14. AIR QUALITY AND CLIMATE

This chapter comprises an assessment of the likely significant effect on air quality and climate associated with the proposed project, which comprises of 10 wind turbines. A full description of the proposed project is presented in Chapter 2 (Description of the Proposed Project). Section 14.1 covers the air quality assessment and the climate assessment is presented in Section 14.2 of this chapter.

The air quality assessment and the climate assessment take into consideration the proposed wind farm area, the options for grid connection areas, turbine delivery haul routes and an estimated energy production from the turbines based on a range of turbine options.

14.1 STATEMENT OF AUTHORITY

This chapter was also prepared by Dr. Jovanna Arndt, a Principal Environmental Consultant in the Air Quality & Climate section of AWN Consulting. She holds a BSc. in Environmental Science and a Ph.D. in Atmospheric Chemistry from University College Cork. She is an Associate Member of both the Institute of Air Quality Management and the Institute of Environmental Sciences. She has been specialising in the area of air quality and climate over 8 years and has prepared air quality and climate assessments for inclusion within EIARs for residential developments such as Twenties Lane (Planning Application Ref: 22713), Cherrywood T13 (Planning Application Ref: DZ23A/0028), Corballis Donabate LRD (Planning Application Ref: LRD0017/S3), commercial and industrial developments by Dublin Airport Authority, Zoetis, Ipsen, Merck Millipore, Greener Ideas Limited and Abbvie, as well as renewable energy developments such as Codling Wind Park and the Cúil Na Móna Anaerobic Digestion Facility. She also specialises in assessing air quality impacts using air dispersion modelling of transportation schemes such as BusConnects Dublin, major Highways England Road schemes and major rail infrastructure in the form of High Speed 2 (HS2 in the UK). She has prepared air dispersion modelling assessments of emissions from data centres, energy centres and the chemical industry as part of EPA Industrial Emissions Licences for Microsoft, Greener Ideas Limited, Merck Millipore, Lilly Limerick, Chemifloc, Takeda, Kingspan and Kilshane Energy. She has also provided Air Quality Action Plan (AQAP) and Air Quality Management Area (AQMA) support to several UK councils and assessed the air quality impacts of potential Clean Air Zones in the UK.

This chapter was reviewed by Ciara Nolan. Ciara is a Principal Environmental Consultant in the Air Quality & Climate section of AWN Consulting. She holds a BSc in Energy Systems Engineering from University College Dublin and has also completed an MSc in Applied Environmental Science at UCD. She is a Member of the Institute of Air Quality Management (MIAQM) and the Institute of Environmental Science (MIEnvSc). She has over 7 years of experience in undertaking air quality and climate assessments. She has prepared air quality and climate impact assessments as part of EIARs for residential developments including Woodbrook, Shankill (Planning Application Ref. ABP30584419), Ballygossan Park, Skerries (Planning Application Ref. LRD0010/S3), SHD Ratoath (Planning Application Ref. SH305196), SHD Rathmullen, Drogheda (Planning Application Ref. SH305552), commercial and industrial developments by Dublin Airport Authority, Abbvie, Mountpark, Pfizer, Takeda, as well as renewable energy developments such as Crockahenny Windfarm, Upperchurch Windfarm, Knocknamona Windfarm and Keerglen Windfarm. She also specialises in conducting air dispersion modelling assessments of emissions from data centres, energy centres and the chemical industry as part of EPA Industrial Emissions Licences for Echelon DC, AWS, Takea, MSD and Regeneron. She has undertaken air quality and climate impact assessments for transportation schemes, primarily regional and national road schemes, from constraints, through to route selection and EIAR stage.

14.2 AIR QUALITY

14.2.1 Introduction

This section comprises an assessment of the likely significant effect on air quality associated with the proposed project.

This report provides a baseline assessment of the setting of the proposed project in terms of air quality and discusses the likely and significant effects that the construction, operation and decommissioning of the proposed project will have. Where required, appropriate mitigation measures to limit any identified likely significant adverse effects on air quality are recommended.

During the construction and decommissioning stages, the main source of air quality impacts will be due to fugitive dust emissions from site activities. Dust emissions will primarily occur as a result of site preparation works, earthworks, construction of turbine foundations and the movement of trucks on-site and exiting the proposed wind farm site, as well as removal of structures during decommissioning.

Direct operational phase impacts to air quality are not predicted as there will be no air emissions from the site once constructed. There will be some minor vehicle emissions associated with site maintenance workers but these will be minor and infrequent in nature. There will be indirect benefits to air quality as a result of generating electricity from renewable wind power rather than fossil fuel sources.

14.2.2 Methods

14.2.2.1Construction Phase

14.2.2.1.1 Construction Dust Assessment

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2024) outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this project in order to predict the likely risk of dust impacts in the absence of mitigation measures and to determine the level of site-specific mitigation required. The use of UK guidance is recommended by Transport Infrastructure Ireland in their guidance document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022).

The IAQM states that as assessment of construction dust impacts is normally required where there is a human or ecological receptor within 250m of the boundary of the site (this should consider offsite construction compounds) and/or within 50 m of the route(s) used by construction vehicles on the public road network (on roads up to 250 m from the site entrance). This constitutes the Zone of Influence (ZoI) for the construction dust assessment.

The major dust generating activities are divided into four types within the IAQM guidance (2024) to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (transport of dust and dirt from the construction site onto the public road network).

The magnitude of each of the four categories is divided into Large, Medium or Small scale depending on the nature of the activities involved. The criteria for determining the category for the works involved are outlined in Table 14.1, these are based on the IAQM guidance (2024). The magnitude of each activity (see Section 14.2.5.2.1.1) is combined with the overall sensitivity of the area (see Section 14.2.4.3) to determine the risk of dust impacts from site activities (see Section 14.2.5.2.1.2). This allows the level of site-specific mitigation to be determined.

Table 14.1: IAQM Criteria to Determine Dust Emissions Magnitude

Dust Emission Magnitude		
Small	**Medium**	**Large**
	Demolition	
• total building volume <12,000 m³ • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <6 m above ground • demolition during wetter months	• total building volume 12,000 - 75,000 m³ • potentially dusty construction material • demolition activities 6 – 12 m above ground level	• total building volume >75,000 m³ • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >12 m above ground level
	Earthworks	
• total site area <18,000 m² • soil type with • large grain size (e.g. sand)	• total site area 18,000 m² - 110,000 m² • moderately dusty soil type (e.g. silt) • 5 – 10 heavy earth moving vehicles active at any one time	• total site area >110,000 m² • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry

Dust Emission Magnitude		
Small	**Medium**	**Large**
• <5 heavy earth moving vehicles active at any one time • formation of bunds <3 m in height • earthworks during wetter months	• formation of bunds 3 – 6 m in height	due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >6 m in height
Construction		
• total building volume <12,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)	• total building volume 12,000 - 75,000 m^3 • potentially dusty construction material (e.g. concrete) • on-site concrete batching	• total building volume >75,000 m^3 • on-site concrete batching • sandblasting
Trackout (heavy duty vehicle movements)		
• <20 HDV (>3.5 t) outward movements in any one day • surface material with low potential for dust release • unpaved road length <50 m	• 20 – 50 HDV (>3.5 t) outward movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50 – 100 m	• >50 HDV (>3.5 t) outward movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100 m

Once the dust emission magnitude has been determined the next step, according to the IAQM guidance (2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling, human health and ecological effects. The level of risk associated with each activity is determined using the criteria in Table 14.2.

Table 14.2: IAQM Criteria to Determine Risk of Dust Impacts

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible
Earthworks			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Construction			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Trackout			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

14.2.2.1.2 Construction Phase Traffic Assessment

Construction phase traffic can also impact air quality. The TII guidance *'Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106'* (TII, 2022), states that road links meeting one or more of the following criteria can be defined as being "affected" by a proposed 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 development that causes a change in traffic and has been applied for this assessment.

- 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 5 m or greater.

As per Chapter 16 (Traffic and Transportation) of this EIAR, it has been determined by the traffic consultant that the construction stage traffic will not increase by 1,000 AADT, or 200 HDV AADT. Therefore, it does not meet the above scoping criteria. In addition, there are no proposed changes to the traffic speeds or road alignment. As a result, a detailed air assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality.

14.2.2.2Operational Phase

14.2.2.2.1 Operational Phase Traffic Assessment

Operational phase traffic has the potential to impact air quality. The TII scoping criteria (TII, 2022) were used to determine if any road links required a detailed modelling assessment.

The operational phase of the project will involve only very occasional inspection and maintenance vehicles. By definition of the criteria, there are no road links impacted as a result of the proposed project. Therefore, a detailed air assessment of operational stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality as a result of vehicle emissions.

14.2.2.2.2 Operational Energy Production

The assessment of baseline air quality in the region is conducted to review and ensure that the current levels of key pollutants are in compliance with their limit values. The indirect impacts to air quality from savings in nitrogen oxides (NO_X) emissions arising from the production of electricity using renewable sources were calculated and compared against those produced using non-renewable sources. The calculations were carried out using SEAI published emission rates from non-renewable energy sources.

The most recent report by the SEAI entitled "*Energy in Ireland 2024 Report*" (SEAI, 2024) estimates that a total of 34.6 TWh of electricity was generated nationally in 2023. Renewable energy accounted for 40.7% of the electricity generated in 2023, with 11.7 TWh from wind generation.

The EPA state that a total of 98.2 kt NO_X was emitted in 2021 in their report entitled "*Ireland's Air Pollutant Emissions 1990 – 2030*" (EPA, 2023). These are the most recently published figures for NO_X emissions. Power generation accounted for 8.7% of the total emissions produced in 2021.

The above figures from the SEAI and EPA were used in the current assessment to quantify the NO_X emissions savings from the windfarm project both annually and over the lifespan of the proposed project and the results were compared against the 2030 national air emissions target of 40.6 kt (see Section 14.2.5.3.1).

Due to the flexibility sought regarding the range of design parameters associated with the wind turbines for the proposed project the make and manufacturer of the turbines to be installed has not yet been decided at this stage of the project and will be decided post consent should permission be granted. As a result, indicative information from various wind turbine manufacturers has been reviewed, and the appropriate information has been used in this assessment. The wind farm is estimated to have an export capacity of approximately 72 MW and an assumed capacity factor of 36%, therefore the power generation from the project is expected to be approximately 221 GWh per annum.

14.2.2.3 Criteria for Rating of Impacts

14.2.2.3.1 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. 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 (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe (recast)*. 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* (CAFE Directive) and it 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 December 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 14.3. 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 14.3: Ambient Air Quality Limit Values

Pollutant	2008/50/EC Limit Type	2008/50/EC Limit Value (applicable until 2030)	2024/2881/EC Limit Type	2024/2881/EC Limit Value (to be attained by 2030)
Nitrogen Dioxide (NO_2)	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

Pollutant	2008/50/EC Limit Type	2008/50/EC Limit Value (applicable until 2030)	2024/2881/EC Limit Type	2024/2881/EC Limit Value (to be attained by 2030)
	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/m^3	Annual limit for protection of vegetation	30 µg/m^3
Particulate Matter (as PM_{10})	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	45 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
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/m^3
	Annual limit for protection of human health	25 µg/m^3	Annual limit for protection of human health	10 µg/m^3

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 14.4), the IT4 targets by 2030 and the final targets by 2040 (shown in Table 14.4). 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/m^3. The strategy also acknowledges that "*meeting the WHO targets will be challenging and will require legislative and societal change, especially with regard to both $PM_{2.5}$ and NO_2*".

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 14.3. 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 14.4: WHO Air Quality 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	-	-	25 µg/m^3
		Annual limit for protection of human health	20 µg/m^3	-	10 µg/m^3
PM (as PM_{10})		24-hour limit for protection of human health	75 µg/m^3	50 µg/m^3	45 µg/m^3
		Annual limit for protection of human health	30 µg/m^3	20 µg/m^3	15 µg/m^3
PM (as $PM_{2.5}$)		24-hour limit for protection of human health	37.5 µg/m^3	25 µg/m^3	15 µg/m^3
		Annual limit for protection of human health	15 µg/m^3	10 µg/m^3	5 µg/m^3

14.2.2.3.2 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust which are less than 10 microns and the EU ambient air quality standards have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

With regard 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.

However, guidelines for dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/m^2/day averaged over a one-year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled *Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals)* (EPA, 2006). The document recommends that the Bergerhoff limit of 350 mg/m^2/day be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from construction of the proposed project.

14.2.2.3.3 National Air Emissions Targets

Regional air emissions associated with the proposed project can be assessed relative to the emission ceilings given in 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 (hereafter referred to as the National Emissions Reduction Directive). This National Emissions Reduction Directive applied the limits set out in Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants until 2020 and established new national emission reduction commitments which are applicable from 2020 and 2030 for sulphur dioxide (SO_2), NO_X, non-methane volatile organic compounds (NMVOC), NH_3, $PM_{2.5}$ and methane (CH_4).

In relation to Ireland, the 2020 to 2029 emission targets are 26 kilotonnes (kt) for SO_2 (65% reduction on 2005 levels), 68kt for NO_X (49% reduction on 2005 levels), 58kt for NMVOCs (25% reduction on 2005 levels), 123kt for NH_3 (1% reduction on 2005 levels) and 15kt for $PM_{2.5}$ (18% reduction on 2005 levels) as shown in Table 14.5. In relation to 2030, Ireland's emission targets are to achieve an 85% reduction in SO_2, 69% reduction in NO_x, 32% reduction in VOCs, 5% reduction in NH_3 and 41% reduction in $PM_{2.5}$ compared to 2005 levels, also shown in Table 14.5.

Table 14.5: National Air Emission Targets (Ireland's Air Pollutant Emissions 2020 to 2030)

Pollutant	2020 – 2029 Reduction Commitments		2030 Reduction Commitments	
	kt	% Reduction Compared to 2005 Levels	kt	% Reduction Compared to 2005 Levels
SO_2	25.6	-65%	11.1	-85%
NO_X	68.2	-49%	41.5	-69%
NMVOC	57.6	-25%	52.5	-32%
NH_3	122.6	-1%	117.6	-5%
$PM_{2.5}$	15.3	-18%	11.0	-41%

14.2.3 Difficulties Encountered

There were no difficulties encountered in compiling this assessment.

14.2.4 Existing Environment

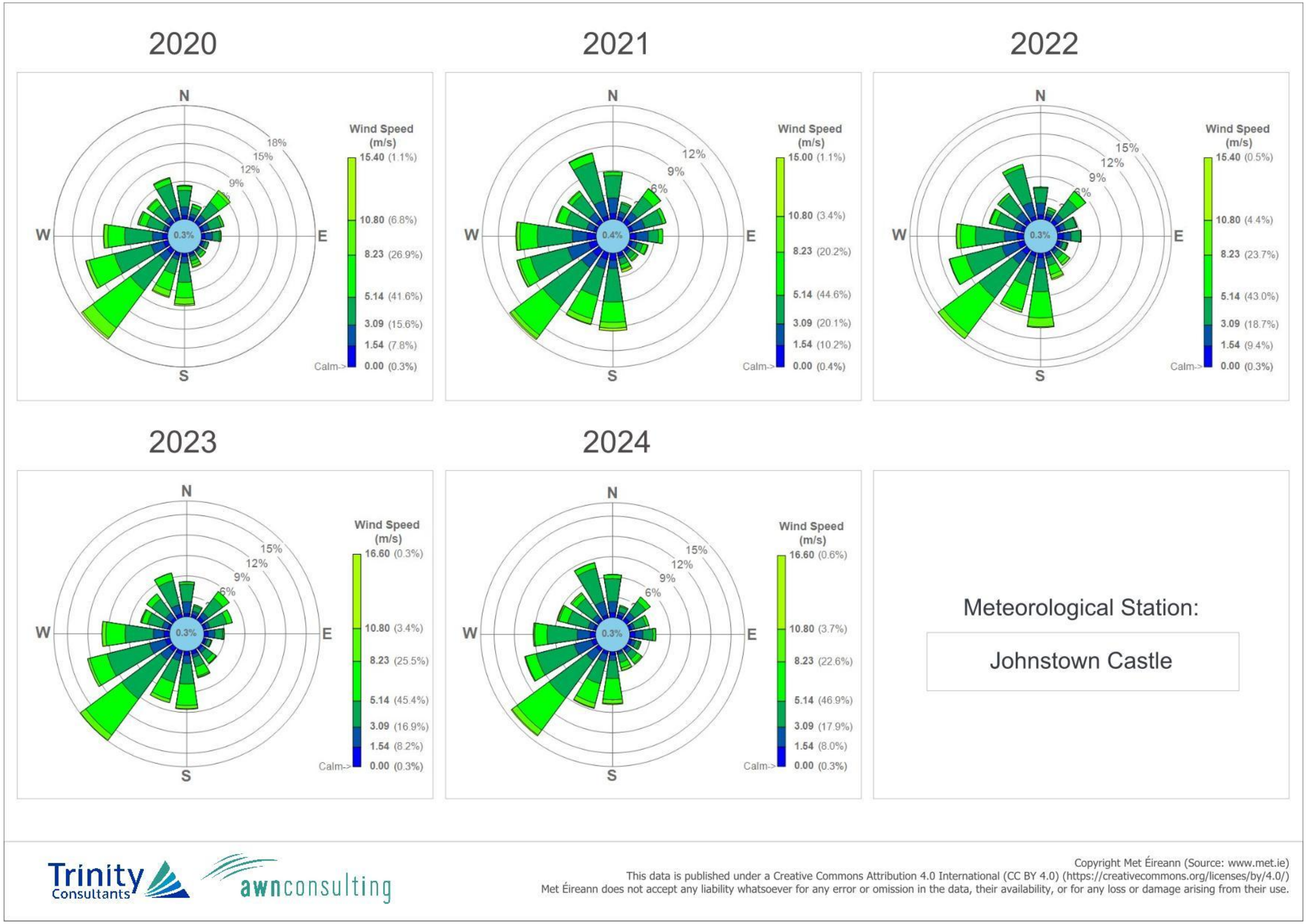
14.2.4.1Meteorological Data

A key factor in assessing temporal and spatial variations in air quality are the prevailing meteorological conditions. 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 nearest representative weather station collating detailed weather records is Johnstown Castle, which is located approximately 11 km south east of the site. Johnstown Castle meteorological station data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period. The mean wind speed is 4.4 m/s over the period of 2020 – 2024 (Met Eireann, 2025). The prevailing winds in the area are westerly to south-westerly in direction, thereby predominantly dispersing any potential dust emissions to the east and north-east of the site (see Figure 14.1).

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 no dust is generated under “wet day” conditions where rainfall greater than 0.2 mm has fallen. Information collected from Casement Aerodrome meteorological station (the closest station with 30 year averages), identified that typically 194 days per annum are “wet” (Met Eireann 2024, 30-year averages). Thus, over 53% of the time no significant dust generation will be likely due to natural meteorological conditions.

Figure 14.1: Wind Roses for Johnstown Castle



14.2.4.2Baseline Air Quality

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes as outlined within the EPA document titled *Air Quality in Ireland 2023* (EPA 2024). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 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, the area of the proposed project is categorised as Zone D.

Continuous monitoring by the EPA is carried out at a number of monitoring stations within Zone D (EPA, 2024); these include rural background sites, roadside (traffic) sites and suburban background sites.

It is necessary to select monitoring stations that are representative of the proposed project location. Not all monitoring stations are considered suitable for determining background pollutant concentrations and must be reviewed on a case-by-case basis to determine the most appropriate EPA monitoring sites for the assessment. The selected monitoring sites are rural background monitoring locations which are not heavily influenced by traffic or other major air emission sources and can provide an indicative estimate of the background NO_2 concentrations in the vicinity of the proposed project.

14.2.4.2.1 Particulate Matter (PM_{10})

Continuous PM_{10} monitoring was carried out at two representative Zone D rural background locations from 2019 – 2023; Kilkitt and Claremorris (EPA, 2024). Annual average PM_{10} concentrations across the sites ranged from 7 – 11 µg/m^3 over the 2019 – 2023 period (see Table 14.6). There was at most 1 exceedance of the daily limit of 50 µg/m^3 in 2023 (35 exceedances are permitted per year) (EPA, 2024). The overall average PM_{10} concentration at the rural background Zone D sites over the 2019 – 2023 period is 11 µg/m^3. Based on the EPA data, a conservative estimate of the current background PM_{10} concentration in the region of the proposed project is 11 µg/m^3.

Table 14.6: Baseline Zone D Air Quality – PM_{10}

Station	Averaging Period	Year				
		2019	2020	2021	2022	2023
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
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

14.2.4.2.2 Particulate Matter ($PM_{2.5}$)

The results of $PM_{2.5}$ monitoring at Claremorris over the period 2019 – 2023 ranged from 5 – 8 µg/m^3 (EPA, 2024). Long-term average $PM_{2.5}$ concentrations measured at this location were significantly lower than the annual average limit value of 25 µg/m^3. Based on this information, a background $PM_{2.5}$ concentration of 8 µg/m^3 has been used in the assessment.

14.2.4.2.3 Dust Deposition

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 area and therefore background levels for the immediate vicinity of the proposed wind farm site are not available.

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

14.2.4.3Sensitivity of the Receiving Environment

In line 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 impact of dust from a proposed project, the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed 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. Table 14.7 outlines the criteria for determining the sensitivity of the area to dust soiling and dust-related human health effects as per the IAQM guidance (2024).

Table 14.7: Criteria for Determining the Sensitivity of the Area to Construction Dust

Sensitivity of the Area to Dust Soiling Effects on People and Property					
Receptor Sensitivity	**Number of Receptors**	**Distance from Source (m)**			
		<20	<50	<100	<250
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

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	<250
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

Sensitivity of the Area to Ecological Impacts		
Receptor Sensitivity	**Distance from Source (m)**	
	20	50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

In terms of receptor sensitivity to dust soiling, the area directly surrounding the proposed project (within 250 m of the proposed project boundary) is predominantly rural in nature. The following range of receptors within 250 m of the proposed project construction works has been identified works (see Figure 14.2):

- There are between 10 and 100 highly sensitive residential properties within 250 m of the wind farm site boundary;
- There are between 1 and 10 highly sensitive residential properties within 20 m of the grid connection area; and

- There are between 1 and 10 highly sensitive residential properties within 20 m of the turbine delivery route.

Based on these receptor numbers and using the IAQM criteria in Table 14.7, the worst-case sensitivity of the area to dust soiling impacts from the proposed project is medium.

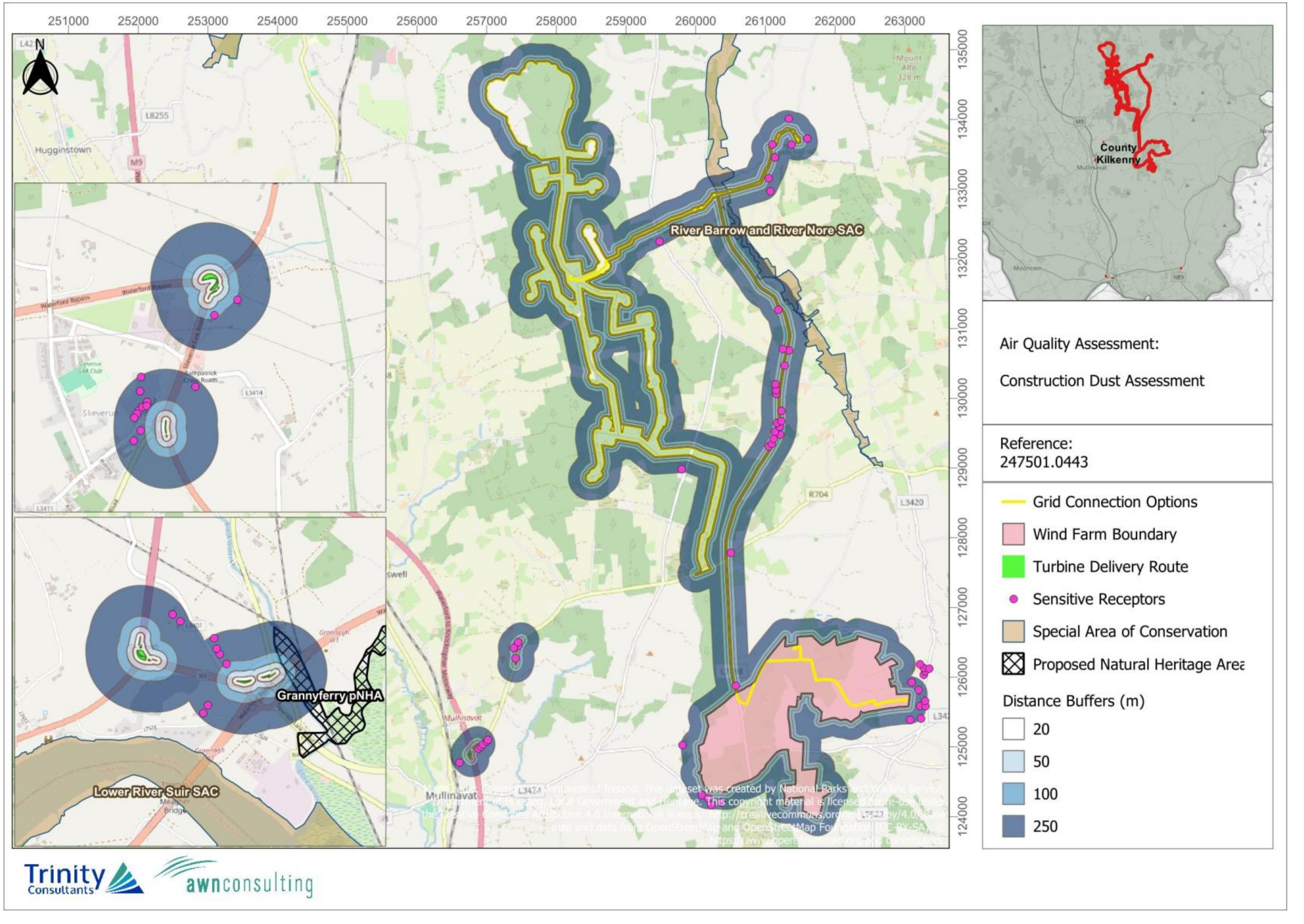
In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type (residential receptors are classified as high 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 proposed project is 11 $\mu g/m^3$. The following range of receptors within 250 m of the proposed project construction works has been identified works (see Figure 14.2):

- There are between 10 and 100 highly sensitive residential properties within 250 m of the wind farm site boundary;
- There are between 1 and 10 highly sensitive residential properties within 20 m of the grid connection area; and
- There are between 1 and 10 highly sensitive residential properties within 20 m of the turbine delivery route.

Based on the IAQM criteria outlined in Table 14.7 the worst-case sensitivity of the area to dust-related human health effects is low.

The IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to dust-related ecological impacts. Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability of the plant, as well as other effects. The guidance states that dust impacts to vegetation can occur up to 50 m from the site, and 50 m from proposed project access roads, up to 250 m for the proposed project site entrance. The sensitivity of the area is determined based on the distance to the source, the designation of the site, (European, National or local designation) and the potential dust sensitivity of the ecologically important species present. The River Barrow and River Nore SAC is within 20 m of Grid Connection Option One, therefore the sensitivity of the area to ecological impacts from construction dust is considered high.

Figure 14.2: Construction Dust Assessment - Sensitive Receptors within 250m of Wind Farm Boundary, Grid Connection and Turbine Delivery Route



14.2.5 Potential Effects

14.2.5.1 Do Nothing Scenario

Under the Do Nothing Scenario no construction works will take place and the previously identified impacts of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur. The ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from new developments in the surrounding area, changes in road traffic, etc.).

In the Do-Nothing scenario the clean renewable power associated with windfarms, which replaces power generated from fossil fuels, would be delayed or prevented (i.e. renewable energy production capacity reduced).

Therefore, this scenario can be considered ***direct, negative, long-term*** and ***slight*** in terms of effect on air quality.

14.2.5.2 Construction Phase

14.2.5.2.1 Construction Dust Assessment

The greatest potential impact on air quality during the construction phase of the proposed project is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 250 m of a construction site, the majority of the deposition occurs within the first 50 m (IAQM, 2024). The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of Johnstown Castle meteorological data indicates that the prevailing wind direction is westerly to south-westerly and wind speeds are generally moderate in nature (see Section 14.2.4.1). In addition, dust generation is considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30 year average data for Casement Aerodrome meteorological station (the nearest station with 30 year data) indicates that on average 194 days per year have rainfall over 0.2 mm (Met Eireann, 2025) and therefore it can be determined that 53% of the time dust generation will be reduced due to natural meteorological conditions.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 14.2.4.2.3). The major dust generating activities are divided into four types within the IAQM (2024) guidance to reflect their different potential impacts. These are: demolition, earthworks, construction and trackout (movement of heavy vehicles).

14.2.5.2.1.1 Determining the Potential Dust Emission Magnitude

The magnitude of the works under each category can be classified as either small, medium or large depending on the scale of the works involved. The potential for dust generating activities is considered for the wind farm site, the grid connection area and the turbine delivery route. The magnitude of each activity has been determined and summarised below for the proposed project using the criteria in Table 14.1.

- <u>Demolition</u>: There is no demolition required as part of the proposed project.

- Earthworks: The dust emission magnitude for the proposed earthwork activities can be classified as **large** as the total site area is greater than 110,000 m^2.
- Construction: The dust emission magnitude for the proposed construction activities can be classified as **small** as a worst-case as the total volume of structures to be constructed will be less than 75,000 m^3.
- Trackout: The dust emission magnitude for the proposed trackout can be classified as **medium**, as there will be between 20 – 50 outward HGV movements per day during the construction phase of the proposed project.

14.2.5.2.1.2 Determining the Risk of Dust Impacts

Once the dust emission magnitude has been determined the next step, according to the IAQM guidance (2024), is to establish the level of risk by combining the magnitude with the overall sensitivity of the area to dust soiling, dust-related human health and ecological effects (see Section 14.2.4.2.3). The level of risk associated with each activity is determined using the criteria in Table 14.2. The overall risk of dust impacts from the construction works is shown in Table 14.8 for each category.

There is at most a medium risk of dust soiling impacts, a low risk of dust-related human health impacts and a high risk of ecological impacts associated with the proposed works. As a result, best practice dust mitigation measures associated with high-risk works will be implemented to ensure there are no significant impacts at nearby sensitive receptors. In the absence of mitigation, dust impacts are predicted to be direct, short-term, negative and slight.

Table 14.8: Risk of Construction Dust Impacts Used to Define Site-Specific Mitigation

Receptor	Receptor Sensitivity	Dust Emission Magnitude – Trackout	Risk of Dust-Related Impacts
Demolition			
Dust Soiling	n/a	n/a	n/a
Human Health	n/a		n/a
Ecology	n/a		n/a
Earthworks			
Dust Soiling	Medium	Large	Medium Risk
Human Health	Low		Low Risk
Ecology	High		High Risk
Construction			
Dust Soiling	Medium	Small	Low risk
Human Health	Low		Negligible
Ecology	High		Low risk
Trackout			

Receptor	Receptor Sensitivity	Dust Emission Magnitude – Trackout	Risk of Dust-Related Impacts
Dust Soiling	Medium	Medium	Medium risk
Human Health	Low		Low risk
Ecology	High		Medium risk

14.2.5.3Operational Phase

14.2.5.3.1 Operational Phase Indirect Air Quality Impacts from Renewable Electricity Production

The generation of electricity due to the installation of the wind farm will lead to indirect net savings in terms of NO_X emissions. The wind farm is estimated to have an export capacity of approximately 72 MW and an assumed capacity factor of 36%, therefore the power generation from the project is expected to be approximately 221 GWh per annum.

The supply of 221 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 14.9, indicate that the impact of the wind farm on Ireland's obligations under the National Emissions Reduction Directive are positive.

The annual impact of the project is annual NO_X emission savings of 0.2% of the 2030 ceiling of 40.6kt and savings of 1.1% relative to the NO_X emissions associated with power generation in Ireland in 2021 (EPA, 2023)). This is considered an ***indirect, long-term, slight, positive*** effect on air quality.

Table 14.9: Predicted Impact of Ballyfasy Wind Farm Project on Ireland's National Emissions Ceiling Obligations

NO_X Emissions Saved Due to Wind farm (tonnes/annum)	Comparison Scenario	NO_X (tonnes/annum)	Annual NO_X Saving (%)
92	National Emission Ceiling 2020 – 2029 [Note 1]	40,600	0.2%
	NO_X Emissions from Power Generation in 2021 [Note 2]	8,543	1.1%

Note 1 National Emission Ceiling (EU Directive 2016/2284)

Note 2 For NO_X emissions associated with power generation in Ireland (taken from EPA (2023) Ireland's Air Pollutant Emissions 1990 – 2030)

14.2.5.4Decommissioning Phase

Dust impacts during the decommissioning phase are expected to be of similar type and similar or lesser in magnitude to those anticipated during the construction phase, but generally of a shorter duration. The same mitigation measures implemented during the construction phase will be applied during the decommissioning works and are also considered appropriate for the decommissioning demolition works. It can therefore be determined that the decommissioning phase will have a ***short-term, direct, localised, negative*** and ***not significant*** effect on air quality.

14.2.6 Mitigation Measures

14.2.6.1Embedded Mitigation

No measures embedded into the design of the proposed project required consideration for the assessment of air quality impacts. Additional mitigation measures to be employed during the construction phase are required and are discussed further in the following section.

14.2.6.2Construction Phase

The proposed project has been assessed as having a medium risk of dust soiling impacts, a low risk of dust related human health impacts and a high risk of ecological impacts during the construction phase as a result of construction and trackout activities (see Section 14.2.5.2.1). Therefore, the following dust mitigation measures shall be implemented during the construction phase of the proposed project. These measures are appropriate for sites with a high risk of dust impacts and aim to ensure that no significant nuisance occurs at nearby sensitive receptors. The mitigation measures draw on best practice guidance from Ireland (DCC (2018), DLRCC (2022)), the UK (IAQM (2024), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997).

These measures are incorporated into the overall CEMP, in Appendix 2-6, prepared for the proposed project. The measures are divided into different categories for different activities.

Table 14.10: Standard Construction Dust Management Measures

Mitigation Type	Location	Description of Mitigation or Monitoring Measures
Communications	Construction Compound/Site Boundary and throughout (as required)	An Environmental Manager (EM) will be in assigned by the appointed contractor. The EM will be responsible for co-ordinating the day-to-day management of environmental impacts during the Construction Phase. The EM will be responsible for performing inspections as deemed necessary and manage responses to environmental incidents. The name and contact details of the EM will be responsible for construction dust management and air quality issues will be displayed at the construction compound/site boundary hoarding, as well as head/regional office contact details. A complaints register will be kept by the appointed contractor detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out.
Construction Works Area Management	Construction Compound/Site Boundary and throughout (as required)	Construction compounds will be laid out so that machinery and dust causing activities such as stockpiles are located away from receptors, as far as is practicable. The appointed contractor will provide a site hoarding of 2.4m height along noise sensitive boundaries, at a minimum, at the Construction Compounds, which will assist in minimising the potential for dust impacts off-site. Construction works area fencing, barriers and scaffolding will be kept clean using wet methods. Stockpiles will be covered to prevent wind whipping.

Mitigation Type	Location	Description of Mitigation or Monitoring Measures
		Any chutes and conveyors will be enclosed and skips will be covered. Drop heights from any conveyors, loading shovels, hoppers and other loading or handling equipment will be minimised. Fine water sprays will be used on such equipment where visible dust plumes are generated. Cutting, grinding or sawing equipment will be fitted with or used in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems. Equipment will be readily available in the construction works areas site to clean any dry spillages. Spillages will be cleaned up as soon as reasonably practicable after the event using wet cleaning methods. An adequate water supply for effective dust or particulate matter suppression and mitigation will be ensured, and non-potable water will be used where possible and appropriate. Construction works area runoff of water or mud will be managed as per the project Surface Water Management Plan and CEMP)
Operating Vehicles / Machinery	Construction Compound/Site Boundary and throughout (as required)	Engines of all vehicles will be switched off engines when stationary - idling vehicles are not permitted. The use of diesel- or petrol-powered generators will be avoided and mains electricity or battery powered equipment will be used where practicable. A Construction Traffic Management Plan (CTMP) has been developed as part of the CEMP to minimise use of the Local Road Network. The CTMP will be adhered to be the appointed contractor.
Earthworks Activities	Areas where earthworks are required	Materials with the potential to produce dust, such as excavated material, will be removed from the construction works area as soon as possible, unless being re-used within the construction works area. Management of extracted material is detailed in the CEMP, Appendix 2-6). Areas exposed by earthworks will be re-vegetated to stabilise surfaces as soon as practicable. Hessian, mulches or trackifiers will be used where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. Cover will only be removed in small areas during work and not all at once. During dry and windy periods and when there is a likelihood of dust nuisance (defined under "Monitoring" measures below), water-based dust suppression (e.g. bowser) will operate to ensure soil moisture content is high enough to increase the stability of the soil and thus suppress dust.
Construction Activities	Areas where construction is required	Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out, unless this is required for a particular process.

Mitigation Type	Location	Description of Mitigation or Monitoring Measures
		Smaller supplies of fine power materials bags will be sealed after use and stored appropriately to prevent dust escaping.
Measures specific to trackout (transport of dust and dirt from the construction works areas onto the public road network)	Construction Compound/Site Boundary and throughout (as required)	A speed restriction of 15 kph will be applied as an effective control measure for dust for on-site vehicles. Vehicles transporting loose materials (e.g. spoil or sand) entering and leaving the Proposed Scheme works areas and construction compounds will be covered with tarpaulin to prevent escape of materials during transport. Before entrance onto public roads, trucks will be checked to ensure the tarpaulins are properly in place. Where construction work area or construction compound conditions result in large amounts of mud building up on truck wheels, wheel washing will be carried out for trucks before they use the public road network. Water-assisted dust sweeper(s) will be used at the access points to a construction compound and the immediate adjoining local road, to remove, as necessary, any material tracked out of the compound. Any on-site haul routes will be inspected for integrity and necessary repairs to the surface will be carried out as soon as reasonably practicable.
Monitoring	Construction Compound/Site Boundary and throughout (as required)	To determine if any short-term dust impacts will occur, a minimum of daily visual inspections for dust soiling of receptors (including roads, and surfaces such as street furniture, cars and windowsills) adjoining the construction works areas will be undertaken. Inspection results will be recorded in the site inspection log. Cleaning will be provided if necessary, such as in the event of a dust complaint resulting from the Proposed Scheme construction works. The potential for dust generation increases when rainfall is less than 0.2 mm/day and at wind speeds of greater than 10 m/s. To determine if these conditions are likely to affect the site, the weather forecast will be consulted daily, specifically the hourly forecasts for wind speeds as well as 12 hour rainfall radar showing anticipated amounts of precipitation in mm. The frequency of site inspections by the EM responsible for dust management will be increased to a minimum of twice daily during the above conditions. The effectiveness of dust control methods will be monitored via visual inspections and work that would generate dust (e.g. moving materials from stockpiles, or transferring loose dry materials from trucks) will be limited in so far as is practicable during these weather conditions.

14.2.6.3Operational Phase

During the operational phase of the proposed project, the works onsite will be limited to maintenance associated with the wind farm components. Although the intensity of activity will be only a small fraction of the construction phase, all employees and contractors that are on site will ensure that machinery used is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic.

14.2.6.4Decommissioning Phase

As the dust emissions during the decommissioning phase are expected to be of a similar or lesser magnitude to those identified during the construction phase, the mitigation measures applicable to construction phase dust emissions are also considered suitable for those during the decommissioning phase.

14.2.7 Residual Effects

14.2.7.1Construction Phase

When the dust mitigation measures detailed in the mitigation section of this report are implemented, the residual effect of fugitive emissions of dust and particulate matter from the site will be ***short-term, direct, localised, negative*** and ***not significant*** in nature and will pose no nuisance at nearby receptors.

Best practice mitigation measures are proposed for the construction phase of the proposed project which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed project will ensure that the impact of the project complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the residual effect of construction of the proposed project will be ***short-term, direct, negative*** and ***not significant*** with respect to human health and ecology.

14.2.7.2Operational Phase

There are no predicted direct impacts to air quality during the operational phase of the proposed project. Emissions from infrequent maintenance vehicles have been assessed as having a ***long-term, direct, localised, negative*** and ***imperceptible*** effect on air quality.

There will be indirect beneficial impacts to air quality from the generation of renewable electricity from the proposed project. There will be NO_X emission savings which may otherwise have been generated from fossil fuels. The generation of a minimum of 221 GWh of renewable electricity will result in a decrease in annual NO_X emission levels by 0.2% of the 2030 National Air Emissions Target of 40.6kt. This is an ***indirect, long-term, slight, positive*** effect on air quality.

14.2.7.3Decommissioning Phase

Dust impacts during the decommissioning phase are expected to be of similar type and similar or lesser in magnitude to those anticipated during the construction phase, but generally of a shorter duration. The same mitigation measures implemented during the construction phase will be applied during the decommissioning works and are also considered appropriate for the decommissioning demolition works. It can therefore be determined that the residual effect of the decommissioning phase on air quality will be ***short-term, direct, localised, negative*** and ***not significant***.

14.2.8 Cumulative Effects

Cumulative construction dust impacts may occur if large-scale developments within 500 m of the site are under construction simultaneously.

A review of the planned and permitted projects within the vicinity of the site (see Chapter 1 Introduction) was undertaken to identify developments with the potential for cumulative construction phase impacts. Similarly, cumulative dust impacts may occur if large-scale developments within 500 m of the site are under construction or decommissioning (i.e. dust generating phases) simultaneously with the decommissioning phases of the proposed project. The dust mitigation measures outlined in Section 14.2.6.2 will be applied during the construction phase which will avoid significant cumulative impacts on air quality. Similar dust mitigation measures are required for other permitted developments as per their respective impact assessments and planning conditions.

With appropriate mitigation measures in place, the predicted cumulative impacts on air quality associated with the construction and decommissioning phases of the proposed project is ***short-term, direct, negative*** and ***not significant***.

No significant cumulative effects on air quality are predicted for the construction or operational phases.

14.2.9 Conclusion

This chapter of the EIAR has assessed the potential environmental impacts on air quality, focusing on the potential construction and decommissioning dust emissions and impacts to nearby sensitive receptors such as ecology, residential properties, schools, hospitals, etc.

Baseline data and data available from similar environments indicates that levels of particulate matter less than 10 microns (PM_{10}) and particulate matter less than 2.5 microns ($PM_{2.5}$) and are generally well below the National and European Union (EU) ambient air quality standards.

An assessment of the potential dust impacts as a result of the construction phase of the proposed project was carried out based on the UK Institute for Air Quality Management 2024 guidance document *'Guidance on the Assessment of Dust from Demolition and Construction'*. This determined that there is at most a high risk of dust related impacts associated with the proposed project. In the absence of mitigation there is the potential for ***direct, short-term, negative,*** and ***slight*** impacts to air quality.

There will be indirect beneficial impacts to air quality from the generation of renewable electricity from the proposed project. There will be NO_X emission savings which may otherwise have been generated from fossil fuels. The generation of a maximum of 72 GWh of renewable electricity will result in a decrease in annual NO_X emission levels by 0.2% of the 2030 National Air Emissions Target of 40.6kt. This is an ***indirect, long-term, slight*** and ***positive*** effect on air quality.

Detailed dust mitigation measures are outlined within Section 14.2.6.2 and are also included in the CEMP (Appendix 2-6) to ensure that no significant effects as a result of construction dust emissions from earthworks, construction and trackout (movement of vehicles) occurs at nearby sensitive receptors. Once these best practice mitigation measures, derived from the Institute for Air Quality Management 2024 guidance '*Guidance on the Assessment of Dust from Demolition and Construction*' as well as other relevant dust management guidance, are implemented, the effects on air quality during the construction of the proposed project are considered ***direct, short-term, negative*** and ***not significant***, and also avoiding significant cumulative effects on air quality.

In summary there are no likely significant effects on air quality as a result of the construction, operational and decommissioning phases of the proposed project. There are also no likely significant effects on air quality as a result of cumulative impacts during the construction, operational and decommissioning phases of the proposed project.

The following table summarises the identified likely significant residual effects during the construction phase of the proposed development following the application of mitigation measures.

Table 14.11: Summary of Air Quality Effects Post Mitigation

Likely Significant Effect in accordance with EPA Terminology	Quality	Significance	Extent	Probability	Duration	Type
Impact of construction dust from construction and trackout in terms of dust soiling, and human health	Negative	Not significant	Study area as per Section 14.2.4.3	Likely	Short-term	Direct
Impact of operational phase emissions from facility on air quality	Positive	Slight - Not significant	National	Likely	Long-term	Indirect

14.2.10 References

BRE (2003) Controlling Particles, Vapours & Noise Pollution from Construction Sites

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

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

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

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

Environmental Protection Agency (2023) Ireland's Transboundary Gas Emissions 1990 – 2030

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

Government of Ireland (2023) Clean Air Strategy for Ireland

Institute of Air Quality Management (IAQM) (2024) Guidance on the Assessment of Dust from Demolition and Construction Version 2.2

Met Éireann (2025) Met Éireann website: https://www.met.ie/

SEAI (2023) Energy In Ireland 2023 Report

The Scottish Office (1996) Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface

Mineral Workings

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

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

World Health Organisation (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 & 2000)

World Health Organisation (2021) Air Quality Guidelines 2021

14.3 CLIMATE

14.3.1 Introduction

This section comprises an assessment of the likely effect on climate associated with the proposed project. A full description of the proposed project is presented in Chapter 2 (Description of the Proposed Project).

This report provides a baseline assessment of the setting of the proposed project in terms of climate and discusses the likely and significant effects that the construction, operation and decommissioning of the proposed project will have. Where required, appropriate mitigation measures to limit any identified likely significant adverse impacts to climate are recommended.

The climate assessment comprises two elements:

- Greenhouse gas emissions assessment (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.
- Climate change risk assessment (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.

14.3.2 Legislation, Policy and Guidance

14.3.2.1International Legislation & Policy

The Paris Agreement (UNFCCC, 2015), which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C (degrees Celsius) above pre-industrial levels with efforts to limit this rise to 1.5°C. Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs comprise the efforts and actions by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requires each country to prepare the NDCs that it intends to achieve, updating and enhancing the NDCs every 5 years. Countries are required to implement mitigation measures, with the aim of achieving the objectives of such contributions. Each of the EU Member States submit their own NDCs, which contribute to the overall EU NDC.

The European Green Deal, published by the European Commission in December 2019, provides an action plan which aims for the EU to be climate neutral by 2050. The EU Green Deal highlights that further decarbonisation of the energy sector is critical to reach climate objectives in 2030 and 2050. The European Green Deal has increased the GHG emissions reduction 2030 target to at least 55% in comparison to 1990 levels.

On 14 July 2021, the European Commission adopted a series of legislative proposals setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target of at least a 55% net reduction in greenhouse gas emissions by 2030. The package of proposals is known as the 'Fit for 55' package.

The package includes revisions to the legislation put forward as part of the Climate and Energy Framework 2021-2030, including the EU Emissions Trading System (ETS), Effort Sharing Regulation, transport and land use legislation, setting out in real terms the ways in which the Commission intends to reach EU climate targets under the European Green Deal.

The EU ETS was launched in 2005 as the world's first international company- level 'cap-and trade' system for reducing emissions of greenhouse gases cost-effectively. The EU ETS regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry.

Under this new package of legislative proposals, the sectors of the economy covered by the current ETS must reduce emissions by 61% by 2030 compared to 2005 levels by increasing annual emissions reduction to 4.2% per annum. This is a substantial increase from the previous target which was a 43% reduction by 2030.

The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and thus includes GHG emissions from transport, residential and commercial buildings and agriculture. These sectors must reduce emissions by 42% by 2030 compared to 2005 levels.

Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') writes into law the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. The law also sets the intermediate target of reducing net greenhouse gas (GHG) emissions by at least 55% by 2030, compared to 1990 levels.

The 2021 EU Strategy on Adaptation to Climate Change sets out the pathway to prepare for the unavoidable impacts of climate change. The aim is that "*by 2050, when we aim to have reached climate neutrality, we will have reinforced adaptive capacity and minimised vulnerability to climate impacts…*"

Adaptation refers to measures that can reduce the negative impact of climate change by, for example, ensuring a project is resilient to future increases in storm frequency and rainfall levels.

The EU has adopted integrated monitoring and reporting rules to ensure progress towards its 2030 climate and energy targets and its international commitments under the 2015 Paris Agreement.

Climate is also addressed specifically in Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. Recital (7) of Directive 2014/52/EU states that:

"*Over the last decade, environmental issues, such as resource efficiency and sustainability, biodiversity protection, climate change, and risks of accidents and disasters, have become more important in policy making. They should therefore also constitute important elements in assessment and decision-making processes*".

Recital (13) of Directive 2014/52/EU states that:

"*Climate change will continue to cause damage to the environment and compromise economic development. In this regard, it is appropriate to assess the impact of projects on climate (for example greenhouse gas emissions) and their vulnerability to climate change*".

Additionally Annex IV requires the following to be considered within Environmental Impact Assessment:

- Paragraph 4: "*A description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora),* *land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape*".

- Paragraph 5 (f): "*A description of the likely significant effects of the project on the environment resulting from, inter alia: the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change*".

14.3.2.2National Legislation

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (as amended (Government of Ireland, 2015) was enacted (the 2015 Act (as amended)). The purpose of the 2015 Act (as amended) was 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 2015 Act (as amended) as the '*national transition objective*'. The 2015 Act (as amended) made provision for a national mitigation plan, and a national adaptation framework. In addition, the 2015 Act (as amended) 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 current 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 fifth and most recent climate action plan, CAP25, was published in April 2025 (Government of Ireland, 2025).

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 (hereafter referred to as the 2021 Climate Act), in March 2021, which amended the Climate Action and Low Carbon Development Act 2015. The 2021 Climate Act was signed into Law on the 23rd July 2021, giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act (Government of Ireland, 2021) 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 also provides 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 2015 Act (as amended) states "*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 in Table 14.12. 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 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 16.2. Electricity has a 75% reduction requirement and a 2030 emission ceiling of 3 Mt CO2e (carbon dioxide equivalent).

Table 14.12: 5-Year Carbon Budgets 2021 – 2035

Budget Period	Carbon Budget	Reduction Required
2021-2025	295 Mt CO_2e	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO_2e	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO_2e	Reduction in emissions of 3.5% per annum for the third provisional budget.

Table 14.13: 2030 Sectoral Emissions Ceilings

Sector	Baseline (Mt CO_2e)	Carbon Budgets (Mt CO_2e)		2030 Emissions (Mt CO_2e)	Indicative Emissions % Reduction in Final Year of 2025- 2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Electricity	10	40	20	3	75
Transport	12	54	37	6	50
Built Environment - Residential	7	29	23	4	40
Built Environment - Commercial	2	7	5	1	45
Industry	7	30	24	4	35
Agriculture	23	106	96	17.25	25
Other (F-gases, waste, petroleum refining)	2	9	8	1	50
Land Use, Land-use Change and Forestry (LULUCF)	5	Reflecting the continued volatility for LULUCF baseline emissions to 2030 and beyond, CAP24 puts in place ambitious activity targets for the sector reflecting an EU-type approach.			
Total	68				
Unallocated Savings	-	-	26	-5.25	-
Legally Binding Carbon Budgets and 2030 Emission Reduction Targets	-	295	200	-	51

14.3.2.3Policy

14.3.2.3.1 National Policy

In December 2023, CAP24 was published, establishing key actions to deliver a 51% reduction in GHG emissions by 2030 (compared to 2018 levels) and achieve climate neutrality by 2050 (Government of Ireland, 2023). The updated and current CAP25, published in April 2025 (Government of Ireland, 2025), builds on the progress of the previous four iterations of the CAP, with CAP23 first publishing carbon budgets and sectoral emission ceilings, and reaffirms Ireland's climate ambition, with a focus on delivery, implementation and measurable outcomes, particularly ahead of the second carbon budget period (2026–2030). 2025 is the last year in the first 5-year carbon budget period. During the initial 5-year budget period the average annual reduction required was 4.8%, this increases to 8.3% in the second budget period (2026-2030). CAP25 retains the high-impact sectors where the biggest savings can be achieved, while emphasising public sector leadership and green procurement. These sectors include renewable energy; energy efficiency of buildings; transport; sustainable farming; sustainable business; and land-use change.

CAP25 also includes targeted actions to decarbonise industrial heat and support the transition to carbon-neutral manufacturing processes. Public sector leadership is strengthened through a new *Buying Greener: Green Public Procurement Strategy and Action Plan* (2024–2027) (Government of Ireland, 2024a) the development of mandatory Climate Action Roadmaps, and enhanced emissions monitoring and reporting across government operations. The government has reinforced the public sector's responsibility to lead by example, particularly through climate-proofing operations and sustainable procurement initiatives. To support innovation and ensure future economic resilience, IDA Ireland continues to attract and support businesses investing in climate technologies and low-carbon solutions.

CAP25 highlights a significant 17% reduction in electricity emissions in early 2024, with wind power supplying nearly 40% of Ireland's total electricity demand and over 100,000 rooftop microgenerators connected to the grid. Investments are ongoing in grid reinforcement, offshore wind development, and interconnectors with France and the UK to enhance renewable generation capacity. According to legal and policy analysts, these developments place Ireland among the top countries globally in per capita wind generation, while continuing to expand domestic and community-based renewable energy. EirGrid, Enterprise Ireland and IDA Ireland have recently signed an MoU to collectively support offshore wind development in Ireland.

CAP25 also reinforces targets first outlined in CAP24 to reduce the embodied carbon of construction materials, with a 10% reduction by 2025 and 30% reduction by 2030 for materials produced and used in Ireland. Cement and high embodied carbon construction materials can be reduced through product substitution, reduced clinker content in cement and uptake of low-carbon construction methods, including those outlined in the Construction Industry Federation 2021 report *Modern Methods of Construction* (Construction Industry Federation, 2021). There also remains scope for the construction industry to use more timber in construction. In 2022, 24% of new construction in Ireland was built using timber frames to satisfy the demand for housing. Public bodies are now required under the Public Sector Mandate to use best practice project design to reduce embodied carbon; procure concretes with clinker replacements (lower carbon); and require that large construction projects produce a whole life cycle GHG emissions assessment. Further guidance on how the built environment can contribute to a circular, low-carbon economy is detailed in the recently published *A Roadmap for a Resource Efficient Circular Built Environment.* This supports the Circular Economy And Miscellaneous Provisions Act 2022 (No. 26 of 2022), which allows for waste material to be safely and sustainably re-used as secondary raw materials and is particularly important for the construction sector.

Furthermore, CAP25 advances sector-specific measures in green procurement, electrification of transport and heat, and just transition (with the introduction of a Just Transition Commission) to support vulnerable communities and ensure equitable decarbonisation. While transport emissions increased by 0.3%, electric vehicles and the expanded use of biofuels are highlighted as the most effective short- to medium-term strategies for emissions reductions in the sector.

As outlined in CAP25 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 CAP25.

In April 2023, the Government published its *Long-Term Strategy on Greenhouse Gas Emissions Reductions* (Government of Ireland, 2024b). This strategy provides a long-term plan on how Ireland will transition towards net carbon zero by 2050, achieving the interim targets set out in the Climate Action Plan.

The National Planning Framework (First Revision) specifies a number of policies relevant for climate in terms of reducing GHG emissions and adapting to climate change:

- National Policy Objective 69: *Reduce our carbon footprint by integrating climate action into the planning system in support of national targets for climate policy mitigation and adaptation objectives, as well as targets for greenhouse gas emissions reductions as expressed in the most recently adopted carbon budgets*.
- National Policy Objective 70: *Promote renewable energy use and generation at appropriate locations within the built and natural environment to meet national objectives towards achieving a climate neutral economy by 2050*.
- National Policy Objective 71: *Support the development and upgrading of the national electricity grid infrastructure, including supporting the delivery of renewable electricity generating development*.
- National Policy Objective 78: *Promote sustainable development by ensuring flooding and flood risk management informs place-making by avoiding inappropriate development in areas at risk of flooding that do not pass the Justification Test, in accordance with the Guidelines on the Planning System and Flood Risk Management, and taking account of the potential impacts of climate change on flooding and flood risk, in line with national policy regarding climate adaptation*.

The second National Adaptation Framework (NAF) (Government of Ireland, 2024c) was published in June 2024 in line with the five-year requirement of the 2015 Climate Act. The plan provides a whole of government and society approach to climate adaptation in Ireland in order 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. With respect to the water sector the 2nd NAF states that the potential adaptation measures for the transport sector, which is led by the Department of Transport, are:

- Projected extreme precipitation may increase pluvial and fluvial flooding, impacting the transport sector with service disruptions, hazardous driving conditions, and bridge scour;
- Intensified windstorms may disrupt transport hubs, causing delays and cancellations, and affecting transport networks with fallen trees and debris;
- Sea level rise and intensified storms may significantly impact transport infrastructure in low-lying coastal areas, eroding coastlines, and estuaries; and
- Heatwaves and drought may degrade transport infrastructure, affecting road surfaces and rails, and require temperature control measures in hubs.

The National Climate Change Risk Assessment (NCCRA) was published in June 2025 (EPA, 2025c). The NCCRA was required to be developed under Action 457 from the 2021 CAP (Government of Ireland, 2021). Action 457 seeks to "Further develop Ireland's national climate change risk assessment capacity to identify the priority physical risks of climate change to Ireland'. The NCCRA uses definitions of the risk determinants from the Intergovernmental Panel on Climate Change (IPCC) Risk Framework (IPCC, 2023):

- **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 NCCRA assess exposure and vulnerability for two future climate change scenarios or Representative Concentration Pathways (RCPs):

- RCP4.5 was selected as it represents a scenario aligned with the global temperature trajectory
- 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 NAF (Government of Ireland, 2024c). In addition to the future climate scenarios, the NCCRA assesses the risk from the future climate during the following timeframes:

- Present (~2030)
- Medium term (~2050)
- Long term (~2100)

14.3.2.3.2 Local Policy

Kilkenny County Council (KCC) aims to reduce its direct carbon emissions by 51% by 2030, and supports the generation of renewable energy as part of this. The *Kilkenny County Council Climate*

Action Plan 2024 – 2029 (Kilkenny County Council, 2024) outlines Kilkenny County Council's goals to mitigate GHG emissions and plans to prepare for and adapt to climate change.

The Kilkenny County Council Climate Action Plan also highlights the risks that climate change poses to the county, these include increases in the number of heatwave events, increases in drought conditions, increased flooding and increased likelihood of extreme windstorms.

As part of the *Kilkenny City and County Development Plan Volume 1 County 2021-2027* (KCC, 2025), a Wind Energy Development Strategy was produced, providing policy areas for a wide range of wind energy developments, with the majority of the county "Open for Consideration" for wind energy developments. Kilkenny currently has approx. 76 MW of installed wind energy, generated by 39 turbines.

It is important to note that a Ministerial Direction was issued on 15th October 2021, with respect to the CDP which states that:

''In accordance with Section 31(4) of the Planning and Development Act 2000, those parts of the Kilkenny City and County Development Plan 2021 – 2027 Plan referred to in the notice shall be taken not to have come into effect, been made or amended; namely;

Chapter 11, Renewable Energy:

- *Section11.4 Kilkenny Targets;*
- *Section 11.5.1 Current status and targets; and*
- *Figure 11.4 Wind Strategy areas. ''*

As such, there is currently no wind energy strategy areas designated for Kilkenny. In the absence of such a strategy, each planning application will be assessed on a case-by-case basis (see Chapter 4 (Policy, Planning and Development Context)).

14.3.2.4Guidance

The principal guidance and best practice documents which the assessment of potential impacts on climate are based on are summarised below. The assessment has also considered national guidelines where available, in addition to international standards and guidelines relating to the assessment of climate impacts. These are summarised below:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA, 2022);
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Transport Infrastructure Ireland (TII) PE-ENV-01104: Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document (TII, 2022);
- Transport Infrastructure Ireland (TII) GE-ENV-01106: TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document (TII, 2025);
- Institute of Environmental Management & Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing GHG Emissions and Evaluating their Significance (hereafter referred to as the IEMA GHG guidance) (IEMA, 2022);
- 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); and
- Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021).

14.3.3 Methods

14.3.3.1 Greenhouse Gas Assessment

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established with reference to EPA data on annual GHG emissions (see Section 14.3.5.1).

14.3.3.1.1 Construction Phase

14.3.3.1.1.1 GHG Assessment – TII Carbon Tool

The GHG assessment has been conducted following the TII PE-ENV-01104 guidance (TII, 2022). PE-ENV-01104 (TII, 2022) recommends the calculation of the construction stage GHG emissions, including embodied carbon, using the TII Online Carbon Tool (TII, 2025). 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, 2025) has been commissioned by TII to assess GHG emissions associated with road or rail projects using Ireland-specific emission factors and data. However, the tool can be used to estimate the GHG emissions from other development types such as the proposed project as a number of the material types and activities are somewhat similar. The TII Carbon Tool has been used to assess the GHG emissions associated with site clearance works, excavation, material transport, construction activities, construction worker travel and construction wastes for the windfarm (excluding the wind turbines) and UEEC.

The TII Carbon Tool (TII, 2025) uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013). 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 outputs are expressed in terms of tCO_2e (tonnes of carbon dioxide equivalent).

The 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. The tool also assesses on-going maintenance associated with the lifetime of the proposed project.

The construction phase of the proposed project will result in GHG emissions from various sources:

- Land clearance activities (i.e. tree felling);
- Construction materials; and
- Construction works (including excavations, fuel usage).

Information on the material quantities, site activities, land clearance, waste product and construction traffic were provided by the project teams for input into the carbon tool. This information was used to determine an estimate of the GHG emissions associated with the development. Standard maintenance, as indicated through the TII Carbon Tool (TII 2022b), required over the operational phase has also been considered as part of the embodied construction emissions. Complete detailed information regarding the proposed construction materials and exact methodologies was not available at the time of this assessment and will be specified at the detailed design stage. Best estimates have been used in this assessment to provide an estimate of the GHGs associated with the proposed project, which is considered appropriate the purposes of this assessment.

14.3.3.1.1.2 Turbine Manufacture Lifecycle Assessment

In addition to the TII Carbon Tool, a lifecycle assessment was undertaken to determine the payback period for the turbines. Due to the flexibility sought regarding the range of design parameters associated with the wind turbines for the proposed project the make and manufacturer of the turbines to be installed has not yet been decided at this stage of the project and will be decided post consent should permission be granted. As a result, indicative information from various wind turbine manufacturers has been reviewed, and the appropriate information has been used in this assessment. The life cycle assessment quantifies the power consumption associated with the production, operation, transport and end-of-life of the wind turbines. The assessment also quantifies the greenhouse gas 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 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.

14.3.3.1.2 Operational Phase

There will be no greenhouse gas emissions from the operation of the wind turbines. 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 greenhouse gas emissions. The savings are calculated and compared to Ireland's 2030 sectoral emissions ceilings.

Vehicular traffic is often a dominant source of greenhouse gas emissions as a result of developments. However, there is no predicted significant effect from operational phase vehicles due to the relatively low volume of vehicles required for maintenance activities during operation.

14.3.3.1.3 Decommissioning Stage

Vehicles related to the decommissioning phase will give rise to CO_2 emissions. It is not predicted that this development will involve the use of a significant number of vehicles during the decommissioning phase. Therefore, emissions from vehicular traffic are predicted to be imperceptible as a result of the decommissioning.

In the decommissioning phase, the turbines are dismantled and the site is remediated to the agreed state (see Chapter 2 (Description of Proposed Project) for more detail). End-of-life recycling of metals will be carried out at the wind farm in order to reduce the climate impact as per the lifecycle assessments for the chosen wind turbine manufacturer. Metal components that are primarily mono-material (e.g. gears, transformers, tower sections, etc.) are assumed to be 98% recycled. It is expected that the reinforced concrete foundation bases will remain in-situ. Decommissioning has been considered as part of the lifecycle assessments and payback periods for the turbines completed by the manufacturer (see Section 14.3.3.1.1.2).

14.3.3.1.4 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, 2022) outlines a recommended approach for determining the significance of both the construction, operational and decommissioning phases of a development.

The significance of GHG effects set out in PE-ENV-01104 (TII, 2022) is based on the IEMA GHG guidance (IEMA, 2022) which is broadly 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 GHG 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.

The IEMA (2022) GHG guidance states that the crux of significance regarding impact on climate 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 by 2050. A project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect. Where the fundamental reason for a proposed project is to combat climate change (e.g. a wind farm or carbon capture and storage project) and this beneficial effect drives the project need, then it is likely to be significant.

TII (TII, 2022) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. Significance is determined using the criteria outlined in

Table 14.14 (derived from Table 6.7 of PE-ENV-01104 (TII, 2022)) along with consideration of the following two factors:

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

The significance of the effect of GHG emissions on climate is assessed for the total GHG emissions across all project stages.

Table 14.14: Greenhouse Gas Assessment (GHGA) Significance Criteria

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. 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	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.

Ireland's carbon budgets can also be used to contextualise the magnitude of GHG emissions from the proposed project (TII, 2022). The approach is based on comparing the net proposed project GHG emissions to the relevant carbon budgets (Government of Ireland, 2025). The relevant sector budgets are for Electricity, Transport, Waste and Industry. The 2030 sectoral emissions ceilings and reduction requirements relative to the 2018 baseline are detailed in Table 16.2.

14.3.3.2Climate Change Risk Assessment

The CCRA phase assessment involves determining the vulnerability of the proposed project to climate change. This involves an analysis of the sensitivity and exposure of the development to climate hazards which together provide a measure of vulnerability.

PE-ENV-01104 (TII, 2022) 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, 2020a).

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) has been used in order to assess the likelihood of a climate risk.

First an initial screening CCRA based on the operational phase is carried out, according to the TII guidance PE-ENV-01104. This has been carried out by determining the sensitivity of proposed project assets (i.e. receptors) and their exposure to climate change hazards.

The proposed project asset categories are assigned a level of sensitivity to climate hazards. PE-ENV-01104 (TII, 2022) provides the below list of asset categories and climate hazards to be considered. The asset categories will vary for development type and need to be determined on a development by development basis.

- **Asset Categories** Pavements; drainage; structures; utilities; landscaping; signs, light posts, buildings, and fences.
- **Climate Hazards** Flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning and hail; landslides; fog.

The sensitivity is based on a High, Medium or Low rating with a score of 1 to 3 assigned as per the criteria below.

- **High Sensitivity** The climate hazard will or is likely to have a major impact on the asset category. This is a sensitivity score of 3.
- **Medium Sensitivity** It is possible or likely the climate hazard will have a moderate impact on the asset category. This is a sensitivity score of 2.
- **Low Sensitivity** It is possible the climate hazard will have a low or negligible impact on the asset category. This is a sensitivity score of 1.

Once the sensitivities have been identified the exposure analysis is undertaken. The exposure analysis involves determining the level of exposure of each climate hazard at the 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 is assigned a level of High, Medium or Low as per the below criteria.

- **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.

- **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.

Once the sensitivity and exposure are categorised, a vulnerability analysis is conducted by multiplying the sensitivity and exposure to calculate the vulnerability.

14.3.3.2.1 Significance Criteria for CCRA

The assessment of vulnerability to climate change combines the outcomes of the sensitivity and exposure analysis with the aim of identifying the key vulnerabilities and potentially significant climate hazards which could impact the proposed project.

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 14.15 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale.

TII guidance (TII, 2022) and the EU technical guidance (European Commission, 2021a) note that if all vulnerabilities are ranked as low in a justified manner, no detailed climate risk assessment may be needed. Therefore, the impact from climate change on the proposed project can be considered to be not significant.

However, 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. An assessment of construction phase CCRA impacts is only required according to the TII guidance (TII, 2022) if a detailed CCRA is required.

The screening CCRA, detailed in Section 14.3.6.3, did not identify any residual medium or high risks to the proposed project as a result of climate change. Therefore, a detailed CCRA for the construction, operational and decommissioning phases were scoped out.

Table 14.15: Climate Change Vulnerability Matrix

		Exposuire		
		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

14.3.4 Difficulties Encountered

There were no difficulties encountered in compiling this assessment.

14.3.5 Existing Environment

PE-ENV-01104 (TII, 2022) states that a baseline climate scenario should identify GHG emissions without the project for both the current and future baseline, consistent with the study area for the project.

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 2018/842 (European Union, 2018) results in changes in GHG emissions either beneficial or adverse being of more significance than previously considered prior to these declarations.

Climate impacts are assessed at a national level and in relation to national targets and sectoral emission ceilings. The study area for climate is the Republic of Ireland and the baseline is determined in relation to this study area.

14.3.5.1Current GHGA Baseline

Data published in July 2025 (EPA, 2025a), indicates that Ireland exceeded, without the use of flexibilities, its 2024 annual limit set under EU's Effort Sharing Decision (ESD) (406/2009/EC) by 1.03 Mt CO_2e. However, the 2024 emissions represent the second consecutive year in which Ireland's emission were below (-4.2%) 1990 levels. ETS (Emissions Trading Scheme) emissions decreased (-1.1%) and ESR (Effort Sharing Regulation) emissions decreased (-2.2%). 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 2024 total national GHG emissions, excluding LULUCF, have decreased by 2.0% on 2023 levels to 53.82 Mt CO2e, with a 0.7 Mt CO2e (-8.9%) reduction in electricity industries alone. This was driven by a 39.7% share of energy from renewables in 2024 and the complete phase-out of peat for electricity generation. Manufacturing combustion and industrial processes decreased by 4.6% to 6.0 Mt CO_2e in 2024 due to declines in fossil fuel usage. The sector with the highest emissions in 2024 was agriculture at 37.9% of the total, followed by transport at 20.8%. For 2024, total national emissions (including LULUCF) were 57.53 Mt CO_2e (EPA, 2025a) (Table 14.16).

The current estimates of National greenhouse gas emissions (including LULUCF) in 2024 are 12.0% below 2018, well off the National Climate ambition of a 51% reduction by 2030. The data indicate that from 2021- 2024 Ireland has used 79% (186 Mt CO_2e) of the 295 Mt CO_2e Carbon Budget for the five-year period 2021-2025. This leaves 21% of the budget available for 2025, requiring a substantial 17.5% annual emissions reduction for 2025 to stay within budget.

Table 14.16: Trends in Total National GHG Emissions 2022 - 2024

Sector Note 1	2021	2022	2023	Total Budget (Mt CO_2e) (2021-2025)	% Budget 2021-2025 Used	Annual Change 2023 to 2024
Electricity	9.69	7.57	6.95	40	85.25%	-8.19%
Transport	11.76	11.8	11.65	54	85.74%	-1.27%
Buildings (Residential)	5.75	5.35	5.61	29	81.31%	4.86%
Buildings (Commercial and Public)	1.45	1.39	1.49	7	82.43%	7.19%
Industry	6.62	6.31	6.01	30	86.77%	-4.75%
Agriculture	21.78	20.72	20.41	106	80.05%	-1.50%
Other Note 2	1.93	1.81	1.63	9	80.33%	-9.94%
LULUCF	3.98	3.89	3.89	–	–	0
Total including LULUCF	62.99	58.83	57.64	295	82.81%	-2.04%

Note 1 Reproduced from latest emissions data on the EPA website (EPA 2025a)

Note 2 Other includes Petroleum refining, F-Gases and Waste (emissions from solid waste disposal on land, solid waste treatment (composting and anaerobic digestion), wastewater treatment, waste incineration and open burning of waste)

14.3.5.2 Future GHGA Baseline

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, 2022) and IEMA GHG 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 CAP25, and future CAPs, alongside binding 2030 and net zero by 2050 EU targets. In order to meet the commitments under the Paris Agreement, 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). 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 thus includes GHG emissions from transport, residential and commercial buildings and agriculture.

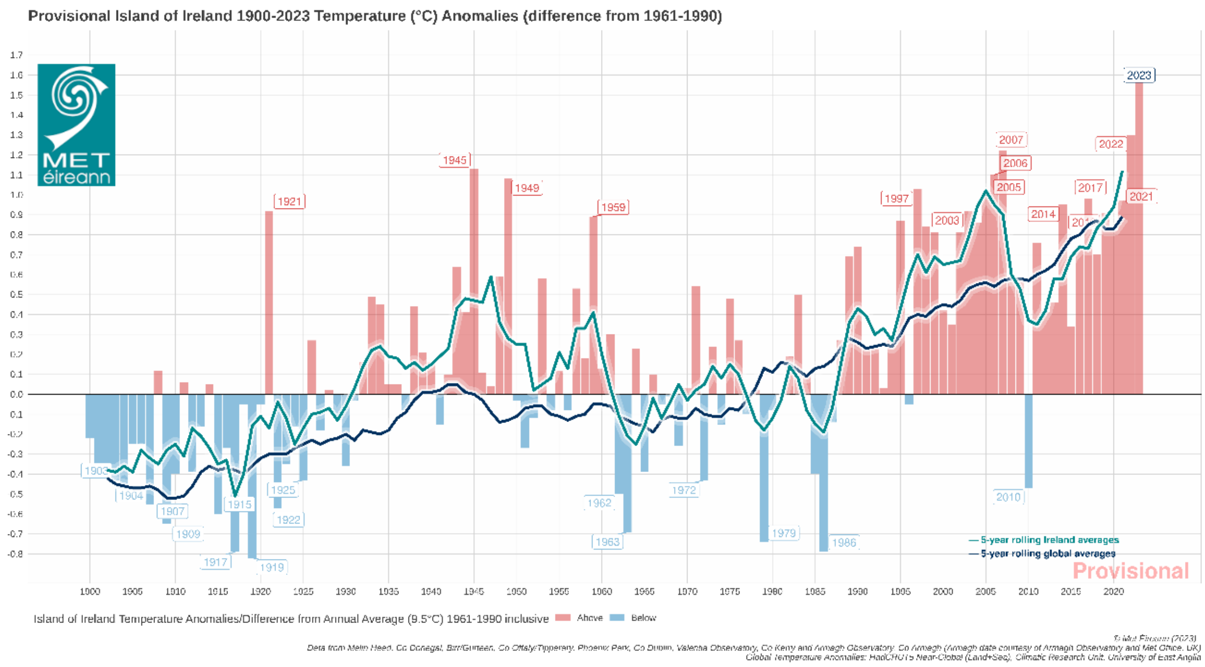
In May 2025, the EPA released the report *Ireland's Greenhouse Gas Emissions Projections 2024-2055* (EPA, 2025b), which includes total projected emissions and a breakdown of projected emissions per sector under the 'With Existing Measures' and 'With Additional Measures' scenarios. The EPA projections indicate that currently implemented measures (With Existing Measures) will achieve a reduction of 10% on 2005 levels by 2030, significantly short of the 42% reduction target. If measures in the higher ambition (With Additional Measures) scenario are implemented, EPA projections show that Ireland can achieve a reduction of 22% by 2030, still short of the 42% reduction target.

14.3.5.3Current CCRA Baseline

The region of the proposed project has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Dublin Airport is the nearest representative weather and climate monitoring station to the proposed project with meteorological data recorded for the 30-year period from 1991 to 2020. The historical regional weather data for Dublin Airport metrological station is representative of the current climate in the region of the proposed project. The data for the 30-year period from 1991 to 2020 indicates that the wettest months at Dublin Airport Metrological Station were October and November, and the driest month on average was March (Met Éireann, 2024a). July was the warmest month with a mean temperature of 15.4 Celsius. January was the coldest month with a mean temperature of 5.2 Celsius.

Met Éireann's 2023 *Climate Statement* (Met Éireann 2024b) states 2023's average shaded air temperature in Ireland is provisionally 11.20 °C, which is 1.65°C above the 1961-1990 long-term average. Previous to this 2022 was the warmest year on record, however 2023 was 0.38 °C warmer. 2023 also had above average rainfall, the warmest June on record and the wettest March and July on record. Record high sea surface temperatures (SST) were recorded since April 2023 which included a severe marine heatwave to the west of Ireland during June 2023. This marine heatwave contributed to the record rainfall in July.

Figure 14.3: 1900-2023 Temperature (°C) Temperature Anomalies (differences from 1961-1990)



2023 also had above average rainfall, this included the warmest June on record and the wettest March and July on record. Record high sea surface temperatures (SST) were recorded since April 2023 which included a severe marine heatwave to the west of Ireland during the June 2023. This marine heatwave contributed to the record rainfall in July.

Recent weather patterns and records of extreme weather events recorded by Met Éireann have been reviewed. Considering the extraordinary 2023 data, Met Éireann states that the latest Irish climate change projections indicate further warming in the future, including warmer winters. The record temperatures means the likelihood of extreme weather events occurring has increased. This will result in longer dry periods and heavy rainfall events. Storm surges and coastal flooding due to sea level rise. Compound events, where coastal surges and extreme rainfall events occur simultaneously will also increase. Met Éireann has high confidence in maximum rainfall rates increasing but not in how the frequency or intensity of storms will change with climate change.

14.3.5.4Future CCRA 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 is needed with respect to this 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 has 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, 2021b):

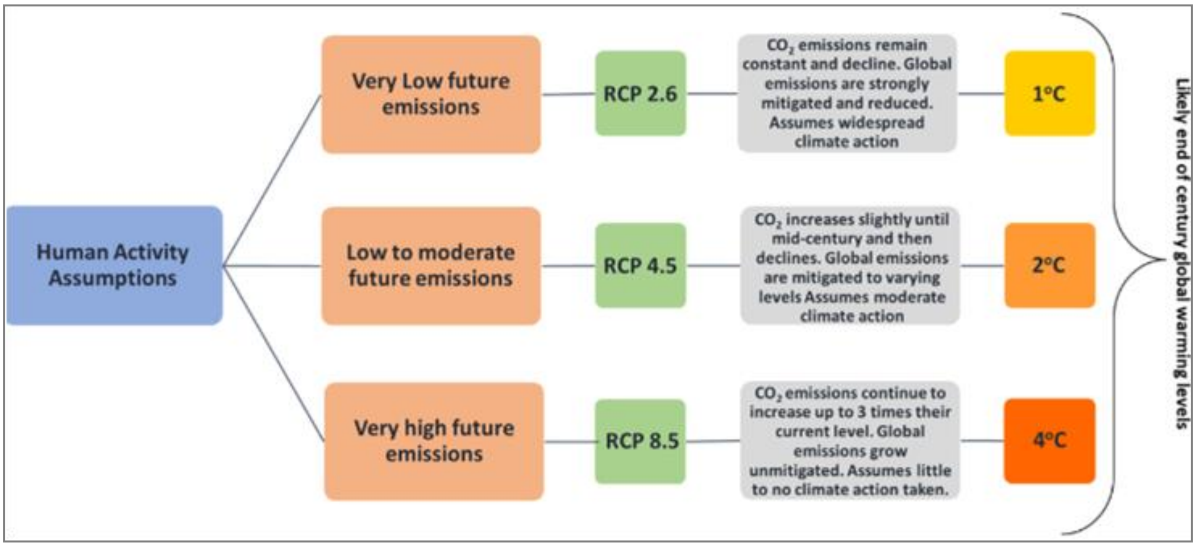
- More intense storms and rainfall events;
- Increased likelihood and magnitude of river and coastal flooding;
- Water shortages in summer in the east;

- Adverse impacts on water quality; and
- Changes in distribution of plant and animal species.

TII's Guidance document PE-ENV-01104 (TII 2022a) states that for future climate change a 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.

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, 2023b) 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 14.4.

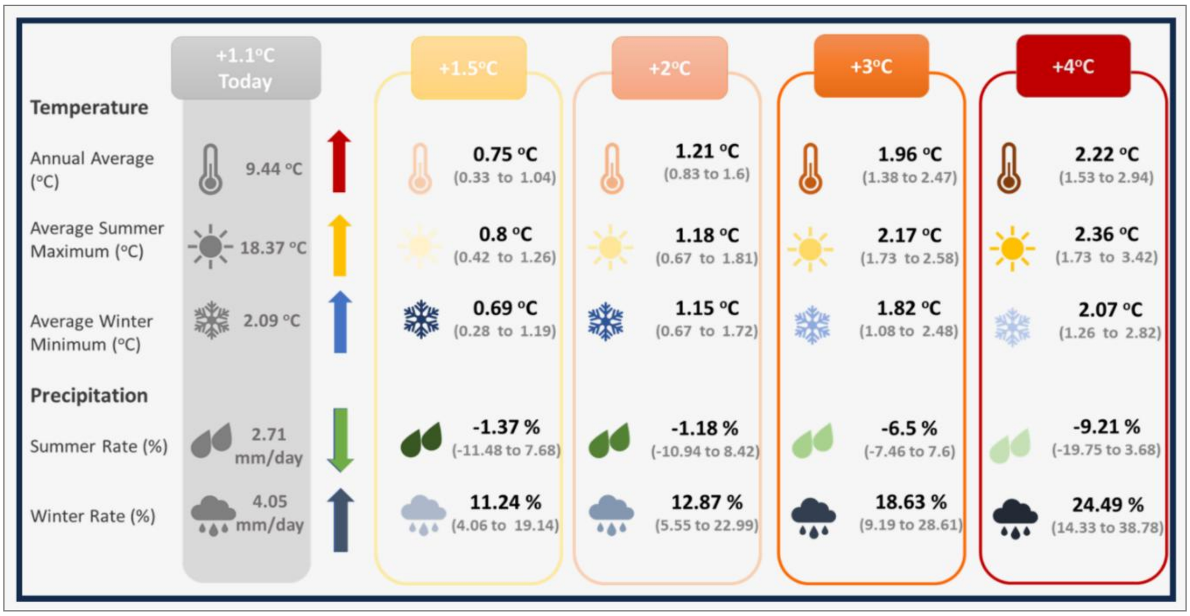
Figure 14.4: Representative Concentration Pathways associated emission levels from TRANSLATE project storymap (Met Éireann, 2023b)



TRANSLATE (Met Éireann, 2023b) 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 (SSTs) (Met Éireann, 2023b). 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% (see Figure 14.5). 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.

Figure 14.5: Change of climate variables for Ireland for different Global warming thresholds (Met Éireann 2023b)



The TRANSLATE research report (Met Éireann 2024d) 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.

In January 2024 the EPA published Ireland's *Climate Change Assessment Synthesis Report* (EPA, 2024e) which contained four volumes:

- Volume 1: Climate Science: Ireland in a Changing World
- Volume 2: Achieving Climate Neutrality by 2050
- Volume 3: Being Prepared for Ireland's Future Climate
- Volume 4: Realising the Benefits of Transition and Transformation

This report reinforces the existing and future risks arising from climate change. Volume 1 (EPA, 2024e) states that under Early action, the temperature increase averaged across the island of Ireland relative to the recent past (1976 to 2005) would reach 0.91°C (0.44 to 1.10°C) by mid-century before falling back to 0.80°C (0.34 to 1.07°C) at the end of the century. Whereas under Late action, by the end of the century it is projected that the temperature increases could be 2.77°C (2.02 to 3.49°C). Heat extremes will become more frequent and more severe and cold extremes will become less frequent and less severe with further warming.

Precipitation was 7% higher over the period 1991 to 2020 than over the 1961 to 1990 period. The average future predicted increase in precipitation is <10% in annual mean accumulated. By 2100 projected additional rises in sea level range from 0.32 to 0.6m under early action to 0.63 to 1.01m under late action scenarios, with greater storm surges potentially effecting critical infrastructure along the coastline. Projections of changes in storminess are highly uncertain and translate into large uncertainties in future frequency and intensity of extreme waves.

Volume 3 (EPA, 2024e) discusses how water supplies will face growing pressures resulting in increased water demand and how options need to be developed, including potential new sources. The report states the key role of critical infrastructure for delivering public services, economic development and a sustainable environment. These are exposed to a range of climate extremes. Failures in critical infrastructure can cascade across other sectors and present a multi-sector risk due to climate change.

The report references the EPA's *Critical Infrastructure Vulnerability to Climate Change* report (EPA, 2021a) as the most substantial research project in Ireland to date on climate change and critical infrastructure which assesses the future performance of Ireland's critical infrastructure when climate is considered. The Critical Infrastructure Vulnerability to Climate Change report states with respect to water availability and quality, that flood risk and heatwaves have a medium vulnerability index and the underground supply network has a high vulnerability to snowstorms and cold spells. However, while the vulnerability is high, the exposure is likely to reduce due to future climate change resulting in less cold weather events. The risk assessment highlights the co-dependence of the water sector to the energy sector, and how vulnerability in the energy sector may have cascading impacts.

Volume 4 (EPA, 2024e) calls for system change, including a transformation of urban settings. Stating that meaningful urban transformation can create a better living environment while simultaneously reducing emissions.

The Kilkenny Climate Risk Assessment, prepared as part of the Kilkenny County Council Climate Action Plan 2024 – 2029 (KCC, 2024), identified river flooding, extreme precipitation and drought as the most significant risks to the delivery of the Kilkenny County Council services. Figure 14.6 shows the predicted frequency for climate change hazards on KCC assets.

Figure 14.6: Future Projected Impacts of Climate Events on Kilkenny County Council (KCC, 2024)

Future Impacts – Hazard Type	Projected Frequency	Projected Frequency (Score)	Asset Damage	Health and Wellbeing	Environment	Social	Financial	Reputation	Cultural Heritage	Projected Impact
River Flood	Frequent	4	Major	Major	Moderate	Moderate	Major	Moderate	Major	3.57
Drought	Frequent	4	Moderate	Major	Major	Moderate	Moderate	Moderate	Negligible	3.00
Severe windstorm	Frequent	4	Moderate	Major	Major	Minor	Minor	Negligible	Moderate	2.71
Pluvial flood	Frequent	4	Moderate	Minor	Moderate	Minor	Minor	Minor	Moderate	2.43
Extreme precipitation	Very Frequent	5	Moderate	Minor	Moderate	Minor	Minor	Minor	Moderate	2.43
Heatwave	Frequent	4	Minor	Moderate	Major	Minor	Negligible	Negligible	Moderate	2.29
Above average precipitation	Common	3	Moderate	Minor	Minor	Minor	Negligible	Negligible	Moderate	2.00
Above average surface temperature	Frequent	4	Negligible	Negligible	Catastrophic	Minor	Negligible	Negligible	Moderate	2.00
Cold spell	Occasional	2	Minor	Minor	Negligible	Minor	Minor	Negligible	Minor	1.71
Heavy snowfall	Occasional	2	Minor	Minor	Minor	Negligible	Minor	Negligible	Minor	1.71
Increase in Relative Sea Level	Occasional	2	Negligible	Negligible	Minor	Negligible	Negligible	Negligible	Minor	1.29
Groundwater flood	Occasional	2	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	1.00

14.3.6 Potential Effects

14.3.6.1Do Nothing Scenario

With respect to climate, the Do Nothing scenario will not assist the CAP25 goal of delivering 80% of the national grid electricity by renewable sources and 9 GW of onshore wind capacity by 2030. Producing 80% renewables for the grid will reduce emissions from electricity, and will also allow electrification of other sectors such as transport and heat and reduce emissions in these sectors too. Therefore, the do-nothing effect is a lost opportunity for a beneficial effect on climate emissions in the long term.

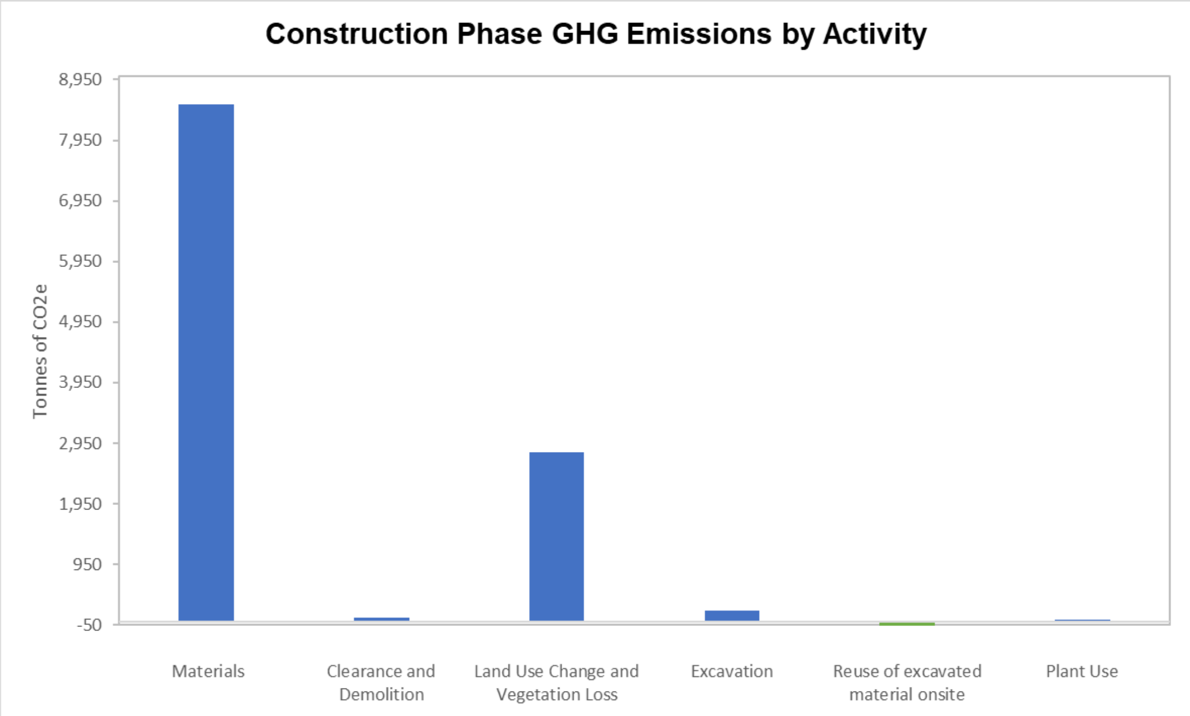
14.3.6.2GHG Assessment

14.3.6.2.1 Construction Phase

The most significant proportion of GHG emissions are anticipated to occur during the construction phase as a result of embodied carbon in construction materials and emissions from construction activities. Figure 14.7 shows the GHG emissions for the proposed project per construction activity.

The GHG assessment has highlighted the areas where the highest embodied carbon emissions occur, specifically as a result of building materials. Construction materials make up the majority of GHG emissions for the proposed project making up approximately 74% of the total construction phase GHG emissions. Removal of forest as part of site clearance makes up the second highest contribution at 24% of the total and material transport and construction activities make up the remainder of the construction GHG emissions.

Figure 14.7: Construction Phase Greenhouse Gas Emissions by Activity



It has been calculated that the total construction phase GHG emissions will be 11,553 tonnes CO_2e (see Table 14.17). The GHG emissions from the development as a total cannot be compared against one specific sector 2030 carbon budget, the emissions are broken down into different assessment categories and these must be compared separately to the relevant sectoral emissions budget which are detailed in Table 14.17 and Table 14.18. The relevant sectoral emissions for the proposed project comparison include the Industry sector, Transport sector and Waste sector. The predicted emissions for the proposed project are annualised over the assumed 35 year lifespan and then compared to the relevant sector 2030 carbon budgets. Annualising the full carbon emissions over the lifetime of the development allows for appropriate comparison with annual GHG targets.

Table 14.17: Construction Phase GHG Emissions

GHG Assessment Category	Elements Considered	Predicted GHG Emissions (tCO_2e)	Predicted GHG Emissions as % of Construction Phase Total	Relevant Sector for Carbon Budget Comparison
Materials	Aggregates and other fill material, plastic pipework and cabling, concrete, road pavement materials (e.g. asphalt), steel, geotextiles, timber	8,534	74%	Industry
Clearance and Demolition	Site preparation and clearance	65	1%	Industry
Land Use Change and Vegetation Loss	Removal of bog and mixed forest	2,792	24%	LULUCF
Excavation	Rock, topsoil and other excavation	192	2%	Industry
	Reuse of excavated material onsite	-73	-1%	Industry
Plant Use	Fuel usage by plant operation (diesel generators)	44	0.4%	Electricity
Total Construction Phase GHG Emissions		11,553		

The predicted GHG emissions (as shown in Table 14.17) can be averaged over the full lifespan of the proposed project to give the predicted annual emissions to allow for direct comparison with national annual emissions and targets.

In Table 14.18, GHG emissions have been compared against the carbon budget for the industry, transport and waste sectors in 2030 (Government of Ireland, 2025), against Ireland's total GHG emissions in 2024 and against Ireland's EU 2030 target of a 42% reduction in non-ETS sector emissions based on 2005 levels (20.1 Mt CO_2e) (set out in Regulation EU 2018/842 of the European Parliament and of the Council).

The estimated total GHG emissions, when annualised over the 35-year proposed project lifespan, are equivalent to 0.001% of Ireland's total GHG emissions in 2024 and 0.002% of Ireland's non-ETS 2030 emissions target. The estimated GHG emissions associated with transport-related activities are 0.0001% of the 2030 Transport budget and industry-related activities are 0.01% of the 2030 Industry budget.

Table 14.18: Estimated Construction Phase GHG Emissions Relative to Sectoral Budgets and GHG Baseline

Target/Sectoral Budget (tCO_2e)		Annualised Development GHG Emissions (tCO_2e)		% of Relevant Target/Budget
Ireland's 2024 Total GHG Emissions (existing baseline)	57,640,000	Total GHG Emissions	332	0.001%
Non-ETS 2030 Target	20,074,313	Total GHG Emissions		0.002%
2030 Sectoral Budget (Industry Sector)	4,000,000	Total Industry Emissions	8,718	0.01%
2030 Sectoral Budget (Electricity Sector)	3,000,000	Total Electricity Emissions	1	0.00004%

14.3.6.2.2 Operational Phase

During the operational phase there will be no significant GHG emissions from the operation of the wind turbines. The estimated 72 MW from the turbines will generate 227,059 MWh of renewable energy annually, assuming a 36% capacity factor.

In order to demonstrate the beneficial impact of this renewable energy, which will have zero GHG emissions, the GHG emissions produced by a typical fossil fuel plant generating the equivalent amount of energy (based on the carbon intensity of electricity generation in Ireland (SEAI, 2024)) has been calculated. The GHG emissions associated with a fossil fuel plant generating 227,059 MWh of energy will include emissions of CO_2, nitrous oxide (N_2O) and methane (CH_4). The CO_2 equivalent emissions of N_2O and CH_4 have been calculated using the global warm potentials in 6th Assessment Report IPCC Guidelines.

The most recent (2025) figure for carbon intensity of electricity generation in Ireland is 226.3 gCO_2e/kWh (SEAI, 2025). Using this carbon intensity and the IPPC emission rates for N_2O and CH_4 the total annual GHG emission savings of the proposed project will amount to approximately 52,606 tonnes of CO_2e when the GHG emissions from the construction phase (as outlined in Section 14.3.6.2.1) are offset. The turbine manufacture has not been removed from this figure as it will vary depending on the turbine type. However, as detailed in Section 14.3.3.1.1.2, the payback period with respect to carbon for the manufacture of the turbines is, at worst, 6.5 months.

The estimated total GHG emissions savings, when annualised over the 35-year proposed project lifespan, are equivalent to 0.1% of Ireland's total GHG emissions in 2023 (and 0.7% of GHG emissions from fossil fuel energy production), 1.8% of the total carbon budget for the electricity sector in 2030 and 0.4% of Ireland's ETS 2030 emissions target (Government of Ireland, 2025) i.e. the proposed project has the potential to reduce Ireland's CO_2e emissions by these percentages.

Table 14.19: Estimated Operational Phase Project GHG Savings

Development Emissions & Savings	tonnes CO_2e	Baseline / Relevant Target	tonnes CO_2e	% of Baseline / Relevant Target
Annual Equivalent GHG Emissions from Power Plant Producing 221 GWh	52,938			
Annualised GHG Emissions due to Construction Phase (averaged over lifespan)	332			
Total Annual Savings Due to the proposed project (averaged over lifespan)	52,606	Ireland's Total GHG Emissions 2023 (existing baseline)	60,620,000	0.1%
		Ireland's GHG Emissions from Fossil Fuel Energy Production 2023 (existing baseline)	7,845,320	0.7%
		ETS 2030 Target (42% of 2005 ETS Level)	12,953,240	0.4%
		2030 Sectoral Budget (Electricity Sector)	3,000,000	1.8%

The proposed project will assist in the CAP25 goal of producing 80% electricity from renewables for the grid and 9 GW of onshore wind capacity, which is one of the Key Targets identified in Section 11 of CAP25. The proposed project will constitute up to 0.02 GW annually of that capacity and will abate Ireland's greenhouse gas emissions by approximately 52.6 Mt CO2e for every year of operation.

14.3.6.2.3 Decommissioning Stage

Vehicles related to the decommissioning phase will give rise to CO_2 emissions. It is not predicted that this development will involve the use of a significant number of vehicles during the decommissioning phase. Therefore, emissions from vehicular traffic are predicted to be imperceptible as a result of the decommissioning.

In the decommissioning phase, the turbines are dismantled and the site is remediated to the agreed state. End-of-life recycling of metals will be carried out at the wind farm in order to reduce the climate impact as per the lifecycle assessments for the chosen wind turbine manufacturer. Metal components that are primarily mono-material (e.g. gears, transformers, tower sections, etc.) are assumed to be 98% recycled. It is expected that the reinforced concrete foundation bases will remain in-situ. Decommissioning has been considered as part of the lifecycle assessments and payback periods for the turbines completed by the manufacturer (see Section 14.3.6.2.2).

14.3.6.2.4 GHGA Significance of Effects

The TII guidance states that the following two factors should be considered when determining significance:

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

The level of mitigation described in Section 14.3.7 has therefore been taken into account when determining the significance of the proposed project's GHG emissions. In addition, the IEMA GHG guidance (2022) states that a project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect. Where the fundamental reason for a proposed project is to combat climate change (e.g. a wind farm or carbon capture and storage project) and this beneficial effect drives the project need, then it is likely to be significant.

As the project is a windfarm development it directly aligns with Ireland's net zero trajectory by 2050 and the CAP25 goal of producing 80% renewable electricity. Additionally, the production of renewable electricity will offset the GHG emissions produced during the construction of the project within the first year of its operation. According to the TII significance criteria described in Section 14.3.3.1.4 the significance of the GHG emissions during the construction, operational and decommissioning phases is beneficial as the net project GHG emissions will be below zero (i.e. the renewable electricity will offset GHG emissions once operational) and the project is aligned with the 2050 net zero trajectory.

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

14.3.6.3Climate Change Risk Assessment

14.3.6.3.1 Construction & Decommissioning Phase

A detailed CCRA of the construction and decommissioning phase has been scoped out, as discussed in Section 14.3.3.2. However, consideration has been given to the proposed project's vulnerability to the following climate change hazards with best practice mitigation measures proposed in Section 14.2.5.4:

- 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; and
- Major Storm Damage – including wind damage.

14.3.6.3.2 Operational Phase

In order to determine the vulnerability of the proposed project to climate change the sensitivity and exposure of the development to various climate hazards must first be determined. The following climate hazards have been considered in the context of the proposed project: flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning, hail, landslides and fog.

The sensitivity of the proposed project to the above climate hazards is assessed irrespective of the project location. The sensitivity of the proposed project assets has been established on a scale of high (3), medium (2) and low (1). Once the sensitivity has been established the exposure of the proposed project to each of the climate hazards is determined, this is the likelihood of the climate hazard occurring at the project location and is also scored on a scale of high (3), medium (2) and low (1). The product of the sensitivity and exposure is then used to determine the overall vulnerability of the proposed project to each of the climate hazards. The results of the vulnerability assessment are detailed Table 14.20.

Table 14.20: Climate Change Vulnerability Assessment

Proposed Project Assets	Vulnerability to Climate Hazards								
	Flooding (Pluvial/ Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Wildfire	Lightning & Hail	Fog	Land-slides
Drainage	1	1	1	1	1	1	1	1	1
Grid Connection	1	1	1	1	1	1	1	1	1
Buildings	1	1	1	1	1	1	1	1	1
Access Roads	1	1	1	1	1	1	1	1	1
Turbines	1	1	1	1	1	1	1	1	1

The sensitivity and exposure of the area was determined with reference to a number of online tools. It was concluded that, with design and management mitigation in place, the proposed project does not have any significant vulnerabilities to the identified climate hazards as described in the below sections.

The turbines will be designed to the appropriate standards (e.g. 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.

Flooding

A Flood Risk Assessment (FRA) for the proposed project was undertaken. The FRA concluded that the site is at minimal risk of fluvial and pluvial flooding, and not at risk of coastal or groundwater flooding.

In terms of fluvial flooding, several turbines are within flood extents of the Smithstown and Smartcastle Streams. However, these turbines are estimated to have a freeboard (the minimum vertical distance between the highest expected water level and the lowest point of a structure's floor, usually ground level) of 2 m. Additionally, channel capacity calculations showed that both the Smithstown and Smartcastle Streams have capacity to covey the 1 in 1000-year (0.1% Annual Exceedance Probability (AEP)) High-End Future Scenario (HEFS) flood event without bursting it banks and therefore there is very little risk to the proposed turbines in the vicinity of the streams.

There is the potential for pluvial flooding on proposed wind farm site due to increased rainfall. However, management measures have been incorporated into the design of the project to reduce the risk of pluvial flooding. The drainage design for the proposed project has been adequately designed with an additional 20% climate change allowance. This additional 20% accounts for the medium risk Representative Concentration Pathway (RCP) 4.5 future scenario, allowing an additional 30% would account for the high risk RCP8.5 future scenario. Therefore, the exposure of the project is considered as 'medium' for flood risk. However, the FRA has indicated that the overall risk to the proposed project as a result of surface water flooding is low with the appropriate design mitigations in place (see SSFRA for full details).

Overall, it can be concluded that the proposed project has a worst-case low vulnerability due to potential future flooding.

Extreme Wind, Fog, Lightning & Hail

In relation to extreme winds, the turbines and overhead lines shall be designed to the appropriate standards to account for the relevant wind loadings. Auto shut off technology is installed within the turbines if wind speed is too high and has the potential to damage the turbines. With future climate change storms are likely to become more extreme, with storms in RCP8.5 likely to be even more extreme than in RCP4.5. Given the nature of their use, the turbines are designed to be placed in high wind environments and therefore significant research has gone into their ability to withstand extreme wind loadings. The grid connection cable will be buried underground so protected from extreme winds.

Due to their nature, wind turbines attract lightning strikes and are therefore designed with this in mind and protection has been built in. 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.

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

Wildfires

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 Kilkenny 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, land clearance activities will be conducted as required (see Chapter 2 (Description of the Proposed Project) and Chapter 8 (Land, Soils and Geology) for more detail) on proposed wind farm site which will remove materials with a high potential for fire creating a buffer and fire breaks in the proximity of turbines. 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 proposed wind farm site. it can be concluded that the proposed project is of low vulnerability to wildfires.

Landslides

Landslide susceptibility mapping developed by Geological Survey Ireland (GSI, 2024) indicates that the proposed project location is within areas of low to moderately high susceptibility to landslides. However, there is no history of landslides within the proposed wind farm site boundary (GSI, 2024). The risk of landslide may become more pronounced with climate change in both RCP4.5 and RCP8.5 due to heavy rain fall and drought cycles which can increase the likelihood of a landslide. However, these risks have been taken into consideration within the design (see Chapter 8 (Land, Soils and Geology) for more detail) and have been accounted for with the foundation design and turbine location choices. The proposed wind farm site is therefore of low vulnerability to landslides.

Extreme Temperatures (Heat & Cold)

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. 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.

When considering the sensitivity of the proposed project to extreme temperatures, both hot and cold conditions, a range of -10 to +35 degrees Celsius has been considered. This temperature range is in line with projections made by Met Eireann. The design team have confirmed that with respect to the operational phase the materials required will not be significantly impacted by fluctuations within this range. High quality, durable building materials will be selected for the proposed project which reduces their sensitivity, including 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. This also applies to the materials required for the overhead lines.

Access roads have the potential to have some limited impacts during heat waves as damage to pavement, e.g. softening, traffic-related rutting, migration of liquid asphalt, roadway buckling, is known to occur at approximately 32 degrees Celsius. Operational site management will ensure that in the event of extreme heat wave events internal roads are not damaged by vehicles driving on them during road softening events. This will ensure the sensitivity of the asset is minimised to low.

The grid connection cable will be buried underground so protected from extreme temperatures by the thermal mass of the ground.

Heightened temperatures have the potential to strain the cooling systems within the substation. However, the cooling systems will be designed to accommodate temperature 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.

Summary

Overall, the proposed project has at most low vulnerabilities to the identified climate hazards and therefore no detailed risk assessment is required.

14.3.6.3.3 CCRA Significance of Effects

As per TII guidance (TII, 2022), the significance of effect has been determined with design mitigation taken into consideration. There are no significant risks to the proposed project as a result of climate change. In accordance with the EPA EIAR Guidelines (2022), the significance of effect as a result of climate change is direct, long-term, negative and imperceptible. This is overall not significant.

14.3.7 Mitigation Measures

14.3.7.1GHGA

14.3.7.1.1 Construction Phase

Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. Best practice measures to reduce the embodied carbon of the construction works will be implemented:

- Appointing a suitably competent contractor who will undertake waste audits detailing resource recovery best practice and identify materials can be reused/recycled;
- The use in construction plant and equipment of sustainably sourced Hydrotreated Vegetable Oil (HVO) as a 100% replacement of fossil fuels. HVO use is considered a stepping stone towards the use of electric construction plant as they become available in the market;
- The replacement, where feasible, of standard concrete containing Portland cement concrete with an alternative concrete mix with lower associated embodied carbon, as per the Climate Action Plan. This will be a minimum of 30% GGBS replacement, or concrete with equivalent or lower associated embodied carbon ;
- Procurement contracts will ensure that material choices with lower associated embodied carbon relative to standard construction materials are considered favourable during tender;
- Materials will be reused on site where possible;
- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods;
- Ensure all plant and machinery are 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;
- Where practicable, opportunities for materials reuse will be incorporated within the extent of the proposed project including the use of reclaimed asphalt and recycled aggregate, which will reduce the virgin material needs; and
- Sourcing materials locally where possible, such as local quarries for aggregates required on site (see Chapter 2 (Description of Proposed Project), to reduce transport related CO_2 emissions.

14.3.7.1.2 Operational Phase

During the operational phase of the proposed project, the works onsite will be limited to maintenance associated with the wind farm components. Although the intensity of activity will be only a small fraction of the construction phase, all employees and contractors that are on site will ensure that machinery used is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic. No other mitigation is proposed.

14.3.7.2CCRA

14.3.7.2.1 Embedded Mitigation

A number of measures have been adopted as part of the project design, primarily in terms of reducing risk to the project from climate change hazards. These have been discussed in detail previously in Section 14.3.6.3, and are summarised as follows:

- The drainage design for the proposed project has been adequately designed with an additional 20% climate change allowance;
- Lightning protection for the turbines will be provided for, following relevant standards;
- The turbines shall be designed to the appropriate standards to account for the high wind loadings; and
- High quality, durable building materials will be selected for the proposed project to reduce their sensitivity to extreme temperatures.

However, a project's climate resilience benefits from review of climate hazards and management of their impacts during the detailed design, construction and operation. The proposed project will be constructed having taken the most up to date Eurocodes, design practices and climate data into account prior to maximise resilience of the project against climate change hazards.

In terms of impact on the proposed project due to climate change, during construction the Contractor will 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 and the Contractor will ensure that these are complied with. Temperatures can affect the performance of some materials, and this will require consideration during construction. During construction, the Contractor will mitigate against the effects of fog, lighting and hail through site risk assessments and method statements.

14.3.8 Residual Effects

The proposed project will result in GHG emissions during the construction phase, however the proposed project will minimise its impacts through design and management measures (see Section 14.3.7). TII reference the IEMA guidance (2022) which states 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 by 2050".

The purpose of the proposed project is to assist with the development of renewable wind energy in Ireland. Renewable energy is a key component of the National Climate Objective of achieving net zero by 2050 detailed within the 2015 Climate Act (as amended). Once mitigation measures are put in place, the effect of the proposed project in relation to GHG emissions is considered direct, long-term, positive and slight. Guidance ((TII, 2022), see Table 14.14) 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 EIAR Guidance (2022), which sets different criteria, the impact to climate can be described as direct, long-term, positive and slight, which is not significant in EIA terms (EPA 2022).

In relation to climate change vulnerability, it has been assessed that there are no significant risks to the proposed project as a result of climate change. The residual effect of climate change on the proposed project is considered direct, long-term, negative and imperceptible, which is overall not significant in EIA terms.

14.3.9 Cumulative Effects

With respect to the requirement for a cumulative assessment the IEMA (2022) and TII (2022a) guidance on which the assessment is based states that

"the identified receptor for the 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. 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. This assessment approach is considered to be inherently cumulative".

As per the above, the cumulative impact of the proposed project in relation to GHG emissions is considered direct, long-term, positive and slight, which is overall not significant in EIA terms.

14.3.10 Conclusion

This chapter of the EIAR has assessed the potential environmental effects on climate, focusing on:

- The potential greenhouse gas emissions during the construction and operational phases of the project.
- The offsetting of GHG emissions through renewable electricity generation, which will contribute to reducing Ireland's reliance on fossil fuels.
- The vulnerability of the project to climate change, including considerations for increased rainfall and other projected climate impacts.
- The long-term benefits of the project in helping Ireland achieve its Climate Action Plan targets and the National Climate Objective of Net Zero by 2050.

The following table summarises the identified likely significant residual effects during the construction phase of the proposed development following the application of mitigation measures.

Table 14.21: Summary of Effects Post Mitigation

Likely Significant Effect in accordance with EPA Terminology	Quality	Significance	Extent	Probability	Duration	Type
GHG emissions and savings from construction and operational	Positive	Slight - Not significant	National	Likely	Long-term	Direct
Climate change and related vulnerability of the proposed development	Negative	Imperceptible - Not significant	Local	Likely	Long-term	Direct

14.3.10.1 Greenhouse Gas Assessment

The impact of GHG emissions during the construction, operational and decommissioning phases on climate was assessed in line with TII guidance PE-ENV-01104 (TII, 2022) and IEMA 2022 GHG Guidance (IEMA, 2022), which states that the significance of the impact of GHG emissions was based on the proposed project's net impact over its lifetime.

The GHG assessment considered the GHG emissions arising from embodied carbon in materials, material transportation, water usage, fuel usage, site excavation, waste disposal, and the carbon savings from the operation of the proposed project.

The estimated output of 72 MW from the proposed project will generate 0.23 GWh annually, which will amount to annual GHG emission savings of approximately 53,423 CO_2eq at the 2024 carbon intensity, which is equivalent to 1.8% of the total carbon budget for the operational sector in 2030 (Government of Ireland, 2025).

The proposed project will significantly assist in the CAP25 goal of producing up to 80% renewables for the grid and the key actions of installing at least 9 GW of onshore wind energy. CAP25 states that "rapid and significant reductions in GHG emissions are required if we are to meet the 2015 Paris Agreement Goals". The proposed project, through its GHG emissions savings potential, will make a significant contribution both annually and over its lifetime to Ireland meeting its legal obligations under EU climate law to achieve the net carbon zero target for 2050. Additionally, Ireland's carbon budget for electricity between 2026 and 2030 of 20 Mt CO_2eq total cannot be achieved unless there is early delivery of a significant volume of the installed onshore wind capacity targets required by CAP25. The proposed project should therefore be considered an essential installation in aiding Ireland's legal climate compliance and combatting the national climate emergency.

The impact of GHG emissions from the proposed project aligns with Ireland's GHG trajectory to net zero by 2050. This is therefore considered a "beneficial" effect according to PE-ENV-01104 (TII 2022a), where a *"project's net GHG impacts are below zero and cause a reduction in atmosphere GHG concentration, the project has gone well beyond existing and emerging policy requirements and is well 'ahead of the curve' for Ireland's trajectory towards net zero, and provides a positive climate* *impact"*. This equates to a direct, positive, long-term and slight effect on climate, according to the EPA guidelines (EPA, 2022), which is not significant in EIA terms.

In summary there are no likely significant effects on climate as a result of the construction, operational and decommissioning phases of the proposed project.

14.3.10.2 Climate Change Risk Assessment

The vulnerability of the proposed project to climate change was assessed by the CCRA, in line with TII guidance PE-ENV-01104 (TII, 2022), European Commission *Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021–2027* (European Commission, 2021a) and IEMA guidance *Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2nd Edition)* (IEMA, 2022). This involved an analysis of the sensitivity and exposure of the proposed project to climate hazards which together provide a measure of vulnerability.

Sensitive elements of the proposed project included drainage, access roads, buildings, underground utilities, turbines, foundations, and cables. Climate hazards included flooding (coastal, pluvial or fluvial), extreme temperatures, drought, wind, fog, lightning, waves, and coastal erosion.

Mitigation measures for sensitive elements, such as flood protection and SuDS, wind turbine design and control during high winds and lightning protection measures have been incorporated into the design and the vulnerability analysis of the proposed project.

Having taken these into account, this results in a worst-case low vulnerability to climate change hazards. In accordance with the EPA EIAR Guidelines (2022), and with the design mitigation in place, the significance of effect on the proposed project as a result of climate change are direct, negative, long-term and imperceptible, which is not significant in EIA terms.

In summary there are no likely significant effects on the proposed project as a result of climate change hazards.

14.3.11 References

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