17.0 Climate

17.1 Introduction

This chapter comprises an assessment of the likely effect on climate associated with the proposed wind farm development and Underground Electricity Export Connection (UEEC) in the townlands of Keerglen, Ballinglen and Ballykinlettragh on a site measuring a combined c.81.88 ha. This report provides a baseline assessment of the setting of the proposed development in terms of climate and discusses the likely and significant effects that the construction, operation and decommissioning of the proposed development will have. Where required, appropriate mitigation measures to limit any identified likely significant adverse impacts to climate are recommended.

A full description of the proposed development is presented in Chapter 3.

17.2 Statement of Competence

This chapter was prepared by Ciara Nolan, a Senior Air Quality Consultant with AWN Consulting Ltd. Ciara holds a BSc(Eng) 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). Ciara has over 7 years of experience in the field of air quality consultancy. She has prepared the air quality and climate EIAR chapters for a range of developments including wind energy, industrial, pharmaceutical, data centre, residential and commercial.

17.3 Legislation, Policy and Guidance

17.3.1 Legislation

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act 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 Act as the 'national transition objective'. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2018). 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 Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2020) and a third update in December 2022 (Government of Ireland, 2022). The most recent Climate Action Plan (CAP24) was published in December 2023 (DECC, 2023).

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019, followed by the publication of the Climate Action and Low Carbon Development (Amendment) Bill 2021 (hereafter referred to as the 2021 Climate Bill) in March 2021. The Climate Act was signed into Law on the 23rd of 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 will also "*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy*". The 2021 Climate Act defines the carbon budget as "*the total amount of greenhouse gas emissions that are permitted during the budget period*".

In relation to carbon budgets, the 2021 Climate Action and Low Carbon Development (Amendment) Act 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 Table 17.1. 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 17.2. Electricity has a 75% reduction requirement and a 2030 emission ceiling of 3 Mt CO_2e.

Table 17.1: 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 17.2: 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**

17.3.2 Policy

In December 2023, CAP24 was published (DECC, 2023). This is the second CAP since the publication of the carbon budgets and sectoral emissions ceilings and builds on the progress of CAP23, and it aims to implement the required changes to achieve a 51% reduction in carbon emissions by 2030 and 2050 net zero goal. The CAP has six vital high impact sectors where the biggest savings can be made: renewable energy, energy efficiency of buildings, transport, sustainable farming, sustainable business

and change of land-use. CAP24 states that the decarbonisation of Ireland's manufacturing industry is key for Ireland's economy and future competitiveness. There is a target to reduce the embodied carbon in construction materials by 10% for materials produced and used in Ireland by 2025 and by at least 30% for materials produced and used in Ireland by 2030. CAP24 states that these reductions can be brought about by product substitution for construction materials and reduction of clinker content in cement. Cement and other high embodied carbon construction elements can be reduced by the adoption of the methods set out in the Construction Industry Federation 2021 report Modern Methods of Construction. In order to ensure economic growth can continue alongside a reduction in emissions, the IDA Ireland will also seek to attract businesses to invest in decarbonisation technologies.

As outlined in CAP24 the target for renewables on the national grid is 80% by 2030 which includes 9 gigawatts (GW) of onshore wind energy. This is a key target and action within CAP24.

In April 2023 the Government published a draft *Long-Term Strategy on Greenhouse Gas Emissions Reductions* (Government of Ireland, 2023). 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 strategy will be updated on the basis of a second round of public consultation throughout 2023 with an updated strategy published after this is complete.

The Mayo County Council (Mayo CoCo) Climate Action Plan 2024 – 2029 (Mayo CoCo, 2024) outlines Mayo CoCo's goals to mitigate GHG emissions and plans to prepare for and adapt to climate change. The vision of the Mayo Climate Action Plan is:

"*To create a sustainable and competitive county that supports the health and well-being of the people of Mayo, providing an attractive destination, as a place in which to live, work, invest, do business and visit, offering high quality employment and educational opportunities within strong and vibrant sustainable communities, whilst ensuring a transition to a low carbon and climate resilient county that supports high environmental quality*".

The Mayo 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.

17.3.3 Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on climate are summarised below. The assessment has made reference to 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, 2022a);
- Transport Infrastructure Ireland (TII) GE-ENV-01106: TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document (TII, 2022b);
- 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).

17.4 Methodology

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

- 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; and
- Climate Change Risk Assessment (CCRA) – Identifies the impact of a changing climate on a project and receiving environment. The assessment considers a projects vulnerability to climate change and identifies adaptation measures to increase project resilience.

17.4.1 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 17.5).

17.4.1.1 Construction Phase

17.4.1.1.1 GHG Assessment – TII Carbon Tool

The GHG assessment has been conducted following the TII PE-ENV-01104 guidance (TII, 2022a). PE-ENV-01104 (TII, 2022a) recommends the calculation of the construction stage GHG emissions, including embodied carbon, using the TII Online Carbon Tool (TII, 2022b). 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, 2022b) 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 development 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, 2022b) 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 development, 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 development.

The construction phase of the proposed development will result in GHG emissions from various sources. As part of the proposed development, Construction phase embodied GHG emissions are categorised under the following headings:

- Land clearance activities (i.e. tree felling);
- Transport of excavated material from the site;
- Manufacture of materials and transport to site;
- Construction works (including excavations, construction, water usage, electrical power/fuel usage, personnel travel and project size); and
- Construction waste products (including transport off-site).

Information on the material quantities, site activities, land clearance, waste product and construction traffic were provided by the ABO Energy 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 development.

17.4.1.1.2 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 development 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 with Mayo County Council should permission be granted. As a result, indicative information from various wind turbine manufacturers has been reviewed. The life cycle assessment quantifies the associated power consumption associated with the production, operation, transport and end-of-life of the wind turbines. The assessment also quantifies the associated 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.

17.4.1.2 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 (Table 17.2).

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

17.4.1.3 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, 2022a) outlines a recommended approach for determining the significance of both the construction and operational phases of a development.

The significance of GHG effects set out in PE-ENV-01104 (TII, 2022a) 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, 2022a) 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 17.3 (derived from Table 6.7 of PE-ENV-01104 (TII, 2022a)) 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 17.3: 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 development (TII, 2022a). The approach is based on comparing the net proposed development GHG emissions to the relevant carbon budgets (DECC, 2023). With the publication of the Climate Action Act in 2021 and the Climate Action Plan 2024, sectoral carbon budgets have been published for comparison with the net GHG emissions from the proposed development over its lifespan.

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 17.2.

17.4.2 Climate Change Risk Assessment

The operational phase assessment involves determining the vulnerability of the proposed development 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, 2022a) 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 17.5, future climate change modelling and input from other experts working on the proposed development (i.e. hydrologists) should be 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 is carried out by determining the sensitivity of proposed development assets (i.e. receptors) and their exposure to climate change hazards.

The proposed development asset categories must be assigned a level of sensitivity to climate hazards. PE-ENV-01104 (TII, 2022a) 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.

17.4.2.1 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 development.

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

Vulnerability = Sensitivity x Exposure

The vulnerability assessment takes any proposed mitigation into account. Table 17.4 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale. A risk that is low or medium is classed as non-significant, while a high or extreme risk is classed as a significant risk.

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

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, 2022a) if a detailed CCRA is required.

Table 17.4: Vulnerability Matrix

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

The screening CCRA did not identify any residual medium or high risks to the proposed development as a result of climate change. Therefore a detailed CCRA for the construction phase was scoped out. While a CCRA for the construction phase was not required, best practice mitigation against climate hazards is still recommended in Section 17.9.

17.5 Receiving Environment

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

17.5.1 Current GHGA Baseline

Ireland's GHG emissions in 2022 are estimated to be 60.76 million tonnes carbon dioxide equivalent (Mt CO_2e), which is 1.9% lower (or 1.19 Mt CO_2e) than emissions in 2021 (61.95 Mt CO_2e) and follows a 5.1% increase in emissions reported for 2021 (EPA, 2023). In 2022 emissions in the stationary emissions trading scheme (ETS) sector decreased by 4.3% and emissions under the ESR (Effort Sharing Regulation) decreased by 1.1%. When LULUCF is included, total national emissions decreased by 1.8%. The sector with the highest emissions in 2022 (excluding LULUCF) was agriculture at 38.4% of the total, followed by transport at 19.1%. Decreased emissions in 2022 compared to 2021 were observed in the largest sectors except for transport, waste and commercial services. These 3 sectors showed increases in emissions (6.0%, 4.9% and 0.2% respectively). For 2022, the total national emissions (excluding LULUCF) were estimated to be 68.1 Mt CO_2e as shown in Table 17.5 (EPA, 2023).

Table 17.5: Total National GHG Emissions in 2022				
Sector	**2021 Emissions (Mt CO_2e)**	**2022 Emissions (Mt CO_2e)**	**% Total 2022 (including LULUCF)**	**% Change from 2021 to 2022**
Agriculture	23.626	23.337	34%	-2.1
Transport	10.978	11.634	17%	6.0
Energy Industries	10.262	10.076	15%	-1.8
Residential	6.992	6.105	9%	-12.7
Manufacturing Combustion	4.614	4.288	6%	-7.1
Industrial Processes	2.475	2.289	3%	-7.5
F-Gases	0.745	0.741	1%	-0.5
Commercial Services	0.765	0.767	1%	0.2
Public Services	0.672	0.659	1%	-1.9
Waste Note 2	0.726	0.867	1%	4.9
LULUFC	7.338	7.305	11%	-0.5
National Total excluding LULUFC	**61.955**	**60.764**	**89%**	**-1.9**
National Total including LULUFC	**62.293**	**68.069**	**100%**	**-1.8**

Note 1 Reproduced from Latest emissions data on the EPA website (EPA, 2023)

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

17.5.2 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, 2022a) 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 CAP24, and future CAPs, alongside binding 2030 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.

17.5.3 Current CCRA Baseline

The region of the proposed development has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Belmullet, 35km west of the proposed development. is the nearest, representative, weather and climate monitoring station to the proposed development with meteorological data recorded for the 30-year period from 1991 to 2020. The historical regional weather data for Belmullet Metrological Station is representative of the current climate in the region of the proposed development. The data for the 30-year period from 1991 to 2020 indicates that the wettest months at Belmullet Metrological Station were January, October and November, and the driest month on average was May (Met Éireann, 2024a). August was the warmest month with a mean temperature of 15 Celsius. January was the coldest month with a mean temperature of 6.4 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 (see Figure 17.1).

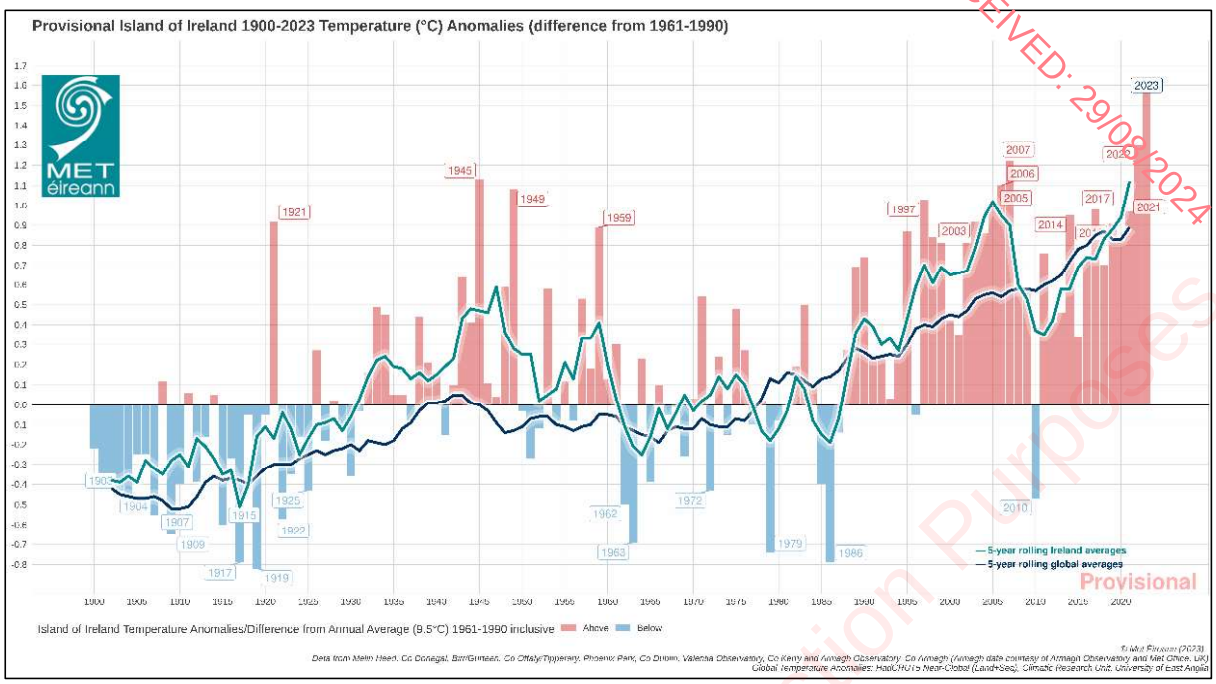


Figure 17.1: 1900-2023 Temperature (°C) Temperature Anomalies (differences from 1961-1990)

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.

17.5.4 Future 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 development.

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 development will be located (EPA, 2021). The EPA have compiled a list of potential adverse impacts as a result of climate change including the following which may be of relevance to the proposed development (EPA, 2021):

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

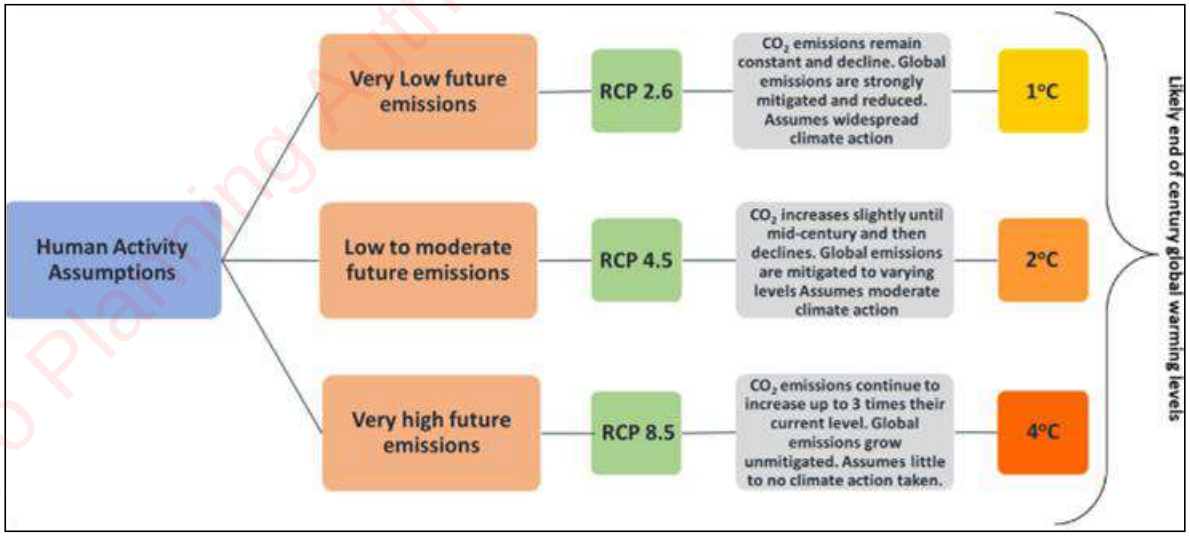
The EPA's State of the Irish Environment Report (Chapter 2: Climate Change) (EPA, 2020b) notes that projections show that full implementation of additional policies and measures, outlined in the 2019 Climate Action Plan, will result in a reduction in Ireland's total GHG emissions by up to 25% by 2030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

TII's Guidance document PE-ENV-01104 (TII, 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.

Future climate predictions undertaken by the EPA have been published in 'Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach (EPA, 2020a). The future climate was simulated under both Representative Concentration Pathway 4.5 (RCP4.5) (medium-low) and RCP8.5 (high) scenarios. This study indicates that by the middle of this century (2041–2060), mid-century mean annual temperatures are projected to increase by 1 to 1.2°C and 1.3 to 1.6°C for the RCP4.5 and RCP8.5 scenarios, respectively, with the largest increases in the east. Warming will be

enhanced at the extremes (i.e. hot days and cold nights), with summer daytime and winter night-time temperatures projected to increase by 1 to 2.4°C. There is a projected substantial decrease of approximately 50%, for the number of frost and ice days. Summer heatwave events are expected to occur more frequently, with the largest increases in the south. In addition, precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events. Climate change also has the potential to impact future energy supply which will rely on renewables such as wind and hydroelectric power. More frequent storms have the potential to damage the communication networks requiring additional investment to create resilience within the network.

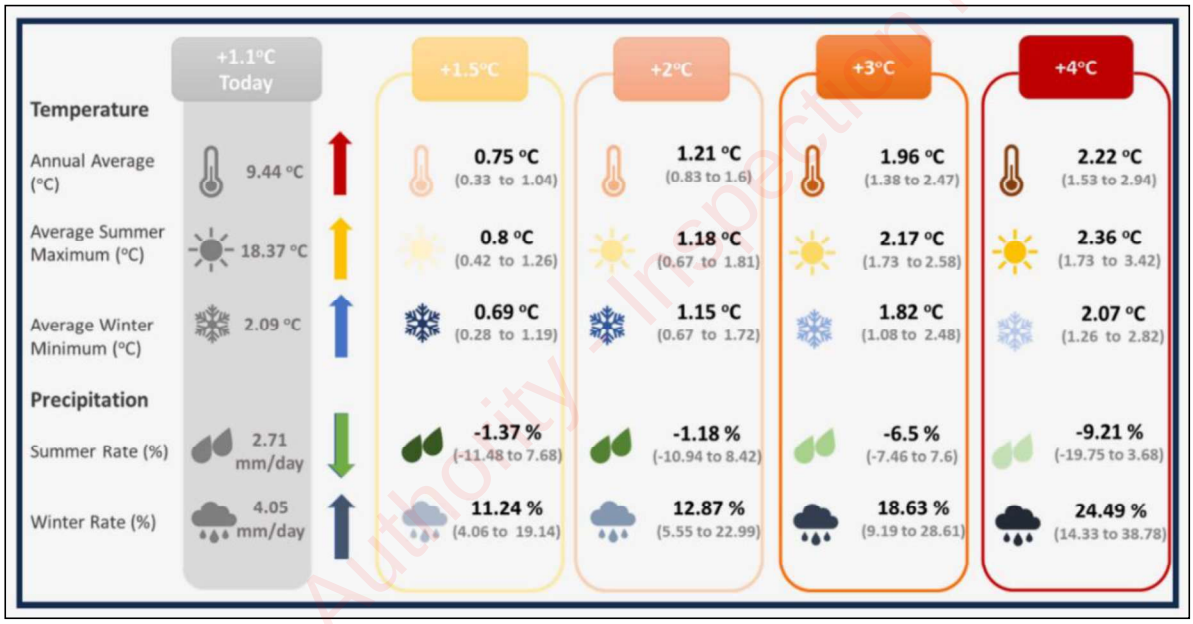
National Framework for Climate Services (NFCS) was founded in June 2022 to streamline the provision of climate services in Ireland and will be led by Met Éireann. The aim of the NFCS is to enable the co-production, delivery and use of accurate, actionable and accessible climate information and tools 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, 2023) 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 17.2.



Source: TRANSLATE Project Story Map (Met Éireann, 2023b)

Figure 17.2: Representative Concentration Pathways Associated Emission Levels

TRANSLATE (Met Éireann, 2023) 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 (see Figure 17.3). Projections broadly agree with previous projections for Ireland. With climate change Ireland's temperature and rainfall will undergo more and more significant changes e.g. on average summer temperature could increase by more than 2°C, summer rainfall could decrease by 9% while winter rainfall could increase by 24%. Future projects also include a 10-fold increase in the frequency of summer nights (values > 15°C) by the end of the century, a decrease in the frequency of cold winter nights and an increase in the number of heatwaves. A heatwave in Ireland is defined as a period of 5 consecutive days where the daily maximum temperature is greater than 25°C.



Source TRANSLATE Project Story Map (Met Éireann, 2023b)

Figure 17.3: Change of Climate Variables for Ireland for Different Global Warming Thresholds

17.6 Characteristics of the Proposed Development

The proposed development will involve the construction 8 no. wind turbines, associated turbine foundations, electrical substation building and associated works, underground cabling, provision of a new temporary roadway connecting the R315 and the L51723, road widening works, site access and all associated works. The proposed development is located in the townlands of Keerglen, Ballinglen and Ballykinlettragh on a site measuring a combined c.81.88 ha. A full description of the development is available in Chapter 3.

17.6.1 Construction Phase

During the construction stage the main source of climate impacts will be as a result of GHG emissions and embodied carbon associated with the proposed construction materials and activities for the proposed development.

17.6.2 Operational Phase

During the operational phase, traffic accessing the site for maintenance purposes has the potential to impact on climate. However, this traffic will not be of the magnitude to cause a significant impact. From an operational climate perspective, the project is expected to lead to a beneficial impact on climate by displacing fossil-fuel derived electricity.

In addition, the vulnerability of the proposed development in relation to future climate change must be considered during the operational phase.

17.7 Potential Impacts of the Proposed Development

17.7.1 Greenhouse Gas Assessment

There is the potential for greenhouse gas emissions to atmosphere during the construction and operational phases of the proposed development. As per the TII guidance (TII, 2022a), the significance of the effect of GHG emissions on climate is assessed for the total GHG emissions across all project stages.

17.7.1.1 Construction Phase

Wind Turbine Manufacture

As the proposed development seeks permission for flexibility in the range of design parameters the particular wind turbine manufacturer is yet to be decided. As such a variety of wind turbine manufacturers have been considered as potential suppliers for the proposed development. Each turbine manufacturer undertakes and prepares detailed lifecycle assessments for their wind turbines and typical wind farm developments in order to inform users and determine the payback period for their plant. The payback period is the time taken for the renewable energy production from the windfarm to offset the emissions from the windfarm construction. Information on the life cycle assessments undertaken by various wind turbine manufacturers has been reviewed as part of this chapter to take into account the

range in design parameters and the various turbine manufacturers which can be delivered on site meeting this range.

The proposed development is smaller in scale than the wind plants assessed within various wind turbine manufacturers lifecycle assessments. The proposed development will involve the erection of up to 8 No. wind turbines and an export capacity of approximately 40 MW. For the purposes of this assessment a capacity factor for wind generation of 32% was used. Based on an export capacity of approximately 40 MW and a capacity factor of 32% the expected electricity production is approximately 112,128 MWh per annum.

Taking the larger of the manufacturer turbine models within the range of the design parameters being sought the lifecycle assessment indicates that there would be 352,608 MWh per year produced. Using this energy production rate an indicative estimate of the payback period for the proposed Keerglen windfarm development is 9.6 months. Therefore, the proposed development will likely offset the energy required for its construction within the first year of its operation. Thereby turning it from negative in relation to climate into an overall net positive development.

GHG Assessment – TII Carbon Tool

The total GHG emissions arising from the construction of the proposed development have been calculated using the TII online Carbon Tool (2022b) and are summarised in Table 17.6. This includes GHG emissions associated with site clearance works, excavation, materials, material transport, construction activities, construction worker travel and construction wastes for the windfarm site and UEEC but excludes the wind turbines themselves. Detailed project information including volumes of materials were obtained from ABO Energy for the purposes of this assessment. 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. Additionally, exact material suppliers and waste disposal facilities are not known at this stage and therefore an estimated distance travelled has been used for the purpose of this assessment. The best estimates used in this assessment have been used to provide an estimate of the GHGs associated with the proposed development.

The predicted GHG emissions associated with the proposed development are presented in Table 17.6. The proposed development is estimated to result in total construction phase GHG emissions of 25,762 tonnes CO_2e. The assessment indicates that the key sources of GHG emissions are associated with the construction materials, making up 75% of total emissions.

Table 17.6: Greenhouse Gas Assessment Results					
Source	**Elements Considered**	**GHG Emissions (tCO_2e)**	**% Of Total**	**Relevant Sector**	**Emissions Annualised Over 35 year Lifespan as % of Sector Budget**
Materials	Fencing, pipework, fill material, road pavement, concrete, blockwork, signage	19,307	75%	Industry	0.014%
Material Transport	HGV trips	619	2.40%	Transport	0.000295%
Clearance and demolition	Site preparation, 1.16Ha general clearance, 0.09Ha forest removal, 5.2Ha peat removal	2.9	0.01%	Industry	0.000002%
Land Use Change and Vegetation Loss	1.16Ha general land clearance, 0.09Ha forest removal, 5.2Ha peat removal	2,106	8%	LULUCF	-
Excavation	Peat, topsoil and rock excavations	2,418	9%	Industry	0.0017%
Construction Water Use	Water use during construction works	0.0015	0.00001%	Industry	0.000000001%
Plant Use	Energy use (gasoline/diesel) during construction	640	2%	Electricity	0.0006%
Construction Worker Travel to Site	Car and van trips, assumed 50km distance for car trips, 75km distance for van trips	353	1%	Transport	0.0002%
Construction Waste Disposal	Mixed C&D waste, general office waste, organic waste, plastic, timber, metals, carboard	21	0.1%	Waste	0.0001%
Construction Waste Transport	HGV trips (Assumed 40 km distance)	3	0.01%	Transport	0.000001%
Maintenance Material	Replacement of materials of project lifetime	292.54	1%	Industry	0.0002%
Total			**25,762 tonnes CO_2e**		

The predicted GHG emissions (as shown in Table 17.6) can be averaged over the lifespan of the proposed development to give the predicted annual emissions to allow for direct comparison with national annual emissions and targets.

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 17.2. The relevant sectoral emissions for the proposed development comparison include the Industry sector, Transport sector, Electricity sector and Waste sector. In Table 17.7, GHG emissions have been compared against the carbon budget for the electricity, transport, industry and waste sectors in 2030 (DECC, 2023), against Ireland's total GHG emissions in 2022 and against Ireland's EU 2030 target of a 30% reduction in non-ETS sector emissions based on 2005 levels (33 Mt CO_2e) (set out in Regulation EU 2018/842 of the European Parliament and of the Council).

The estimated total construction phase GHG emissions, when annualised over the 35-year proposed development lifespan, are equivalent to 0.001% of Ireland's total GHG emissions in 2022 and 0.002% of Ireland's non-ETS 2030 emissions target. The estimated GHG emissions associated with energy use during the construction phase are equivalent to 0.0006% of the 2030 Electricity budget, while the total GHG emissions associated with transport-related activities are 0.0005% of the 2030 Transport budget and industry-related activities are 0.02% of the 2030 Industry budget (DECC, 2023). Emissions associated with waste materials and transport off-site are equivalent to 0.0001% of the 2030 Waste sector budget.

Table 17.7: Estimated Project GHG emissions relative to sectoral budgets and GHG baseline

Target/Sectoral Budget	(tCO_2e)	Annualised (35 year lifespan) Proposed Development GHG Emissions	Annualised (35 year lifespan) Proposed Development GHG Emissions as % of Relevant Target/Budget
Ireland's 2022 Total GHG Emissions (existing baseline)	60,746,000	Total GHG Emissions	0.001%
Non-ETS 2030 Target	33,000,000	Total GHG Emissions	0.002%
2030 Sectoral Budget (Industry Sector)	4,000,000	Total Industry Emissions	0.02%
2030 Sectoral Budget (Transport Sector)	6,000,000	Total Transport Emissions	0.0005%
2030 Sectoral Budget (Electricity Sector)	3,000,000	Total Electricity Emissions	0.0006%
2030 Sectoral Budget (Waste Sector)	1,000,000	Total Waste Emissions	0.0001%

17.7.1.2 Operational Phase

During the operational phase there will be no GHG emissions from the operation of the wind turbines. The 40 MW from the turbines will generate 112,128 MWh of renewable energy annually, assuming a 32% 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 has been calculated. The GHG emissions associated with a fossil fuel plant generating 112 GWh of energy will include emissions of CO_2, N_2O and CH_4. The CO_2 equivalent emissions of N_2O and CH_4 have been calculated using the emission rates in Volume 2 Table 2.2 of the IPCC Guidelines (2006).

The most recent (2022) figure for carbon intensity of electricity in Ireland is 332 gCO_2e/kWh (SEAI, 2023). Using this carbon intensity and the IPPC emission rates for N_2O and CH_4 the total annual GHG emission savings of the proposed development will amount to approximately 36,410 tonnes of CO_2e when the GHG emissions from the construction phase and the turbines are removed. This is equivalent to 1.2% of the total carbon budget for the electricity sector in 2030 and 0.1% of Ireland's non-ETS 2030 emissions target (DECC, 2023) i.e. the proposed development has the potential to reduce Ireland's CO_2e emissions by these percentages.

Table 17.8: Estimated Operational Phase Project GHG Savings

Category	GHG Emissions (tonnes CO_2e)
Equivalent GHG Emissions / Annum from Fossil Fuel Power Plant Producing 112 GWh (1)	37,993
Construction Phase GHG Emissions (annualised over project lifespan)	736
Total Energy Consumed During Manufacture & Disposal of Wind Turbines (averaged over project lifespan)	847
Total / Annum Savings Due To Wind Farm	36,410
Total GHG Saving Over Project Lifespan as % of 2030 Electricity Sectoral Budget	1.2%
Total GHG Saving Over Project Lifespan as % of Non-ETS 2030 Target	0.1%

(1) Includes CO_2, N_2O & CH_4 emissions. N_2O & CH_4 emission rates based on Volume 2 Table 2.2 of IPCC Guidelines (2006)

The proposed development will assist in the CAP 2024 goal of producing up to 80% renewables for the grid and 9 GW of onshore wind capacity, which is one of the Key Targets identified in Section 12 of the Climate Action Plan 2024. The proposed development will constitute up to 0.004 GW annually of that capacity and will abate Ireland's greenhouse gas emissions by approximately 0.04 Mt CO_2e for every year of operation.

17.7.1.3 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 17.9 has therefore been taken into account when determining the significance of the proposed development'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 CAP24 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 17.4.1.3 and Table 17.3 the significance of the GHG emissions during the construction and operational phase 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 guidelines (EPA, 2022), the above significance equates to a significance of effect of GHG emissions during the construction and operational phase which is direct, long-term, positive and slight, which is overall not significant.

17.7.2 Climate Change Risk Assessment

17.7.2.1 Construction Phase

A detailed CCRA of the construction phase has been scoped out, as discussed in Section 17.4.2.117.4.2. However, consideration has been given to the proposed development's vulnerability to the following climate change hazards with best practice mitigation measures proposed in Section 17.9:

- 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.

17.7.2.2 Operational Phase

In order to determine the vulnerability of the proposed development 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 development: flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning, hail, landslides and fog.

The sensitivity of the proposed development to the above climate hazards is assessed irrespective of the project location. The sensitivity of the proposed development 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 development 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 development to each of the climate hazards. The results of the vulnerability assessment are detailed Table 17.9.

Table 17.9: Climate Change Vulnerability Assessment

Climate Exposure	Vulnerability to Climate Variables									
	Flooding (Pluvial / Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Wildfire	Lightning & Hail	Fog	Lightning & Hail	Landslides
Earthworks	2	1	1	1	1	1	1	1	1	1
Drainage	2	1	1	1	1	1	1	1	1	1
Underground Electricity Export Connection	2	1	1	1	1	1	1	1	1	1
Buildings	2	1	1	1	1	2	1	1	1	1
Access Roads	2	1	1	1	1	2	1	1	1	1

Table 17.9: Climate Change Vulnerability Assessment										
Climate Exposure	Vulnerability to Climate Variables									
	Flooding (Pluvial / Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Wildfire	Lightning & Hail	Fog	Lightning & Hail	Landslides
Turbines	2	1	1	1	1	2	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 proposed development does not have any significant vulnerabilities to the identified climate hazards as described in the below sections. All vulnerabilities are classified as low.

Flooding

A Flood Risk Assessment (FRA) for the proposed development was undertaken. The FRA concluded that the site is not within an area at risk of flooding. The FRA states "a *section of the Wind Farm Site is located in Fluvial Flood Zone A and B, associated with fluvial flooding along the Keerglen and Ballinglen Rivers. However, due to the steep sided nature of the river valleys, all flooding is constrained to be immediate vicinity of this watercourse. All key proposed infrastructure within the Wind Farm Site is located in Flood Zone C and is at low risk of fluvial flooding. As for the Underground Electricity Export Connection, the majority of the route is located in Flood Zone C. However, some areas are located in Flood Zone A and B. These flood zones are along the Cloonaghmore River at Tonrehown Bridge and along a tributary of the Cloonaghmore River in the townland of Magherbrack. These are existing watercourse crossings over these watercourses and therefore the Proposed Development will not be at risk of fluvial flooding at these locations. The overall risk of flooding within the proposed Wind Farm Site is estimated to be low.*"

Extreme Wind, Fog, Lightning & Hail

In relation to extreme winds, the turbines shall be designed to the appropriate standards to account for the relevant wind loadings. If required as part of the building design, lightning protection shall be provided for. Hail and fog are not predicted to significantly affect the turbines and related infrastructure due to their design. However, lighting of the turbines will be required 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 Mayo area. This means that there is between a 10% to 50% chance of experiencing weather that could support a hazardous wildfire that may poses 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 on site which will remove materials with a high potential for fire. Additionally, systems will be in place to prevent impacts from wildfires to the turbines. it can be concluded that the proposed development is of low vulnerability to wildfires.

Landslides

Landslide susceptibility mapping developed by Geological Survey Ireland (GSI, 2024) indicates that the proposed development location is within areas of low to moderately low susceptibility to landslides and there are no recorded historical landslide events at the project location. It can be concluded that landslides are not a risk to the proposed development site.

Extreme Temperatures (Heat & Cold)

In relation to extreme temperatures, both extreme heat and extreme cold, these have the potential to impact the building materials and some related infrastructure. However, the building materials selected at the detailed design stage will be of high quality and durability. Therefore, extreme temperatures are not considered a significant risk.

Summary

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

17.7.2.3 CCRA Significance of Effects

With design mitigation in place, there are no significant risks to the project as a result of climate change. In accordance with the EPA Guidelines (EPA, 2022), the significance of effect of the impacts to the project as a result of climate change are direct, long-term, negative and imperceptible.

17.7.3 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.

The effect on climate due to decommissioning will be direct, temporary, negative and imperceptible if recycling of components is carried out where possible.

17.7.4 Do Nothing Scenario

With respect to climate, the Do Nothing scenario will not assist the CAP 2024 goal of delivering up to 80% of the national grid electricity by renewable sources by 2030. Producing up to 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.

17.8 Cumulative Impacts

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 a result, the cumulative impact of the proposed development in relation to GHG emissions is considered direct, long-term, beneficial and slight, which is overall not significant in EIA terms.

17.9 Remedial and Mitigation Measures

17.9.1 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 include:

- Appointing a suitably competent contractor who will undertake waste audits detailing resource recovery best practice and identify materials can be reused/recycled;
- 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; and
- Sourcing materials locally where possible to reduce transport related CO_2 emissions.

In terms of impact on the proposed development due to climate change, during construction the Contractor will be required to mitigate against the effects of extreme rainfall/flooding through site risk assessments and method statements. The Contractor will also be required to mitigate against the effects of extreme wind/storms, temperature extremes through site risk assessments and method statements. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. Temperatures can affect the performance of some materials, and this will require consideration during construction. During construction, the Contractor will be required to mitigate against the effects of fog, lighting and hail through site risk assessments and method statements.

17.9.2 Operational Phase

During the operational phase of the proposed development, 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.

17.10 Residual Impacts of the Proposed Development

The proposed development will result in some impacts to climate through the release of GHGs. TII state that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*". As per Section 17.7.1.3, the proposed development will result in overall GHG emission savings.

As per the assessment criteria in Table 17.3 the residual effect of GHG emissions during the construction and operational phases which is direct, long-term, beneficial and slight.

In relation to climate change vulnerability, it has been assessed that the effect on the proposed development as a result of climate change is direct, long-term, negative and imperceptible.

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