Environmental Impact Assessment Report

NISA

North Irish Sea Array

Volume 5: Wider Scheme Aspects

Chapter 28
Climate

Statkraft

CIP Copenhagen Infrastructure Partners

GoBe APEM Group

ARUP

Contents

Tables

28. Climate

28.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) presents an assessment of likely significant effects from the North Irish Sea Array (NISA) Offshore Wind Farm (hereafter referred to as the 'proposed development') in relation to Climate during the construction, operation and decommissioning phases. In addition, an assessment of the proposed development's vulnerability and resilience to climate change (i.e. a climate change risk assessment) is included.

This chapter initially sets out the methodology followed (Section 28.2), describes the baseline environment (Section 28.3) and summarises the main characteristics of the proposed development which are of relevance to climate (Section 28.4). The evaluation of significant effects of the proposed development on climate are described (Section 28.5). Measures are proposed to mitigate and monitor these effects (Section 28.6) and residual effects are described (Section 28.7). Transboundary effects are considered (Section 28.8). Cumulative effects are summarised in Section 28.8 and detailed in full in Chapter 38 Cumulative and Inter-Related Effects. The chapter concludes with a summary of Transboundary effects (Section 28.8) and a reference section (Section 28.10).

The EIAR also includes the following:

- Detail on the competent experts that have prepared this chapter is provided in Appendix 1.1 in Volume 8;
- Detail on the extensive consultation (including anything specific to climate) has been undertaken with a range of stakeholders during the development of the EIAR is set out in Appendix 1.2; and
- A glossary of terminology, abbreviations and acronyms is provided at the beginning of Volume 2 of the EIAR.

The potential effects on air quality due to the proposed development are considered in Volume 5, Chapter 27: Air Quality.

Volume 2, Chapter 6: Offshore Description of Development (hereafter referred to as the 'Offshore Description Chapter') and Volume 2, Chapter 7: Onshore Description of Development (hereafter referred to as the 'Onshore Description Chapter') provides a description of the proposed development and Volume 2, Chapter 8: Offshore Construction Strategy (hereafter referred to as the 'Offshore Construction Chapter') and Volume 2, Chapter 9: Onshore Construction Strategy (hereafter referred to as the ' Onshore Construction Chapter') describes the construction strategy for the proposed development.

28.2 Methodology

This section presents the study area, relevant guidance, legislation, and assessment method for the assessment of impacts to climate from the proposed development.

28.2.1 Introduction

Transport Infrastructure Ireland (TII) Climate Assessment of Proposed National Roads – Standard (PE-ENV-01105) (2022) has been applied in the assessment of potential climatic impacts. This is the only Irish guidance relating to climate impact assessment of infrastructural projects and is therefore considered relevant in the context of the proposed development. The chapter has also had regard to the EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022).

The potential effects of emissions of carbon due to the construction, operation and decommissioning of the proposed development have been considered in the context of Ireland's energy carbon budget. The climate assessment for the construction phase estimates the potential for greenhouse gas (GHG) emissions, i.e., carbon dioxide equivalence (CO_2 eq.), for the proposed development.

EU greenhouse gas emission reduction targets and reduction obligations for Ireland are split into two broad categories. The first category covers the large energy and power (i.e., energy intensive) industries which have their emissions controlled under the EU Emissions Trading Scheme (ETS). The second category deals with the non-Emissions Trading Scheme (non-ETS) sectors such as agriculture, transport, residential, commercial, waste, and non-energy intensive industry.

However, in accordance with the TII Standard, Ireland's carbon budgets should be used to contextualise the magnitude of GHG emissions from the proposed development, during construction, operational and decommissioning phases. The carbon budgets relate to the electricity, transport and industry so are considered representative of potential GHG emissions from the proposed development.

The sources and life cycle stages of likely GHG emissions is provided in Table 28.1 based on the Design Manual for Roads and Bridges (DMRB) LA 114 Climate (UKHA 2021).

Table 28.1 Sources and Life Cycle Stages for a Project's GHG Emissions (reproduced from Table 3.11.1 of LA 114 Climate (UKHA 2021))

Main Stage of a Project Life Cycle	Sub-Stage of Life Cycle	Potential Sources of GHG Emissions (Not Exhaustive)	Examples of Activity Data
Construction Stage	Product stage: including raw material supply, transport and manufacture.	Embodied GHG emissions associated with the required raw materials.	Material quantities.
	Construction process stage; including transport to / from works site and construction/installation processes.	Activities for organisations conducting construction work.	Fuel/electricity consumption. Construction activity type/duration. Transportation of materials from point of purchase to site, mode / distance. Area of land use change.
	Land use change.	GHG emissions mobilised from vegetation or soil loss during construction.	Type and area of land subject to change of usage.
Operation ('use-stage') (to extend 35 years in line with assessment period)	Operation and maintenance (including repair, replacement and refurbishment).	Energy consumption for infrastructure operation and activities of organisations conducting routine maintenance.	Fuel / electricity consumption. For vehicles, lighting and plant. Raw material quantities and transport mode / distance. Waste and arisings quantities, transport mode/distance and disposal fate.
	Land use and forestry.	Ongoing land use GHG emissions / sequestration each year.	Type and area of land subject to change in usage. Net change in vegetation.
Opportunities for Reduction	GHG emissions potential of recovery including reuse and recycling GHG emissions potential of benefits and loads of additional functions associated with the study system.	Avoided GHG emissions through substitution of virgin raw materials with those from recovered sources.	Waste and arisings material quantities and recycling/reuse fate.

Note: The first life cycle stage is 'construction', which includes GHG emissions from the construction process and the manufacture/transport of materials. The second life cycle stage is 'operation', which includes: 1) Operation and maintenance, repair, replacement, refurbishment and land use change (operational maintenance GHG emissions); and 2) Emissions from end-users (operational user GHG emissions). The third life cycle stage comprises opportunities to minimise production/use of GHG emissions i.e. the potential for reduction of GHG emissions through reuse and recycling during the construction of the proposed development.

A climate change risk assessment for the proposed development has been carried out in accordance with TII methodology.

28.2.2 Study Area

The proposed development comprises of a combination of offshore infrastructure and onshore infrastructure within the proposed development boundary which is displayed in Volume 7A, Figure 1.1.

The potential impacts on climate are based on the national implications of changes in carbon emissions due to the proposed development, considering Ireland's climate commitments and carbon budget. Therefore the study area encompasses the Republic of Ireland.

28.2.3 Relevant Guidance and Policy

The assessment has been undertaken with reference to the most appropriate guidance documents relating to climate which are set out in the following sections.

The assessment has made reference to national guidelines, where available, in addition to international and local standards and guidelines relating to the assessment of GHG emissions and associated climatic impacts, which have been summarised in Section 28.2.3.1, Section 28.2.3.2 and Section 28.2.3.3.

For further information on policy and legislation relevant to the proposed development, refer to Volume 2, Chapter 3: Legal and Policy Framework and Chapter 4: Need for the Proposed Development.

28.2.3.1 International Policy

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

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

On 14 July 2021, the European Commission adopted a series of legislative proposals setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target of at least a 55% net reduction in greenhouse gas emissions by 2030. The package of proposals is known as the 'Fit for 55' package. The package includes revisions to the legislation put forward as part of the Climate and Energy Framework 2021-2030, including the EU Emissions Trading System (ETS), Effort Sharing Regulation, transport and land use legislation, setting out in real terms the ways in which the Commission intends to reach EU climate targets under the European Green Deal.

The 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.

The European Climate Law aims to write into law the goal set out in the European Green Deal, for Europe's economy and society to become climate-neutral by 2050. On 17 September 2020, the Commission adopted a proposal to include a revised EU emissions reduction target of at least 55% by 2030 as part of the European Climate Law. In 2023, the Commission issued a new Effort Sharing Regulation, requiring Ireland to reduce non-ETS carbon emissions by 42% relative to 2005 levels.

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

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

28.2.4.1 National Policy

In 2015, the Climate Action and Low Carbon Development Act (Climate Act) was enacted by the Irish Government, in the Houses of the Oireachtas. The purpose of the Climate 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'*. This is referred to in the Climate Act as the 'national transition objective'. The Climate Act allows for the submission of an adaptation framework for Ireland referred to as the 'National Adaptation Framework', which is required to be submitted to Government for approval every five years.

The Climate Action and Low Carbon Development (Amendment) Act (2021 Climate Act) was enacted into national law in July 2021. The 2021 Climate Act commits Ireland, in law, to move to a climate resilient and climate neutral economy by 2050 in alignment with the European Green Deal, and includes the following elements:

- Establishes 2050 emissions target;
- Introduces a system of successive 5-year, economy-wide carbon budgets. The first two carbon budgets covering the periods 2021-2025 and 2026-2030 were announced by the Climate Change Advisory Council in 2021 (with a provisional budget from 2031). Once adopted by the Oireachtas, the carbon budgets will be used to prepare sectoral emissions ceilings for relevant sectors of the economy;
- Strengthens the role of the Climate Change Advisory Council in proposing carbon budgets;
- Introduces a requirement to annually revise the Climate Action Plan and prepare a National Long Term Climate Action Strategy at least every decade; and
- Introduces a requirement for all Local Authorities to prepare individual Climate Action Plans which will include both mitigation and adaptation measures.

The Energy White Paper: Ireland's Transition to a Low Carbon Energy Future 2015-2030 was launched in 2015. This policy set out a framework to guide policy and actions that the government needed to take in the energy sector up to 2030.

Ireland's first statutory National Adaptation Framework (NAF) which was published in 2018, sets out the national strategy, for government and society, to reduce the vulnerability of the country to the negative effects of climate change.

The National Energy and Climate Plan 2021-2030 (NECP), required under the Regulation on the governance of the energy union and climate action (EU) 2018/1999, which entered into force in 2018 as part of the Clean Energy for all Europeans package, will see the production of a climate strategy with a statutory basis in EU law. The NECP incorporates all planned energy and climate policies and measures (up to the end of 2019) and if implemented will collectively deliver a 30% reduction by 2030 in non-ETS greenhouse gas emissions (from 2005 levels).

The objectives in the NECP are regarded as a baseline, as opposed to the limit, of Ireland's ambition (DCCAE 2018).

Ireland's 'Long-term Strategy on Greenhouse Gas Emissions Reductions' was published in April 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 new Programme for Government, 'Our Shared Future', agreed in June 2020, accelerated the decarbonisation agenda, committing to a 7% average yearly reduction in overall greenhouse gases over the next decade, and to achieving net zero emissions by 2050.

As part of Ireland Government's commitments to annually update the Climate Action Plan and the roadmap of actions to reflect developments in the previous year, developments in technology and research in relation to climate action, and to ensure the required emissions reductions are achieved, the Government published the first Climate Action Plan in June 2019. The Climate Action Plan 2024 (CAP 2024) approved in December 2023, is the third annual update to Ireland's Climate Action Plan 2019. The Plan sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022. This will '*enable Ireland to meet 2030 targets and be well placed to meet mid-century decarbonisation objectives. This will also deliver cleaner air, warmer homes, a more secure energy system and a better quality of life for Irish citizens'*.
The first carbon budget programme proposed by the Climate Change Advisory Council was approved by Government and adopted by both Houses of the Oireachtas in April 2022. The CAP 2024 then implemented the carbon budgets and sectoral emissions ceilings for the non-ETS sectors.

The carbon budgets comprise of three successive 5-year budgets. The total emissions allowed under each budget is set out below in Table 28.2 as well as the average annual reduction for each 5-year period.

Table 28.2 2021 – 2035 Carbon Budgets

Period	Mt CO_2eq	Emission Reduction Target
2021 - 2025	295 Mt CO2eq	Reduction in emissions of 4.8% per annum for the first budget period.
2026 - 2030	200 Mt CO2eq	Reduction in emissions of 8.3% per annum for the second budget period.
2031 - 2035	151 Mt CO2eq	Reduction in emissions of 3.5% per annum for the third provisional budget.

The Sectoral Emission Ceilings for each Sector, published in July 2022, are shown in Table 28.3. It should be noted that 5.25 $MtCO_{2eq}$ of annual emissions reductions are currently unallocated on an economy-wide basis for the second carbon budget period (2026-2030). These will be allocated following a mid-term review and identification of additional abatement measures. It is noted that the electricity sector is required to reduce emissions by 75% by 2030 relative to 2018 emissions.

Table 28.3 Sectoral Emission Ceilings

Sector	Reduction Required	2018 Emissions ($MtCO_{2eq}$)	2030 Emission Ceiling ($MtCO_{2eq}$)
Electricity	75%	10.5	3
Transport	50%	12	6
Buildings (Commercial and Public)	45%	2	1
Buildings (Residential)	40%	7	4
Industry	35%	7	4
Agriculture	25%	23	17.25
Other*	50%	2	1

* = F-gases, Petroleum Refining and Waste

The key National Marine Planning Framework (NMPF) policy that is applicable to the assessment of climate is summarised in Table 28.4. NMPF policies are addressed in their entirety in Appendix 3.1: NMPF Compliance Report.

Table 28.4 NMPF Policy Point of Relevance to Climate

NMPF Policy Point	Policy Description	Where addressed
Climate Change Policy 2	For the lifetime of the proposal, the following climate change matters must be demonstrated: • estimation of likely generation of greenhouse gas emissions, both direct and indirect; • measures to support reductions in greenhouse gas emissions where possible; • likely impact of climate change effects upon the proposal from factors including but not limited to: sea level rise, ocean acidification, changing weather patterns; • measures incorporated to enable adaptation climate change effects; • likely impact upon climate change adaptation measures adopted in the coastal area relevant to the proposal and/or adaptation measures adopted by adjacent activities; • where likely impact upon climate change adaptation measures in the coastal area relevant to the proposal and/or adaptation measures adopted by adjacent activities is identified, these impacts must be in order of preference and in accordance with legal requirements: a. avoided, b. minimised, c. mitigated, d. if it is not possible to mitigate significant adverse impacts, the reasons for proceeding must be set out	The proposed development is an offshore wind energy project which will significantly contribute to the Government's target of achieving 5GW of offshore wind by 2030. The associated generation of greenhouse gas emissions as well as the calculation of the total embodied carbon of the proposed development is provided in Section 28.5. The carbon assessment also demonstrates a net positive of carbon reductions equating to 9,872,520 tonnes of CO_{2eq} over the lifecycle of the proposed development. Mitigation measures relating to the construction of the proposed development to reduce greenhouse gas emissions are provided in Section 28.6

28.2.4.2 Local Policy

Given the location of the proposed development's onshore infrastructure, the following local policies were considered:

- Fingal County Council's (FCC) Climate Change Action Plan 2019-2024 contains 133 actions that are on-going or planned within the Council, covering five key action areas of Energy and Buildings, Transport, Flood Resilience, Nature-Based Solutions and Resource Management, in order to combat Climate Change. A Climate Action Plan for 2024 – 2029 was published by FCC in March 2024. The targets of the Plan are:
  - To achieve a 50% improvement in the Council's energy efficiency by 2030;
  - To achieve a 51% reduction in the Council's greenhouse gas emissions by 2030;
  - To make Dublin a climate resilient region by reducing the impacts of future climate change-related events; and
  - To actively engage and inform communities on climate action.
- The Dublin City Council Climate Change Action Plan 2024 -2029 (Climate Neutral Dublin 2030) contains three key targets: a 51% reduction in GHG emissions by 2030, a climate resilient city prepared for the known and unknown impacts of climate change, and a just transition. These targets are designed to support the four foundations of: a Resilient City, a Resource-Full City, a Creative City, and a Social City.
- Meath County Council's Climate Action Strategy 2024-2029 addresses both climate adaptation and mitigation measures across five thematic areas including governance and leadership, built environment and transport, natural environment and green infrastructure, communities: resilience and transition, and sustainability and resource management.

- Louth County Council's Climate Change Adaptation Strategy 2019 -2024 represents a proactive step by Louth County Council in the process of adaptation planning to build resilience and respond effectively to the threats posed by climate change.

28.2.5 Data Collection and Collation

The EPA's Ireland's Greenhouse Gas Emissions Projections 2021-2040 was considered, which includes total projected emissions and a breakdown of projected emissions per sector under the "*With Existing Measures*" and "With Additional Measures" scenarios.

28.2.6 Method for Assessment of Impacts

This section sets out how the climate assessment has been undertaken and highlights where input from other environmental disciplines has been included within the assessment.

28.2.6.1 Construction Phase

An assessment of carbon emissions was carried out to determine the likely GHG emissions (CO_2eq) predicted due to the construction phase of the proposed development. The construction materials are manufactured using carbon intensive practices, which results in embodied carbon associated with the materials. The results of this assessment have been compared with the EPA's projected GHG emissions for Ireland's total projected emissions for 2026 (assumed construction year as outlined in Chapter 9: Onshore Construction Methodology). The assessment considers the material manufacture, the transport of construction materials to site, the construction processes and the construction compounds.

The TII Carbon Assessment Tool (Version 3) (hereafter referred to as the TII Carbon Tool) (TII 2022c) has been used to calculate the embodied carbon of materials, which incorporates the energy needed in the mining or processing of the raw material and its manufacture, in terms of CO_2eq. The TII Carbon Tool uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013).

For a small number of materials not covered by the TII Carbon Tool, the UK Environment Agency's (UKEA) Carbon Calculator has been used to estimate carbon emissions due to construction activities in terms of CO_2eq. In addition, the UKEA Carbon Calculator has been used to estimate embodied carbon associated with the transportation of materials to and from site.

The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that is predicted to be used over the construction phase. The varying, relevant transport distances have been included in the calculations for the onshore transportation of materials to and from site for construction of both the onshore and the offshore infrastructure.

The assessment includes the pre-construction (site clearance) stage, the assessment of the embodied carbon associated with all materials used in the construction phase, the emissions during the construction phase and additionally emissions related to waste generated during the construction phase.

The assumptions were made in the assessment of embodied carbon likely to be generated during the construction phase:

- The climate assessment reflects availability of data at the current stage of the project
- Assumptions of transport distances of materials and the mode of transport are made (refer to Table 28.8Table 28.8 and Table 28.9 for details of assumptions made in the assessment)
- Construction plant fuel use is excluded from the embodied carbon assessment, it is assumed to be captured through the consideration of 'construction stage carbon' as outlined in Table 28.8 and Table 28.9Table 28.9; and
- Emissions that may arise from offshore construction vessels are expected to be minimal due to the irregular nature of the use and the vessels' ability to transfer large loads at any one time. The use of helicopters is expected to be minimal and only in the event of an emergency.

28.2.6.2 Operational Phase

The operation of offshore wind turbines is likely to result in significant reductions in carbon emissions for Ireland's energy sector and is predicted to result in largely positive impacts to climate as a result. The potential savings are calculated using the following formula:

$$Tonnes\ CO2eq = \frac{A\ x\ B\ x\ C\ x\ D}{1000}$$

Where;

A. the rated capacity of the wind energy development in MW (assumed to be 700MW for the proposed development);

B. The capacity factor, which takes into account the intermittent nature of wind, the availability of wind turbines and array losses etc. A conservative capacity factor of 46% is assumed for the proposed development;

C. number of hours in the year; and

D. Carbon load in grammes per kWhr of electricity generated and distributed via the national grid. A value of 100gCO_2/kWhr is assumed for the opening year of 2028 on the basis that the current factor is 296gCO_2/kWh (SEAI emission factors 2022) and the ESB is projecting a value of 66 gCO_2/kWh for 2030.

Offshore marine vessel emissions may arise from due to vessels accessing the proposed development for operation and maintenance purposes over the anticipated life span of the proposed development (35 years). No significant impact on climate is likely to arise due to the infrequent nature of these vessel movements.

28.2.6.3 Construction and Operational Phase Significance Criteria

The TII Standard outlines a recommended approach for determining the significance of both the construction and operational phases of a proposed development. The approach is based on the TII Standard which considers the net project GHG emissions relative to the sectoral carbon budgets, refer to Table 28.3. As the proposed development will not fall within the remit of the ETS, predicted GHG emissions are compared against the non-ETS budgets and baseline.

Table 28.5 Climate significance criteria

Effects	Significance level	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 provide 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	Beneficial	The project's net GHG impacts are below zero and it causes a reduction in atmosphere GHG concentration.

Effects	Significance level	Description
		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.

28.2.6.4 Vulnerability of the Proposed Development to Climate Change

The TII Standard outlines an approach for undertaking a risk assessment where there is a potentially significant impact on the proposed development receptors (e.g., turbines, substations at grid facility etc.) due to climate change. The risk assessment assesses the likelihood and consequence of the impact occurring to each receptor due to the receptor's vulnerability to climate change, leading to the evaluation of the significance of the impact.

Likelihood refers to how likely the identified climate hazards are to occur over the lifetime of the project. Consequence refers to the severity or magnitude of the impact associated with the climate risk, should it eventuate.

The likelihood and consequence of each impact is combined in the form of a matrix to identify the significance of each effect as outlined in Table 28.6.

Table 28.6 Vulnerability Significance Matrix

Likelihood	Magnitude of consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	Not significant	Not significant	Not significant	Significant	Significant
Unlikely	Not significant	Not significant	Not significant	Significant	Significant
Moderate	Not significant	Not significant	Significant	Significant	Significant
Likely	Not significant	Significant	Significant	Significant	Significant
Almost certain	Significant	Significant	Significant	Significant	Significant

Legend

Low	Medium	High	Extreme

28.3 Baseline Environment

28.3.1 Climate baseline for the purposes of the assessment of climate change vulnerability

Dublin City Council's Climate Action Plan 2019 - 2024, Fingal County Council's Climate Change Action Plan 2019 - 2024, Fingal County Council's Draft Climate Change Action Plan 2024 - 2029, Meath County Council's Climate Action Strategy 2019 - 2024 and Louth County Council's Climate Change Adaptation Strategy 2019 - 2024 were consulted. Within each, it is stated that the main risks of climate change around the area of the onshore and offshore infrastructure are likely to include the following:

- Rising temperatures increasing heat stress and diseases
- Ocean warming and acidification
- Sea level rise and inundation of low-lying communities
- Flooding
- Changes to natural ecosystems; and
- An increase in the frequency and intensity of extreme weather events.

The EPA (2019) Irish Climate Futures: Data for Decision Making report states that it is expected that weather extremes will become more likely and more frequent with future climate change.

The EPA (2021) The Status of Ireland's Climate 2020 includes a number of recent climate observations for Ireland. The report states that the annual average surface air temperature in Ireland has increased by approximately 0.9°C over the last 120 years, with a rise in temperatures being observed in all seasons.

This compares with a global average temperature estimated to be 1.1°C above pre-industrial levels. The report indicates that the sea level around Ireland has risen by approximately 2–3 mm per year since the early 1990s. In addition, annual precipitation was 6% higher in the period 1989 to 2018, compared to the 30-year period 1961 to 1990.

Analysis of the meteorological records shows that Ireland's climate is changing in line with global patterns.

According to the EPA[1] climate change is expected to lead to the following adverse effects:

- Sea level rise
- 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
- Changes in distribution of plant and animal species; and
- Effects on fisheries sensitive to changes in temperature

LA 114 Climate (UKHA 2021) outlines that the study area for assessing a project's vulnerability to climate change should be based on the construction footprint / project boundary (including compounds and temporary land take).

The region where the proposed development will be located has a temperate, oceanic climate, resulting in mild winters and cool summers. The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed. A noticeable feature of the recent weather has been an increase in the frequency and severity of storms with notable events including Storm Darwin in February 2014, Storm Emma in March 2018, and Storm Ophelia in October 2018. Heavier historical rainfall events have also been recorded in recent years including heavy rainfall and flooding.

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.

A flood risk assessment (FRA) was prepared for the proposed development (Refer to Appendix 22.1 in Volume 10). The results of the flood risk assessment are presented in Volume 4, Chapter 22: Water. The FRA had regard to sea level rise, intense rainfall events and the risk of river and coastal flooding. The FRA concluded that all sources of flood risk identified within the proposed development boundary can be managed to acceptable levels with the implementation of mitigation measures.

28.3.2 Climate Pollutants

Climate is defined as the average weather over a period of time, whilst climate change is a significant change to the average weather. Climate change is a natural phenomenon but in recent years human activities, through the release of GHGs, have impacted on the climate (IPCC 2021).

The release of anthropogenic GHGs is altering the Earth's atmosphere resulting in a 'Greenhouse Effect'. This effect is causing an increase in the atmosphere's heat trapping abilities resulting in increased average global temperatures over the past number of decades.

---

[1] What impact will climate change have on Ireland? | Environmental Protection Agency (epa.ie)

The release of CO_2 as a result of burning fossil fuels, has been one of the leading factors in the creation of this 'Greenhouse Effect'. The most significant GHGs are CO_2, methane (CH_4) and nitrous oxide (N_2O) and also includes hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).

GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere.

In order to compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWPs) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The IPCC AR6 Synthesis Report: Climate Change 2021 sets out the global warming potential for a 100-year time period (GWP100) for CO_2 as the basic unit (GWP = 1) whereas CH_4 has a global warming potential equivalent to 29.8 units of CO_2 (for fossil sources) and N_2O has a GWP100 of 273. These values have been refined since the AR5 report.

The Wind Turbine Generators (WTGs), offshore substation and grid facility will use electrical equipment insulated with Sulphur Hexafluoride (SF_6) gas. The handling and maintenance of the equipment will lead to very low-level losses of SF_6.

SF_6 is listed under Section 3 of Annex 1 of the European F-Gas Regulations 2015. SF_6 is also listed as a GHG and, according to the Intergovernmental Panel on Climate Change (IPPC), it is the most potent GHG that has been tested, with a greenhouse gas potential 23,000 times higher than that of CO_2.

Table 4.3 page 133 of the EPA Ireland's National Inventory Report 2020 shows that Ireland's total SF_6 emissions from emission source category *2.G.1 Electrical Equipment* in 2018, the latest year for which the information is provided, was 16.13 kt CO_2 eq. This represented 0.026% of Ireland's total calculated emissions in 2018.

The design and manufacture of the gas insulated electrical equipment in the Offshore Substation Platform (OSP) and the grid facility substations will follow industry best practice to reduce losses to a practical minimum. The switchgear will be equipped with pressure or density monitoring devices. Staff and any sub-contractors involved in equipment installation, servicing or disposal will also be trained to ensure they understand the techniques required to minimise the generation of fugitive emissions.

The emission of SF_6 from the OSP and grid facility substations are not expected to have a significant effect on climate, and thus is not considered further in this assessment.

The potential for a substantial leak of SF_6 is assessed in Volume 5, Chapter 34: Major Accidents and Disasters.

28.3.3 Baseline Greenhouse Gas Emissions

In June 2023, the EPA released the report Ireland's Greenhouse Gas Emissions Projections 2022-2040, which includes total projected emissions and a breakdown of projected emissions per sector under the "With Existing Measures" and "With Additional Measures" scenarios.

The Climate Act 2021 has specified the base year by which a 51% emission reduction is to be achieved by 2030. Therefore, the percentage changes referred to within the text of the following assessment are referring to the period 2018 to 2030.

Implementation of "Additional Measures" (including those in the 2024 Climate Action Plan) is projected to deliver 29% emission reduction by 2030 compared to the 2018 level, while the implementation of "With Existing Measures" can deliver 11% emission reduction over the same period. This represents a reduction of 3% per annum in emissions over the period with the implementation of the "Additional Measures".

The latest greenhouse gas emissions projections show total emissions decreasing from the latest inventory (2021) levels by 15% by 2030 under the "With Existing Measures" scenario and by 32% under the "With Additional Measures" scenario.

Table 28.7 presents the EPA "With Existing Measures" and "With Additional Measures" scenarios for 2026 (assumed construction year) and 2028 (year of opening). 2026 is assumed as the construction year as the majority of construction emissions occur within the first year of construction.

Table 28.7 Projected Emissions for the Energy and Non ETS Sector Total Emissions (EPA, 2022)

Projections	Year	Energy Industries (Mt CO_2 eq.)	National Total (Mt CO_2eq)
Projections (with existing measures)	2026	8.31	57.81
	2028	7.0	55.71
Projections (with additional measures)	2026	7.8	53.13
	2028	6.1	48.59

The Energy sector contributed 17% of Ireland's total emissions in 2021 and is projected to reduce by 10% in 2030 (in the *With Existing Measures* scenario).

As outlined in the *With Existing Measures* scenario, emissions from the energy industries sector are projected to decrease by 50% from 10.3 to 5.2 Mt CO_2 eq. over the period 2021 to 2030. In terms of the renewable energy generated, this scenario projects Ireland reaching approximately 68% of electricity consumption from renewable energy by 2030. Renewable electricity generation capacity is dominated by wind energy, with solar and hydro sources also contributing to the mix.

As outlined in the *With Additional Measures* scenario, emissions from the energy industries sector are projected to decrease by 60% from 10.3 to 4.2 Mt CO_2 eq. over the period 2021 to 2030. In this scenario it is estimated that renewable energy generation increases to approximately 80% of electricity consumption by 2030. This is mainly a result of further expansion in wind energy (comprising 7.8 GW onshore and 5.0 GW offshore). Expansion of other renewables (e.g., solar photovoltaics increasing to 6 GW by 2030) also occurs under this scenario.

28.4 Characteristics of the Proposed Development

From a climate perspective, the characteristics of the proposed development which are included in this assessment relate to specific activities undertaken during the construction, operation, and decommissioning phases of both the offshore and onshore infrastructure of the proposed development.

Construction works specific to the construction of the offshore infrastructure include pre-construction surveys, seabed clearance, foundation installation, offshore cable installation, cable protection, WTG installation and installation of the offshore substation platform. Waste materials from offshore construction are also considered.

In relation to the construction works associated with the onshore infrastructure, the assessment focused on the construction methodologies to be employed with the installation of the underground cables; such as horizontal direction drilling (HDD) and open cut trenching, enabling and site clearance activities, manufacture of materials and transport to site, construction works (including landfall, grid facility, onshore cable route and connection into the existing substation at Belcamp), construction waste products (including transport off site) and construction traffic.

During the operational phase of the proposed development, positive impacts on climate are expected given the generation of wind powered renewable energy. There will be occasional maintenance works required during the operational phase which will require trips by road and by marine vessel to the site, resulting in very minor increases in road and marine traffic. However, it is not predicted that this will result in any significant carbon emissions.

The assessment of the operational phase also examines the vulnerability of the proposed development to climate change, including the risk of flooding and the potential increased frequency of storms and the measures that have been put in place to ensure the resilience of the proposed development to climate change.

Decommissioning of the proposed development which may include the removal of WTG components such as blades, nacelles, foundations and towers (offshore) and above ground structures between the landfall site and grid facility (onshore) have the potential to generate carbon emissions, refer to the Offshore Construction Chapter and the Onshore Construction Chapter for further information.

The land use change associated with the construction phase of the proposed development has also been quantified. Trees are a natural carbon sink and absorb carbon dioxide (CO_2) from the atmosphere helping in the reduction of climate change. Within the 5.97ha that accommodates the grid facility, a comprehensive landscaping scheme will be implemented, incorporating planting of native mixed-woodland trees, and zones of grassland meadow. Refer to Volume 5, Chapter 29: Seascape, Landscape and Visual for further details of the landscaping plan for the grid facility.

A default value for the amount of CO_2 which a mature tree can absorb is approximately 22 kg CO_2 eq./annum (EEA 2011). Trees have the ability to sequester carbon with the peak CO_2 eq. (carbon dioxide equivalent) uptake rate for tree stands in the order of 5t CO_2eq./hectare/year (tonnes of carbon dioxide equivalent per hectare per year) to 20t CO_2 eq./hectare/year with CO_2 eq. uptake rates declining with maturity and health (UK Forestry Commission 2012). Thus, based on these emission rates, a hectare will typically contain between 225 – 900 trees depending on tree type and maturity. Any felling of trees has the potential to result in a loss of this carbon sink thus increasing the levels of CO_2 in the atmosphere. In contrast, increased planting of trees on suitable lands will, over time, help to increase the carbon sink potential of the land and benefit climate. The change in land use associated with the proposed development, including the felling and planting of trees and vegetation, has been considered.

As set out in the Offshore Description Chapter, the proposed development includes two project options for the offshore infrastructure: the options and key parameters relevant to the climate assessment are as follows:

- Option 1: 49 turbines, 250m rotor diameter on monopile foundations
- Option 2: 35 turbines, 276m rotor diameter on monopile or jacket foundations.

The emissions assessment presented in Section 28.5.2 considers these two options to ensure that the assessment reflects the project option that will result in the greatest magnitude of impact.

28.5 Potential Effects

28.5.1 Do-Nothing Scenario

In the scenario where the proposed development did not proceed as planned, none of the construction or operational effects as set out in this chapter would occur. However, the indirect positive effects of the overall proposed development on GHG of a significant reduction of emissions for power generation would also not occur. In the absence of the proposed development, Ireland risks missing binding climate and environmental targets for 2030 and beyond. With the urgency surrounding the climate crisis, these are targets that cannot be missed; therefore, the do-nothing is considered to result in a likely significant, long term adverse impact.

28.5.2 Construction Phase

The carbon footprint of the proposed development during the construction phase is estimated, based on an assessment of carbon equivalents, outlined in Table 28.8 for onshore infrastructure and Table 28.9 for offshore infrastructure. The carbon assessment assumes no improvement in the carbon intensity of the production of cement and steel is achieved through time.

The predicted results are compared to the EPA’s Projected Non-ETS Sector CO_2 eq. emissions in 2026 assuming additional measures. In accordance with the TII Standard, the assessment significance criteria are based on the net project GHG emissions, so consider both construction and operational phases.

Table 28.8 Estimated Embodied Carbon Associated with the Construction Phase of the Onshore Infrastructure

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material	Unit	Comment / Assumptions	Tonnes CO_2e	Additional tCO_2 from transport	Total CO_2 equivalent (tCO2e)	Sources (Circular Ecology (CE) / UKEA / TII / National Highways England / UK Government (2021) (BEIS))
Excavations								
Excavations Topsoil	0.0007	67,150	Tonnes	Assumed carbon factor of 0.731kgCO_2eq./m^3 - General Excavation - Topsoil (TII). Assumed Density 1.7t/m^3	28.9	0.0	28.9	TII
Topsoil reused	0.0	38,080	Tonnes	No carbon associated with use of sitewon material, construction plant carbon captured elsewhere.	0.0	0.0	0.0	TII
Topsoil Exported off site	0.0012	29,070	Tonnes	Assumed carbon factor of 1.239kgCO_2e/tonne - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2e/km (TII). Average road load 30t to calculate round trip.	36.0	104	140	TII
Excavations Subsoil	0.001	76,000	Tonnes	Assumed carbon factor of 1.04kgCO_2eq/m^3 - General Excavation - Other (TII). Assumed density 2t/m^3	39.5	0.0	39.5	TII
Subsoil reused	0	7,400	Tonnes	No carbon associated with use of sitewon material, construction plant carbon captured elsewhere.	0	0	0	TII
Subsoil Exported off site	0.0012	68,600	Tonnes	Assumed carbon factor of 1.239kgCO_2eq./tonne - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 30t to calculate round trip.	85.0	245.4	330.4	TII
Excavations Surface Course (Asphalt)	0.001	4,080	Tonnes	Assumed carbon factor of 1.04kgCO_2eq./m^3 - General Excavation - Other (TII). Assumed Density 1t/m^3	4.2	0.0	4.2	TII
Surface Course (Asphalt) Reused	0	2,880	Tonnes	No carbon associated with use of sitewon material, construction plant carbon captured elsewhere.	0	0	0	TII

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material	Unit	Comment / Assumptions	Tonnes CO_2e	Additional tCO_2 from transport	Total CO_2 equivalent (tCO2e)	Sources (Circular Ecology (CE) / UKEA / TII / National Highways England / UK Government (2021) (BEIS))
Surface Course (Asphalt) Exported off site	0.0012	1,200	Tonnes	Assumed carbon factor of 1.239kgCO_2eq./tonne - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 30t to calculate round trip.	1.5	4.3	5.8	TII
Excavations Base/Binder Course (Asphalt)	0.001	16,080	Tonnes	Assumed carbon factor of 1.04kg$CO_{2eq.}$/m^3 - General Excavation - Other (TII). Assumed Density 1t/m^3	16.7	0	16.7	TII
Base/Binder Course (Asphalt) reused	0	11,280	Tonnes	No carbon associated with use of sitewon material, construction plant carbon captured elsewhere.	0	0	0	TII
Base/Binder Course (Asphalt) Exported off site	0.0012	4,800	Tonnes	Assumed carbon factor of 1.239kgCO_2eq./tonne - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 30t to calculate round trip.	5.9	17.2	23.1	TII
Excavations Sub-base (Crushed Stone)	0.0010	18,260	Tonnes	Assumed carbon factor of 1.04kgCO_2eq./m^3 - General Excavation - Other (TII). Assumed Density 2.2t/m^3	8.6	0.0	8.6	TII
Sub-base (Crushed Stone) reused	0.0	12,980	Tonnes	No carbon associated with use of sitewon material, construction plant carbon captured elsewhere.	0	0	0	TII
Sub-base (Crushed Stone) Exported Offsite	0.0012	1,760	Tonnes	Assumed carbon factor of 1.239kgCO_2eq./tonne - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 30t to calculate round trip.	2.2	6.3	8.5	TII
Excavated Capping (Crushed Stone)	0.001	27,500	Tonnes	Assumed carbon factor of 1.04kgCO_2eq./m^3 - General Excavation - Other (TII). Assumed Density 2.2t/m^3	13.0	0	13.0	TII

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material	Unit	Comment / Assumptions	Tonnes CO_2e	Additional tCO_2 from transport	Total CO_2 equivalent (tCO2e)	Sources (Circular Ecology (CE) / UKEA / TII / National Highways England / UK Government (2021) (BEIS))
Capping (Crushed Stone) Exported Offsite	0.0012	27,500	Tonnes	Assumed carbon factor of 1.239kgCO_2eq./tonne - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 30t to calculate round trip.	34.1	98.4	132.5	TII
Excavations Road Subgrade	0.001	66,220	Tonnes	Assumed carbon factor of 1.04kgCO_2eq./m^3 - General Excavation - Other (TII). Assumed Density 2.2t/m^3	31.3		31.3	TII
Road Subgrade Exported off site	0.0012	66,200	Tonnes	Assumed carbon factor of 1.239kgCO_2eq./tonne - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.073 kg$CO_{2eq.}$/km (TII). Average road load 30t to calculate round trip.	82.0	236.8	318.8	TII
HDD Bore Material Excavation Activity	0.001	25,200	Tonnes	Assumed carbon factor of 1.04kgCO_2eq./m^3 - General Excavation - Other (TII). Assumed Density 2t/m^3	13.1	0.0	13.1	TII
HDD Bore Material Exported offsite	0.0012	25,200	Tonnes	Assumed carbon factor of 1.239kgCO_2eq./tonne - Aggregate and Soil exported to landfill (worst case) (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 30t to calculate round trip.	31.2	90.1	121.4	TII
Construction Material Imports								
Surface Course (Asphalt)	0.0542	1,900	tonnes	Assumed carbon factor of 54.2kgCO_2eq./tonne - Asphalt (5% Binder Content as average - CE). Assumed 50km additional transport, HGV Average - 1.073 kgCO2eq./km (TII). Average road load 30t to calculate round trip.	103.0	6.9	109.8	CE/TII
Base/Binder course (asphalt)	0.0542	7,700	tonnes	Assumed carbon factor of 54.2kgCO_2eq./tonne - Asphalt (5% Binder Content as average - CE). Assumed 50km additional transport, HGV Average - 1.073 kg$CO_{2eq.}$/km (TII). Average road load 30t to calculate round trip.	417.3	27.6	444.9	CE/TII

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material	Unit	Comment / Assumptions	Tonnes CO_2e	Additional tCO_2 from transport	Total CO_2 equivalent (tCO2e)	Sources (Circular Ecology (CE) / UKEA / TII / National Highways England / UK Government (2021) (BEIS))
Sub-Base (crushed stone)	0.013	18,900	tonnes	Assumed carbon factor of 13.027kgCO_2eq./m^3 - Granular material Limestone fill (TII). Assumed density 2.2t/m^3. Assumed 50km additional transport, HGV Average - 1.073 kg$CO_{2eq.}$/km (TII). Average road load 30t to calculate round trip.	111.9	67.6	179.5	TII
Capping (crushed stone)	0.013	64,900	tonnes	Assumed carbon factor of 13.027kgCO_2eq./m^3 - Granular material Limestone fill (TII). Assumed density 2.2t/m^3. Assumed 50km additional transport, HGV Average - 1.073 kg$CO_{2eq.}$/km (TII). Average road load 30t to calculate round trip.	384.3	232.2	616.5	TII
Cement Bound Granular Material (CBGM)	0.058	68,400	tonnes	Assumed carbon factor of 0.058tCO_2eq./t - Stabilised Soil-Cement (National Highways). Assumed 50km additional transport, HGV Average - 1.073 kg$CO_{2eq.}$/km (TII). Average road load 30t to calculate round trip.	3,967	245	4,212	National Highways carbon tool version 2.5
Water (for HDD)	0.0001	37,800	m^3	Assumed Carbon factor of 0.000149 kg CO_2eq./litre - Water use - UK average (TII).	5.6	0.0	5.6	TII
Bentonite (for HDD)	0.24	1,900	tonnes	Assumed carbon factor of 0.24tCO_2eq./t (CE - clay). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 30t to calculate round trip.	456	6.9	462.9	CE/TII
Concrete for HDD anchor block (per HDD compound)	0.2640	3,100	tonnes	Assumed carbon factor of 263.75kgCO_2eq./m^3 (Concrete Average-TII). Assumed 2.4t/m^3. Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 10m^3 to calculate round trip.	341.0	12.3	353.3	TII
Concrete (for substation foundation/slabs)	0.264	4,800	tonnes	Assumed carbon factor of 263.75kgCO_2eq./m^3 (Concrete Average-TII). Assumed 2.4t/m^3. Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 10m^3 to calculate round trip.	528.0	19.1	547.1	TII

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material	Unit	Comment / Assumptions	Tonnes CO_2e	Additional tCO_2 from transport	Total CO_2 equivalent (tCO2e)	Sources (Circular Ecology (CE) / UKEA / TII / National Highways England / UK Government (2021) (BEIS))
Steel reinforcement (for substation foundations/slabs)	0.604	150	tonnes	Assumed Plain round steel bar reinforcement- Average carbon factor 0.604tCO_2eq/t (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 10m^3 to calculate round trip.	90.6	0.5	91.1	TII
Structural steel (for substation foundations/slabs)	1.55	300	tonnes	World average steel - Steel Section ICE carbon factor 1.55tCO_2eq./t. Assumed 50km additional transport, HGV Average - 1.073 kg$CO_{2eq.}$/km (TII). Average road load 30t to calculate round trip.	465.0	1.1	466	CE/TII
Steel cladding (for substation buildings walls/roofs)	3.06	10,500	m2	World average steel ICE carbon factor 3.06tCO_2eq./t. Assumption 1mm thickness. Assumed density 8t/m^3 (CE). Assumed 50km additional transport, HGV Average - 1.073 kg$CO_{2eq.}$/km (TII). Average road load 30t to calculate round trip.	257.0	0.3	257	CE/TII
HDPE ducting	0.011	317,000	m	Assumed carbon factor of 10.644kgCO_2eq./m - HDPE duct 225mm diameter (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). The cables will be supplied to site on large reels (c.600m) to calculate round trip.	3,374	56.8	3,431	TII
Power cables (onshore export circuit)	0.0014	15,000	m	Assumed carbon factor of 1.3764kgCO_2eq./m - armoured power cable (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). The cables will be supplied to site on large reels (c.600m) to calculate round trip.	20.7	2.7	23.4	TII
Power cables (onshore cable route)	0.0014	214,800	m	Assumed carbon factor of 1.3764kgCO_2eq./m - armoured power cable (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). The cables will be supplied to site on large reels (c.600m) to calculate round trip.	296.1	38.4	334.5	TII
Earthing cable	0.0014	78,600	m	Assumed carbon factor of 1.3764kgCO_2eq./m - armoured power cable (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). The cables will be supplied to site on large reels (c.600m) to calculate round trip.	108.3	14.1	122.4	TII

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material	Unit	Comment / Assumptions	Tonnes CO_2e	Additional tCO_2 from transport	Total CO_2 equivalent (tCO2e)	Sources (Circular Ecology (CE) / UKEA / TII / National Highways England / UK Government (2021) (BEIS))
Fibre Optic cable	0.0014	78,600	m	Assumed carbon factor of 1.3764kgCO_2eq./m - armoured power cable (TII). Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). The cables will be supplied to site on large reels (c.600m) to calculate round trip.	108.3	14.1	122.4	TII
Concrete (for joint bays, link boxes, comms chambers)	0.264	21,600	tonnes	Assumed carbon factor of 263.75kgCO_2eq./m^3 (Concrete Average-TII). Assumed 2.4t/m^3. Assumed 50km additional transport, HGV Average - 1.073 kgCO_2eq./km (TII). Average road load 10m^3 to calculate round trip.	2,376	85.8	2462	TII
Temporary access tracks/contractor compound bases	0.439	4.73	Ha	General Site Clearance - 439.36kgCO_2eq./ha (TII).	2.1	0.0	2.1	TII
Construction Stage Carbon								
Employee Commuting Construction Site - Onshore	3.5	156	weeks	Very Large size construction site, 3.5 tonnes CO_2eq per week, 156-week duration (3 years)	546	0	546	TII
						Total	**16,025**	**tCO2eq.**

Table 28.9 Estimated Embodied Carbon Associated with the Construction Phase of the Offshore Infrastructure

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material Project 1	Quantity of material Project 2	Unit	Comment / Assumptions	Project 1 Tonnes $CO_{2eq.}$	Project 2 Tonnes $CO_{2eq.}$	Source	Rationale for the project option with the greatest magnitude of impact
Wind Turbine Generators									
Primary Steel (t)	2.13	73,500	70,000	Tonnes	A Carbon Factor 2.13 $tCO_2eq./t$ - Steel (global seamless tube)	156,555	149,100	ICE DB V3.0 Nov 2019	**Project 1 represents the greatest magnitude of impact in relation to this impact.** The greatest likely significant effect for WTG construction results from the greater quantity of material required for Project Option 1.
Fiberglass, Resin or Plastic (t) (Turbine Blades, Fibre Reinforced Plastic)	4.26	11,025	9,625	Tonnes	Polyurethane Rigid Foam Carbon Factor (4.26$tCO_2eq./t$) used for Wind turbine blades.	46,967	41,003	ICE DB V3.0 Nov 2019	
Iron or Cast Iron (t)	2.03	7,840	8,750	Tonnes	Carbon Factor Copper (EU tube and sheet) 2.71$tCO_2eq./t$	15,915	17,763	ICE DB V3.0 Nov 2019	
Copper (t)	2.71	1,470	1,295	Tonnes	Carbon Factor Copper Iron 2.03$tCO_2eq./t$	3,984	3,509	ICE DB V3.0 Nov 2019	
					Total	**223,421**	**211,375**		
Foundations and Substructures									
Primary Steel (t)	2.13	130,000	125,000	Tonnes	Carbon Factor 2.13 $tCO_2eq./t$ - Steel (global seamless tube)	276,900	26,6250	ICE DB V3.0 Nov 2019	**Project 2 (Jacket Foundations) represents the greatest magnitude of impact in relation to Foundations**
Grouting (m3)	0.159	13,760	15,750	m3	Assumed density 1.8t/m^3. Carbon Factor Grout Materials - Cement 0.159$tCO_2eq./t$	3,938	4,508	TII	

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material Project 1	Quantity of material Project 2	Unit	Comment / Assumptions	Project 1 Tonnes $CO_{2eq.}$	Project 2 Tonnes $CO_{2eq.}$	Source	Rationale for the project option with the greatest magnitude of impact
Secondary Steel (t) - (access platforms, boat landing platforms, ladders, cable trays)	2.76	115	100	Tonnes	Steel, hot-dip galvanized steel Carbon factor 2.76tCO_2eq./t	317	276	ICE DB V3.0 Nov 2019	**and Substructures.** The is as a result of the large quantity of scour protection required for this option although it should be noted there is a greater steel demand for Project 1.
GACP Anodes (t) Zinc/Aluminium	6.67	12	12	Tonnes	Carbon factor Aluminium (general, European mix, Inc Imports) 6.67tCO_2eq./t	80	80	ICE DB V3.0 Nov 2019	
Scour Protection (m3)	0.175	118,385	297,465	m3	Assumed Rock Placement (graded stones/rock filled mesh fibre bags). Assumed Density 2t/m^3. Carbon Factor Rock Armour 0.175tCO_2eq./t	41,435	104,113	TII	
					Total	**322,670**	**375,227**		
Offshore Substation Platform (topside)									
Steel (t)	2.76	1,000	1,000	Tonnes	Steel, hot-dip galvanized steel Carbon factor 2.76tCO_2eq./t	2,760	2,760	ICE DB V3.0 Nov 2019	The design of the OSP is consistent across both Project Options. Therefore, there is no difference in impacts between the two.
Copper (t)	2.71	150	150	Tonnes	Carbon Factor Copper (EU tube and sheet) 2.71tCO_2eq./t	407	407	ICE DB V3.0 Nov 2019	
Transformer Oil (t)	3.228	200	200	Tonnes	Carbon Factor Assumed Fuel Oil 3.228tCO_2eq./t	646	646	BEIS (2023) Greenhouse gas reporting: conversion factors	

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material Project 1	Quantity of material Project 2	Unit	Comment / Assumptions	Project 1 Tonnes $CO_{2eq.}$	Project 2 Tonnes $CO_{2eq.}$	Source	Rationale for the project option with the greatest magnitude of impact
Offshore Substation Platform (Foundation/Substructure)									
Steel (t)	2.13	5,000	5,000	Tonnes	Carbon Factor 2.13 $tCO_2eq./t$ - Steel (global seamless tube)	10,650	10,650	ICE DB V3.0 Nov 2019	The design of the OSP is consistent across both Project Options. Therefore, there is no difference in impacts between the two. However, of the foundation options considered, Two monopiles have the greater magnitude of impact due to the increased quantity of materials required for construction
Grouting (m^3)	0.159	720	720	m^3	Assumed density $1.8t/m^3$. Carbon Factor Grout Materials - Cement $0.159tCO_2eq./t$	206	206	TII	
					Total	**14,669**	**14,669**		
Cables									
Offshore Inter Array Cables (m)	0.001	111,000	91,000	m	Cable Dimension 3x1x1200mm. As the inter array cable is a triple core cable, multiply length cable x3. Carbon factor of $1.3764kgCO_2eq./m$ - armoured power cable (TII)	460	377	TII	Project Option 1 represents the greatest magnitude of impact due to the greater quantity of materials required for cable installation and protection.
Offshore Export Cables (m)	0.001	36,000	36,000	m	Cable 270mm OD. As the export cable is a triple core cable, multiply length cable x3.	149	149	TII	

Element	Embodied Carbon Contribution - Emission Factor	Quantity of material Project 1	Quantity of material Project 2	Unit	Comment / Assumptions	Project 1 Tonnes $CO_{2eq.}$	Project 2 Tonnes $CO_{2eq.}$	Source	Rationale for the project option with the greatest magnitude of impact
					Carbon factor of 1.3764kgCO_2eq./m - armoured power cable (TII)				
Inter Array Cable protection volume (m^3) (rock/concrete mattress)	0.175	138,400	114,400	m3	Assumed Rock Placement. Assumed Density 2t/m^3. Carbon Factor Rock Armour 0.175tCO_2eq./t	48,400	40,040	TII	
Export Cables Cable protection volume (m^3) (rock/concrete mattress)	0.175	43,200	43,200	m3	Assumed Rock Placement. Assumed Density 2t/m^3. Carbon Factor Rock Armour 0.175tCO_2eq./t	15,120	15,120	TII	
					Total	90,909	76,826		
Total						**624,889**	**656,957**	**tCO2eq.**	**Project 2 represents the greatest magnitude of impact.**

The total embodied carbon predicted to be generated during the construction phase of the proposed development is c.657,000 tonnes of CO_2 equivalent based on Project Option 2 greatest magnitude of impact. Assuming a three-year construction period, this amounts to c. 219,000 tonnes of CO_2eq per annum. In accordance with Table 28.5, the level of impact during the construction phase is considered to be minor adverse as the project's GHG impacts are mitigated through 'good practice' measures. This aligns with an impact rating of slight adverse impact which is not significant in EIA terms in accordance with the EPA guidelines. However, overall the project is fully in line to achieve Ireland's trajectory towards net zero.

28.5.3 Operational Phase

28.5.3.1 Greenhouse Gas Emissions

Based on the data provided in Section 28.2.5.2, the proposed development has the potential to displace circa 282,072 tonnes of CO_2eq. from the largely carbon-based traditional energy mix in the national grid per annum (based on projected 2028 (opening year) emission factors), as follows:

$$Tonnes\ CO2eq = \frac{700x0.46x8{,}760x100}{1000}$$

Over the lifetime of the project (circa 35 years), the displacement amounts to 9,872,520 tonnes of CO_{2eq} based on assumed 2028 emission factors. The total lifecycle of the proposed development is considered in Table 28.10 relative to Ireland's carbon budgets assuming construction takes place from 2025 to 2027 inclusive and the development becomes operational in 2028.

Table 28.10 The Proposed Development in the context of Ireland's Carbon Budget

Carbon Budget Period	Lifecycle stage	Carbon budget ($tCO_{2eq.}$)	Proposed Development GHG emissions ($tCO_{2eq.}$)	Percentage of carbon budget emissions (%)
1st carbon budget (2021 to 2025)	Construction	295,000,000	+219,000 (2025 construction)	+0.07
2nd carbon budget (2026 to 2030)	Construction and operation	200,000,000	-394,883 (2026, 2027 construction, operational from 2028)	-0.2

In accordance with the TII Standard as outlined in Table 28.5, the proposed development will have a net significant beneficial impact on climate during its life cycle. Note that further future carbon budgets beyond 2030 are not included as emission factors are not applicable. Nonetheless, it can be concluded that the proposed development aligns with the sectoral carbon budgets and will continue, post-2030, to assist Ireland in achieving carbon neutrality by 2050 in accordance with the Climate Act 2021.

28.5.3.2 Vulnerability to Climate Change

Climate adaptation seeks to ensure adequate resilience of major projects to the adverse impacts of climate change, such as increased flooding or droughts. Mitigation, on the other hand, seeks to reduce the emissions of GHGs by implementing low-carbon energy options.

A risk assessment has been conducted for potentially significant impacts on the proposed development associated with climate change. The risk assessment considered the likelihood and consequence of potential impacts occurring and then provided an evaluation of the significance of the impact using the framework set out in Section 28.2.5.5.

The flood risk assessment included in Appendix 22.1 concludes that the sources of flood risk identified in the study area can be managed to acceptable levels in accordance with relevant guidance. Therefore, in line with the criteria outlined in Table 28.6, due to an unlikely likelihood and a minor consequence, the impact rating is considered to be low and not significant.

The proposed development is also susceptible to the risk potential of meteorological events, particularly due to lightning strike.

EPA research (EPA 2020) shows an overall reduction of approximately 10% in the numbers of storms affecting Ireland and suggest an eastward extension of the more severe windstorms over Ireland and the UK from the middle of the century. However, the research notes that this should be taken with some caution as extreme storms are rare events.

In addition, the research indicated a likely reduction in windspeed by the mid-century. A summer reduction in 10-m wind speed range is expected from 0.3% to 3.4% for the RCP4.5 (medium global emission) scenario and from 2% to 5.4% for the RCP8.5 (high global emission) scenario.

The probability and frequency likelihood of a lightning strike are considered in accordance with the criteria set out in Section 28.2.5 to have the potential to be minor with mechanical damage to a blade. This is an unmitigated scenario, however due to the proposed development design, these events are mitigated to reduce the likelihood to rare (approximately once in the proposed development's lifespan). Therefore, the magnitude of consequence (Table 28.6) can be classed as minor as there may be a slight impact on operations. The significance conclusion (Table 28.6) indicates that the impact is not significant and therefore the significance of impacts is at an acceptable level in accordance with the TII Standard leading to a finding of a not significant effect.

28.5.4 Decommissioning

Once the proposed development has reached the end of its operational life, it is expected to be decommissioned. The process will involve similar activities to the construction process, with the removal of WTG structures such as blades, nacelle, foundations and towers (offshore) and above ground structures between the landfall site and grid facility (onshore). As the removal of subsurface features such as foundations, subsea cables, underground cables etc may have more of an environmental impact if they were to be removed, these features are anticipated to remain in-situ.

The grid facility, underground onshore, offshore export and onshore export cables will not be decommissioned as these will form part of the wider National Electricity Transmission Network (NETN) owned by EirGrid.

The carbon emissions generated during the decommissioning phase are expected to be less than that during the construction phase.

28.6 Mitigation and Monitoring Measures

A schedule of mitigation measures has been formulated for the construction and operational phases of the proposed development.

28.6.1 Construction Phase

A series of mitigation measures have been incorporated into the construction design with the goal of reducing the embodied carbon associated with the construction phase of the proposed development. These mitigation measures include:

- The substitution , where feasible, of concrete containing Portland cement with concrete containing ground granulated blast furnace slag (GGBS). This measure has led to an estimated saving of c.2,800 tonnes of CO_2eq in the current design of the proposed development
- The proposed development will minimise wastage of materials due to poor timing or over ordering on site thus helping to minimise the embodied carbon footprint of the proposed development
- Where practicable, opportunities for materials reuse will be incorporated within the extent of the proposed development including the use of reclaimed asphalt and recycled aggregate. This measure has led to an estimated saving of 2,545 tonnes of CO_2eq; and
- Where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport.

The combined measures, including the incorporation of GGBS, recycled and reused material where practicable has led to an estimated saving of 5,340 tonnes of CO_2eq.

The construction traffic GHG emissions associated with the construction phase of the proposed development will be short-term and temporary in nature. A Construction Traffic Management Plan for the proposed development is included as part of Volume 8, Appendix 9.1: Onshore Construction Environmental Management Plan. As outlined in Section 28.2.5, the GHG emissions associated with the additional onshore and offshore construction movements due to the proposed development will be negligible.

28.6.2 Operational Phase

In accordance with the TII Standard as outlined in Table 28.3, the proposed development will have a beneficial impact on climate during its full lifecycle, so no mitigation measures are proposed.

As no significant adverse impacts are likely due to the vulnerability of the proposed development to climate change no mitigation measures are required.

28.6.3 Decommissioning

It is expected that the offshore infrastructure will be reused as much as possible, thereby minimising carbon emissions during the decommissioning phase.

As no significant adverse impacts are likely to arise during the decommissioning of the proposed development, no mitigation measures are required.

28.7 Residual Effects

The summary of the lifecycle residual effects is provided in Table 28.11.

During the construction phase, an impact rating of slight adverse impact which is not significant in EIA terms in accordance with the EPA guidelines is assigned due to embodied carbon associated with the development and transportation of construction materials. During the operational phase, the proposed development is predicted to have a significant beneficial impact on climate.

Overall, the proposed development is expected to have a beneficial impact on climate and greenhouse gas emissions over its lifecycle based on significance criteria provided in the TII standard. Table 28.11 concludes the likely potential effects based on EPA guidelines.

Table 28.11 Summary of Lifecycle Residual Effects

Assessment Topic/Receptor	Potential Effect (Pre-Mitigation)	Predicted Effect (Post-Mitigation)
Lifecycle carbon (greenhouse gas emissions)	Significant beneficial	Significant beneficial
Operational phase vulnerability (construction and operation)	Not significant	Not significant

28.8 Transboundary Effects

Whilst there will be CO_{2eq} emissions generated during the construction phase of the proposed development, Section 28.7 concludes there will be a significant beneficial effects on the climate during the lifecycle of the proposed development relative to Ireland’s carbon budgets.

Transboundary climatic effects should be considered on a European basis due to the legal EU CO_{2eq} targets. Although the beneficial effects on climate a result of the proposed development can be deemed as significant in national terms, at an EU level the effects are considered not significant. Therefore, transboundary effects due to the proposed development are predicted to be not significant from a climate perspective.

28.9 Cumulative Effects

A long list of projects which were deemed to be potentially relevant to be included in the cumulative impact assessment was compiled (see Volume 6, Chapter 38: Cumulative and Inter-related Effects (hereafter referred to as the ‘Cumulative and Interrelated Effects Chapter’)).

A screening exercise of the "long list" was carried out in order to determine whether each of those other projects have the potential to give rise to likely significant cumulative effects from a Climate perspective with the proposed development. Many of the other projects were screened out for a number of reasons including the location, scale and nature of the project. Those projects which were "screened in" were carried forward for assessment. The results of the assessment are presented in the Cumulative and Interrelated Effects chapter.

Given there is a beneficial impact on climate predicted from the proposed development, there is no potential for any adverse cumulative impacts associated with identified projects. Due to the nature of the Tier 2 projects (Phase One projects) (renewable offshore energy) there will be significant beneficial cumulative effects with the proposed development, and these screened-in projects due to the significant cumulative reduction in greenhouse gas emissions.

No likely significant adverse cumulative effects on climate are predicted during the construction, operation or decommissioning phases of the proposed development.

28.10 References

DCCAE (2015). The Energy White Paper: Ireland's Transition to a Low Carbon Energy Future 2015-2030 (updated in 2021).

DCCAE (2018). National Adaptation Framework - Planning for a Climate Resilient Ireland (updated in 2021).

DCCAE (2021) National Energy and Climate Plan 2021-2030 (NECP).

DCCAE (2021) Climate Action and Low Carbon Development (Amendment) Act 2021 (the 2021 Climate Act) (No. 32 of 2021).

DCCAE (2022) Climate Action Plan (CAP23) (2022)

DCCAE (2023) Climate Action Plan (CAP24) (2023)

DCC (2024) A Climate Neutral Dublin 2030: Dublin City Council's Climate Change Action Plan 2024-2029

EEA (2011) Forests, Health and Climate Change.

EPA (2019) Irish Climate Futures: Data for Decision Making.

EPA (2020) High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach

EPA (2021) The Status of Ireland's Climate 2020.

EPA (2021) Ireland's National Inventory Report 2020

EPA (2021). Ireland's Greenhouse Gas Emissions Projections 2020 – 2040.

EPA (2022). Ireland's Greenhouse Gas Emissions Projections 2021 – 2040.

EPA (2022). Ireland's Greenhouse Gas Emissions Projections 2022 – 2040

EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports. May 2022.

European Commission (2005) EU Emissions Trading System (ETS)

European Commission (2018) Effort Sharing Regulation

European Commission (2019) European Green Deal

European Commission (2021) The European Climate Law

European Commission (2021) Climate and Energy Framework 2021-2030

European Commission (2021) New EU Strategy on Adaptation to Climate Change.

FCC (2024) Fingal County Council Climate Change Action Plan 2014-2029

Government of Ireland (2020). Programme for Government – Our Shared Future.

Highways England (2021) Design Manual for Roads and Bridges (DMRB) – LA 114 Climate.

IEMA (2022). Assessing Greenhouse Gas Emissions and Evaluating their Significance.

IEMA (2020) EIA Guide to: Climate Change Resilience and Adaptation.

IPCC (2015). AR5 Synthesis Report: Climate Change 2014.

IPCC (2021) AR6 Synthesis Report: Climate Change 2021 of the Sixth Assessment Report (AR6).

LCC (2019) Louth County Council's Climate Change Adaptation Strategy 2019 -2024.

MCC (2024) Meath County Council's Climate Action Strategy 2024-2029.

Met Éireann (2023) TRANSLATE.

Transport Infrastructure Ireland (TII) Climate Assessment of Proposed National Roads – Standard (PE-ENV-01105) (2022).

TII (2021) TII Carbon Assessment Tool (Version 2.1).

UKHA (2021). Design Manual for Roads and Bridges Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 – Climate.

UNFCCC (2015). The Paris Agreement United Nations Framework Convention on Climate Change Conference of the Parties 30 November to 13 December 2015.