18. CLIMATE

18.1 INTRODUCTION

This chapter assesses the likely climate effects associated with the proposed Derryadd Wind Farm. The proposed development comprises the construction of 22 no. wind turbines and ancillary works. The turbines will have a blade tip height of 190 m above the top of the foundation level and will be accessible from internal access routes within the Bord na Móna site. A full description of the development can be found in Chapter 3 (Description of the Proposed Development).

18.1.1 Statement of Authority

This chapter was also prepared by Dr. Jovanna Arndt, a Senior 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, 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 specialises in the fields of air monitoring, air quality & climate assessments for EIA and air dispersion modelling. She has prepared air quality and climate impact assessments as part of EIARs for renewable energy developments such as Crockahenny Windfarm, Upperchurch Windfarm, Knocknamona Windfarm and Keerglen Windfarm.

18.1.2 Legislation, Policy and Guidance

18.1.2.1 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 18.1. 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 18.2. Industry has a 35% reduction requirement and a 2030 emission ceiling of 4 Mt CO_2e.

Table 18.1 5-Year Carbon Budgets 2021-2025, 2026-2030 and 2031-2025

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 18.2 – Sectoral Emission Ceilings 2030 (DECC, 2023a)

Sector	Baseline ($MtCO_2e$)	Carbon Budgets ($MtCO_2e$)		2030 Emissions ($MtCO_2e$)	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**

18.1.2.2 Policy

In December 2023, CAP24 was published (DECC, 2023a). 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. CAP24 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 its *Long-Term Strategy on Greenhouse Gas Emissions Reductions* (DECC, 2023b). 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 Longford County Council Climate Action Plan 2024 - 2029 (Longford County Council, 2024) outlines Longford County Council's goals to create a low carbon and climate resilient county through delivering and promoting best practice in climate action at a local level. The Longford County Council Climate Action Plan contains key climate actions that will be undertaken in order to achieve the objectives of the plan. The climate actions are split into 5 thematic areas: Governance and leadership; Built Environment and Transport; Natural Environment and Green Infrastructure; Communities, Resilience and Transition; and Sustainability and Resource Management. The plan outlines how Longford County Council will support and promote climate action projects, particularly projects that support and maximise environmental co-benefits, such as biodiversity protection and enhancement; improved air, water, or soil quality; or enhanced recreation, amenity, and cultural heritage value, to ensure win-win benefits are gained. The plan contains observations in relation to GHG mitigation as well as plans to prepare for and adapt to future climate change, particularly in the area of flood risk. There are no specific measures within the Longford County Council Climate Action Plan 2024-2029 in relation to renewable electricity or windfarm development, however, the plan does mention support for renewable energy projects.

In addition to the Longford County Council Climate Action Plan 2024-2029, the Longford County Development Plan 2021-2027 contains a Climate Strategy, which in conjunction with the Climate Action Plan sets out a vision for the future and key actions towards climate change and sustainable development.

18.1.2.3 Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on climate 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) PE-ENV-01105: Climate Assessment Standard for Proposed National Roads (TII, 2022b);
- Transport Infrastructure Ireland (TII) GE-ENV-01106: TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document (TII, 2022c);

- 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).

18.2 ASSESSMENT 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.

18.2.1 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 18.1.2.1).

18.2.1.1 Construction Phase

PE-ENV-01104 (TII, 2022a) recommends the calculation of the construction stage GHG emissions, including embodied carbon, using the TII Online Carbon Tool (TII, 2022c). 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, 2022c) has been commissioned by TII to assess GHG emissions associated with road or rail projects in Ireland. The TII Carbon Tool (TII, 2022c) uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013), which can be applied to a variety of developments, not just road or rail. The use of the TII carbon tool is considered appropriate for the current assessment as the material types and construction activities employed by the proposed development are accounted for in the tool. The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that will be used over the entire construction phase. The outputs are expressed in terms of tCO_2e (tonnes of carbon dioxide equivalent). The TII Carbon Tool has been used to assess the GHG emissions associated with site clearance works, excavation, material transport, construction activities and construction worker travel for the windfarm (excluding the wind turbines) associated with the proposed development. The GHG emissions associated with the removal of peat bog and the GHG sequestration associated with the reinstatement of the removed peat bog have also been included in the GHG assessment using the TII carbon Tool.

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 within the TII Carbon Tool:

- Materials;
- Material transport;
- Site clearance and demolition;
- Land Use Change;
- Excavation;
- Plant Use; and
- Construction worker travel to site.

Information on the material quantities, site clearance activities, excavations, fuel usage during construction, and construction traffic (material, staff transport) were provided by the design team for input into the carbon tool. This information was used to determine an estimate of the GHG emissions associated with the proposed development. 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. Reasonable conservative estimates have been used in this assessment to provide an estimate of the GHGs associated with the proposed development.

18.2.1.2 Turbine Manufacture Lifecycle Assessment

In addition to the TII Carbon Tool, a lifecycle assessment was undertaken to determine the payback period for the turbines. As the make and manufacturer of the turbines to be installed has not yet been decided at this stage of the proposed development and will be decided post consent should permission be granted, indicative information from a potential wind turbine manufacturer (Vestas) 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.

18.2.1.3 Operational Phase Traffic

Emissions from road traffic associated with the proposed development have the potential to emit carbon dioxide (CO_2) which will impact climate.

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

- 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.

There will be minimal traffic associated with the proposed development once operational. Vehicle movements associated with staff accessing the site for maintenance works will not increase the AADT on the local road network by more than 1,000 AADT or 200 HDV AADT. Therefore, a detailed assessment of traffic related CO_2 emissions for the operational phase was scoped out of this assessment as there is no potential for significant effects to climate from operational traffic emissions. Construction stage traffic emissions are accounted for within the TII Carbon Tool.

18.2.1.4 Operational Phase Renewable Energy Generation

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 18.2).

18.2.1.5 Significance Criteria for GHGA

The 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 (and decommissioning phase in relation to the proposed development).

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

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

- When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should, therefore, be based on its net impact over its lifetime, which may be positive, negative or negligible;
- Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages; and,
- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered.

TII (TII, 2022a) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. In line with IEMA GHG Guidance (IEMA, 2022), TII state that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

Significance is determined using the criteria outlined in Table 18.3 (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 18.3 – 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 and sectoral emissions ceilings 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 CAP24, 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 and Industry. The 2030 sectoral emissions ceilings and reduction requirements relative to the 2018 baseline are detailed in Table 18.2.

18.2.2 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:

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

The baseline environment information provided in Section 18.2, 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 project type and need to be determined on a project-by-project 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.

18.2.2.1 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 18.4 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.

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 18.4 - 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 detailed in Section 18.4.3 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, see Section 18.6 for detail.

18.3 EXISTING ENVIRONMENT

Climate effects 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.

18.3.1 Current GHGA Baseline

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

Ireland declared a climate and biodiversity emergency in May 2019 and in November 2019 there was European Parliament approval of a resolution declaring a climate and environment emergency in Europe. This, in addition to Ireland's current failure to meet its EU binding targets under Regulation 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.

Data published in July 2024 (EPA, 2024a), indicates that Ireland exceeded, without the use of flexibilities, its 2023 annual limit set under EU's Effort Sharing Decision (ESD) (EU 2018/842) by 2.27 Mt CO_2e. However, the 2023 emissions were the first time that Irelands emission were below (-1.2%) 1990 levels. ETS emissions decreased (-17.0%) and ESR emissions decreased (-3.4%). Ireland's target is an emission reduction of 626 kt of CO_2e by 2030 on an average baseline of 2016 to 2018. The EPA estimate that 2023 total national GHG emissions, excluding LULUCF, have decreased by 6.8% on 2022 levels to 55.01 Mt CO_2e, with a 2.2 Mt CO_2e (-21.6%) reduction in electricity industries alone. This was driven by a 40.7% share of energy from renewables in 2023 and by increasing our imported electricity. Manufacturing combustion and industrial processes decreased by 5.1% to 6.3 Mt CO_2e in 2023 due to declines in fossil fuel usage. The sector with the highest emissions in 2023 was agriculture at 37.6% of the total, followed by transport at 21.4%. For 2023, total national emissions (including LULUCF) were 60.62 Mt CO_2e (EPA, 2024a), as shown in Table 18.5.

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

Table 18.5 – Trends in Total National GHG Emissions 2021 - 2023

Sector *Note 1*	2021	2022	2023	Total Budget (Mt CO_2e) (2021-2025)	% Budget 2021-2025 Used	Annual Change 2022 to 2023
Electricity	9.893	9.694	7.558	40.0	67.9%	-22.0%
Transport	11.089	11.760	11.791	54.0	64.1%	0.3%
Buildings (Residential)	6.868	5.753	5.346	29.0	62.0%	-7.1%
Buildings (Commercial and Public)	1.444	1.447	1.409	7.0	61.4%	-2.6%
Industry	7.093	6.622	6.288	30.0	66.7%	-5.0%
Agriculture	21.940	21.795	20.782	106.0	60.9%	-4.6%
Other *Note 2*	1.864	1.931	1.832	9.0	62.5%	-5.1%
LULUCF	4.628	3.983	5.614	–	–	40.9%
Total including LULUCF	**64.819**	**62.986**	**60.620**	**295.0**	**63.9%**	**-3.8%**

Note 1 Reproduced from Latest emissions data on the EPA website (EPA, 2024a)

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).

18.3.2 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, 2022c) 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 CAP23, 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.

18.3.3 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 Dublin Airport is the nearest weather and climate monitoring station to the proposed development with meteorological data recorded for the 30-year period from 1991 to 2020 (Met Éireann, 2023a). The historical regional weather data for Dublin Airport 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 Dublin Airport Metrological Station were November and December, and the driest month on average was June. July was the warmest month with a mean temperature of 15.4 °C. January was the coldest month with a mean temperature of 5.2 °C.

Met Éireann's 2023 Climate Statement (Met Éireann, 2024) 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 18.1).

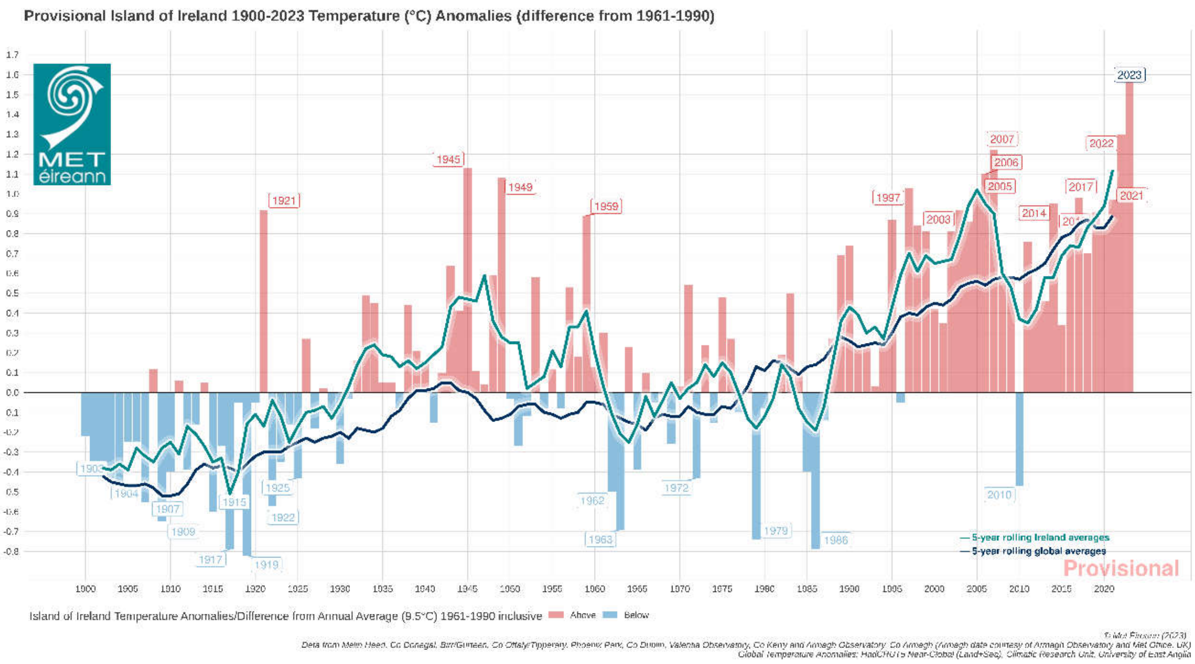


Figure 18.1 - 1900-2023 Temperature (°C) Temperature Anomalies (Differences from 1961-1990)

The year 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 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 mean 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.

18.3.4 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, 2021b). The EPA also note the following may occur as a result of climate change (EPA, 2021a):

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

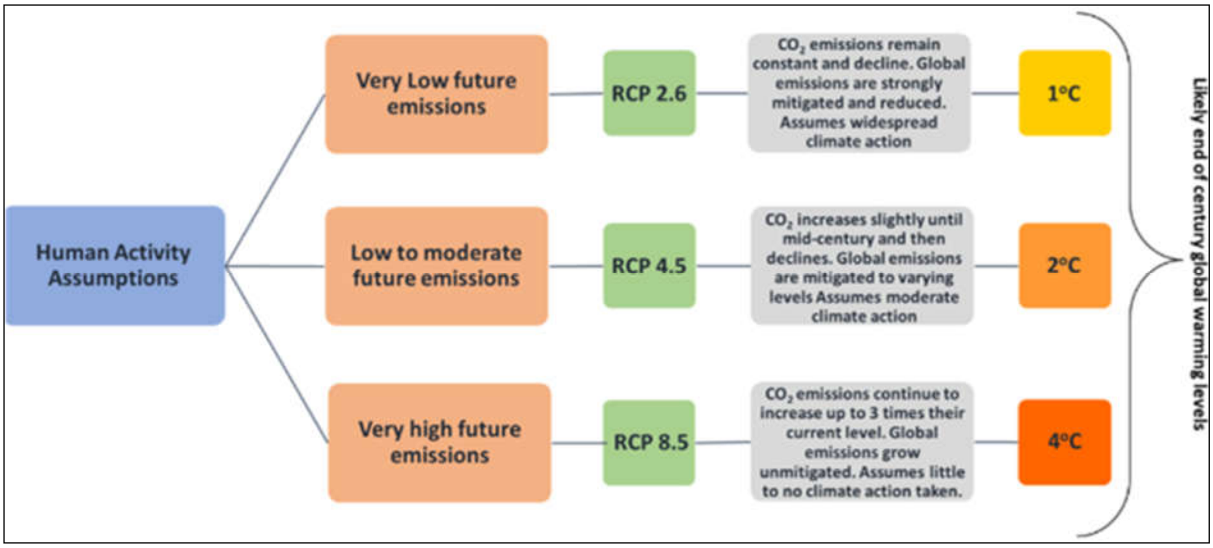
The EPA's State of the Irish Environment Report (Chapter 2: Climate Change) (EPA, 2024b) notes that projections show that full implementation of additional policies and measures, outlined in the 2024 Climate Action Plan, will result in a reduction in Ireland's total GHG emissions by up to 29% by 2030 compared with 2018 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, 2024b) 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 the key project climate risks for Ireland are transport infrastructure being exposed to increases in sea levels and flooding, extreme wind speeds, increased precipitation and saturated soils for energy infrastructure, with flooding also a cause for concern. For information and communications technology infrastructure, extreme wind speeds and increased storminess are key concerns. The report also states that *"failures in critical infrastructure can cascade across other sectors and present a multisector risk. For example, as many sectors electrify to reduce emissions, power supply interruption would have a significantly increased impact on transport, domestic heating, industry and health than previously".*

TII's Guidance document PE-ENV-01104 (TII, 2022a) states that for future climate change a moderate to high Representative Concentration Pathway (RCP) should be adopted. RCP4.5 is considered moderate while RCP8.5 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, 2020). The future climate was simulated under both Representative Concentration Pathway 4.5 (RCP4.5) (medium-low) and RCP8.5 (high) scenarios. This study indicates that by the middle of this century (2041–2060), mid-century mean annual temperatures are projected to increase by 1 to 1.2°C and 1.3 to 1.6°C for the RCP4.5 and RCP8.5 scenarios, respectively, with the largest increases in the east. Warming will be enhanced at the extremes (i.e. hot days and cold nights), with summer daytime and winter night-time temperatures projected to increase by 1 to 2.4°C. There is a projected substantial decrease of approximately 50%, for the number of frost and ice days. Summer heatwave events are expected to occur more frequently, with the largest increases in the south. In addition, precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events. Climate change also has the potential to impact future energy supply which will rely on renewables such as wind and hydroelectric power. More frequent storms have the potential to damage the communication networks requiring additional investment to create resilience within the network.

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

The 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 18.2.

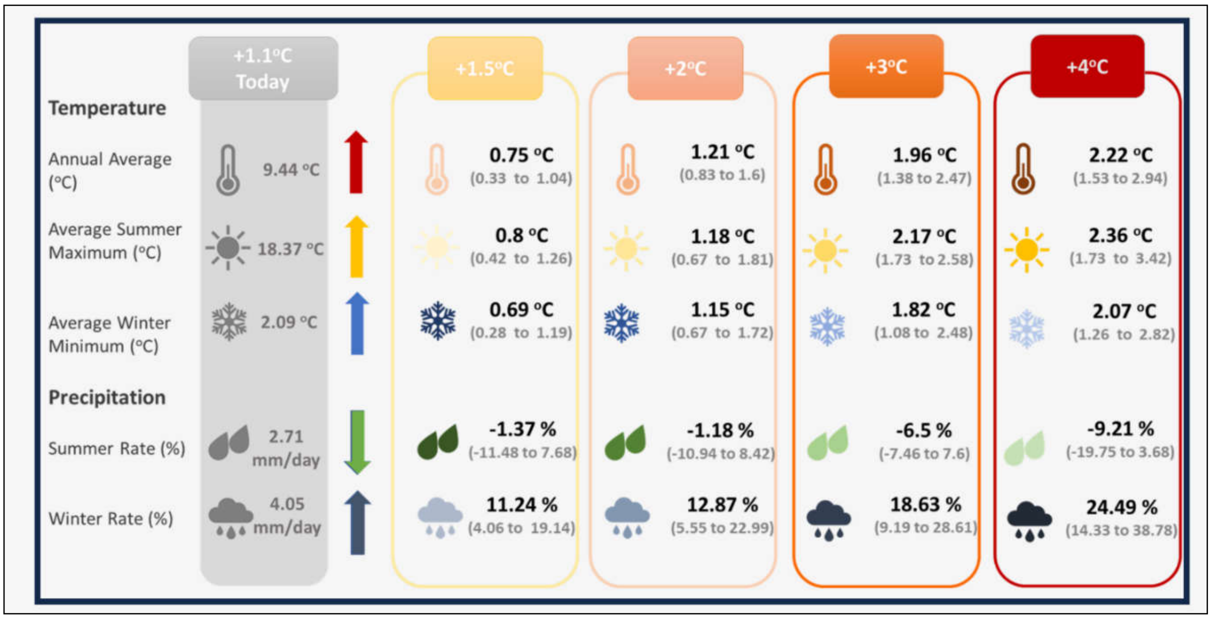


Source TRANSLATE Project Story Map (Met Éireann, 2023b)

Figure 18.2 - Representative Concentration Pathways Associated Emission Levels

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 (see Figure 18.3Figure 18.2).

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. Future projections 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 18.3 - Change of Climate Variables for Ireland for Different Global Warming Thresholds

The TRANSLATE research report (Met Éireann, 2024d) considers radiative concentrative pathways (RCP) 2.6, RCP4.5 and RCP8.5 representing early, mid and late action respectively as well as global warming scenarios for if global average temperatures exceed 1.5°C, 2°C, 2.5°C. 3°C and 4°C. It provides publicly available projected information for temperature and precipitation based on 27 simulations for RCP 4.5 and 35 simulations for RCP 8.5. Ireland currently has an average warming of 1.1°C. The TRANSLATE project has standardised climate projections and services for Ireland addressing this climate information gap by creating an accessible risk framework to assess future climate risk.

The report 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.

18.4 POTENTIAL EFFECTS

18.4.1 Do-Nothing Scenario

Under the Do-Nothing Scenario no construction works associated with the overall development will take place and the identified impacts on climate will not occur. Impacts from increased traffic volumes or emissions savings from the operational phase of the proposed development will also not occur. The climate baseline will continue to develop in line with the identified trends (see Section 18.3). 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.

Rehabilitation of Derryadd, Derryaroge and Lough Bannow bogs will continue in the Do-Nothing scenario, as part of the rehabilitation plans produced to address the requirements of Condition 10.2 of IPC License Ref. P0504-01.

18.4.2 Greenhouse Gas Assessment

There is the potential for GHG 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 stages of the proposed development.

18.4.2.1 Construction Phase

The total GHG emissions arising from the construction of the proposed development have been considered and are summarised in Table 18.6. The embodied carbon within the construction materials has been calculated. This calculation was based on the TII Online Carbon Tool (TII, 2022b), and the quantities provided on the design as described in Chapter 3 (Description of the Proposed Development). 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.

The predicted GHG emissions associated with the proposed development are presented in Table 18.6. The proposed development is estimated to result in total construction phase GHG emissions of 49,830 tonnes CO_2e for the material use and construction processes.

The assessment indicates that the key sources of GHG emissions associated with construction phase are from the loss of carbon sequestration area via the removal of peat and from the excavation activities themselves, accounting for 63% and 20% of construction phase emissions, respectively.

In terms of the embodied carbon associated with the wind turbines themselves, a lifecycle assessment by a manufacturer of wind turbines similar to those which are proposed has determined that the payback period of the turbines is 6.5 months for low wind conditions. This may be interpreted that over a turbine's life cycle it will return 37 times more energy back than it consumed over its life cycle (Vestas, 2022). The site-specific payback period for the turbines has been calculated below in Section 18.4.2.2.

Table 18.6 Construction Phase Greenhouse Gas Emissions

Category (as per TII Carbon Tool)	Elements Considered	GHG Emissions (tCO_2e)	% Of Cons-truction Total	Relevant Sector	Emissions Annualised Over Lifespan as % of Sector Budget
Materials	Aggregates, concrete, road pavement materials, cabling, steel	3,736	7%	Industry	0.003%
Material Transport	HGV trips	10	0.02%	Transport	0.000005%
Clearance and demolition	Site preparation and clearance activities. (incl. peat bog removal)	77	0.2%	Industry	0.00006%
Land Use Change and Vegetation Loss	Removal of bog and mixed forest	31,460	63%	LULUCF	n/a
Excavation	Rock, topsoil and other excavation	9,732	20%	Industry	0.008%
Construction Water Use	Water used during construction	4,643	9%	Industry	0.004%
Plant Use	Energy use (diesel) during construction	44	0.1%	Electricity	0.00005%
Construction Worker Travel to Site	Car and van trips	130	0.3%	Transport	0.0001%
Total		**49,830 tonnes CO_2e**			

The predicted GHG emissions (as shown in Table 18.5 Table 18.6) 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 proposed 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 18.2.

In Table 18.7, GHG emissions have been compared against the 2030 carbon budget for the electricity, transport, and industry sectors (see Table 18.2), against Ireland's total GHG emissions in 2023 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 30-year proposed development lifespan, are equivalent to 0.003% of Ireland's total GHG emissions in 2023 and 0.005% of Ireland's non-ETS 2030 emissions target. The estimated GHG emissions associated with energy use during the construction phase are equivalent to 0.00005% of the 2030 Electricity budget, while the total GHG emissions associated with transport-related activities are 0.0001% of the 2030 Transport budget and industry-related activities are 0.02% of the 2030 Industry budget (see Table 18.2 for relevant sectoral budgets).

Table 18.7 Estimated GHG emissions relative to sectoral budgets and GHG baseline

Target/Sectoral Budget (tCO_2e)		Annualised GHG Emissions over 30 year Proposed Development Lifespan (tCO_2e)		% of Relevant Target/ Budget
Ireland's 2023 Total GHG Emissions (existing baseline)	60,620,000	Total GHG Emissions	1,661	0.003%
Non-ETS 2030 Target	33,000,000			0.005%
2030 Sectoral Budget (Industry Sector)	4,000,000	Total Industry Emissions	18,187	0.02%
2030 Sectoral Budget (Transport Sector)	6,000,000	Total Transport Emissions	5	0.0001%
2030 Sectoral Budget (Electricity Sector)	3,000,000	Total Electricity Emissions	1	0.00005%

18.4.2.2 Operational Phase

Wind Turbine Manufacture

The exact rating and design of the proposed turbine type will be subject to a competitive procurement process that will only commence if and when the proposed development receives planning permission. 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 assessment undertaken by a potential wind turbine manufacturer has been reviewed as part of this chapter in order to estimate the potential payback period for the proposed development.

The proposed development is of a similar scale to the wind plant assessed within the wind turbine manufacturer lifecycle assessment. The proposed development will involve the erection of 22 No. wind turbines and an export capacity of approximately 132 MW. For the purposes of this assessment a capacity factor for wind generation of 29.2%[1] was used. Based on an export capacity of approximately 132 MW and a capacity factor of 29.2% the expected electricity production is approximately 337,645 MWh per annum (see Chapter 3 (Description of the Proposed Development) for further detail).

The lifecycle assessment provided by Vestas for their EnVentus V162-6.2 MW turbines (Vestas, 2023), which is similar in size to the turbines in the proposed development, includes details on the CO_2e per MW for the wind-plant and the turbines only. For the EnVentus V162-6.2 MW, the results are 430 tonnes CO_2e per MW for the complete wind plant and 313 tonnes CO_2e per MW for the turbine-only, over the full life-cycle. The lifecycle assessment undertaken by Vestas for their ENVentus V162-6.2 MW turbines indicates that there would be 21,568 MWh per turbine per year produced.

Taking both the Vestas energy production rate and the site specific energy production of 337,645 MWh per annum into consideration, an indicative estimate of the payback period for the proposed development of 10.2 months has been calculated. 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 Emissions Savings

During the operational phase there will be no GHG emissions from the operation of the wind turbines. The 132 MW from the wind farm will generate 337,645 MWh of renewable energy annually, assuming a 29.2% capacity factor (see Chapter 3 (Description of the Proposed Development)). 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 405 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).

Additionally, reinstatement of the bog excavated during the construction phase will take place over a total area of approx. 38 ha within the proposed development boundary. The amount of CO_2e sequestered by this restored carbon sink has been estimated at 15,327 tonnes, or 511 tonnes CO_2e annualised over the proposed development lifetime, and has been factored into the total GHG savings associated with the development shown in Table 18.8. Additionally, ca. 1,800 ha of the land within the 1,900 ha planning boundary area will remain untouched during the proposed development construction and operational phases.

The most recent (2023) figure for carbon intensity of electricity in Ireland is 259 gCO_2e/kWh (SEAI, 2024). 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 103,998 tonnes of CO_2e, at the 2023 carbon intensity, when the carbon sequestration of the bog rewetting and reinstatement are taken into account and the GHG emissions from the construction phase and the turbines are removed. This is equivalent to 3.5% of the total carbon budget for the electricity sector in 2030 and 0.3% of Ireland's non-ETS 2030 emissions target (DECC, 2023) (Table 18.8) i.e. the proposed development has the potential to reduce Ireland's CO_2e emissions by these percentages.

[1] energy-in-ireland-2024.pdf

Table 18.8 Estimated Operational Phase Project GHG Savings

Category	GHG Emissions (tonnes CO_2e)
Equivalent GHG Emissions /Annum from Power Plant Producing 132 GWh	107,589
Construction Phase GHG Emissions (annualised over project lifespan)	1,661
Total Energy Consumed During Manufacture / Disposal of Wind Turbines (averaged over project lifespan)(3)	1,662
Reinstatement of Excavated Bog (annualised over project lifespan)	-511
Total / Annum (tonnes CO_2 Equivalent) Savings Due To Wind Farm	-103,998
Total GHG Saving (%) Over Project Lifespan as % of 2030 Electricity Sectoral Budget	-3.5%
Total GHG Saving (%) Over Project Lifespan as % of Non-ETS 2030 Target	-0.3%

The proposed development will assist in the CAP24 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 CAP24. The proposed development will constitute up to 0.4 GW annually of that capacity and will abate Ireland's greenhouse gas emissions by approximately 0.1 Mt CO_2e for every year of operation.

18.4.2.3 GHG 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 proposed development 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 18.5 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 18.2.1.5 and Table 18.3 the significance of the GHG emissions during the construction and operational phase is beneficial as the net projected 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 phases which is ***direct, long-term, positive*** and ***slight***, which is overall ***not significant***.

18.4.3 Climate Change Risk Assessment

18.4.3.1 Construction Phase

A detailed CCRA of the construction phase has been scoped out, as discussed in Section 18.2.2.1. 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 18.5:

- 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.

18.4.3.2 Operational Phase

In order to determine the vulnerability of the proposed development to climate change the sensitivity and exposure of the proposed 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 proposed development location. The sensitivity of the proposed development has been assessed 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 proposed development 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 18.9.

Table 18.9 - Climate Change Vulnerability Assessment

Proposed Development Assets	Vulnerability to Climate Hazards								
	Flooding (Pluvial/ Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Wildfire	Lightning & Hail	Fog	Landslides
Earthworks	2	1	1	1	1	1	1	1	2
Drainage	2	1	1	1	1	1	1	1	2
Grid Connection	2	1	1	1	1	1	1	1	1
Buildings	2	1	1	1	1	2	1	1	2
Access Roads	2	1	1	1	1	2	1	1	2
Turbines	2	1	1	1	1	2	2	1	2

Proposed Development Assets	Vulnerability to Climate Hazards								
	Flooding (Pluvial/ Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Wildfire	Lightning & Hail	Fog	Landslides
Battery Storage	2	1	1	1	1	1	1	1	2

The sensitivity and exposure of the area was determined with reference to a number of online tools and studies by other environmental specialists on the project. It was concluded that the proposed development does not have any significant vulnerabilities to the identified climate hazards as described in the below sections.

Flooding

The Flood Risk Assessment (FRA) completed by Nicholas O'Dwyer (available as Appendix 7-3) indicates that the substation and wind turbine locations are all situated within Flood Zone C, which is above the 1000-year flood levels The site access roads in Derryaroge bog cross through an area identified as Flood Zone B, which is considered appropriate by the FRA. In the southeast of Derryadd bog the site entrance and the access road for Pump Station 15 crosses through an area of Flood Zone A, however there is an embankment between the bog and the river which prevents fluvial flooding at this location.

The FRA also identified that the proposed development is at a low risk of pluvial flooding. Although there is frequent accumulation of water on the site, the layout has been designed to avoid these wet areas as far as possible. As detailed in the drainage design flood protection measures are proposed to manage the risk of flooding. Culverts will be provided at intervals beneath the road to maintain connectivity of the exiting field drains. The proposed development will be designed to ensure that sensitive equipment is located above the flood levels and that any other infrastructure in areas which may be subject to flooding will be designed to accommodate occasional flooding. Therefore, the risk to infrastructure of pluvial flooding can be considered low.

Assessment of the Catchment-based Flood Risk Assessment and Management (CFRAM) maps do not indicate any coastal flood risk at the proposed wind farm site, as the site is located in the centre of Ireland, approximately 80 km from Galway Bay, 90 km from Sligo Bay, and 105 km from the Irish Sea. There is also no predicted risk of groundwater flooding at the site (see FRA, Figure 3-6).

The vulnerability of the proposed development to fluvial, pluvial and coastal flooding is therefore considered low.

Extreme Wind, Fog, Lightning & Hail

Wind turbines are vulnerable to extreme storms because the maximum wind speeds in those storms can exceed the design limits of wind turbines – the likelihood of such events occurring will be increased with future climate change. The wind turbines will be designed to withstand the severe wind loads in accordance with IS-EN1991-1-4 (wind loading). A monitoring and control system in each wind turbine will enable it to slow or cease operation in response to high wind speeds. The vulnerability to extreme wind is therefore considered low.

In terms of lightning risk, lightning protection measures have been incorporated into the design of the wind turbines, therefore the vulnerability is considered low.

Fog is unlikely to have an adverse effect on the turbines and other elements of the proposed development. Lighting of the turbines will be required to ensure no impacts with low flying aviation (see Chapter 16 (Material Assets - Telecoms, Aviation & Other) for further detail). The vulnerability of the proposed development to fog is considered low.

Hail is unlikely to have a significant adverse effect on the proposed development due to the construction materials used. The standards for materials discussed below to protect against extreme heat and cold also offer durability against hail. The vulnerability to hail is considered low.

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. Structures will be designed in accordance with IS-EN 1991-1-5 (temperature loads) and will include additional temperature tolerance due to climate change (2 degrees Celsius). Structures will include additional measures to increase durability (including protecting against the effects of freeze / thaw action). These include structural waterproofing, increased concrete cover to reinforcement in accordance with IS-EN1992-1-1, IS-EN206 and BS8500 and designing for temperature extremes as per IS-EN1991-1-5. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. However, the building materials selected at the detailed design stage will be of high quality and durability. Therefore, the vulnerability to extreme temperatures is considered low.

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 Offaly area. This means that there is between a 10% and 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. Systems will be in place to prevent impacts from wildfires to the turbines. The vulnerability to extreme wildfires is therefore considered low.

Landslides

Landslide susceptibility mapping developed by Geological Survey Ireland (GSI, 2024) indicates that the proposed development location is not within an area that is susceptible to landslides; the landslide susceptibility classification is 'Low' 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 wind farm site.

18.4.3.3 CCRA Significance of Effects

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

18.4.4 Decommissioning Phase

Vehicles related to the decommissioning phase will give rise to CO_2 emissions. It is not predicted that the proposed 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.

Following the end of their lifespan, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site may be decommissioned fully, with the exception of the electricity substation, underground cable and amenity access tracks.

Upon decommissioning phase of the proposed wind farm, the wind turbines would be disassembled in reverse order to how they were erected and the site 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.

18.5 MITIGATION MEASURES

18.5.1 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;
- Alignment with requirements under the Local and National Climate Action Plans
- 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 concrete containing Portland cement with a low carbon concrete as per the Climate Action Plan;
- Procurement contracts will ensure that lower carbon choices are considered favourable during tender;
- 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 considered and incorporated within the extent of the proposed development such the use of reclaimed asphalt and recycled aggregate, which will reduce the virgin material needs;
- All excavated material will be retained on site, with no export off site for disposal required, which represents 17,856 tonnes of CO_2e emissions avoided; 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.

18.5.2 Operational Phase

Some measures have been incorporated into the design of the proposed development to mitigate the impacts of future climate change. For example, adequate attenuation and drainage have been incorporated in the design to avoid potential flooding impacts due to increased rainfall events in future years. These measures have been considered when assessing the vulnerability of the proposed development to climate change (see Section 18.4.2).

No additional specific mitigation measures in relation to climate have been identified for the operational phase.

18.6 RESIDUAL EFFECTS

The proposed development will result in some impacts to climate through the release of GHGs during the construction phase. However, the proposed development will constitute up to 0.4 GWh annually of the CAP24 goal of producing up to 80% renewables for the grid and 9 GW of onshore wind capacity and will abate Ireland's greenhouse gas emissions by approximately 0.1 Mt CO_2e for every year of operation.

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 18.4.2 the proposed development will result in overall GHG emission savings.

As per the assessment criteria in Table 18.3 the residual effect of GHG emissions during the construction and operational phases is ***direct, long-term, positive*** 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***.

18.7 CUMULATIVE EFFECTS

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

However, by presenting the GHG 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 proposed development to affect Ireland's ability to meet its national carbon reduction target. Therefore, the assessment approach is considered to be inherently cumulative.

18.8 DIFFICULTIES ENCOUNTERED DURING PREPARATION OF THIS CHAPTER

There were no difficulties or limitations encountered when undertaking this assessment.

18.9 SUMMARY

This chapter of the EIAR has assessed the potential environmental impacts on climate from the construction, operational and decommissioning phases of the proposed development. This section summarises the impact assessment undertaken and confirms the significance of any residual effects, following the application of additional mitigation.

GHGA

The impact of GHG emissions during the construction and operational phases on climate was assessed in line with TII guidance PE-ENV-01104 (TII, 2022a) and IEMA GHG Guidance (IEMA, 2022), which states that the significance of the impact of GHG emissions was based on the proposed development's net impact over its lifetime (see Section 18.4).

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

The 132 MW from the wind farm has the potential to generate up to 337,645 MWh annually, which will amount to annual GHG emission savings of approximately 105,194 tonnes of CO_2e, at the 2023 carbon intensity, when the GHG emissions from the construction phase and the turbines are removed. This is equivalent to 3.5% of the total carbon budget for the electricity sector in 2030 and 0.3% of Ireland's non-ETS 2030 emissions target (DECC, 2023).

As the proposed development 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 18.2.1.5 and Table 18.3 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.

The impact of GHG emissions from the proposed development is therefore considered to have a ***direct, long-term, positive*** and ***slight*** effect on climate, in EIA terms.

CCRA

A screening climate change risk assessment of the vulnerability of the proposed development to climate change was undertaken, in line with TII guidance PE-ENV-01104 (TII, 2022a), European Commission *Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027* (European Commission, 2021) 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 development to climate hazards which together provide a measure of vulnerability. Sensitive elements of the proposed development included drainage works, access roads, buildings, underground utilities, and turbines, foundations and cables. Climate hazards included flooding (coastal, pluvial or fluvial), extreme temperatures, drought, wind, fog, lightning, hail, wildfires and landslides. Mitigation measures for sensitive elements, such as flood protection measures, 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 development. Having taken these into account, it has been determined that the proposed development has at most low vulnerabilities to the identified climate hazards. In accordance with the EPA Guidelines (EPA, 2022), and with the design mitigation in place, the significance of effect of the impacts to the proposed development as a result of climate change are ***direct, long-term, negative*** and ***imperceptible***, which is not significant in EIA terms.

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