, NO_X, NMVOC, NH_3, $PM_{2.5}$ and CH_4. In relation to Ireland, 2020-29 emission targets are 25 kt for SO_2 (65% reduction on 2005 levels), 65 kt for NO_X (49% reduction on 2005 levels), 43 kt for VOCs (25% reduction on 2005 levels), 108 kt for NH_3 (1% reduction on 2005 levels) and 10 kt for $PM_{2.5}$ (18% reduction on 2005 levels). In relation to 2030, Ireland's emission targets are 10.9 kt (85% below 2005 levels) for SO_2, 40.7 kt (69% reduction) for NO_X, 51.6 kt (32% reduction) for NMVOCs, 107.5 kt (5% reduction) for NH_3 and 11.2 kt (41% reduction) for $PM_{2.5}$.

14.1.5 Relevant Legislation & Guidance - Climate

14.1.5.1 International and National Guidelines, Policy and Legislation

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) was enacted (the Act). The purpose of the Act is to enable Ireland '*to* pursue*, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050'* (3. (1) of No. 46 of 2015). This is referred to in the Act as the 'national transition objective'. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019). The Climate Action Plan 2019 outlined the status across key sectors including electricity, transport, built environment, industry and agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2021a) and a third update in December 2022 (Government of Ireland, 2022) with an Annex of Action published in March 2023.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in

December 2019, followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 in March 2021. The 2021 Climate Act was signed into Law on 23 July 2021, giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act is to provide for the approval of plans "for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050". The 2021 Climate Act will also "provide for carbon budgets and a decarbonisation target range for certain sectors of the economy". The 2021 Climate Act defines the carbon budget as "the total amount of greenhouse gas emissions that are permitted during the budget period".

In relation to carbon budgets, the 2021 Climate Action and Low Carbon Development (Amendment) Act (or 2021 Climate Act) states that 'a carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Climate Change Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on the 1 January 2021 and ending on 31 December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')'. The carbon budget is to be produced for 3 sequential budget periods, as shown in Table 14-3. The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change. In relation to the sectoral emissions ceiling, the Minister for the Environment, Climate and Communications (the Minister for the Environment) shall prepare and submit to government the maximum amount of Greenhouse Gas (GHG) emissions that are permitted in different sectors of the economy during a budget period and different ceilings may apply to different sectors. The sectorial emission ceilings for 2030 were published in July 2022 and are shown in Table 14-4. Electricity has a 75% emissions reduction requirement and a 2030 emission ceiling of 3 $MtCO_2eq$[1].

Table 14-3: 5-Year Carbon Budgets: 2021-2025, 2026-2030 and 2031-2025

Sector	Reduction Required	2018 Emissions ($MtCO_2eq$)
2021-2025	295 Mt CO_2eq	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO_2eq	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO_2eq	Reduction in emissions of 3.5% per annum for the third provisional budget.

[1] Mt CO_2eq denotes million tonnes carbon dioxide equivalent.

Table 14-4: Sectoral Emission Ceilings 2030

Sector	Baseline ($MtCO_2eq$)	Carbon Budgets ($MtCO_2eq$)		2030 Emissions ($MtCO_2eq$)	Indicative Emissions % Reduction in Final Year of 2025-2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Transport	12	54	37	6	50
Electricity	10	40	20	3	75
Built Environment - Residential	7	29	23	4	40
Built Environment - Commercial	2	7	5	1	45
Agriculture	23	106	96	17.25	25
LULUCF[Note 1]	5	TBC[Note 2]	TBC	TBC	TBC
Industry	7	30	24	4	35
Other (F-gases, waste, petroleum refining)	2	9	8	1	50
Unallocated Savings	-	7	5	-5.25	-
Total	68	TBC	TBC	-	-
Legally Binding Carbon Budgets and 2030 Emission Reduction Targets	-	295	200	-	51

[Note 1] No targets for Land Use, Land-use Change and Forestry (LULUCF) published.

[Note 2] Not provided in the C2023 Climate Action Plan.

In December 2023, the current Climate Action Plan (CAP24) was published (DECC, 2024). This CAP builds on the progress of CAP23, which first published carbon budgets and sectoral emissions ceilings. It aims to implement the required changes to achieve a 51% reduction in carbon emissions by 2030 and the 2050 Net Zero goal. The CAP has six vital high impact sectors where the biggest savings can be made. These sectors are Renewable Energy, Energy Efficiency of Buildings, Transport, Sustainable Farming, Sustainable Business and Change of Land-Use. CAP24 states that the decarbonisation of Ireland's manufacturing industry is key for Ireland's economy and future competitiveness. There is a target to reduce the embodied carbon in construction materials by 10% for materials produced and used in Ireland by 2025 and by at least 30% for materials produced and used in Ireland by 2030. CAP24 states that these reductions can be brought about by product substitution for construction materials and reduction of clinker content in cement. Cement and other high embodied carbon construction elements can be reduced by the adoption of the methods set out in the Construction Industry Federation 2021 report Modern Methods of Construction (Construction Industry Federation, 2021). The IDA Ireland will also seek to attract businesses to invest in decarbonisation technologies to ensure economic growth can continue alongside a reduction in emission. As outlined in CAP24 the target for renewables on the national grid is 80% by 2030 which includes 9 gigawatts (GW) of onshore wind energy. This is a key target and action within CAP24.

In August 2024, the Government published a *Long-Term Strategy on Greenhouse Gas Emissions Reductions* (Department of the Environment, Climate and Communications, 2024) prepared under *Ireland's Climate Action and Low Carbon Development Acts 2015 to 2021*. This strategy provides a long-term plan on how Ireland will transition towards net carbon zero by 2050 covering a 30-year period, achieving the interim targets set out in the Climate Action Plan 2024. It conforms to both EU and national requirements, and as such, will replace the 2023 Strategy that was submitted to the EU Commission and UNFCCC. The strategy aligns with Ireland's National Energy and Climate Plan.

The second National Adaptation Framework (NAF) (DECC, 2024) was published in June 2024 in line with the five-year requirement of the 2015 Climate and Low Carbon Development Act (the Climate Act). The plan provides a whole of government and society approach to climate adaptation in Ireland to reduce Irelands vulnerability to climate change risks including extreme weather events, flooding, drought, loss of biodiversity, sea level rise and increased temperatures. Similar to the '*Just Transition*' when considering carbon emissions, the NAF aims for *'Just Resilience'* stating that *"A climate resilient Ireland will have a reduced reliance on fossil fuel, it will have widely accessible electrified public transport and will have transitioned towards sustainable agricultural practices such as agroforestry and organic farming."*

The NAF highlights that there is a projected increased frequency of droughts, coupled with higher evapotranspiration rates, which could cause reduced river flow, groundwater recharge, and reservoir refill capacity, leading to potential water supply shortages. The NAF warns that national long-term water supply projects must be planned for within budgets to ensure the adaptation required to make Ireland resilient by 2050 and beyond is funded.

The National Climate Change Risk Assessment (NCCA) was published in May 2024 (EPA, 2024a). The NCCA was required to be developed under Action 457 from the 2021 Climate Action Plan. Action 457 states "*Further develop Ireland's national climate change risk assessment capacity to identify the priority physical risks of climate change to Ireland.*". The NCCA uses definitions of the risk determinants from the Intergovernmental Panel on Climate Change (IPCC) Risk Framework (IPCC, 2023), which are outlined below.

- Hazard The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.
- Exposure The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.
- Vulnerability The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity
- Risk The potential for adverse consequences for human or ecological systems.

When considering risk, the NCCA assess exposure and vulnerability for two future climate change scenarios or Representative Concentration Pathways (RCPs).

- RCP4.5 was selected as it represents an alignment with the global temperature trajectory; and
- RCP8.5 was selected as it represents a high-emissions scenario and achieves the highest level of modelled temperature increases by the end of the century. Consequently, this

scenario will result in the highest level of physical risk for Ireland, and therefore the greatest requirement for adaptation.

These scenarios align with a conservative approach to assess risks to Ireland and assumes global emission reduction targets are not met. This aligns with the principle of precaution as stated in the 2024 NAF. In addition to the future climate scenarios, the NCCA assesses risk on the future climate during the following timeframes:

- Present (~2030),
- Medium-Term (~2050) and
- Long-Term (~2100).

See Chapter 4 (Planning, Policy and Development Context) of this EIAR for further discussion regarding climate policy and legislation.

14.1.5.2 Local Policy and Guidelines

Waterford City and County Council's Climate Action Plan 2024 – 2029 (Waterford City and County Council 2024) aims to work to make Waterford Ireland's first city, Ireland's first Carbon Neutral City by 2040, reducing fossil fuel use in the city and replacing with renewables where possible. The Action Plan supports deployment of renewable energy technologies. Action 1.23 of the plan states "*County Council investment in partnership for renewable energy projects where a suitable project is identified*". In addition the Actions 2.73 state that the City and County Council will source 100% renewable energy and Action 2.74 will Assess Council land for Renewable Energy suitability. Priority area 4 for the City and County Council is Energy, where there is an aim to producing local renewable energy.

In addition to the Climate Change Adaptation Strategy, in April 2021 Waterford City and County Council nominated the entire area of Waterford City to be a decarbonized zone (DZ). Waterford City and County Council produced a Roadmap to Carbon Neutrality (Waterford City and County Council 2021), under which the use of renewables and energy efficient technologies is a key metric.

14.2 METHODOLOGY

14.2.1 Air Quality Guidance

The following Environmental Protection Agency (EPA) guidelines were considered in this assessment: -

- Guidelines on the Information to be contained in Environmental Impact Assessment Statements (EPA, 2022).

The statutory ambient air quality standards in Ireland are outlined in the Air Quality Regulations), which incorporate the ambient air quality limits set out in Directive 2008/50/EC for a range of air pollutants. The statutory ambient air quality guidelines are discussed in greater detail in the sections below.

In addition to the specific statutory air quality standards, the assessment has made reference to national guidelines, where available, in addition to international standards and guidelines relating to the assessment of ambient air quality impact. These are summarised below: -

- PE-ENV-01106: Air Quality Assessment of Specified Infrastructure Projects (Transport Infrastructure Ireland (TII), 2022a);

- Guidance on the Assessment of Dust from Demolition and Construction Version 2.1 (Institute of Air Quality Management (IAQM), 2023) (hereafter referred to as the IAQM Guidelines); and
- A Guide to The Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1) (IAQM, 2020).

14.2.2 Climate Guidance

The assessment has been carried out in accordance with national guidelines, where available, in addition to international standards and guidelines relating to the assessment of GHG emissions and associated climatic impact from road schemes. These are summarised below: -

- PE-ENV-01104: Climate Guidance for National Roads, Light Rail and Rural Cycleways (offline & Greenways) – Overarching Technical Document (TII, 2022b);
- PE-ENV-01105: Climate Assessment of Proposed National Roads – Standard (TII, 2022c);
- GE-ENV-01106: TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document (TII, 2022d);
- Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2022);
- Technical guidance on the climate proofing of infrastructure in the period 2021-2027 (European Commission 2021a);
- IEMA Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (hereafter referred to as the IEMA 2020 EIA Guide) (IEMA, 2020a);
- IEMA GHG Management Hierarchy (hereafter referred to as the IEMA 2020 GHG Management Hierarchy) (IEMA, 2020b);
- Publicly Available Specification (PAS) 2080:2023 on Carbon Management in Infrastructure (BSI, 2023); and
- Technical guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021a).

The climate assessment in this Chapter is divided into two distinct sections – a greenhouse gas assessment (GHGA) and a climate change risk assessment (CCRA).

- GHGA – Quantifies the GHG emissions from a project over its lifetime. The assessment compares these emissions to relevant carbon budgets, targets and policy to contextualise magnitude.
- CCRA – Identifies the impact of a changing climate on a project and receiving environment. The assessment considers a project's vulnerability to climate change and identifies adaptation measures to increase project resilience.

14.2.3 Study Area

14.2.3.1 Air Quality

With respect to the air quality study area the UK Institute of Air Quality Management (IAQM) guidance document Guidance on the Assessment of Dust from Demolition and Construction (2024) states that dust impacts should be considered for up to 250m from the project red line boundary. When considering a cumulative study area, the dust cumulative study area is up to 500m (a 250m radius from other active construction sites).

With respect to road traffic impacts, TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a), considers the study area to be 200m of "affected" road links. Affected road links are define in Section 14.2.4.2.

14.2.3.2 Climate

As per PE-ENV-01104 (TII, 2022b), the study area with respect to the GHGA is Ireland's Climate budget. The study area with respect to the CCRA can be considered the project boundary and its assets that are considered within the methodology. The study area will be influenced by current and future baselines (Section 14.3.4).

14.2.4 Construction & Decommissioning Phase

14.2.4.1 Air Quality – Construction Dust

The assessment first identified the existing baseline levels of NO_2 and PM_{10} in the region (Cappoquin, Co. Waterford) of the proposed project by an assessment of EPA monitoring data. Thereafter, the impact of the proposed project on air quality at the neighbouring sensitive receptors during the construction and decommissioning phases was determined by an assessment of the dust generating construction activities associated with the proposed project based on the guidance issued by the IAQM (2024). The impacts of dust from the construction and decommissioning phases will be short-term in nature and are assessed at Section 14.4.2.1 and Section 14.4.4.1 respectively.

14.2.4.2 Air Quality - Construction Traffic

Construction phase traffic also has the potential to impact air quality. The TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a), states that road links meeting one or more of the following criteria can be defined as being 'affected' by a project and should be included in the local air quality assessment. While the guidance is specific to infrastructure projects the approach can be applied to any proposed project that causes a change in traffic within 200m of a sensitive receptor.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5m or greater.

TOBIN have estimated traffic data for the proposed project and prepared Chapter 16 (Traffic and Transportation) of this EIAR, it has been determined that the construction stage traffic will not increase by 1,000 AADT, or 200 HDV AADT, the project will not result in speed changes or changes in public road alignment greater than 5m, therefore the traffic does not meet the above scoping criteria. There is some road widening associated with the proposed project however this will not result in a realignment of 5m or more (generally <0.5m each side). Chapter 16 (Traffic and Transportation) of this EIAR estimates that the proposed project will generate an average 262 AADT including 30 HDV trips during peak construction (an average of 194 AADT including 20 HDVs over the construction period). As a result a detailed air quality assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for likely significant impacts to air quality. As the decommissioning phase traffic is anticipated to be lower than the construction phase, this will also be scoped out. Effects are considered temporary and imperceptible and do not require further assessment.

14.2.4.3 Climate – Embodied Energy Assessment

Climate change is a result of increased levels of carbon dioxide and other GHGs in the atmosphere causing the heat trapping potential of the atmosphere to increase. GHGs can be emitted from vehicles and embodied energy associated with materials used in the construction of a project. Embodied energy refers to the sum of the energy needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site. There is the potential for a number of embodied GHGs and GHG emissions during the construction phase of the proposed project. Construction vehicles, generators etc. may give rise to CO_2 and N_2O emissions as well as the large quantities of material such as stone, concrete and steel that will be required for a proposed project of this scale.

PE-ENV-01104 (TII, 2022b) recommends the calculation of the construction stage embodied carbon using the TII Online Carbon Tool (TII, 2022d). Embodied carbon refers to the sum of the carbon needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site. The TII Online Carbon Tool (TII, 2022d) uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013), UK National Highways Carbon Tool v2.4 and UK Government 2021 Greenhouse Gas Reporting Conversion Factors. The tool aligns with PAS 2080. The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that will be used over the entire construction / maintenance phase.

The GHG assessment commences with the high-level design, through the pre-construction (site clearance) stage, followed by the assessment of the embodied carbon associated with all materials used in the construction of the proposed project, the emissions during the construction phase activities and additionally emissions related to waste generated during the construction phase. As part of the proposed project, Construction Phase embodied GHG emissions are categorised under the following headings:

- Product Stages: The carbon emissions generated at this stage arise from extracting the raw materials from the ground, their transport to a point of manufacture and then the primary energy used (and the associated carbon impacts that arise) from transforming the raw materials into construction products. These stages have been included within the scope of this assessment.
- Construction: These carbon impacts arise from transporting the construction products to site, and their subsequent processing and assembly into the building. This has been included within the scope of the assessment.
- In-Use Stages: This covers a wide range of sources from the embodied carbon emissions associated with the operation of the building, including the materials used during maintenance, replacement and refurbishment. Material refurbishment and replacement throughout the lifetime of the proposed project has been included within this assessment.
- End of Life Stages The eventual deconstruction and disposal of the existing building at the end of its life takes account of the on-site activities of the demolition contractors. No 'credit' is taken for any future carbon benefit associated with the reuse or recycling of a material into new products.

Detailed information for the proposed project, including volumes of materials, is provided in Chapter 2 (Description of the Proposed Project) of this EIAR. All peat and spoil material will remain within the proposed project boundary, unless any contaminated soil is found, in which case it will be taken off site to a licensed waste facility.

As part of the proposed project, a quantity of peat will be excavated (see Chapter 2 (Description of the Proposed Project), Chapter 8 (Land, Soils and Geology) and Section14.4.2.2 below). As discussed in the *Best Practice Guidelines for the Irish Wind Energy Industry* (IWEA, 2012), excavation of peat can be a contributor to carbon losses associated with wind farm construction.

The guidance states "*it is good practice to undertake a calculation of the carbon costs of the construction and operation of a wind farm. The carbon release associated with the excavation and oxidization of peat soils can be relatively significant and should be included in any carbon calculation"* (IWEA, 2012). Carbon emissions from peat loss have been included in the calculations for the proposed project via the TII Carbon Tool (Section 14.4.2.2).

Forests are an important part of the global carbon cycle and effective management at a regional scale can help to reduce GHG concentrations (UK Forestry Commission, 2012). Trees have the ability to sequester carbon with the peak CO_2 uptake rate for tree stands of the order of 5–20 tonnes of CO_2/hectare/year with CO_2 uptake rates declining before stand maturity. Additionally, after afforestation on mineral soils, there will be an increase of soil carbon soon after planting of the order of 0.2–1.7 tonnes of CO_2/hectare/year (UK Forestry Commission 2012 and Intergovernmental Panel on Climate Change (IPCC) 2006). The TII Carbon Tool includes an assessment for forestry loss.

Based on this analysis, the GHG emissions associated with the loss of 91.6 and 99.7 hectares of forestry as a result of the proposed project has been assessed. However, it should be noted that the proposed project also provides for the planting of an equivalent area of forestry which will offset the loss of carbon sink.

14.2.4.4 Climate – Turbine Manufacture Lifecycle Assessment

A lifecycle assessment was undertaken to determine the payback period for the proposed wind turbines. The wind turbine model proposed for installation at the proposed project has not yet been confirmed and a number of options are being investigated(within the parameters set out in Chapter 2 (Description of the Proposed Project) of this EIAR) with power outputs of between 5.7 – 7.2MW per turbine. Information on the life cycle assessments undertaken for five proposed options have been reviewed:

- Vestas -V150
- SGRE - SG 155
- Nordex-Acciona - N149
- Vestas - V162
- Nordex - N163

The life cycle assessment quantifies the associated power consumption associated with the production, operation, transport and end-of-life of the wind turbines. The information was sourced from information provided on the manufacturers websites.

The assessment also quantifies the associated GHG emissions associated with the production, operation, transport and end-of-life of the wind turbines. The energy balance associated with the wind power production during its lifetime (assumed to be 35-years) and the energy associated with the manufacturing, operation, transport, dismantling and disposal was also calculated on a site-specific basis as the energy balance is based on the expected GWh of production during its lifetime. The energy balance is expressed in terms of the time taken for the energy consumed by the turbine through its full life cycle to be repaid in terms of wind energy exported to the electricity grid.

14.2.4.5 Climate – Climate Change Risk Assessment

In addition to assessing the impacts of the proposed project on climate change in the form of a GHGA, the impact of climate change on the proposed project must be considered. This is completed by CCRA which considers a project's vulnerability to climate change and identifies adaptation measures.

The climate vulnerability and risk assessment helps to identify the significant climate risks. It is the basis for identifying, appraising and implementing targeted adaptation measures. This will help reduce the residual risk to an acceptable level.

14.2.5 Operational Phase

14.2.5.1 Air Quality

An assessment of baseline air quality in the region (see Section 14.3.2) has been conducted to determine current levels of key pollutants relative to their limit values. The savings in NOx emissions arising from the production of electricity using renewable sources have been compared against those produced using non-renewable sources. The calculations were carried out using SEAI published emission rates from non-renewable energy sources[2] and EPA data (EPA 2023c). The total NO_X savings, annually and over the lifespan of the project relative to NO_X emissions from power generation, was then established to determine the overall impact of the proposed project on air quality.

As per the construction phase scoping criteria detailed in Section 14.2.4.2 and *PE-ENV-01106* (TII, 2022a), traffic effects have been scoped out of the operational phase as they are considered insignificant.

14.2.5.2 Climate - GHGA

There will be no significant greenhouse gas emissions from the operation of the proposed project. However, due to the displacement of electricity which otherwise would have been produced from fossil fuels, there will be a net benefit in terms of GHG emissions. The savings have been calculated and compared to Ireland's 2030 commitment target for gross electricity consumption from renewable energy sources.

Vehicular traffic is often a dominant source of GHG emissions as a result of proposed projects. However, there is no predicted likely significant operational phase vehicle effect due to the low volume of vehicles required during operation (see Chapter 16 (Traffic and Transportation) of this EIAR for details).

14.2.5.3 Climate - CCRA

PE-ENV-01104 (TII 2022b) states that the CCRA is guided by the principles set out in the overarching best practice guidance documents:

- EU (2021) Technical guidance on the climate proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021); and
- The Institute of Environmental Management and Assessment, Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2nd Edition) (IEMA, 2020).

The baseline environment information provided in Section 14.3.4, future climate change modelling and input from other experts working on the proposed project (i.e. hydrologists) should be used in order to assess the likelihood of a climate hazard.

The initial stage of an assessment is to establish a scope and boundary for the assessment taking into account the following criteria:

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[2] https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/

- Spatial boundary: As per PE-ENV-01104 (TII, 2022b), the study area with respect to the GHGA is Ireland's Climate budget. The study area with respect to the CCRA can be considered the project boundary and its assets that are considered within the methodology. The study area will be influenced by current and future baselines (Section 14.3.4).
- Climate hazards: The outcomes of the climate screening i.e. vulnerability assessment and baseline assessment; and
- Project receptors: TII state that the project receptors are the asset categories considered in the climate screening. In addition, any critical connecting infrastructure and significant parts of the surrounding environment e.g. water bodies that should be considered as a part of the indirect, cumulative and in combination impact assessment should also be considered project receptors (i.e. the turbines, access roads).

Technical guidance on the climate proofing of infrastructure in the period 2021-2027 (European Commission, 2021a) outlines an approach for undertaking a climate change risk assessment where there is a potentially significant impact on the project due to climate change. The risk assessment assesses the likelihood and consequence of the impact occurring, leading to the evaluation of the significance of the impact. The role of the climate consultant in assessing the likelihood and impact is often to facilitate the climate change risk assessment process with input from the project design team or specific specialists such as hydrology.

Examples of climate hazards which are considered in the risk assessment include:

- Flooding (coastal) – including sea level rise and storm surge.
- Flooding (pluvial);
- Flooding (fluvial);
- Extreme heat – including extreme heat events and increasing temperatures overtime;
- Extreme cold – including frost and snow;
- Wildfire;
- Drought;
- Extreme wind;
- Lightning and hail;
- Landslides; and,
- Fog.

The climate screening risk assessment comprises of a sensitivity analysis which is intended to evaluate the project's vulnerability to climate change. This is completed by combining a sensitivity (Table 14-5) and exposure (Table 14-6) analysis. The sensitivity analysis identifies the climate hazards relevant to the specific project type irrespective of its location (example: sea level rise will affect seaport projects regardless of location). Sensitivity ratings are classed as:

- High Sensitivity: the climate hazard may have a significant impact on assets and processes, inputs, outputs and transport links. This is a sensitivity score of 3;
- Medium Sensitivity: the climate hazard may have a slight impact on assets and processes, inputs, outputs and transport links. This is a sensitivity score of 2; and
- Low Sensitivity: the climate hazard has no (or insignificant) impact. This is a sensitivity score of 1.

The European Commission assessment states that there are four themes to sensitivity analysis. Transport links may be outside the direct control of the project but still should be considered. TII (TII, 2022b) set out the following as potential sensitive receptors: drainage, structures, earthworks, geotechnical, utilities, landscaping, turbines, or access roads.

Table 14-5: Screening Assessment: Sensitivity Categories (example layout)

Sensitive Receptors	Sensitivity to Climate Hazards (No consideration of site location)								
	Flood (Fluvial/Pluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Wildfire	Fog	Lightning & Hail	Landslides
Drainage									
Structures / Turbines									
Earthworks									
Utilities									
Turbines									
Access Roads									

The exposure analysis identifies the climate hazards relevant to the planned project location irrespective of the project type for example: flooding could be a risk if the project location is next to a river in a floodplain. Exposure may be classed as high, medium or low:

- High exposure: It is almost certain or likely this climate hazard will occur at the project location i.e. might arise once to several times per year. This is an exposure score of 3;
- Medium exposure: It is possible this climate hazard will occur at the project location i.e. might arise a number of times in a decade. This is an exposure score of 2; and,
- Low exposure: It is unlikely or rare this climate hazard will occur at the project location i.e. might arise a number of times in a generation or in a lifetime. This is an exposure score of 1.

Table 14-6: Screening Assessment: Exposure Assessment (example layout)

Climate Exposure	Exposure Risk to Climate Variable (Consider the site location)								
	Flood pluvia l	Extrem e Heat	Extrem e Cold	Drough t	Win d	Wildfir e	Fo g	Lightnin g & Hail	Landslide s
Without exposure at project location									

Once sensitivity and exposure are categorised, a vulnerability analysis is conducted using Table 14-7. If the project scores a high or medium vulnerability, the project should proceed to add further mitigation measures including management for vulnerabilities that cannot be fully mitigated.

Table 14-7: Screening Assessment: Vulnerability Analysis

		Exposure (current + future climate)		
		High	**Medium**	**Low**
Sensitivity (highest across the four themes)	**High**	High	High	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Low

14.2.6 Cumulative Assessment

14.2.6.1 Air Quality

During the construction and decommissioning phases, there is potential for cumulative effects to arise in relation to dust (IAQM 2024). This effect is only likely to arise if these phases of the proposed project run concurrently with the construction of another project.

During the operational phase, it is assessed that there is no likelihood of significant adverse cumulative effects. The project will, in combination with other wind energy developments, result in long-term beneficial effects on air quality.

14.2.6.2 Climate

With respect to the requirement for a cumulative assessment PE-ENV-01104 (TII, 2022b) states that *"for GHG Assessment is the global climate and impacts on the receptor from a project are not geographically constrained, the normal approach for cumulative assessment in EIA is not considered applicable."*

However, by presenting the GHG impact of a project in the context of its alignment to Ireland's trajectory of net zero and any sectoral carbon budgets, this assessment will demonstrate the potential for the project to affect Ireland's ability to meet its national carbon reduction target. Therefore, the assessment approach is considered to be inherently cumulative.

14.2.7 Acceptable Limits

14.2.7.1 Significance Criteria Air Quality

The TII document Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106 (TII, 2022a) details a methodology for determining air quality impact significance criteria for road schemes which can be applied to any project that causes a change in traffic. The degree of impact is determined based on the percentage change in pollutant concentrations relative to the do-nothing scenario. The TII significance criteria are outlined in Table 4.9 of Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106 (TII, 2022a) and reproduced in

Table 14-8 below. These criteria have been adopted for the proposed project to predict the impact of NO_2, PM_{10} and $PM_{2.5}$ emissions as a result of the proposed project.

Table 14-8: Air Quality Significance Criteria

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Standard Value (AQLV)			
	1%	2-5%	6-10%	>10%
75% or less of AQLV	Neutral	Neutral	Slight	Moderate
76 – 94% of AQLV	Neutral	Slight	Moderate	Moderate
95 – 102% of AQLV	Slight	Moderate	Moderate	Substantial
103 – 109% of AQLV	Moderate	Moderate	Substantial	Substantial
110% or more of AQLV	Moderate	Substantial	Substantial	Substantial

Source: TII (2022a) Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106

14.2.7.2 Significance Criteria for Climate

Significance Criteria for GHGA

The Transport Infrastructure Ireland (TII) guidance document entitled PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document (TII, 2022b) outlines a recommended approach for determining the significance of both the construction and operational phases of a development. The approach is based on comparing the 'Do Something' scenario and the net project GHG emissions (i.e. Do Something – Do Minimum) to the relevant carbon budgets (Department of the Taoiseach 2022). With the publication of the Climate Action Act in 2021, sectoral carbon budgets have been published for comparison with the net CO_2 GHG emissions from the proposed project. Electricity has a 75% emissions reduction requirement and a 2030 emission ceiling of 3 $MtCO_2eq$.

The significance of GHG effects set out in PE-ENV-01104 (TII, 2022b) is based on IEMA guidance (IEMA, 2022) which is consistent with the terminology contained within Figure 3.4 of the EPA's (2022) 'Guidelines on the information to be contained in Environmental Impact Assessment Reports'.

The 2022 IEMA Guidance (IEMA, 2022) sets out the following principles for significance:

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

TII (TII, 2022b) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. In line with IEMA

Guidance (IEMA, 2022), TII state that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero[3] by 2050*".

Significance is determined using the criteria outlined in Table 14-9 (derived from Table 6.7 of PE-ENV-01104 (TII, 2022b)) along with consideration of the following two factors:

- The extent to which the trajectory of GHG emissions from the proposed project aligns with Ireland's GHG trajectory to net zero by 2050; and
- The level of mitigation taking place.

Table 14-9: Climate Significance Criteria for GHGA

Effects	Significance level Description	Description
Significant adverse	Major adverse	The project's GHG impacts are not mitigated. The project has not complied with do-minimum standards set through regulation, nor provided reductions required by local or national policies; and No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate adverse	The project's GHG impacts are partially mitigated. The project has partially complied with do-minimum standards set through regulation, and have not fully complied with local or national policies; and Falls short of full contribution to Ireland's trajectory towards net zero.
Not significant	Minor adverse	The project's GHG impacts are mitigated through 'good practice' measures. The project has complied with existing and emerging policy requirements; and Fully in line to achieve Ireland's trajectory towards net zero.
	Negligible	The project's GHG impacts are mitigated beyond design standards.

[3] Net Zero: "*When anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period.*" Net zero is achieved where emissions are first educed in line with a 'science-based' trajectory with any residual emissions neutralised through offsets.

		The project has gone well beyond existing and emerging policy requirements; and Well 'ahead of the curve' for Ireland's trajectory towards net zero.
Beneficial	Beneficial	The project's net GHG impacts are below zero and it causes a reduction in atmosphere GHG concentration. The project has gone well beyond existing and emerging policy requirements; and Well 'ahead of the curve' for Ireland's trajectory towards net zero, provides a positive climate impact.

Significance Criteria for CCRA

The CCRA involves an initial screening assessment to determine the vulnerability of the proposed project to various climate hazards. The vulnerability is determined by combining the sensitivity and the exposure of the proposed project to various climate hazards.

Vulnerability = Sensitivity x Exposure

The vulnerability assessment takes any proposed mitigation into account. Table 14-10 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale. Where residual medium or high vulnerabilities exist the assessment may need to be progressed to a detailed climate change risk assessment and further mitigation implemented to reduce risks.

Table 14-10: Vulnerability Matrix

		Exposure		
		High (3)	Medium (2)	Low (1)
Sensitivity	High (3)	9 - High	6 – High	3 - Medium
	Medium (2)	6 - High	4 - Medium	2 - Low
	Low (1)	3 - Medium	2 – Low	1 - Low

14.3 EXISTING ENVIRONMENT

14.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality are the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$–PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Cork Airport meteorological station, County Cork, which is located approximately 59km south-west of the site. Data from Cork Airport has been examined to identify the prevailing wind direction and average wind speeds over the period 2019-2023 (Met Éireann, 2024a) (see Figure 14-1). Wind frequency is important as dust can only be dispersed by winds, and deposition of dust is a simple function of particle size, wind speed and distance. The closer the source of dust is to a receptor the higher the potential risk of impact of dust blow. The prevailing winds in the area are south to south-westerly in direction, thereby predominantly dispersing any potential dust emissions to the north or north-east of the site.

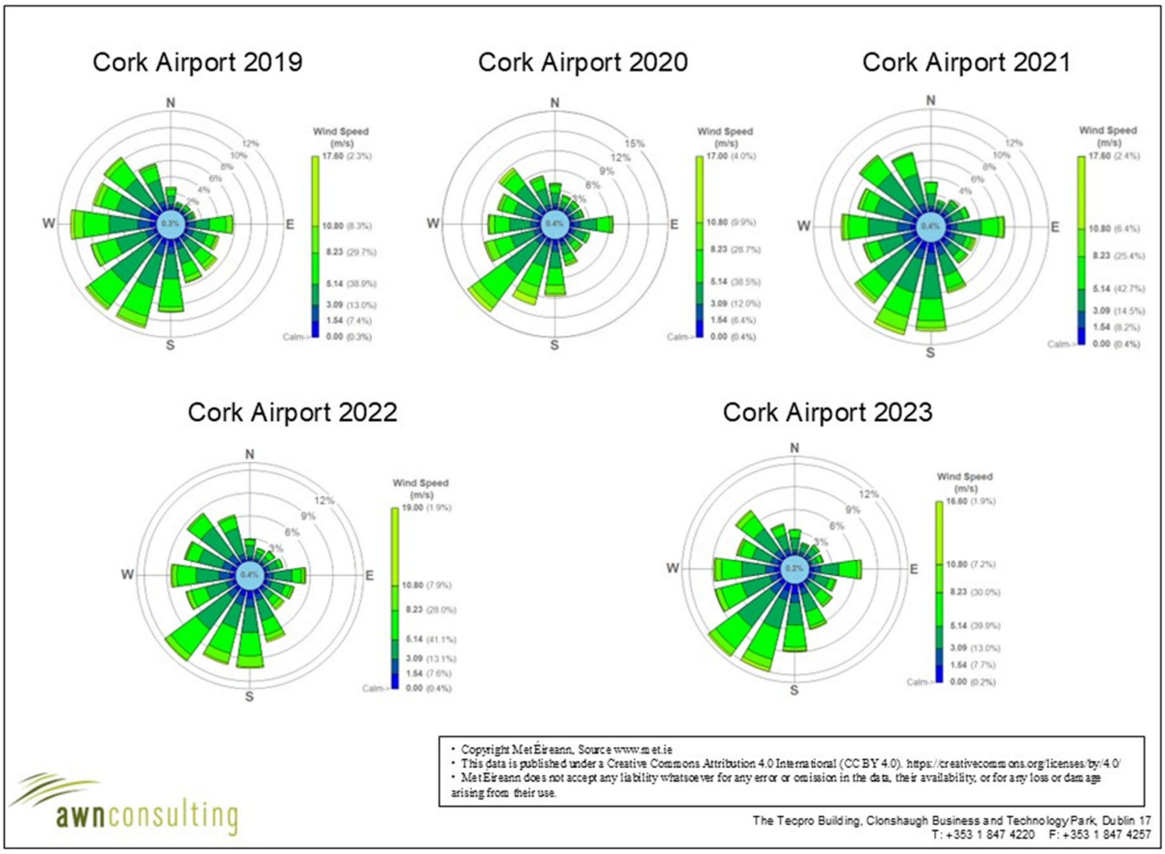


Figure 14-1: Cork Windroses 2019 – 2023 (Met Éireann, 2024a)

Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume that no dust is generated under 'wet day' conditions where rainfall greater than 0.2mm has fallen. Long-term information collected from Cork Airport (the closest station with long-term historical data) identified that typically 199-days per annum are 'wet' (Met Éireann, 2023a, 30-year averages 1991–2020). Thus, in excess of 60% of the time no significant dust generation will be likely due to meteorological conditions.

14.3.2 Review of EPA Monitoring Data

Dust is present naturally in the air from a number of sources including weathering of minerals, pick-up across open land, and dust generated from fires. Monitoring of dust deposition is not undertaken in the vicinity of the proposed project and therefore background levels for the immediate vicinity of the proposed project are not available.

However, a study by the UK ODPM (UK ODPM, 2002) gives estimates of likely dust deposition levels in specific types of environments. In open country, a level of 39mg/m^2/day is typical, rising to 59mg/m^2/day on the outskirts of towns, and peaking at 127mg/m^2/day for a purely industrial area. A level of 39mg/m^2/day can be estimated as the background dust deposition level for the proposed project due to its rural location.

Air quality monitoring programmes have been undertaken in recent years by the EPA. The most recent annual report on air quality in Ireland is *Air Quality In Ireland 2023* (EPA, 2024b). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2024b).

As part of the implementation of the Air Quality Standards Regulations 2022 (S.I. No. 1739 of 2011), as amended, four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2024b). Dublin is defined as *Zone* A and Cork as Zone B. Zone C is composed of 23 no. towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air *monitoring* and assessment, the proposed project is within Zone D (EPA, 2024b). Long-term monitoring data has been used to determine background concentrations for the key pollutants at the proposed project site. It should be noted that background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

NO_2 monitoring was carried out at two long term rural Zone D locations over the period 2019-2023 (EPA, 2024b). Over the 2019-2023 period, annual mean concentrations ranged from 2–4µg/m^3 for the rural sites (Table 14-11). Hence, long-term average concentrations measured at all locations were significantly lower than the current annual average limit value of 40µg/m^3. The hourly limit value of 200µg/m^3 was not exceeded in any year, albeit 18 no. exceedances are permitted per year. The average results over the last 5-years at the rural Zone D locations suggest an upper average of no more than 4 µg/m^3 as a background concentration. Based on the above information, a conservative estimate of the background NO_2 concentration in the study area of the proposed project is 4µg/m^3.

Table 14-11: Trends in Zone D Air Quality – Nitrogen Dioxide (NO_2)

Station	Averaging Period Notes 1, 2	Year				
		2019	2020	2021	2022	2023
Kilkitt	Annual Mean NO_2 (µg/m^3)	4	3	4	3	2
	Max 1-hr NO_2 (µg/m^3)	28	23	28	38	-
Emo	Annual Mean NO_2 (µg/m^3)	5	2	2	2	2
	Max 1-hr NO_2 (µg/m^3)	42	13	11	15	-

Note 1 *Annual average limit value – 40µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).*

Note 2 *Hourly limit value – 200µg/m^3 measured as a 99.8th percentile (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).*

Long-term PM_{10} monitoring was carried out at the Zone D locations of Kilkitt and Claremorris over the period 2019–2023 (EPA, 2024b). Annual mean concentrations range from 7–11µg/m^3 for the rural sites at Kilkitt (Table 14-12). Hence, long-term average PM_{10} concentrations measured at these locations were significantly lower than the annual average limit value of 40µg/m^3. The 90.4th percentile of 24-hour values was well below the limit value of 50µg/m^3 at the Zone D monitoring locations. Data for the rural sites suggests an upper average annual mean of no more than 11µg/m^3 as a background value. Based on the above data, a conservative estimate of the current background PM_{10} concentration in the study area of the proposed project is 11µg/m^3.

Table 14-12: Trends in Zone D Air Quality – PM_{10}

Station	Averaging Period Notes 1, 2	Year				
		2019	2020	2021	2022	2023
Claremorris	Annual Mean PM_{10} (µg/m^3)	11	10	10	8	8
	24-hr Mean > 50 µg/m^3 (days)	0	0	0	0	0
Kilkitt	Annual Mean PM_{10} (µg/m^3)	7	8	8	9	7
	24-hr Mean > 50 µg/m^3 (days)	1	0	0	0	0

Note 1 *Annual average limit value - 40µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).*

Note 2 *Daily limit value - 50µg/m^3 measured as a 90.4th percentile (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).*

The results of $PM_{2.5}$ monitoring at Claremorris and Askeaton over the period 2019–2023 ranged from 4-8µg/m^3 (EPA, 2024b), with an average $PM_{2.5}/PM_{10}$ ratio between 0.4–0.9, with an average of 0.63. Long-term average $PM_{2.5}$ concentrations measured at this location were significantly lower than the current EU Council Directive 2008/50/EC annual average limit value of 25µg/m^3. Based on this information, a conservative ratio of 0.63 was used to generate a rural background $PM_{2.5}$ concentration of 7.7 µg/m^3.

In summary, existing baseline levels of NO_2, PM_{10} and $PM_{2.5}$ based on extensive long-term data from the EPA are well below the current ambient air quality limit values which are legally binding up to 2030 in the study area of the proposed project.

14.3.3 Sensitivity of the Air Quality Receiving Environment

In accordance with the UK Institute of Air Quality Management (IAQM) guidance document Guidance on the Assessment of Dust from Demolition and Construction (2024), prior to assessing the effect of dust from a project, the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to construction works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity, while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity. IAQM Guidance (2024) states that dust impacts should be considered for up to 250m from the project red line boundary.

In terms of receptor sensitivity to dust soiling, there are less than 10 no. high sensitivity residential properties within 20m of the proposed wind farm site however there are greater than 10 receptors within 20m when the GCR is also considered. Therefore, the worst-case sensitivity of the area to dust soiling is considered high as per Table 14-13.

Table 14-13: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	**High**	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Source: Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health effects. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the project is 11μg/m^3. The worst-case sensitivity of the area to human health impacts is considered low as per Table 14-14.

Table 14-14: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<200
High	< 24 μg/m^3	>100	Medium	Low	Low	Low
		10-100	**Low**	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	< 24 μg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	< 24 μg/m^3	>1	Low	Low	Low	Low

Source: Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

The IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to ecological effects from dust. The criteria takes into consideration whether the receiving environment is classified as a Special Area of Conservation (SAC), a Special Protected Area (SPA), a Natural Heritage Area (NHA) or a proposed Natural Heritage Area (pNHA) or whether the site is a local nature reserve or home to a sensitive plant or animal species. Blackwater River (Cork/Waterford) SAC is within the site boundary. The proposed wind farm site and GCR are located in the immediate vicinity of designated sites therefore the area is considered of high sensitivity to dust related ecological impacts.

14.3.4 Climate

Climate is defined as the average weather over a period of time, whilst climate change is a significant change to the average weather. Climate change is a natural phenomenon but in recent years human activities, through the release of GHGs, have impacted on the climate (IPCC, 2022). The release of anthropogenic GHGs is altering the Earth's atmosphere resulting in a 'Greenhouse Effect'. This effect is causing an increase in the atmosphere's heat trapping abilities resulting in increased average global temperatures over the past number of decades. The release of CO2 as a result of burning fossil fuels, has been one of the leading factors in the creation of this 'Greenhouse Effect'. The most significant GHGs are CO2, methane (CH4) and nitrous oxide (N2O).

CO_2 accounted for 61% of total GHG emissions in Ireland in 2023 CH_4 and N_2O contributing 28.9% and 8.8%, respectively. The main source of CH_4 and N_2O is from the agriculture sector (EPA, 2024c).

GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. In order to compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWPs) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The IPCC Sixth Assessment Report (AR6) (IPCC, 2021) sets out the global warming potential for 100-year time period (GWP100) for CO_2 as the basic unit (GWP = 1) whereas methane gas (CH_4) has a global warming potential equivalent to 25 units of CO_2 and N_2O has a GWP100 of 310.

14.3.4.1 GHG Baseline

Ireland declared a climate and biodiversity emergency in May 2019 and in November 2019 there was European Parliament approval of a resolution declaring a climate and environment emergency in Europe. This, in addition to Ireland's current failure to meet its EU binding targets under Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (European Union, 2018) results in changes in GHG emissions either beneficial or adverse being of more significance than previously considered prior to these declarations.

Data published in July 2024 (EPA, 2024c), indicates that Ireland exceeded, without the use of flexibilities, its 2023 annual limit set under EU's Effort Sharing Decision (ESD) (EU 2018/842) by 2.27 Mt CO_2e. However, the 2023 emissions were the first time that Irelands emission were below (-1.2%) 1990 levels. ETS (Emissions Trading Scheme) emissions decreased (-17.0%) and ESR (Effort Sharing Regulation) emissions decreased (-3.4%). Ireland's target is an emission reduction of 626 kt of CO_2e by 2030 on an average baseline of 2016 to 2018. The EPA estimate that 2023 total national GHG emissions, excluding LULUCF, have decreased by 6.8% on 2022 levels to 55.01 Mt CO_2e, with a 2.2 Mt CO_2e (-21.6%) reduction in electricity industries alone. This was driven by a 40.7% share of energy from renewables in 2023 and by increasing our imported electricity. Manufacturing combustion and industrial processes decreased by 5.1% to 6.3 Mt CO_2e in 2023 due to declines in fossil fuel usage. The sector with the highest emissions in 2023 was agriculture at 37.6% of the total, followed by transport at 21.4%. For 2023, total national emissions (including LULUCF) were 60.62 Mt CO_2e (EPA, 2024c), as shown in Table 14-15 (EPA, 2024c).

The provisional 2023 figures indicate that Ireland has used 63.9% of the 295 Mt CO_2e Carbon Budget for the five-year period 2021-2025.

Table 14-15: Total National GHG Emissions 2021-2023

Sector [Note 1]	2021	2022	2023	Total Budget (Mt CO_2e) (2021-2025)	% Budget 2021 – 2025 Used	% Change from 2022 to 2023
Electricity	9.893	9.694	7.558	40	67.90%	-22.00%
Transport	11.089	11.76	11.791	54	64.10%	0.30%
Buildings (Residential)	6.868	5.753	5.346	29	62.00%	-7.10%
Buildings (Commercial sand Public)	1.444	1.447	1.409	7	61.40%	-2.60%
Industry	7.093	6.622	6.288	30	66.70%	-5.00%
Agriculture	21.94	21.795	20.782	106	60.90%	-4.60%
Other [Note 2]	1.864	1.931	1.832	9	62.50%	-5.10%
LULUFC	4.628	3.983	5.614	-	-	40.90%
Total including LULUFC	**64.819**	**62.986**	**60.62**	**295**	**63.90%**	**-3.80%**

The future baseline with respect to the GHGA can be considered in relation to the future climate targets which the assessment results will be compared against. In line with TII (TII, 2022c) and IEMA Guidance (IEMA, 2022) the future baseline is a trajectory towards net zero by 2050, "*whether it* [the project] *contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

The future baseline will be determined by Ireland meeting its targets set out in the CAP24, and future CAPs, alongside binding 2030 EU targets. The European Union (EU) enacted *'Regulation (EU) 2018/842 on binding annual GHG emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013'* (hereafter referred to as the Regulation) (European Union, 2018) to meet the commitments under the Paris Agreement. The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. The Regulation was amended in April 2023 and Ireland must now limit its greenhouse gas emissions by at least 42% by 2030. The ETS is an EU-wide scheme which regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and includes GHG emissions from transport, residential and commercial buildings and agriculture.

In June 2024, the EPA released the report Ireland's Greenhouse Gas Emissions Projections 2023-2050 (EPA 2024d), which includes total projected emissions and a breakdown of projected emissions per sector under the 'With Existing Measures' and 'With Additional Measures' scenarios. The EPA projections indicate that under the 'With Existing Measures' scenario, Ireland will achieve a reduction of 11% on 2018 levels by 2030. A reduction of 29% by 2030 can be achieved under the 'With Additional Measures' scenario, which is still short of the 42% reduction target, set out in the carbon budgets.

14.3.4.2 Climate Vulnerability Baseline

Impacts as a result of climate change will evolve with a changing future baseline; changes have the potential to include increases in global temperatures and increases in the number of rainfall days per year. Therefore, it is expected that the baseline climate will evolve over time and consideration of this is needed within the design of the proposed project.

Ireland has seen increases in the annual rainfall in the north and west of the country, with small increases or decreases in the south and east including in the region where the proposed project will be located (EPA, 2021b). The EPA have compiled a list of potential adverse impacts as a result of climate change including the following which may be of relevance to the proposed project (EPA, 2021a):

- More intense storms and rainfall events;
- Increased likelihood and magnitude of river and coastal flooding;
- Water shortages in summer in the east;
- Adverse impacts on water quality; and
- Changes in distribution of plant and animal species.

The EPA's State of the Irish Environment Report (Chapter 2: Climate Change) (EPA, 2020b) notes that projections show that full implementation of additional policies and measures, outlined in the 2019 Climate Action Plan, will result in a reduction in Ireland's total GHG emissions by up to 25% by 2030 compared with 2020 levels. Climate change is not only a future issue in Ireland, as a warming of approximately 0.8°C since 1900 has already occurred. The EPA state that it is critically important for the public sector to show leadership and decarbonise all public transport across bus and rail networks to the lowest carbon alternatives. The report (EPA, 2020b) underlines that the next decade needs to be one of major developments and advances in relation to Ireland's response to climate change in order to achieve these targets. Ireland must accelerate the rate at which it implements GHG emission reductions. The report states that mid-century mean annual temperatures in Ireland are projected to increase by between 1.0°C and 1.6°C (subject to the emissions trajectory). In addition, heat events are expected to increase by mid-century (EPA, 2020b). While individual storms are predicted to have more severe winds, the average wind speed has the potential to decrease (EPA, 2020b).

TII's Guidance document PE-ENV-01104 (TII, 2022b) states that for future climate change moderate to high Representative Concentration Pathways (RCP) should be adopted. RPC4.5 is considered moderate while RPC8.5 is considered high. Representative Concentration Pathways (RCPs) describe different 21st century pathways of GHG emissions depending on the level of climate mitigation action undertaken.

Future climate predictions undertaken by the EPA have been published in 'Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach (EPA, 2020a). The future climate was simulated under both Representative Concentration Pathway 4.5 (RCP4.5) (medium-low) and RCP8.5 (high) scenarios. This study indicates that by the middle of this century (2041–2060), mid-century mean annual temperatures are projected to increase by 1 to 1.2°C and 1.3 to 1.6°C for the RCP4.5 and RCP8.5 scenarios, respectively, with the largest increases in the east. Warming will be enhanced at the extremes (i.e. hot days and cold nights), with summer daytime and winter night-time temperatures projected to increase by 1 to 2.4°C. There is a projected substantial decrease of approximately 50%, for the number of frost and ice days. Summer heatwave events are expected to occur more frequently, with the largest increases in the south. In addition, precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events. Climate change also has the potential to impact future energy supply which will rely on renewables such as wind and hydroelectric power. More frequent storms have the potential to damage the communication networks requiring additional investment to create resilience within the network.

The EPA's Critical Infrastructure Vulnerability to Climate Change report (EPA, 2021b) assesses the future performance of Irelands critical infrastructure when climate is considered. With respect to road infrastructure, fluvial flooding and coastal inundation/coastal flooding are considered the key climate change risks with snowstorm and landslides being medium risks. Extreme winds and heatwaves/droughts are considered low risk to road infrastructure. One of the key outputs of the research was a framework that will provide quantitative risk-based decision support for climate change impacts and climate change adaptation analysis for infrastructure.

National Framework for Climate Services (NFCS) was founded in June 2022 to streamline the provision of climate services in Ireland and will be led by Met Éireann. The aim of the NFCS is to enable the co-production, delivery and use of accurate, actionable and accessible climate information and tools to support climate resilience planning and decision making. In addition to the NFCS, further work has been ongoing into climate projects in Ireland through research under the TRANSLATE project. TRANSLATE (Met Éireann, 2024b) has been led by climate researchers from University of Galway – Irish Centre for High End Computing (ICHEC), and University College Cork – SFI Research Centre for Energy, Climate and Marine (MaREI), supported by Met Éireann climatologists. TRANSLATE's outputs are produced using a selection of internationally reviewed and accepted models from both CORDEX and CMIP5. Representative Concentration Pathways (RCPs) provide a broad range of possible futures based on assumptions of human activity. The modelled scenarios include for "least" (RCP2.6), "more" (RCP4.5) or "most" (RCP8.5) climate change, see Figure 14-2.

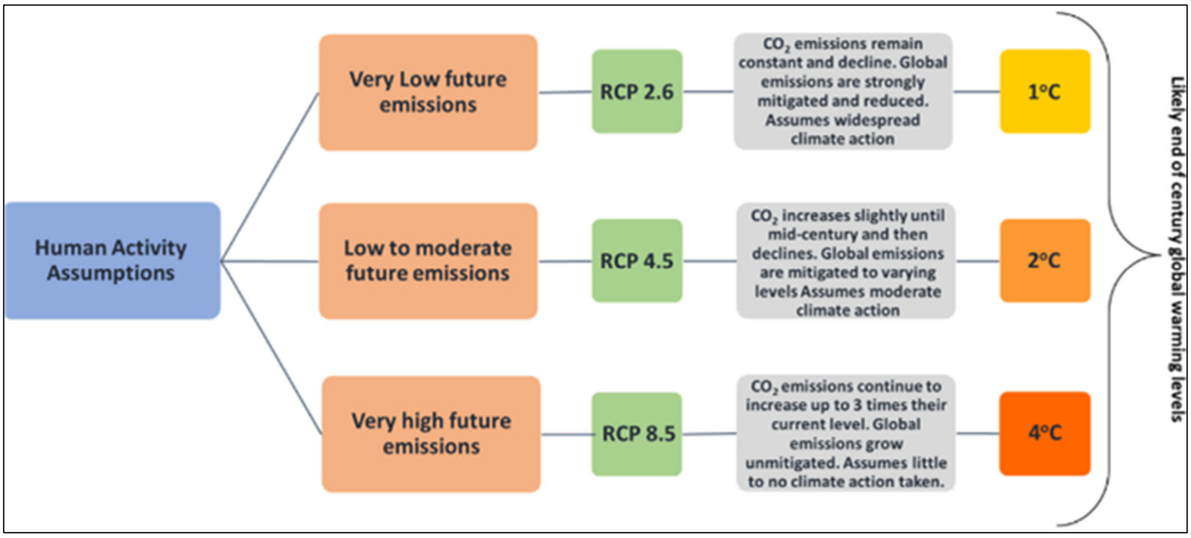
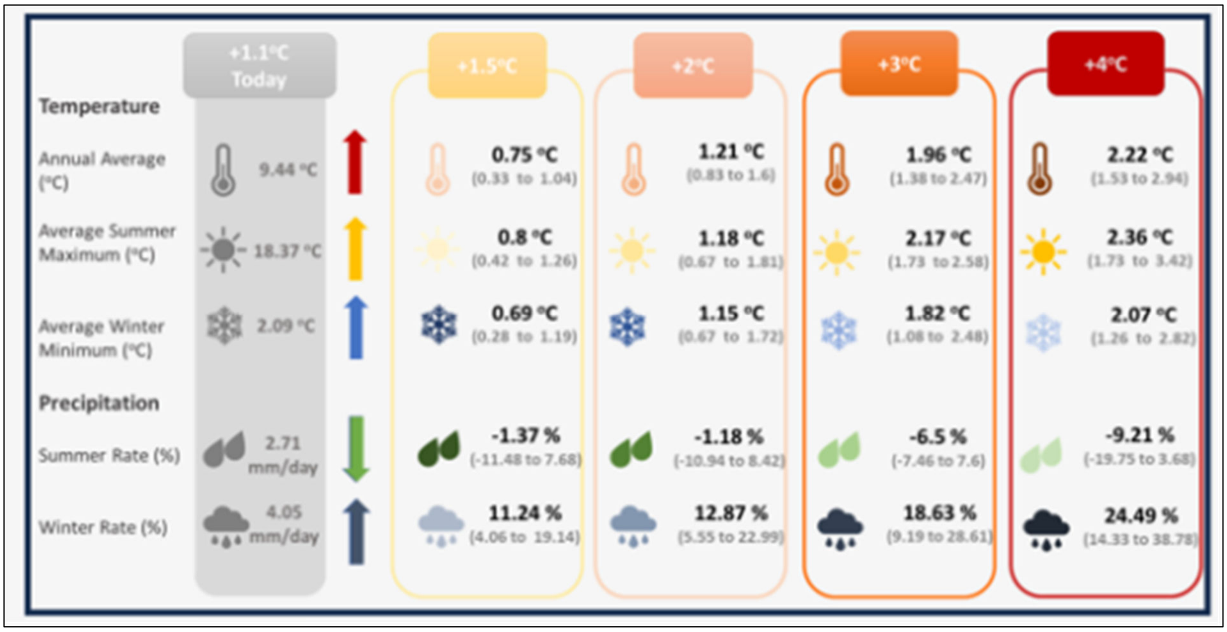


Figure 14-2: Representative Concentration Pathways associated emission levels

*Source: TRANSLATE project storymap (*Met Éireann, *2024b)*

TRANSLATE (Met Éireann, 2024b) provides the first standardised and bias-corrected national climate projections for Ireland to aid climate risk decision making across multiple sectors (for example, transport, energy, water), by providing information on how Ireland's climate could change as global temperatures increase to 1.5˚C ,2˚C, 2.5˚C, 3˚C or 4˚C. Projections broadly agree with previous projections for Ireland. Ireland's climate is dominated by the Atlantic Meridional Overturning Circulation (AMOC), a large system of ocean currents – including the Gulf Stream – characterised by a northward flow of warm water and a southward flow of cold water. Due to the AMOC, Ireland does not suffer from the extremes of temperature experienced by other countries at a similar latitude. Recent studies have projected that the AMOC could decline by 30 – 40 % by 2100, resulting in cooler North Atlantic Sea surface temperatures (SST)s (Met Éireann, 2024b). Met Éireann projects that Ireland will nevertheless continue to warm, although the AMOC cooling influence may lead to reduced warming compared with continental Europe. AMOC weakening is also expected to lead to additional sea level rise around Ireland. With climate change Ireland's temperature and rainfall will undergo more and more significant changes e.g. on average summer temperature could increase by more than 2°C, summer rainfall could decrease by 9% while winter rainfall could increase by 24%. Future projects also include a 10-fold increase in the frequency of summer nights (values > 15°C) by the end of the century, a decrease in the frequency of cold winter nights and an increase in the number of heatwaves. A heatwave in Ireland is defined as a period of 5 consecutive days where the daily maximum temperature is greater than 25°C.



*Source: TRANSLATE project storymap (*Met Éireann, *2024b)*

Figure 14-3: Change of climate variables for Ireland for different Global warming thresholds

The TRANSLATE research report (Met Éireann 2024c) finds that night-time temperatures will warm more than day-time temperatures, with temperatures increases across all seasons but the highest in the summer (with an increase of 0.5°C to 3.5°C). Autumn is projected to have the highest increase in average minimum temperatures (with an increase of 1.1°C to 4.4°C). The variance is dependent on the scenario that is being reviewed. While these temperatures are projected across all of Ireland, they increase most in the east of the country compared to the west. With respect to rainfall, increases of 4% to 38% are projected, however this will not be spread across the year as during summer months there are projected decreases in rainfall beyond the 2°C warming scenario.

14.4 POTENTIAL EFFECTS

14.4.1 Do-Nothing Effect

The Do-Nothing assessment assumes that the proposed project is not built. In this scenario the air quality and climate emissions will remain as per the current baseline in the short-term. Given the land is commercial forestry, this may include felling and subsequent replanting of some of the forestry areas.

With respect to climate the do-nothing scenario the additional renewable energy capacity associated with the proposed project is not generated during the operational phase. Such renewable energy is required to ensure targets set out in CAP23 are met. Such targets include up to 80% of the national grid being generated from renewable sources including 9 GW onshore wind by 2030. In addition, CAP23 aims to phase out and end the use of coal and peat in electricity generation by 2030. The Do-Nothing scenario is not in line with such plans. Reducing the use of coal and peat in energy generation and a reliance on renewable energy will also have a beneficial effect on air quality. Therefore, the do-nothing effect is a lost opportunity for a beneficial effect on air quality and climate in the long term.

14.4.2 Construction Phase

14.4.2.1 Air Quality

In terms of air quality, the greatest likelihood of effects during the construction stage will be from dust emissions associated with the construction works. The key works likely to be associated with dust emissions include earthworks and excavation activities, construction of hardstanding areas and movement of vehicles on and off site.

During construction, the primary source of dust emissions likely to affect sensitive receptors will be movement of vehicles on and off site. Materials with the highest likelihood of dust emissions will be concrete and aggregates for the construction of the hardstanding areas, turbine foundations and access tracks. There is no demolition associated with the proposed works.

Earthworks will result in some dust emissions, particularly during excavations. However, the majority of sensitive properties are located a significant distance from the most extensive excavations (e.g. turbine foundations); while works to be undertaken at closer proximity to properties are of a reduced scale (e.g. site entrances) and/or of a transitory nature (e.g. GCR). The magnitude of dust emissions according to IAQM guidance (IAQM, 2024) is Large; and when combined with the previously established sensitivity of the area (High sensitivity to dust soiling, Low sensitivity in terms of human health impacts, High sensitivity in terms of ecology), there is a likelihood of adverse dust effects. The likelihood of a significant nuisance arising from dust effects as a result of earthworks, prior to mitigation, is High. With respect to human health and ecology effects, the likely effect is assessed to be low and high risk respectively (see Table 14-16).

Table 14-16: Likelihood of Dust Effects – Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Construction works taking place within the proposed wind farm site will result in some dust emissions. However, the majority of properties which border the site are a significant distance from the actual works areas. Work areas that are in closer proximity to sensitive receptors along the GCR will have more limited activities and short construction periods. There will also be some minor works along the turbine delivery route (TDR) to facilitate the size of HGVs required, similar to the GCR these will be limited activities over the short-term. The magnitude of dust emissions according to IAQM guidance (IAQM, 2024) is Medium; and when combined with the previously established sensitivity of the area (High sensitivity to dust soiling, Low sensitivity in terms of human health, High sensitivity in terms of ecology) there is a Medium risk of dust soiling effects. The risk of ecology dust effects as a result of construction, prior to mitigation, is Medium. With respect to human health effects, the likely effect is assessed as Low risk (Table 14-17).

Table 14-17: Likelihood of Dust Effects – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

The likelihood of trackout for vehicles leaving the site has also been assessed. According to the IAQM guidance (2024), the peak number of one-way vehicle movements per day is classified as Large in terms of potential dust emission magnitude. There will, up to 15 HGV one-way movements per day during peak construction (medium magnitude). However, the average trips will be circa 10 HGVs daily (low magnitude). In addition, there will be up to 116 LGV one way movements during the peak period and an average of 87 LGV moments. In order to be conservative in the assessment, a worst-case Medium classification has been selected for this assessment.

When combined with the previously established (Section 14.3.3) sensitivity of the area (High sensitivity to dust soiling, Low sensitivity in terms of human health impacts, High sensitivity in terms of ecology) the likelihood of significant nuisance dust effects, prior to mitigation, is Medium. The overall likelihood of human health impacts predicted to be Low (see Table 14-18). The impact due to ecology is Medium risk.

Table 14-18: Likelihood of Dust Effects – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 14-19: Likelihood of Dust Effects – Summary

	Risk of Dust Effects			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	N/A	High Risk	Medium Risk	Medium Risk
Human Health	N/A	Low Risk	Low Risk	Low Risk
Ecology	N/A	High Risk	Medium Risk	Medium Risk

14.4.2.2 Climate

Construction Materials & Forestry

Embodied carbon is carbon dioxide emitted during the manufacture, transport and construction of building materials, together with site activities. The most significant proportion of carbon emissions tend to occur during the construction phase as a result of embodied carbon in construction materials and emissions from construction activities. Therefore, the assessment has included the construction phase embodied carbon for the purposes of the EIAR. The assessment is broken down into the following stages as per Section 14.2.4.3:

- Materials
- Material Transport
- Clearance and demolition
- Land Use Change and Vegetation Loss
- Clearance and Demolition Water Use
- Excavation
- Plant Use
- Construction Worker Travel to Site

Detailed project information including volumes of materials can be found in Chapter 2 of this EIAR (Description of the Proposed Project). For the purposes of this assessment, it is predicted that quarried material and concrete will be sourced from one of the following suppliers:

- Roadstone Cappagh 10.6km;
- Kereen Quarry 11.7km;
- Roadstone Kilmacow – 64.7km

While these are the most likely sources of materials, other suppliers may also need to be utilised to source materials during the construction stage.

For turbines the manufacturers of the turbines complete detailed lifecycle assessment reports to provide payback periods or total emissions per kWh produced, included under Section 14.2.4.4.

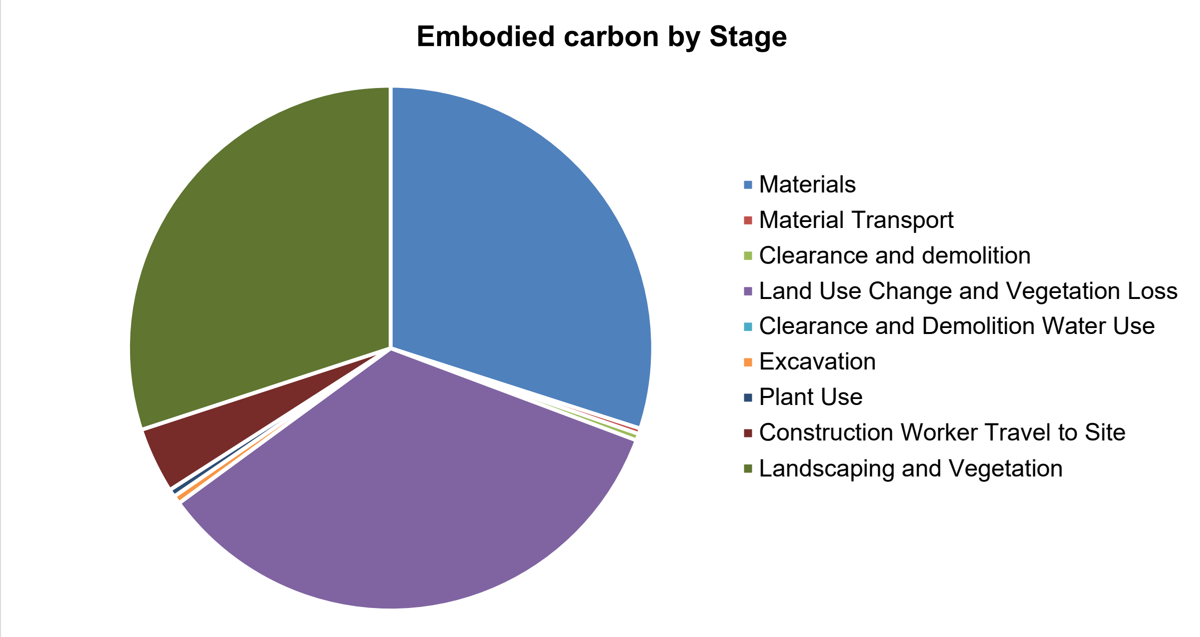


Figure 14-4: Embodied Carbon by Stage

The selected quarries have been chosen to provide an estimate of the distance likely to be travelled to the proposed project site for materials. Estimates have been made of the required construction phase materials (turbine foundations, electricity substation, GCR, and TDR works areas), these include:

- 330,651m^2 Granular material (some of which will be available form an onsite source)
- Steel reinforcement (2,500 tonne)
- Precast Concrete Beams for Bridge Supports
- Concrete (16,484m^3)

Figure 14-4 and Table 14-20 shows the embodied carbon for the proposed project per stage of construction. The project is expected to have a construction phase of two years and an operational lifespan of 35 years. The predicted embodied emissions can be averaged over the full construction phase and the lifespan of the project to give the predicted annual emissions to allow for direct comparison with national annual emissions and targets. Emissions have been compared against both Ireland's EU 2030 target of a 30% reduction in non-ETS sector emissions based on 2005 levels (33.3Mt CO_2eq) (set out in Regulation EU 2018/842 of the European Parliament and of the Council) and the industrial sector carbon budget for 2030 (Table 14-4).

The GHG emissions associated with the loss of between 91.6ha and 99.7ha of forestry (higher value considered to be conservative) and 3.4 ha of shallow peat has been included within the calculations under the construction and installation process. During construction the loss of peat and forestry will be minimised where possible. 1 ha of forestry will be replanted onsite with all other forestry loss replanted at an alternative location, therefore there is no overall forestry loss.

The total construction phase embodied emissions totals 13,113 tonnes CO_2eq; which equates to 0.001% of Ireland's 2030 GHG emission target when annualised over the lifespan of the proposed project. The likely effect on climate will be considered cumulatively across the lifespan of the project.

Table 14-20: Predicted Construction Stage GHG Emissions

Source	Construction Phase Embodied Emissions (tonnes CO_2eq)
Materials (excluding wind turbine manufacture)	9843.9
Material Transport	113.8
Clearance and demolition	133.6
Land Use Change and Vegetation Loss (Including Peat and Forestry)	11241.6
Clearance and Demolition Water Use	0.3
Excavation	166.3
Plant Use	153.6
Construction Worker Travel to Site	1329.7
Landscaping and Vegetation – Replanting	-9870.3
Total	13112.6
Annualised over lifespan	374.6
Total Annual Emissions as % of Irelands 2030 GHG emission target	0.040%
Total Embodied Carbon Emissions as % of the 2030 Industry budget	0.328%
Total Annualised Emissions as % of Irelands 2030 GHG emission target	0.001%
Total Annualised Embodied Carbon Emissions as % of the 2030 Industry budget	0.009%

Note- This value does not include for energy generation from turbines during the operational phase or embodied energy during the construction phase

Wind Turbine Manufacture

The proposed project will involve the erection of 15 no. wind turbines with an output capacity of between 5.7 and 7.2 MW individually, which results in a total minimum output of 85.5MW and maximum output of 108MW. For the purposes of this assessment, a capacity factor for wind generation of 35% was used, based on future capacity factors for wind farms in this region provided in the EirGrid report *Enduring Connection Policy 2 Constraints Report for Area 1 Solar and Wind* (EirGrid, 2022). On this basis, the expected electricity production is expected to be a minimum of 262 GWh per annum and maximum of 331GWh per annum.

Turbines which are being considered for the proposed project include:

- Vestas -V150
- SGRE - SG 155
- Nordex-Acciona – N149
- Vestas - V162
- Nordex – N163

The lifecycle assessments output information provided by manufacturers vary but all of the potential turbines have a payback period or a value for carbon emissions per kWh produced. The lifecycle assessments payback periods for the potential turbines vary between 5.6 and 10.4 months. The currently carbon intensity for generation from the energy grid is 229.9 g CO_2eq/kWh in 2023 (SEAI 2024), the lifecycle assessment of the potential turbines state that the wind energy is significantly lower than this at 4.5gCO_2eq/kWh over 25 years to 5.28gCO_2e/kwh over 25 years.

The below is an example of what is included within lifecycle assessments produced by Vestas Wind Systems A/S (Vestas 2023a, Vestas 2023b):

- Production of all parts of the wind plant: This includes parts that are manufactured by factories as well as supplier fabricated parts. Most of the information on parts and components (materials, weights, manufacturing operations, scrap rates) was obtained from bills of materials, design drawings and supplier data, covering over 99.4% of the turbine mass. Manufacturing processes at Vestas' sites: which includes both the Vestas global production factories (i.e. for casting, machining, tower production, generator production, nacelle assembly and blades production), as well as other Vestas activities (e.g. sales, servicing, etc.);
- Transport: of turbine components to wind plant site and other stages of the life cycle including incoming raw materials to production and transport from the power plant site to end-of-life disposal;
- Installation and erection: of the turbines at the wind power plant site, including usage of cranes, onsite vehicles, diggers and generators;
- Site servicing and operations (including transport): serviced parts, such as oil and filters, and replaced components (due to wear and tear of moving parts within the lifetime of a wind turbine);
- Use-phase electricity production: including wind turbine availability (the capability of the turbine to operate when wind is blowing), wake losses (arising from the decreased wind power generation capacity of wind a certain distance downwind of a turbine in its wake) and transmission losses; and
- End-of-life treatment: of the entire power plant including decommissioning activities.

The lifecycle assessments provided by the manufacturer provides a detailed review of all embodied carbon and processes within the manufacturing with far greater detail of specific components and activities compared to what could be completed using a carbon tool such as the TII tool. For this reason the published data from the manufacture is utilised when assessing turbine manufacturing.

It can therefore be assumed that the likely payback period for the full turbine lifecycle this, in addition to the other payback period above, is a maximum of 10.4 month, with a carbon intensity of electricity generated that is more than 43 times lower than the current national grid carbon intensity (SEAI 2024).

Climate Change Risk Assessment

Examples of potential climate impacts during operation are included in Annex D (Climate Proofing and Environmental Impact Assessment) of the Technical Guidance on the Climate Proofing of Infrastructure (European Commission, 2021a). Potential impacts of climate change on the proposed project include:

- Flood risk due to increased precipitation, and intense periods of rainfall. This includes fluvial and pluvial flooding;
- Increased temperatures potentially causing drought, wildfires and prolonged periods of hot weather;
- Reduced temperatures resulting in ice or snow;

- Geotechnical impacts; and
- Major storm damage – including wind damage.

Each of these potential risks are considered with respect to the operational phase of the project as detailed in Section 14.2.5.3. During construction, the Contractor appointed by the Developer will be required to mitigate against the effects of extreme rainfall/flooding through site risk assessments and method statements. The Contractor will mitigate against the effects of extreme wind/storms, temperature extremes through site risk assessments and method statements. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. Temperatures can affect the performance of some materials; this will require consideration during construction.

During construction, the Contractor will be required to mitigate against the effects of fog, lightning and hail through site risk assessments and method statements.

14.4.3 Operational Phase

14.4.3.1 Air Quality

The assessment of baseline air quality in the region of the proposed project has shown that current levels of key pollutants are significantly lower than their limit values. Due to the size, nature and remote location of the proposed project, the minor associated increase in road traffic emissions is assessed as having an imperceptible effect on air quality during the operational phase. The GCR element of the project will have a neutral impact on air quality during the operational phase as it will be buried underground and there will be no significant operational emissions associated with it.

As described above, the power generation from the proposed project is assessed to be between a minimum of 85.5 MW to a maximum of 108 MW (15 turbines at 5.7 to 7.2 MW each). The annual supply of between 262 GWh and 331 GWh of renewable electricity to the national grid will lead to a net saving in terms of NO_X emissions which may have been emitted from fossil fuels to produce electricity. Results, outlined in Table 14-21, indicate that the effect of the proposed project on Ireland's obligations under the Gothenburg Protocol and the Directive (EU) 2016/2284 targets are positive. The annual impact of the proposed project is to decrease annual NO_X emission levels by 0.15% to 0.18% of the ceiling levels (relative to the NO_X emissions associated with power generation in Ireland 2021. The total NO_X emissions savings over its 35-year lifespan will amount to between 3,499 – 4,420 tonnes of NO_X. In accordance with the EPA guidelines (EPA, 2022), the above significance equates to a significance of effect of GHG emissions during the construction and operational phase which is direct, long-term, positive and slight, which is overall not significant.

Table 14-21: Predicted Impact of proposed project on Ireland's National Emissions Ceiling Obligations

Scenario	Minimum Turbine Power Output NO_X (tonnes/annum)	Maximum Turbine Power NO_X (tonnes/annum)
Emissions Saved Due to proposed project Note 1	**100.0**	**126.3**
National Emission Ceiling Note 2	68,410	68,410
Positive Impact of proposed project (%) (as a percentage of National Emission Ceiling on an annual basis)	0.15%	0.18%
Total NO_X Saving (%) Over 35-Years Relative to NO_X Emissions from Power Generation in 2021	40.96%	51.74%

Note 1 *For NO_X emissions associated with power generation in Ireland (taken from EPA (2021) Ireland's Air Pollutant Emissions 1990-2030*

Note 2 *National Emission Ceiling (EU Directive 2016/2284) for 2020-2029 (68.41 kt)*

14.4.3.2 Climate GHGA

The proposed project is predicted to cause a net loss of between 91.6ha and 99.7ha hectares of forestry (99.7 used in the assessment to be conservative). This area includes primarily conifer plantation which is Coillte land for commercial forestry. However, replanting of an equivalent area of forestry will be conducted to prevent a loss of forestry.

During the operational phase, there will be no significant GHG emissions from the operation of the proposed project. However, due to the displacement of between 262 GWh to 331 GWh of electricity per annum which would otherwise have been produced from fossil fuels, there will be a net benefit in terms of GHG emissions.

The reduction in GHG emissions, as a result of the generation of 262 GWh to 331 GWh of renewable electricity to the national grid will result in a net saving in terms of GHG emissions. The carbon budget (see Table 14-4) states reduction of 75% in GHG emissions from electricity by 2030 (2018 base year) with wind energy being the primary source in achieving this target.

In order to calculate the net benefit in terms of GHG emissions, the GHG emissions from the provisional average fossil fuel electricity mix (electricity generation carbon intensity, 229.9gCO_2/kWh) in 2022 (SEAI 2024) has been calculated.

Windfarm with minimum predicted output (262 GWh)				
	CO_2	N_2O	CH_4	% Of Irelands Total 2030 Target (1)
Windfarm producing 262 GWh (tonnes)	60,267	4	28	-
Windfarm producing 262 GWh (tonnes CO_2 Equivalent)	60,267	1,125	708	-
Annum (tonnes CO_2 Equivalent) Savings Due to Windfarm 262 GWh Windfarm	61,350			0.19%
Annual GHG Saving (%) Relative To 2030 Carbon Budget for Electricity from 262 GWh Windfarm	2.05%			-
Windfarm with maximum predicted output (331 GWh)				
	CO_2	N_2O	CH_4	% Of Irelands Total 2030 Target (1)
Windfarm producing 331 GWh (tonnes)	60,267	4	28	-

Windfarm producing 331 GWh (tonnes CO2 Equivalent)	60,267	1,125	708	-
Annum (tonnes CO2 Equivalent) Savings Due to Windfarm 331 GWh Windfarm	77,692			0.24%
Annual GHG Saving (%) Relative To 2030 Carbon Budget for Electricity from 331 GWh Windfarm	2.59%			-

). The production of wind energy for export to the national grid transforms the proposed project from negative in terms of GHGs (associated with embodied energy from construction) to having a net positive annual impact on GHG emissions of the order of 0.19% to 024% of the annual Total 2030 GHG Emissions target for Ireland in 2030. The total annual GHG emission savings will amount to between 61,350 tonnes and 77,694 tonnes of CO_2eq which is equivalent to 2.05% to 2.59% of the energy sector budget in 2030.

In accordance with the EPA guidelines (EPA, 2022), the above significance equates to a significance of effect of GHG emissions during the construction and operational phase which is direct, long-term, positive and slight, which is overall not significant.

Table 14-22: Predicted GHG Benefit from the proposed project as A Result of Exporting 262 to 331 GWh per annum

Windfarm with minimum predicted output (262 GWh)				
	CO_2	N_2O	CH_4	% Of Irelands Total 2030 Target (1)
Windfarm producing 262 GWh (tonnes)	60,267	4	28	-
Windfarm producing 262 GWh (tonnes CO_2 Equivalent)	60,267	1,125	708	-
Annum (tonnes CO_2 Equivalent) Savings Due to Windfarm 262 GWh Windfarm	61,350			0.19%
Annual GHG Saving (%) Relative To 2030 Carbon Budget for Electricity from 262 GWh Windfarm	2.05%			-
Windfarm with maximum predicted output (331 GWh)				
	CO_2	N_2O	CH_4	% Of Irelands Total 2030 Target (1)
Windfarm producing 331 GWh (tonnes)	60,267	4	28	-

Windfarm producing 331 GWh (tonnes CO2 Equivalent)	60,267	1,125	708	-
Annum (tonnes CO2 Equivalent) Savings Due to Windfarm 331 GWh Windfarm	77,692			0.24%
Annual GHG Saving (%) Relative To 2030 Carbon Budget for Electricity from 331 GWh Windfarm	2.59%			-

(1) Based on an electricity generation of 0.2299 tonnes CO_2/MWh (SEAI, 2024)

(2) Conversion factors: 298 = kgCO_2e/kg N_2O and 25 = kgCO_2e/kg CH_4

14.4.3.3 Climate CCRA

A risk assessment has been conducted for potentially significant impacts on the proposed project associated with climate change during the Operational Phase. The risk assessment assesses the likelihood and consequence of potential impacts occurring and then provides an evaluation of the significance of the impact using the framework set out in Section 14.2.5.3.

Potential sensitivities (Table 14-23) are considered in accordance with the likelihood categories set out in Section 14.2.7.2 (Table 14-10), which take account of designed-in (embedded) mitigation, in combination with the exposure analysis (Table 14-24) in order to assess the significance conclusion (Table 14-25).

Each of the potential climate related hazards (Section 14.2.7.2) are considered with respect to the operational phase of the project. An initial scoping of the risk assessments has been conducted, in line with ‘Technical guidance on the climate proofing of infrastructure in the period 2021-2027’ (European Commission 2021) and PE-ENV-01104 (TII 2022b).

Table 14-23: Sensitivity to Climate Hazards (with design mitigation in place)

Sensitive Receptors (Project Assets)	Sensitivity to Climate Hazards (No consideration of site location)								
	Flood (coastal, pluvial or fluvial)	Extreme Heat	Drought	Wind	Extreme Cold	Wildfire	Fog	Lightning & Hail	Landslides
On-site assets i.e. Pavements, utilities, buildings, structures, buildings etc	1	1	1	1	1	1	1	1	1
Inputs (water, energy, planting etc)	1	1	1	1	1	1	1	1	1
Outputs (products and services)	1	1	1	1	1	1	1	1	1
Transport links and access	1	1	1	1	1	1	1	1	1

Table 14-24: Exposure Risk to Climate Hazards

Climate Exposure	Exposure Risk to Climate Variable (Consider the site location)								
	Flood (coastal, pluvial or fluvial)	Extreme Heat	Drought	Wind	Drought	Wildfire	Fog	Lightning & Hail	Landslides
Without exposure at project location	1	2	2	2	2	1	1	1	1

Table 14-25: Vulnerability Analysis to Climate Hazards

Climate Hazard	Sensitivity	Exposure	Vulnerability
On-site assets i.e. Pavements, utilities, buildings, structures, buildings etc	1 (Low)	2 (Medium)	2 (Low Risk)
Inputs (water, energy, planting etc)	1 (Low)	2 (Medium)	2 (Low Risk)
Outputs (products and services)	1 (Low)	2 (Medium)	2 (Low Risk)
Transport links and access	1 (Low)	2 (Medium)	4 (Medium Risk)

The EPA's Critical Infrastructure Vulnerability to Climate Change report (EPA 2021) assesses the future performance of Irelands critical infrastructure when climate is considered. Wind farms are considered to be vulnerable to a medium risk of wind related impacts, with flooding and snowstorms being a low risk.

Wind turbines are vulnerable to extreme storms because the maximum wind speeds in those storms can exceed the design limits of wind turbines – the likelihood of such events occurring will be increased with future climate change. The foundations and turbines will be designed to withstand the severe wind loads in accordance with IS-EN1991-1-4 (wind loading). With these design measures in place to ensure additional wind loading due to climate change are considered the sensitivity reduces to low, the vulnerability decreases.

A Stage 2 Flood Risk Assessment (FRA) conducted in September 2023 for the proposed project was prepared to inform the wind farm site layout design at an early stage and to keep as much of the proposed high infrastructure outside of fluvial flood zones as possible. The FRA states that:

- Given the topography of the site, the nature of the hydraulic features, extensive drainage network, and proposed site design, fluvial flood risk is considered minimal;
- The proposed wind farm infrastructure is not at risk of pluvial flooding and it is assumed that there will be no cumulative effects on flood risk elsewhere;
- There is no evidence to suggest liability to groundwater flooding at the subject site;
- Given the elevated nature of the proposed wind farm site (140 mOD to 486 mOD); it is estimated that there is no risk of coastal flooding.

Surface water drainage design has been prepared for the proposed project and incorporates the principles of Sustainable Drainage Systems (SuDS) to reduce any residual risk. In addition, all proposed bridge crossings and any proposed modifications to existing crossings will be designed and approved appropriately following the OPW Section 50 Approval process. When mitigation is put in place to ensure that where sensitivities to flood risk are designed out for both the high end future scenarios (RCP8.5) and mid end future scenario (RCP4.5) then the sensitivity reduces to a low. Given the information set out in the FRA the exposure to flood risk is considered low.

In the event of access or public roads locally flooding, or being impacted by other hazards such as extreme temperatures or wind, the sensitivity remains low as access to the turbines is only required intermittently and may not coincide with times of flooding.

Regarding extreme heat events, the proposed project will be designed in accordance with IS-EN 1991-1-5 (temperature loads) and will include additional temperature due to climate change (2 degrees Celsius). A review of technical guidance for wind turbines and associated infrastructure indicates that the projected weather temperature ranges (-20°C to +50°C) for RCP4.5 in 2100 are within the safe operating ranges.

At the detailed design stage the building materials chosen for ancillary structures including the substation will be high quality, durable and hard-wearing and chosen to withstand increased variations in temperature in the future as a result of climate change. Heightened temperatures have the potential to strain the cooling systems within the substation. However, the cooling systems will be designed to accommodate temperatures extremes predicted for both RCP4.5 and RCP8.5 in Ireland and in a manner that they can be further upgraded should additional thermal loading become likely. This increases the resilience to potential climate risks.

The proposed project will include additional measures to increase its durability (including protecting against the effects of freeze/thaw action). A fan heater installed at the root of the blade circulates a stream of hot air right up to the tip of the blade. The temperature of the blade surface is heated to 0^{C}, and the ice build-up is melted. Other measures include structural waterproofing, increased concrete cover to reinforcement in accordance with IS-EN1992-1-1, IS-EN206 and BS8500 and designing for temperature extremes as per IS-EN1991-1-5. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures.

Hail is not deemed to pose a significant risk to the turbines and associated infrastructure such as the substation. In attrition, fog is unlikely to have an adverse effect on the turbines however lighting of the turbines will be required to ensure no impacts with low flying aviation.

The turbines will be designed to IEC 61400. This is a set of design requirements made to ensure that wind turbines are appropriately engineered against damage from hazards (including weather events caused by climate change) within the planned lifetime.

Design mitigation has been put in place in order to alleviate the known vulnerability to future climate change increasing lightning storms. EC 61400-24:2019 provides guidance regarding lightning protection of wind turbine generators and wind power systems. It defines requirements for protection of blades, other structural components and electrical and control systems against both direct and indirect effects of lightning. Test methods to validate compliance are included.

In relation to wildfires, the Think Hazard! tool developed by the Global Facility for Disaster Reduction and Recovery (GFDRR) (2023), indicates that the wildfire hazard is classified as medium for the proposed project area. This means that there is between a 10% to 50% chance of experiencing weather that could support a hazardous wildfire that may pose some risk of life and property loss in any given year. Future climate modelling indicates that there could be an increase in the weather conditions which are favourable to fire conditions, these include increases in temperature and prolonged dry periods. However, due to the project clearing a buffer area around the turbines the risk of wildfire is significantly lessened and it can be concluded that the main asset of the proposed project is of low vulnerability to wildfires. Wildfire may cause issues with pavement softening for access roads This would be classed as an adverse event that may require repair work. However, it is unlikely to require emergency repair works given the level of access required to the site.

Landslide susceptibility mapping developed by GSI indicates that the proposed project site location is not within an area that is susceptible to landslides and there are no recorded historical landslide events at the site location. It can be concluded that landslides are not a risk to the proposed project. Drought is considered to have a low potential for risk; however it may impact soil stability however this has been considered within the design.

Where additional information becomes available, such as updated Eurocodes of design practices these will be followed during detailed design to ensure the proposed project is robust in its residual climate vulnerability. With design mitigation in place, there are no significant risks to the project as a result of climate change however some vulnerability will remain the impact is considered to result events that can be absorbed by taking business continuity actions. In accordance with the EPA Guidelines (EPA, 2022), the significance of effect of the impacts to the project as a result of climate change are ***direct, long-term, negative*** and ***slight***.

14.4.4 Decommissioning Phase

14.4.4.1 Air Quality

The decommissioning phase will involve the removal of the project infrastructure. Construction dust, vehicles and generators associated with the removal of infrastructure are likely to result in a temporary negative impact on local air quality. However, due to the short-term nature of any associated works and low background pollutant concentrations in the vicinity of the project site, decommissioning is assessed as likely to have an imperceptible, temporary, negative impact on local air quality.

14.4.4.2 Climate

The lifecycle assessment of turbines includes for decommissioning within the lifecycle assessment and payback period. This period will vary depending on the final turbine choice but is likely to be a maximum of 10.4 months.

Decommissioning will be undertaken in accordance with the methods set out at Chapter 2 (Description of the Proposed Project) of this EIAR and given the significant potential for recycling of materials a decommissioning plan will ensure that waste is diverted from landfill and recycled in line with the most recent guidelines at the time of decommissioning.

14.5 MITIGATION MEASURES

The preceding sections have determined that the proposed project is not assessed as likely to result in any significant adverse impacts on air quality and climate. Notwithstanding this, and in order to sufficiently avoid, reduce or offset any impacts which are likely to arise, a schedule of air quality (See Appendix 14.1) and GHG control measures has been formulated. It should be noted that measures implemented during the construction phase are also relevant for the decommissioning phase.

14.5.1 Construction Phase

14.5.1.1 Air Quality Mitigation

The greatest likelihood of effects on air quality during the construction and decommissioning phases is from dust emissions and nuisance dust. In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of an outline Dust Management Plan (see Appendix 14.1).

The Dust Management Plan (Appendix 14.1) will be reviewed prior to the construction and decommissioning phase of the proposed project, it includes the following: -

- On-site access tracks and public roads in the vicinity of the site shall be regularly cleaned to remove mud, aggregates and debris and maintained when the daily inspections deem any trackout to public roads has occurred. All road sweepers shall be water assisted;
- Any road that has the potential to give rise to fugitive dust shall be regularly watered, as appropriate, during dry and/or windy conditions;
- Public roads within 250m of the site entrance/exit shall be regularly inspected for cleanliness and cleaned as necessary due to trackout from the proposed project;
- In the event of dust nuisance occurring outside the site boundary, movement of materials will be immediately terminated, and satisfactory procedures implemented to rectify the problem before the resumption of operations;
- During movement of materials both on and off-site, trucks carrying materials which have the potential to generate dust will be covered at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods (as determined by the site environmental manager on site); and
- The Dust Management Plan will be reviewed by the appointed contractor and client at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

14.5.1.2 Climate Mitigation

The IEMA GHG Management Hierarchy (IEMA 2020b) will be followed for impact minimisation. The Hierarchy is as follows:

- First Eliminate
  - Influence business decisions/use to prevent GHG emissions across the lifecycle
  - Potential exists when organisations change, expand, rationalise or move business
  - Transition to new business model, alternative operation or new product/service
- Then Reduce
  - Real and relative (per unit) reductions in carbon and energy
  - Efficiency in operations, processes, fleet and energy management
  - Optimise approaches (e.g. technology) and digital as enablers
- If you can’t eliminate or reduce, then Substitute
  - Adopt renewables/low-carbon technologies (on site, transport etc)
  - Reduce carbon (GHG) intensity of energy use and of energy purchased
  - Purchase inputs and services with lower embodied/embedded emissions

- The final option is to Compensate

- Compensate ‘unavoidable’ residual emissions (removals, offsets etc)
- Investigate land management, value chain, asset sharing, carbon credits
- Support climate action and developing markets (beyond carbon neutral)

Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. Measures to reduce the embodied carbon of the construction works will be implemented as follows:

- A construction programme will be created to allow for sufficient time to determine reuse and recycling opportunities;
- Alignment with requirements under the Local and National Climate Action Plan;
- The replacement, where feasible, of concrete containing Portland cement with a low carbon concrete as per the Climate Action Plan;
- The IEMA mitigation hierarchy will be followed (see above);
- A suitably competent contractor will be appointed who will undertake waste audits detailing resource recovery best practice and identify materials can be reused/recycled;
- Materials will be reused on site within the new build areas where possible;
- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods;
- All plant and machinery will be well maintained and inspected regularly;
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site; and
- Sourcing materials locally where possible to reduce transport related CO2 emissions.

Measures (see Section 14.4.3.3) have been incorporated into the design of the proposed project in order to mitigate against the impacts of future climate change. These measures have been considered when assessing the vulnerability of the proposed project to climate change but will be reviewed on a regular basis (every 5 years) to ensure they continue to be appropriate to mitigate the effects of climate change (see Section 14.4.3.3). The vulnerability of the project to accidents and disasters is discussed in Chapter 17 of this EIAR (Major Accidents and Natural Disasters).

14.5.2 Operational Phase

14.5.2.1 Air Quality Mitigation

No operational phase mitigation is required for air quality as there are no significant effects.

14.5.2.1 Climate Mitigation

No operational phase mitigation is required for climate as there are no significant effects.

14.5.3 Decommissioning Phase

14.5.3.1 Air Quality Mitigation

Mitigation measures as per Section 14.5.1.1 will be put in place for the decommissioning phase. At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of decommissioning operations.

14.5.3.1 Climate Mitigation

As stated previously the wind turbines are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site will be decommissioned fully, with the exception of the electricity substation and site roads and drainage.

Upon decommissioning of the proposed wind farm, the wind turbines will be disassembled and removed off-site for recycling. Turbine foundations will remain in place underground and along with hardstands will be allowed to revegetate naturally. Leaving the turbine foundations and hardstands in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete and stone from the ground could result in potentially needless environment nuisances such as noise, dust and/or vibration and the associated expenditure of energy of removing them.

A detailed decommissioning plan will be agreed in advance of works taking place with Waterford City and County Council. This plan will include mitigation measures as per Section 14.5.1.114.5.1.2, including the IEMA GHG Management Hierarchy (IEMA 2020b) will be followed for impact minimisation for the decommissioning phase.

14.6 RESIDUAL EFFECTS

14.6.1 Construction Phase

14.6.1.1 Air Quality

With effective implementation of the Dust Management Plan, outlined in Section 14.5.1 and Appendix 14.1, the project is assessed as likely to have an imperceptible, not significant, short-term effects on air quality during the construction and decommissioning phases.

14.6.1.2 Climate

No significant residual effects from the project are assessed as likely for the construction or decommissioning phases as any effects will be off set during the operational phase. The payback period is expected to be a maximum of 10.4 months. Therefore, the residual effect on climate is not considered to be significant over the project's full lifecycle (see Section 14.6.2.2.)

14.6.2 Operational Phase

14.6.2.1 Air Quality

No significant residual effects from the project are assessed as likely for the operational phase. As the project causes a reduction in atmosphere NOx emissions through the provision of non-fossil fuel-based electricity, its effect can be considered beneficial, long-term, slight and not-significant (as Ireland is currently below its NO_x emission targets so receiving environment is not considered as sensitive).

14.6.2.2 Climate

No significant adverse residual effects from the project are assessed as likely for the operational phase. Residual effects are assessed to be positive and long term due to the production of between 262 to 331 GWh of renewable electricity per annum which will lead to a net saving in terms of CO_2 emissions which may have been emitted from fossil fuels to produce electricity.

Once mitigation measures are put in place, the effect of the proposed development in relation to GHG emissions is considered direct, long-term, negative and slight. Guidance ((TII 2022b), see Section14.2.7.2) states that this is appropriate for a project which:

- The project's GHG impacts are mitigated through 'good practice' measures.
- The project has complied with existing and emerging policy requirements; and
- Fully in line to achieve Ireland's trajectory towards net zero.

Irelands trajectory to net zero requires significant renewables generated from on and offshore windfarms. The IEMA Guidance (IEMA 2022) (which has been embraced by the updated TII Guidance (TII 2022a) in Section 6.7.2) states as follows:

"A minor adverse not significant impact is described with: A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a minor adverse effect that is not significant. The project may have residual impacts but is doing enough to align with and contribute to the relevant transition scenario. A 'minor adverse' or 'negligible' non-significant effect conclusion does not necessarily refer to the magnitude of GHG emissions being carbon neutral (i.e. zero on balance) but refers to the likelihood of avoiding severe climate change and achieving net zero by 2050. A 'minor adverse' effect or better is a

high bar and indicates exemplary performance where a project meets or exceeds measures to achieve net zero earlier than 2050."

In terms of EPA Guidance, which sets different criteria, direct, long-term, beneficial and slight in EIA terms (EPA 2022).

14.6.3 Decommissioning Phase

14.6.3.1 Air Quality

Due to the short-term nature of any associated works and low background pollutant concentrations in the vicinity of the project site and the use of a dust management plan (see Section 14.5.1.1) decommissioning is assessed as likely to have an imperceptible, temporary, negative effects on local air quality.

14.6.3.2 Climate

The GHG associated decommissioning of the turbines has been considered as part of the lifecycle assessment from the manufacturers and included within the payback. In addition, there will be some additional HGV movements. Any additional effects on climate in excess of those considered within the construction phase turbine lifecycle assessment is considered to be not significant and will have been "paid back" during the operational phase.

14.7 CUMULATIVE EFFECTS

14.7.1 Air Quality Cumulative Effects

14.7.1.1 Construction Phase

Section 4.2.2 of Chapter 4 of this EIAR (Policy, Planning and Development Context) discusses a full list of cumulative developments. The proposed Dyrick Hill Wind Farm (ABP Ref. 317265), the site of which is located directly adjacent to the currently proposed Scart Mountain Wind Farm site, was recently (October 2024) refused planning permission by An Bord Pleanála. As there is still a potential for judicial review at the time of writing this EIAR chapter (November 2024), it has been decided to include the project in the cumulative impact assessments. In the event that the refusal of the Dyricck Hill Wind Farm application is confirmed prior to the determination of the current application, then any discussions around cumulative impacts for this project in this EIAR can be ignored by ABP.

Details of all developments considered within the study area are provided in Appendix 4-1 of the EIAR, which provides a full list of approved and undecided projects (i.e., currently under consideration by the local planning authority or ABP) that can be considered cumulatively with the proposed project.

The location of any offsite replanting (alternative afforestation) associated with the project will be greater than 10km from the proposed wind farm site and will not result in any effect that requires cumulative assessment.

Should another construction project such as Dyrick Hill Wind Farm occur within 500m (as per IAQM Guidance) of the proposed project and constructed during the same time period there is potential for cumulative impacts with respect to construction phase dust. Mitigation measures will be put in place during the construction of the proposed project which will mitigate the potential for significant dust emissions, therefore, the potential for cumulative impacts is significantly reduced and are not predicted to be significant. Construction outside the 500m radius of the proposed project does not have potential for cumulative effects.

Traffic impacts due to the proposed project were screened out and therefore do not have significant likelihood of potential effects.

No other potential cumulative effects are predicted for the air quality construction phase.

14.7.1.2 Operation Phase

As the proposed project was found to have no significant effects on air quality in the operational phase, therefore, there is no significant likely cumulative effect.

14.7.2 Climate Cumulative Effects

There are a number of other windfarms planning applications surrounding the proposed project site which will have cumulative effects on climate due to the generation of renewable energy:

- Coumnagappul Wind Farm ABP Ref. 318446;
- Dyrick Hill Wind Farm ABP Ref. 317265;
- Knocknamona Wind Farm ABP Ref. – 309412; and
- Lyrenacarriga Wind Farm ABP Ref – 309121.

With respect to the requirement for a cumulative assessment PE-ENV-01104 (TII, 2022a) states that "*for GHG Assessment is the global climate and impacts on the receptor from a project are not geographically constrained, the normal approach for cumulative assessment in EIA is not considered applicable*".

However, by presenting the GHG effect of a project in the context of its alignment to Ireland's trajectory of net zero and any sectoral carbon budgets, this assessment will demonstrate the potential for the project to affect Ireland's ability to meet its national carbon reduction target. Therefore, the assessment approach is considered to be inherently cumulative.

14.8 CONCLUSIONS

An assessment of the likely air quality and climate effects associated with the proposed project has been undertaken. The project will comprise 15 no. wind turbines with an export capacity of between 262 to 331 GWh per annum. The proposed project life is 35-years after which the turbines will be decommissioned or re-energised. The assessment of baseline air quality in the region has shown that current levels of key pollutants are significantly lower than their limit values.

During the construction phase of the project, appropriate mitigation measures will be implemented to minimise any potential adverse effects on air quality and climate. During the operational phase, the proposed project will result in a long-term positive effect on both air quality and climate. The generation of between 262 to 331 GWh per annum of electricity from the proposed project will lead to a net saving in terms of greenhouse gas emissions. The production of this renewable electricity results in the project having a net positive annual effect on GHG emissions of the annual total GHG emissions in Ireland in 2030 in the order of 0.19% to 0.24% of the annual total 2030 GHG Emissions target for Ireland in 2030. The total annual GHG emission savings will amount to between 61,350 tonnes and 77,694 tonnes of CO2eq which is equivalent to 2.05% to 2.59% of the energy sector budget in 2030.

14.9 REFERENCES

Civil Engineering Standard Method of Measurement (CESSM) (2013) Carbon and Price Book database.

Construction Industry Federation (2021) Modern Methods of Construction.

Department of the Environment Heritage and Local Government (DEHLG) (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities

Department of the Taoiseach (2022) Carbon Budgets Available at https://www.gov.ie/en/publication/9af1b-carbon-budgets/

Dublin City Council (2018) Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition

Eirgrid (2022) Enduring Connection Policy 2 Constraints Report for Area 1 Solar and Wind

Environmental Protection Agency (EPA) (2020a) Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach.

Environmental Protection Agency (2020b) State of the Irish Environment Report (chapter 2: climate change)

Environmental Protection Agency (EPA) (2021a) What impact will climate change have for Ireland? [Online] Available at https://www.epa.ie/environment-and-you/climate-change/what-impact-will-climate-change-have-for-ireland/

Environmental Protection Agency (EPA) (2021b) Critical Infrastructure Vulnerability to Climate Change Report no. 369

Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports

Environmental Protection Agency (2024a) National Climate Change Risk Assessment (NCCRA)

Environmental Protection Agency (2024b) Air Quality in Ireland 2023 (& previous annual reports)

Environmental Protection Agency (2024c) Ireland's Provisional Greenhouse Gas Emissions 1990-2023

Environmental Protection Agency (2024d) Ireland's Greenhouse Gas Emissions Projections 2023-2050

European Commission (2021a) Technical guidance on the climate proofing of infrastructure in the period 2021-2027.

European Commission (2021b) Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change.

European Union (2018). Regulation 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013

German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft

Government of Ireland (2015) Climate Action and Low Carbon Development Act

Government of Ireland (2019) Climate Action Plan 2019

Government of Ireland (2020) Draft General Scheme of the Climate Action (Amendment) Bill 2019

Government of Ireland (2021a) Climate Action Plan 2021

Government of Ireland (2021b) Climate Action and Low Carbon Development (Amendment) Act 2021 (No. 32 of 2021)

Government of Ireland (2022) Climate Action Plan 2023

Government of Ireland (2023) Long-term Strategy on Greenhouse Gas Emissions Reductions

Institute of Air Quality Management (IAQM) (2023) Guidance on the Assessment of Dust from Demolition and Construction Version 2.1

Institute of Environmental Management & Assessment (IEMA) (2010). IEMA Principles Series on Climate Change Mitigation & EIA

Institute of Environmental Management & Assessment (IEMA) (2017) Assessing Greenhouse Gas Emissions and Evaluating their Significance

Institute of Environmental Management & Assessment (IEMA) (2020a) EIA Guide to: Climate Change Resilience and Adaptation.

Institute of Environmental Management & Assessment (IEMA) (2020b) GHG Management Hierarchy. Assessing Greenhouse Gas Emissions and Evaluating their Significance

Institute of Environmental Management & Assessment (IEMA) (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance

IPCC (2019) Refinement of 2006 IPCC Guidelines for National Greenhouse Inventories, including production of a Methodology Report

Met Éireann (2024a) Met Eireann website: https://www.met.ie/.

Met Éireann (2024b) TRANSLATE project story map https://www.met.ie/science/translate

Met Éireann (2024c). TRANSLATE research report.

SEAI (2024) Conversion Factors https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/ Accessed 26/11/2024.

Transport Infrastructure Ireland (2022a) Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106

Transport Infrastructure Ireland (TII) (2022b) PE-ENV-01104: Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document

Transport Infrastructure Ireland (TII) (2022c) PE-ENV-01105: Climate Assessment Standard for Proposed National Roads (PE-ENV-01105)

Transport Infrastructure Ireland (TII) (2022d) GE-ENV-01106: TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document

Transport Infrastructure Ireland (TII) (TII 2021) Sustainability Implementation Plan – Our Future

UK Highways Agency (2019) UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 Climate

UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance

USEPA (1997) Fugitive Dust Technical Information Document for the Best Available Control Measures

Waterford County Council (2021) A Roadmap to Carbon Neutrality

Waterford City and County Council (2024) Waterford City and County Council's Climate Action Plan 2024 – 2029

World Health Organisation (2021) Air Quality Guidelines (and previous Air Quality Guideline Reports)

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