11. CLIMATE

11.1 Introduction

This chapter identifies, describes, and assesses the potential significant direct and indirect effects on climate arising from the construction, operation and decommissioning of the Proposed Project and has been completed in accordance with the EIA guidance and legislation set out in Chapter 1: Introduction. The full description of the Proposed Project is detailed in Chapter 4 of this EIAR.

The objective of this assessment is to assess the potential effects that the Proposed Project may have on Climate and sets out proposed mitigation measures to avoid, reduce or offset any potential significant effects that are identified. This EIAR comprehensively assesses the susceptibility of the Proposed Project to climate change across EIAR Chapters 5 through 16, outlining specific measures in each chapter to enhance the Proposed Project's ability to withstand potential impacts that are identified. Chapter 16 of this EIAR consolidates the risks and vulnerabilities identified throughout all EIAR chapters to assess the overall risk to the Proposed Project concerning major accidents and natural disasters, including climate change.

The aim of the Proposed Project, when in operation, is to reduce the input of carbon intensive energy into the national grid and reduce the amount of greenhouse gas emissions being released to the atmosphere that are associated with electricity generation and use. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment.

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project, 'Proposed Wind Farm', 'Proposed Grid Connection' and the 'Site'.

11.1.1 Background

The Proposed Wind Farm is located approximately 2.4km south of the village of Hollyford and 4.3km north of the village of Dundrum, Co. Tipperary. It is proposed to access the Proposed Wind Farm site during both the construction and operational phase via a site entrance off the L1154 local road along the southwestern boundary of the Proposed Wind Farm site in the townland of Moheragh. The proposed entrance will included temporary accommodation works in order to facilitate the delivery of turbine components and other abnormal loads. The Proposed Wind Farm is served by a number of existing public, forestry and agricultural roads and tracks.

The Proposed Grid Connection Route includes for underground 110kV grid connection cabling from the Proposed on-site 110kV Substation, in the townland of Moheragh, Co. Tipperary to the existing Killonan 110kV substation in the townland of Milltown, Co. Limerick. The Proposed Grid Connection Route to Milltown, Co. Limerick measuring approximately 37.6km in length, is primarily located within the public road corridor. Approximately 3.2km is proposed within National Roads, 15.5km proposed within Regional Roads, 16.9km proposed within Local Roads, 900 meters proposed within the Proposed Wind Farm internal road network and approximately 1.1km proposed within agricultural lands in Brittas, Cloghnadromin and Kishyquirk, Co. Limerick.

Accommodation works will be required at various locations on the national and regional road network between the port of entry and the Proposed Wind Farm site. These will be limited to temporary measures including temporary local road widening, temporary access road through agricultural land, overruns of roundabout islands and temporary relocation of some signs and street furniture.

Current land-use on the Proposed Wind Farm comprises commercial forestry, agricultural pastural land, mixed forest and transitional woodland-shrub. Current land-use along the Proposed Grid Connection Route comprises of public road corridor, public open space, agriculture, commercial forestry, land principally used by agriculture with significant areas of natural vegetation, mineral extraction sites, mixed forest and discontinuous urban fabric. Land-use in the wider landscape of the Site comprises a mix of

agriculture, quarrying, renewable energy, low density residential and commercial. Land-use in the areas proposed for turbine delivery route accommodation comprises a mix of agriculture, transitional woodland-shrub, and coniferous forest.

11.1.2 Chapter Structure and Climate Study Areas

This chapter of the EIAR provides an assessment of the potential significant direct and indirect effects on climate arising from all phases of the Proposed Project, as well as the vulnerability of the Proposed Project to changes in climate.

The chapter structure is as follows:

- A review of all relevant climate change legislation policy and guidance applicable to the Proposed Project (Section 11.2).
- Presentation of the baseline environment (Section 11.3 below), including:
  - A description of the current baseline environment established from desk study, utilising relevant datasets and data provided within other sections of the EIAR (Section 11.3.1 below)
  - A description of the future baseline environment, established from desk study, utilising relevant datasets and data provided within other sections of the EIAR (Section 11.3.2 below)
- A detailed carbon assessment, which considers how the Proposed Project will affect Ireland's national greenhouse gas emissions as a result of its construction, operation, and decommissioning phase activities (inclusive of both carbon losses and carbon savings) (Section 11.4 below)
- Presents an assessment of the potential likely significant effects on climate arising from the Proposed Project during the construction phase (Section 11.5.2) operational phase (Section 11.5.3), and decommissioning phase (Section 11.5.4) based on the information gathered and the analysis and assessments undertaken.
  - All required mitigation measures to prevent, minimise, reduce or offset the likely significant environmental effects identified in the construction phase, operational phase, and decommissioning phase is provided in this section.
- An assessment of potential cumulative impacts is provided in Section 11.6 and details any potential cumulative effects on climate between the Proposed Project and other permitted or proposed projects and plans in the area, (wind energy or otherwise) for the construction phase (Section 11.6.1), operational phase (Section 11.6.2), and decommissioning phase (Section 11.6.3)

By their very nature, the impacts and resulting effects of greenhouse gas emissions are global rather than affecting one localised area. For the purposes of the EIAR, the overall Climate Study Area for the Project is defined as the national environment (Ireland), where the receptor is the climate and the global atmosphere. As stated in the IEMA 2022 guidance *'greenhouse gas emission impacts and resulting effects are global rather than affecting one localised area*'[1]. Therefore, effects arising from the potential impacts on climate are considered to impact on a national level. National, regional and local data has been considered where relevant and available. The study areas considered across the different assessments provided within this report are detailed below.

Baseline Environment

- Current Baseline
  - Current Baseline Study Area: defined as the EIAR Site Boundary, as defined in Section 1.1.1 of Chapter 1 of this EIAR. Relevant information taken from EIAR Chapters for inclusion in the current baseline assessment is within the relevant discipline's specific assessment boundary, as identified in each cited EIAR Chapter.

[1] *IEMA (2022). Assessing Greenhouse Gas Emissions and Evaluating their Significant, 2nd Edition. Available online at: https://www.iema.net/resources/blog/2022/02/28/launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions*

- Future Baseline
  - Future Baseline Study Area: defined as the EIAR Site Boundary, i.e., the primary study area for the EIAR as defined in Section 1.1.1 of Chapter 1 of this EIAR. Relevant information taken from relevant EIAR Chapters for inclusion in the future baseline assessment will be within the relevant discipline's specific assessment boundary, as identified in each cited EIAR Chapter.

Carbon Assessment

- Carbon Assessment Study Area: defined as the EIAR Site Boundary, as defined in Section 1.1.1 of Chapter 1 of this EIAR.

11.1.3 Statement of Authority

This section of the EIAR has been prepared by Edward and reviewed and approved by Catherine Johnson and Eoin McCarthy, all of MKO. Edward is an Environmental Scientist with over 4 years of consultancy experience in the environmental sector and holds a MSc (hons) in Environmental Systems from Atlantic Technological University (previously GMIT). Catherine is an Environmental Scientist and Climate Project Manager at MKO with over 3 years of consultancy experience in renewable energy projects. Catherine has expertise in greenhouse gas assessments, international climate law and policy, earth science, and sustainability/ESG processes. Catherine possesses skills in mapping and design, which complement her experience in preparing comprehensive reports for EIAs with a particular focus on climate change. Catherine has a BSc in Earth and Ocean Science and an LLM in Global Environment and Climate Change Law. Eoin is a Project Director with MKO with over 15 years of experience in private consultancy. Eoin holds B.Sc. (Hons) in Environmental Science from NUI, Galway. Eoin has scripted the Air & Climate chapter for over a dozen wind farm EIARs (including grid connection routes).

11.2 Climate Legislation, Policy, and Guidance

Although variation in climate is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing the world today and is primarily the result of increased levels of greenhouse gases in the atmosphere. Increasing human emissions of carbon dioxide and other greenhouse gases cause a positive radiative imbalance at the top of the atmosphere, meaning energy is being trapped within the climate system. The imbalance leads to an accumulation of energy in the Earth system in the form of heat that is driving global warming.[2,3] Greenhouse gases come primarily from the combustion of fossil fuels in energy use.

In March 2024 the European Environment Agency (EEA) published the European Climate Risk Assessment.[4] This assessment states that Europe is the fastest warming continent on the planet and is warming at about twice the global rate. The average global temperature in the 12-month period between February 2023 and January 2024 exceeding pre-industrial levels by 1.5°C. 2023 was the warmest year on record in more than 100,000 years, at 1.48°C above pre-industrial levels, with the world's ocean temperature also reaching new heights.

The Intergovernmental Panel on Climate Change (IPCC), in their AR6 Synthesis Report: Climate Change 2023[5], state that widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. This has led to widespread adverse impacts and related losses and damages to people and nature due to the pressures of climate change and the inability to adapt to a rapidly changing

[2] *Hansen, J.; Sato, M.; Kharecha, P. et al. Earth's Energy Imbalance and Implications. Atmospheric Chemistry and Physics 2011, 11 (24), 13421–13449. https://doi.org/10.5194/acp-11-13421-2011*
[3] *von Schuckmann, K.; Palmer, M. D.; Trenberth, K. E. et al. An Imperative to Monitor Earth's Energy Imbalance. Nature Clim Change 2016, 6 (2), 138–144. https://doi.org/10.1038/nclimate2876.*
[4] *European Environment Agency (2024) European Climate Risk Assessment <https://www.eea.europa.eu/publications/european-climate-risk-assessment>*
[5] *IPCC AR6 Synthesis Report: Climate Change 2023. https://www.ipcc.ch/report/sixth-assessment-report-cycle/*

environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

Relevant legislation, policy, and guidance in an international (Section 11.2.1), national (Section 11.2.2), and local (Section 11.2.3) context are detailed below.

11.2.1 International Greenhouse Gas Emission and Climate Targets

Globally, governance relating to climate change has changed significantly since 1994 when the United Nations Framework Convention on Climate Change (UNFCCC) entered into force. Greenhouse gas emissions have been a primary focus of climate related international agreements for almost two decades.

Table 11-1 below identifies international instruments relating to greenhouse gas emissions and climate change targets. The following table provides an overview of the international agreements that have played key roles in establishing climate governance; please refer to Appendix 11-1 Climate Legislation, Policy, and Guidance for further detail on each of the below international instruments.

Table 11-1 International Instruments Relating to Greenhouse Gases and Climate Change Targets

International Instrument	Description
Kyoto Protocol	The Kyoto Protocol was adopted on 11 December 1997; this Protocol operationalised the UNFCCC and was the first international agreement that committed countries to reduce their greenhouse gas emissions. The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, became binding for the first time.
Doha Amendment to the Kyoto Protocol	In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes: › New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from starting in 2013 and lasting until 2020. › A revised list of greenhouse gases to be reported on by Parties in the second commitment period; and
Conference of the Parties (COP): *Every year since 1995, the Conference of the Parties (COP) has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments, and is the supreme decision-making body of the UNFCCC.*	**COP21 – Paris** (30th November to 12th December 2015) COP21 closed with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C.
	COP25 – Madrid (December 2nd to December 13th, 2019) At COP25 the European Union launched its most ambitious plan, 'The European Green Deal' which aims to lower CO_2 emissions to zero by 2050.
	COP28 – Dubai (30th of November 2023 to the 13th of December 2023) COP28 resulted in a landmark deal to 'transition away' from fossil fuels, the United Arab Emirates (UAE) Consensus. The agreement calls for 'transitioning away from fossil fuels in energy systems, in a just, orderly, and equitable manner.' COP28 concluded the first ever Global Stocktake under the Paris Agreement. The Global Stocktake recognises that the world is not on track to meet 1.5°C and will require Parties to align their national targets and measures with the Paris Agreement.

	COP29 – Azerbaijan (11th November 2024 to 22nd November 2024) COP29 focused on accelerating global efforts to address climate change, in particular global efforts related to climate finance. The New Collective Quantified Goal on Climate Finance (NCQG) was agreed in the final days of COP with developed nations agreeing to triples finance to developing countries, with commitments increasing from USD 100 billion annually to USD 300 billion annually by 2035. Significant progress was made in the discussions surrounding carbon markets, with nearly 200 nations agreeing on critical rules under Article 6 of the Paris Agreement. The adoption of these rules is seen as a crucial step towards operationalising a robust and credible carbon market. Despite the advances, concerns were expressed about the potential for weak governance and risks of exploitation in the system; these issues must be addressed to ensure the market's full functionality.
	COP30 – Belém (10th November 2025 to 20th November 2025) COP30 in Belém, Brazil, focused on enhancing national climate plans known as Nationally Determined Contribution (NDCs) for 2035, aiming to increase adaptation finance and mobilize over a trillion annually for climate action. Key takeaways included a strong focus on the social dimension of climate action. While a formal, binding fossil fuel phase-out roadmap was not finalised, the summit advanced voluntary commitments, and highlighted growing trade-climate tensions.
United Nations Sustainable Development Goals	On the 14th July 2025, the United Nations published 'The Sustainable Development Goals Report 2025' this report finds that, following an assessment of all 169 targets, for which trend data is available, only 17% of the SDG targets are on track, 18% of SDG targets are showing minimum or moderate progress, 47% having stalled in progress and 18% having regressed from 2024.
Climate Change Performance Index	Established in 2005, the Climate Change Performance Index (CCPI)[6] is an independent monitoring tool which tracks individual countries climate protection performance. Ireland, ranked 43rd in 2024, has risen 14 places to 29th for 2025, and is now considered a 'medium' performer in international performance. The CCPI states that Ireland's policies are missing a long-term strategy for phasing out fossil fuel infrastructure and shifting investments from natural gas towards an emissions-neutral energy supply.
State of the Global Climate 2024	In March 2025, the World Meteorological Organisation (WMO) published a report entitled the 'State of the Global Climate 2024'. This report provided a summary on the state of the climate indicators in 2023 with sections on key climate indicators, extreme events and impacts. The key messages in the report include: › Greenhouse gases reached record observed levels in 2023. Real time data indicate that the level of greenhouse gases continued to rise in 2024. › The annually averaged global mean near-surface temperature in 2024 was 1.55 °C ± 0.13 °C above the 1850–1900 average used to represent pre-industrial conditions.

[6] *Climate Change Performance Index 2024* <https://ccpi.org/>

Renewable Energy Directive	The first Renewable Energy Directive (RED)[7] is legislation that influenced the growth of renewable energy in the EU and Ireland for the decade ending in 2020. From 2021, RED was replaced by the second Renewable Energy Directive (REDII),[8] which continues to promote the growth of renewable energy out to 2030. REDII introduced a binding EU-wide target for overall RES of 32% in 2030 and requires Member States to set their national contributions to the EU-wide target. As per the National Energy and Climate Plan (NECP) 2021-2030, Ireland's overall RES target is 34.1% in 2030. Given the need to ratchet up the EUs clean energy transition, RED was revised in 2023, and the amending Directive EU/2023/2413 (REDIII)[9] entered into force on 20 November 2023. REDIII amended the EU-wide overall 2030 RES target from 32% to at least 42.5% with the aim of 45%., and it is assumed that Irelands 2030 RES target will increase accordingly.
European Green Deal	The European Green Deal is a comprehensive package of policy initiatives aimed at achieving climate neutrality across the EU by 2050. It features a wide range of actions and targets in different sectors such as energy, transport, industry, environment and agriculture. The goal is to transform the EU into a resource-efficient, competitive circular economy that is fair and inclusive for every individual and region. In its approach to decarbonisation, the EU has split greenhouse gas emissions into two categories, the Emissions Trading System (ETS) and the non-ETS. Under the EU Green Deal, the targets for the ETS and non-ETS sectors will be revised upwards in order to achieve the commitment, at EU level, to reach an economy-wide 2030 reduction in emissions of at least 55%, compared to 1990 levels.
Council Regulation (EU) 2022/2577 and 2024/223	Council Regulation (EU) 2022/2577 and 2024/223 lay down a framework to accelerate the deployment of renewable energy. Regulation 2022/2577 and 2024/223 recognises the relative importance of renewable energy deployment in the current difficult energy context and provides significant policy and legislative support to enabling renewable energy projects. Further detail is provided in Section 1.1.1.8 of Appendix 11-1 and in Section 2.3.1 in Chapter 2 of this EIAR.
EU Nature Restoration Law	The Nature Restoration Law is the first continent-wide, comprehensive law of its kind. It is a key element of the EU Biodiversity Strategy, which sets binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters. The law aims to restore ecosystems, habitats and species across the EU's land and sea areas in order to › Enable the long-term and sustained recovery of biodiverse and resilient nature; › Contribute to achieving the EU's climate mitigation and climate adaptation objectives; and › Meet international commitments

[7] *Directive 2009/28/EC on the promotion of the use of energy from renewable sources. Available from: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF*
[8] *Directive (EU) 2018/2001 on the promotion of the use of energy from renewable resources (recast). Available from: https://eurlex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018L2001*
[9] *Directive (EU) 2023/2413 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources and repealing Council Directive (EU) 2015/652. Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202302413*

	The EU Nature Restoration Law was approved on June 17th, 2024; EU countries are expected to submit National Restoration Plans to the Commission within two years of the Regulation coming into force (by mid-2026), showing how they will deliver on the targets. They will also be required to monitor and report on their progress.
EU Effort Sharing Regulation	Emissions from all other sectors, including agriculture, transport, buildings, and light industry are covered by the EU Effort Sharing Regulation (ESR). This established binding annual greenhouse gas emission targets for Member States for the period 2021–2030. Ireland is required to reduce its emissions from these sectors by 30% by 2030, relative to 2005 levels. Please see Section 1.1.1.10 of Appendix 11-1 for further details on the EU ESR

11.2.2 National Greenhouse Gas Emission and Climate Targets

Ireland has reached a crucial point in addressing climate change with a goal to becoming climate neutral by 2050 and to significantly cut greenhouse gases by 2030. National greenhouse gas emission and climate targets are critical for achieving Irelands climate ambitions.

Table 11-2 below provides an overview of the national legislation and reports relating to greenhouse gases and climate change targets in Ireland; please refer to Appendix 11-1 Climate Legislation and Policy for further detail on each of the below national legislation measures.

Table 11-2 National Legislation and Reports relating to Greenhouse Gas Emission and Climate Change Targets

National Instrument	Description
Programme for the Government – Securing Irelands Future	The Programme for Government – Securing Irelands Future was published in January 2025. The programme notes that the government are committed to reducing greenhouse gas emissions by an average 7% per annum over the next decade in a push to achieve a net zero emissions by the year 2050. The Programme states the Government's ongoing support and commitment to take "*the necessary action to deliver at least 70% renewable electricity by 2030*".
Climate Action and Low Carbon Development Act 2015	The Climate Action and Low Carbon Development Act 2015 established the national framework for the approval of plans by the Government in relation to climate change for the purpose of pursuing the transition to a low carbon, climate resilient and environmentally sustainable economy.
Climate Action and Low Carbon Development (Amendment) Act 2021	The Climate Action and Low Carbon (Amendment) Act 2021 amended the Climate Action and Low Carbon Development Act 2015 and is a piece of legislation which commits the country to move to a climate resilient and climate neutral economy by 2050. This was passed into law in July 2021. The Programme for Government has committed to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieve net zero emissions by 2050. This Act will manage the implementation of a suite of policies to assist in achieving these annual targets.
Climate Change Advisory Council (CCAC)	The Climate Change Advisory Council (CCAC) was established on 18th January 2016 under the Climate Action and Low Carbon Development Act 2015. The Annual Review 2025: Electricity report has been released by the CCAC and focuses specifically on key findings and recommendations for the Electricity sector. In 2024, emissions from the sector reduced by approximately 7.3% from 2023. Ireland's carbon intensity of electricity generation is higher than the EU average due to continued reliance on coal and oil, which are estimated to have contributed 13.4% and 3.1% of total electricity emissions for 2024, while accounting for only 3.2% and 0.7% of indigenous generation, respectively.

Carbon Budgets	The first national carbon budget programme proposed by the CCAC, approved by Government and adopted by both Houses of the Oireachtas in April 2022 comprises three successive 5-year carbon budgets. The total emissions allowed under each budget are shown in Section 1.1.2.4 of Appendix 11-1.
Sectoral Emission Ceilings	The Sectoral Emissions Ceilings were launched in September 2022. The Sectoral Emissions Ceilings alongside the annual published Climate Action Plan provide a detailed plan for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030. The Sectoral Emission Ceilings for each 5-year carbon budget period was approved by the government on the 28th of July 2022 and is shown in Section 1.1.2.5 of Appendix 11-1.
Climate Action Plan 2025	The National Climate Action Plan (CAP) 2025 was launched in April 2025. CAP 2025 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 following the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030. CAP 2025 highlights the firm commitment that has been made by Ireland in relation to the clean energy transition and provides an outline of precise goals for renewable energy, focusing on solar, onshore wind, and offshore wind.
Irelands Climate Change Assessment	In 2023 the EPA published Irelands Climate Change Assessment (ICCA). This assessment provides a comprehensive overview and breakdown of the state of knowledge around key aspects of climate change with a focus on Ireland. The ICCA report is presented in four volumes: › Volume 1: Climate Science – Ireland in a Changing World; › Volume 2: Achieving Climate Neutrality in 2050; › Volume 3: Being Prepared for Irelands Future; and › Volume 4: Realising the Benefits of Transition and Transformation Please refer to Section 1.1.2.7 of Appendix 11-1 for further information on the ICCA.

11.2.3 Local Greenhouse Gas Emission and Climate Targets

11.2.3.1 Tipperary County Council Local Authority Climate Action Plan 2024-2029

The Tipperary County Council Local Authority Climate Action Plan 2024-2029[10] (Tipperary LACAP) was adopted in February 2024 and published in March of the same year.

The Tipperary LACAP highlights the current state of climate action in Ireland, and how Tipperary County Council intends to deliver and enable climate action for a just transition to a low carbon and climate resilient future within County Tipperary. The Tipperary LACAP will help address the mitigation of greenhouse gases, the implementation of climate change adaption measures, and will strengthen the alignment between national climate policy and the delivery of effective local climate action.

Overall, the greenhouse gas emissions generated from County Tipperary equated to 8.5ktCO2eq in the baseline year, 2018. The top four emitting sectors within County Tipperary in terms of total greenhouse gas emissions in the baseline year were agriculture, residential, transport and manufacturing and commercial producing 49.9%, 13.7%, 13.2% and 12.8% of total emissions respectively. Tipperary County

[10] *Tipperary County Council Local Authority Climate Action Plan 2024-2029 <*
<https://www.tipperarycoco.ie/sites/default/files/2024-04/Climate%20Action%20Plan%20-%20Digital.pdf>

Council, along with all public sector entities must reduce greenhouse gas emissions by 51% by 2030 as compared to 2018 in line with the National Climate Action Plan 2025 (Section 11.2.2).

The Tipperary LACAP assesses climate risk relevant to Ireland and to County Tipperary, this, plus the evidence baseline, inform the climate objectives and actions that will be undertaken by Tipperary County Council to assist in the achievement of national and international climate targets.

The Tipperary County Development Plan 2022-2028[11] sets out the overall strategy for the proper planning and sustainable development of the County over a 6-year period. Key components of the County Development Plan are the settlement strategy, housing strategy and renewable energy strategy for the county; please refer to Section 2.5.4.1 of Chapter 2 of this EIAR for more details.

11.2.3.2 Limerick City and County Council Local Authority Climate Action Plan 2024-2029

The Limerick City and County Council Local Authority Climate Action Plan 2024-2029[12] (Limerick LACAP) was published in the first quarter of 2024.

The Limerick LACAP highlights the current state of climate action in Ireland, and how Limerick City and County Council intends to deliver and enable climate action for a just transition to a low carbon and climate resilient future within County Limerick. The Limerick LACAP will help address the mitigation of greenhouse gases, the implementation of climate change adaption measures, and will strengthen the alignment between national climate policy and the delivery of effective local climate action.

A precise greenhouse gas emissions figure for County Limerick in the baseline year, 2018 is not available. However, the 2023 Limerick City and County Council Summary Report for the preparation of the Local Authority Climate Action Plan illustrates that the top three emitting sectors within County Limerick in terms of total greenhouse gas emissions in the baseline year were Industrial Processes, Agriculture and Transport, producing 41%, 25%, and 11% of total emissions respectively. Limerick City and County Council, along with all public sector entities must reduce greenhouse gas emissions by 51% by 2030 as compared to 2018 in line with the National Climate Action Plan 2025 (Section 11.2.2).

The Limerick LACAP assesses climate risk relevant to Ireland and to County Limerick, this, plus the evidence baseline, inform the climate objectives and actions that will be undertaken by Limerick City and County Council to assist in the achievement of national and international climate targets.

The Limerick Development Plan 2022-2028[13] sets out the overall strategy for the proper planning and sustainable development of the County over a 6-year period. Key components of the County Development Plan are the settlement strategy, housing strategy and the wind energy strategy for the county; please refer to Section 2.5.6 of Chapter 2 of this EIAR for more details.

11.2.4 Relevant Guidance

The climate chapter of this EIAR is carried out in accordance with the 'EIA Directive' as amended by Directive 2014/52/EU and has been prepared in accordance with guidance listed in Section 1.7.2 of Chapter 1: Introduction. Due to the nature of the Proposed Project, a wind farm and associated infrastructure, the following methodology and guidance was utilised for the climate section of this EIAR:

- '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment'* (2013) European Commission
- *'Calculating Carbon Savings from Wind Farms on Scottish Peat Lands*' (University of Aberdeen and the Macauley Institute 2008); and

[11] *Tipperary County Development Plan 2022-2028 <https://www.tipperarycoco.ie/planning-and-building/development-plan-consultation/tipperary-county-development-plan-2022-2028>*
[12] *Limerick City and County Council Local Authority Climate Action Plan 2024-2029 <https://www.limerick.ie/sites/default/files/media/documents/2024-03/local-authority-climate-action-plan-2024-2029.pdf>*
[13] *Limerick Development Plan 2022-2028 < https://www.limerick.ie/council/services/planning-and-placemaking/development-plan-strategies/limerick-development-plan-0>*

- '*Wind Farms and Carbon Savings*' (Scottish Natural Heritage, 2003).
- Macauley Institute Carbon Calculator for Wind Farms on Scottish Peatlands (Version 2.14.0) (2023)
- Transport Infrastructure Ireland (TII) Carbon Assessment Tool (Version 0.7.10) (TII, 2020)

Consideration has also been given to the 'Air Quality Assessment of Proposed National Roads – Standard PE-ENV-01107' (Transport Infrastructure Ireland, December 2022 (2022a)), Climate Assessment of Proposed National Roads – Standard and Overarching Technical Documentation (Transport Infrastructure Ireland December 2022b/c) and Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document, GE-ENV-01106 (TII 2022d).

11.3 Climate and Weather in the Existing Environment

Climate change projections show that the Earth is getting warmer and extreme weather events are increasing in frequency on an annual basis. The Proposed Project will assist in mitigating these effects through the deployment of clean renewable energy to the national grid and subsequent decarbonisation of energy systems. Changes to climate and weather in Ireland will occur as a result of climate change, for further details on the risks associated with the Proposed Project please refer to Chapter 16: Major Accidents and Natural Disasters.

11.3.1 Baseline Environment

11.3.1.1 Data Sources

A review of literature and data relating to climate change in Ireland was undertaken and utilised to provide an overview of the current baseline environment. The following key data sources were reviewed:

- Met Éireann 30-Year Averages[14];
- Irelands Climate Averages 1991-2020 Summary Report[15];
- Ireland's National Inventory Report 2025[16];
- Climate Status Report for Ireland 2020[17]; and
- Annual Review 2025 – Our Changing Climate in 2024[18].

11.3.1.2 Physical Environment

Ireland has a temperate, oceanic climate, resulting in mild winters and cool summers. Met Éireann provides 30-year weather averages for Ireland at specific weather stations throughout Ireland. The closest weather and climate monitoring station to the Proposed Wind Farm is the Shannon Airport weather station in Shannon, Co. Clare, located approximately 56km northwest of the Proposed Wind Farm infrastructure. This weather and climate monitoring station has meteorological data recorded over the 30-year period from 1991-2020 and is shown in Table 11-3 overleaf. The wettest months are November and December, and April is usually the driest. July is the warmest month with a mean daily temperature of 19.5° Celsius.

[14] *Met Éireann 30-Year Averages* <https://www.met.ie/climate/30-year-averages>
[15] *Department of Housing, Local Government and Heritage (2024) Irelands Climate Averages 1991-2020 Summary Report* <https://edepositireland.ie/bitstream/handle/2262/108695/Ireland%27s_climate_averages_1991-2020_rev2.pdf?sequence=1&isAllowed=y>
[16] *EPA (2025) Ireland's National Inventory Report* <https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/Ireland's-NID-2025.pdf>
[17] *EPA (2021) Climate Status Report for Ireland 2020* <https://www.epa.ie/publications/research/climate-change/research-386-the-status-of-irelands-climate-2020.php>
[18] *Climate Change Advisory Council (2025) Annual Review 2025 – Our Changing Climate in 2024* <https://www.climatecouncil.ie/councilpublications/annualreviewandreport/CCAC%20AR25%20Our%20Changing%20Climate-final.pdf>

Recent monthly meteorological data recorded at Shannon Airport, Co. Clare from January 2022 to January 2025 is available at: https://www.met.ie/climate/available-data/monthly-data. February 2024 was the wettest month in this time period, with 156.5mm of rainfall recorded, while February 2023 was the driest month with 21.4mm of rainfall. June 2023 was the warmest month in this time period, with a mean monthly temperature of 17.5° Celsius. December 2022 was the coldest month in this time period with a mean monthly temperature of 4.5° Celsius.

More recent, monthly meteorological data recorded at Gurteen, Co Tipperary, located approximately 47km north of the Proposed Wind Farm site, from January 2022 to January 2025 is available at: https://www.met.ie/climate/available-data/monthly-data. July 2023 was the wettest month in this time period, with 206mm of rainfall recorded, while February 2023 the driest month with 21.7mm of rainfall. June 2023 was the warmest month in this time period, with a mean monthly temperature of 15.7° Celsius. December 2022 was the coldest month with a mean monthly temperature of 2.8° Celsius.

Table 11-4 below provides a summary of the current physical baseline environment with reference to relevant chapters within the submitted EIAR where further information is available.

Table 11-3 Data from Met Éireann Weather Station at Shannon Airport 1991-2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
Mean daily max	8.9	9.4	10.9	13.4	16	18.3	19.5	19.1	17.5	14.2	11.1	9.2	14
Mean daily min	3.3	3.3	4	5.8	8.1	10.8	12.6	12.4	10.7	8.1	5.5	3.7	7.4
Mean temperature	6.1	6.3	7.5	9.6	12	14.5	16	15.8	14.1	11.2	8.3	6.4	10.7
Absolute max.	14.7	15.5	19.6	23	27.8	32	30.2	29.2	25.6	21.9	17.2	15.4	32
Absolute Min.	-11.2	-5.1	-5.8	-2.9	0.1	3.1	6.2	4.4	1.7	-2.3	-6.6	-11.4	-11.4
Mean No. of Days with Air Frost	5.2	4.6	3.2	0.6	0	0	0	0	0	0.4	1.9	4.4	20.3
Mean No. of Days with Ground Frost	13	11.8	11.9	7.7	2.9	0.2	0	0	0.8	3.3	8	11.3	70.9
RELATIVE HUMIDITY (%)													
Mean at 0900UTC	87.8	87.9	85	79.3	76.2	76.6	80	82.3	85.1	87.4	89.9	88.9	83.9
Mean at 1500UTC	81.2	75.4	69.8	64.1	63.5	64.6	69.3	69.1	70	75	81	83.5	72.2
SUNSHINE (Hours)													
Mean daily duration	1.7	2.4	3.6	5.4	5.9	5.5	4.4	4.6	3.9	3	2.1	1.5	3.7
Greatest daily duration	8.1	10.2	11.5	13.6	15.6	15.8	15.7	14.4	12.2	10.1	8.3	7.1	15.8
Mean no. of days with no sun	9.1	5.9	5.3	2.3	1.9	1.8	2.1	2.1	2.6	5.1	7.7	10.1	56
RAINFALL (mm)													
Mean monthly total	103.8	86.7	75.8	62.3	63.1	69.6	75.8	87.6	77.4	95.5	106.6	115.4	1019.7
Greatest daily total	38.2	33.8	34.8	40.2	25.0	45.3	39.5	51.0	52.3	36.9	29.4	33.5	52.3
Mean num. of days with >= 0.2mm	21.3	18.3	18	16.2	16.2	15.5	18.3	19	17.7	19.9	21.6	21	223
Mean num. of days with >= 1.0mm	16.9	13.9	13.4	11.4	12.1	11.3	13.5	13.7	12.9	15.4	16.8	17.2	168.5
Mean num. of days with >= 5.0mm	7.8	5.8	5.5	4.7	4.6	4.8	4.9	5.8	4.8	7	8	8.5	72.2
WIND (knots)													
Mean monthly speed	10	10.1	9.6	9.2	9	8.5	8.4	8.3	8.4	8.9	9.1	9.7	9.1
Max. gust	75	86	63	66	52	51	52	61	58	66	69	83	86
Max. mean 10-minute speed	47	61	44	45	37	37	38	44	44	47	50	57	61
Mean num. of days with gales	1.8	1.2	0.9	0.4	0.2	0.2	0	0.1	0.1	0.5	0.8	1.3	7.5
WEATHER (Mean No. of Days With:)													
Snow or sleet	1.5	1.8	1.2	0.3	0	0	0	0	0	0	0.1	1	5.9
Snow lying at 0900UTC	0.2	0	0.1	0	0	0	0	0	0	0	0	0.1	0.5

Hail	3.1	3.4	2.8	2	0.7	0	0	0.1	0.1	0.5	1	2.3	16
Thunder	0.9	0.4	0.3	0.3	0.5	0.4	0.7	0.5	0.2	0.3	0.3	0.4	5.2
Fog	3.4	2.2	2.4	1.8	1.3	1	0.9	1.6	2.8	3.1	4	3.8	28.3

Table 11-4 Summary of Current Physical Baseline Environment

Climate variable	Summary of current baseline environment	Relevant EIAR chapter (if applicable)
Air Temperature	Climate change is impacting air temperatures in the Northern European region, with a range of observable effects including rising temperature, increased frequency of heatwaves, changes in seasonal temperature patterns and milder winters[19]. Irelands Climate Averages 1991-2020 Summary Report identifies that the annual mean air temperature for Ireland over the period 1991-2020 is 9.8°C. The annual mean air temperature ranges from approximately 8.5°C to 10.8°C. Comparing the 1991-2020 annual mean air temperature for Ireland with that of the 1961-1990 period, there has been an increase of approximately 0.7°C. The Climate Status Report for Ireland 2020[20] states that air temperatures in Ireland have '*been increasing at an average rate of 0.078°C per decade since 1900 and that the annual average temperature is now approximately 0.9°C higher than it was in the early 1900s'.* Temperatures in Ireland are increasing, with 16 of the top 20 warmest years on record occurring since 1990[21]. On 10th July 2024 Met Éireann confirmed that 2023 was Irelands wettest and warmest year on record (with records dating back to 1900).[22] Due to the moderating influence of the North Atlantic, Ireland has, and will continue to, experience much milder air temperatures as compared to mainland Europe and other continental countries.[23] However, this moderating influence could be in jeopardy if the Atlantic Meridional Overturning Circulation (AMOC) continues to weaken[24]. The AMOC is a large system of ocean currents responsible for carrying warm water from the tropics into the North Atlantic and the strength of this current is a	Chapter 10 Air Quality

[19] *IPCC (2021) Climate Change 2021: The Physical Science Basis* <https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf>
[20] *Government of Ireland (2020) Climate Status Report for Ireland 2020* <https://www.epa.ie/publications/research/climate-change/Research_Report_386.pdf>
[21] *Irelands Climate Change Assessment (2023) Volume 1 Climate Science – Ireland in a Changing World* <https://www.epa.ie/publications/monitoring--assessment/climate-change/irelands-climate-change-assessment-volume-1.php>
[22] https://www.met.ie/2023-confirmed-as-irelands-wettest-year-on-record
[23] https://www.met.ie/climate/what-we-measure/temperature#:~:text=The%20moderating%20influence%20of%20the,mild%20winters%20and%20cool%20summers.
[24] *IPCC (2019) IPCC Special Report on the Ocean and Cryosphere in a Changing Climate Chapter 6. Extremes, Abrupt Changes, and Managing Risk* <https://www.ipcc.ch/site/assets/uploads/sites/3/2022/03/08_SROCC_Ch06_FINAL.pdf>

Climate variable	Summary of current baseline environment	Relevant EIAR chapter (if applicable)
	function of global mean temperature. The weakening of this current would counterbalance the warming effects of climate change creating instability for local ecosystems, agriculture, and fisheries.	
Precipitation	Climate change is impacting precipitation patterns in the Northern European region, with a range of observable effects including increased precipitation, more extreme precipitation events, seasonal variations and impacts on hydrological regimes[25]. Precipitation has been measured systematically in Ireland since the late 19th century and is a key indicator of changes in the climate; measurements and analysis of rainfall are essential for assessing the effects of climate change on the water cycle, water balance and for flood mitigation. Met Éireann highlights that it is already observing these trends, with the national annual average rainfall over the period 1991-2020 being approximately 1,288mm, which represents an increase of 7% from the previous 30-year monitoring period (1961-1990)[26]. Irelands Climate Averages 1991-2020 Summary Report obtained averages for the annual, seasonal and monthly number of rain days (number of days with rainfall ≥ 0.2 mm), wet days (number of days with rainfall ≥ 1 mm) and very wet days (number of days with rainfall ≥ 10 mm). Over the period 1991-2020, on an annual basis, the average number of rain days ranges from 201 days to 272 days; the average number of wet days ranges from 147 days to 226 days; and the average number of very wet days ranges from 22 days to 68 days.	Further detail on rainfall and evaporation data is provided in Section 9.3.2 in Chapter 9 Water.
Wind and Storms	Climate change is impacting wind patterns in the Northern European region with a range of observable effects including increased wind speeds, changes in wind direction and seasonal variations[27]. Irelands Climate Averages 1991-2020 Summary Report identifies that the annual mean hourly wind speed ranges from 9 knots at Shannon Airport to 15 knots at Malin Head. Winds are generally strongest in the northwest of the country. The strongest winds are observed during the winter months and range from 10 knots at Shannon Airport to 18 knots at Malin Head. The lightest winds are observed during the summer months and range from 8 knots at Valentia Observatory to 13 knots at Malin Head.	N/A

[25] *IPCC (2021) Climate Change 2021: The Physical Science Basis* <https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf>
[26] Department of Housing, Local Government and Heritage (2024) Irelands Climate Averages 1991-2020 Summary Report <https://edepositireland.ie/handle/2262/108695>
[27] *IPCC (2021) Climate Change 2021: The Physical Science Basis* <https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf>

Climate variable	Summary of current baseline environment	Relevant EIAR chapter (if applicable)
	In late 2023 and early 2024, Ireland experienced a very active storm season; the county was affected by 13-14 severe storms[28]. The increased frequency and intensity of storm events will lead to associated increases in precipitation (see above). As stated in 'Air Temperature' above, the AMOC has a moderating influence on Europe, however as identified by the IPCC, the strength of the AMOC is directly correlated to global mean temperature, and as global mean temperature increases, the AMOC will weaken[29]. The weakening of this current would result in increased storm activity in Northern Europe.	

[28] *Met Éireann (2024) Human-caused Climate Change Brings Increased Storm Rainfall* <https://www.met.ie/human-caused-climate-change-brings-increased-storm-rainfall>
[29] *IPCC (2019) IPCC Special Report on the Ocean and Cryosphere in a Changing Climate Chapter 6. Extremes, Abrupt Changes, and Managing Risk* <https://www.ipcc.ch/site/assets/uploads/sites/3/2022/03/08_SROCC_Ch06_FINAL.pdf>

11.3.1.3 Existing Greenhouse Gas Emissions

Greenhouse gas emissions arise from a large majority of anthropogenic activities. The main sectors which release emissions in Ireland are detailed in Section 1.1.2.5 of Appendix 11-1 Climate Legislation Policy and Guidance. These sectors include:

- Electricity;
- Transport;
- Built Environment;
  - Residential
  - Commercial
- Industry;
- Agriculture;
- Land Use, Land Use Change, and Forestry (LULUCF)[1];
- Other (F-Gases, Waste, Petroleum refining); and
- Unallocated savings.

The most recent inventory report for Ireland, National Inventory Report 2025 (NIR 2025)[30], was published in 2025 and refers to the greenhouse gas inventory timeseries for the years 1990-2023. From 1990-2001, total emissions of greenhouse gases (excluding LULUCF) increased steadily from 55,734.9 $ktCO_2e$ in 1990 to 70,848.8 $ktCO_2e$ in 2001, which is the highest level of greenhouse gas emissions ever reported in Ireland. Emissions then plateaued until 2008 with estimates ranging from 70,149.9 $ktCO_2e$ to 67,927 $ktCO_2e$. There was then a sharp decrease from 67,927 $ktCO_2e$ in 2008 to 57,836.3 $ktCO_2e$ in 2011. The declining trend between 2008 and 2011 is largely attributable to a slowing down of the previously sustained increase in transport emissions, coupled with the 2008 financial crisis. In 2023, total emissions of greenhouse gases including indirect emissions from solvent use (excluding LULUCF) in Ireland were 54,934.4$ktCO_2e$, which is 6.8% lower than emissions in 2022, and the lowest level in the time series

The Electricity sector accounted for the bulk of the CO_2 emissions in 2023 (57.1%), Agriculture contributed 36.2%, while a further 5.2% emanated from Industrial Processes and Product Use and 1.5% was due to Waste. Emissions of CO_2 accounted for 61.1% of the national total in 2023, with CH_4 and N_2O contributing 28.9% and 8.8%, respectively. The combined emissions of fluorinated gases (HFC, PFC, SF_6 and NF_3) accounted for 1.2% of total emissions in 2023.[31]

11.3.2 Future Environment

Ireland is experiencing climate change in line with global trends, with current projections, detailed below, indicating that these effects will intensify in the coming decades. The baseline environment, detailed above, will undergo significant shifts, influencing Ireland's environment, economy, and society. Predicted changes include rising temperatures, altered precipitation patterns, and increased frequency of extreme weather events.

Visible changes in global climate are evident worldwide, with climate change projections suggesting further, more pronounced impacts in the future. These impacts will have wide-ranging effects on both natural and man-made environments across various sectors and regions, resulting in socio-economic repercussions. Referred to as the 'costs of inaction,' these economic impacts of climate change are increasingly influencing policy discussions[32]. It has become clear that even if greenhouse gas emissions were to cease immediately, climate alterations would persist for many decades. Therefore, alongside efforts for mitigation, it's imperative to develop effective adaptive strategies (adaptation) to mitigate damages or seize opportunities arising from climate change.

[30] *EPA (2024) National inventory Report 2025* <https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/Ireland's-NID-2025.pdf>
[31] *Ibid.*
[32] *European Environment Agency (2007) Climate change: the cost of inaction and the cost of adaptation* <https://www.eea.europa.eu/publications/technical_report_2007_13/download>

This section provides a description of the future predictions for climate change.

11.3.2.1 Data sources

A review of literature and data relating to climate change in Ireland was undertaken and utilised to provide an overview of the future baseline environment. The following key data sources were reviewed:

- High-resolution Climate Projections for Ireland – A Multimodel Ensemble Approach (report No. 339)[33];
- Climate Status Report for Ireland 2020[34]; and
- Climate Ireland[35].

11.3.2.2 Physical environment

This section will describe the future baseline for the Site's physical environment under the Representative Concentration Pathways (RCP) 8.5 high emission scenario. RCPs represent climate change scenarios used in modelling the possible future climate evolution, and are based on a wide suite of assumptions, to specify the greenhouse gas concentrations that will result in defined radiative forcing by 2100. The RCP 8.5 combines assumptions about high population and relatively slow income growth with modest rates of technological change and energy intensity improvements, leading in the long term to high energy demand and greenhouse gas emissions in absence of climate change policies. Compared to the total set of RCPs, RCP 8.5 thus corresponds to the pathway with the highest greenhouse gas emissions[36]. The physical environment of the Proposed Project under the RCP 8.5 scenario is discussed under the following headers:

- Air Temperature;
- Precipitation and Flood Risk;
- Wind and Storms.

Air Temperature

Annual surface air temperatures[37] in Ireland are now approximately 1°C higher than they were in the early 1900's (2013 – 2022 period relative to 1903 - 1912). The upward trend in air temperatures is predicted to continue for all seasons: annual air temperatures may increase by over 3°C by the end of the 21st century relative to a 1976 to 2005 reference period under an RCP 8.5 high emission scenario[38].

Met Éireann projections[39] indicate an increase of 1–1.6°C in mean annual temperatures in Ireland, with the largest increases seen in the east of the country. Warming is enhanced for the extremes (i.e. hot or cold days), with highest daytime temperatures projected to rise by 0.7–2.6°C in summer and lowest night-time temperatures to rise by 1.1–3°C in winter. Averaged over the whole country, the number of frost days (days when the minimum temperature is less than 0°C) is projected to decrease by 62% for the RCP 8.5 high emissions scenario[40,41].

[33] *EPA Research (2020) High-resolution Climate Projections for Ireland – A Multimodel Ensemble Approach* <https://www.epa.ie/publications/research/climate-change/Research_Report_339_Part1.pdf>
[34] https://www.epa.ie/publications/research/climate-change/Research_Report_386.pdf
[35] https://www.climateireland.ie/
[36] *Climate Change (2011) A scenario of comparatively high greenhouse gas emissions* <https://link.springer.com/article/10.1007/s10584-011-0149-y>
[37] https://www.epa.ie/publications/monitoring--assessment/climate-change/irelands-climate-change-assessment-volume-1.php
[38] *Irelands Climate Change Assessment (2023) Volume 1 Climate Science – Ireland in a Changing World*
[39] https://www.met.ie/climate/climate-change#Reference3
[40] *Nolan, P. 2015. EPA Report: Ensemble of Regional Climate Model Projections for Ireland. EPA climate change research report no. 159. EPA: Wexford.*
[41] *O'Sullivan, J., Sweeney, C., Nolan, P. and Gleeson, E., 2015. A high-resolution, multi-model analysis of Irish temperatures for the mid-21st century. International Journal of Climatology. doi: 10.1002/joc.4419.*

Precipitation and Flood Risk

Climate change is expected to have a significant impact on Ireland's precipitation patterns. Ireland is predicted to experience greater seasonality in precipitation, with more extreme fluctuations between wet and dry periods. Winter and autumn are anticipated to see increased rainfall, while spring and summer are projected to become drier, leading to more frequent droughts. The EPA's climate projections indicate that very wet days (i.e., days with more than 30mm of rainfall) will become more common, increasing by 31% under a high emissions scenario (RCP 8.5).

Due to Ireland's location in the west of Europe, exposure to Atlantic storms is of concern and this is particularly the case in the context of rising sea levels which will enhance the impacts of storm surges[42].

Extreme rainfall events, such as those currently expected only once every 50 years, could become twice as frequent by the end of the century. This means more frequent flooding risks, particularly during the winter months[43]. Further information on flood risk is presented in the section below.

Flood Risk

Chapter 9 Water, and the accompanying Flood Risk Assessment (FRA) (Appendix 9-1) detail the flood risk of the Proposed Project. Based on the information provided in the stated documents, the areas of the Proposed Project at risk of flooding were identified.

No recurring or historic flood incidents are recorded within the Proposed Wind Farm. The closest mapped historic and recurring flood events are situated in the townland of Cumask, at Dundrum Rossmore Bridge along the Multeen (East) River, ~3.6km southeast (straight line distance) of the Proposed Wind Farm site (ID:4357). According to the OPW Flood Hazard Mapping Programme Flood engineer notes; land and minor road flooding occurs approximately twice a year at this location.

The GSI's Winter 2015/2016 Surface Water Flood Map shows surface water flood extents for this winter flood event. This flood event is recognised as being the largest flood event on record in many areas. The flood map for this event does not record any flood zones along the streams and watercourses which drain the Proposed Wind Farm site. The nearest mapped flood zones are mapped at the location of unnamed lake segments mapped by the GSI ~3.5km southwest of the Proposed Wind Farm site.

National Indicative Fluvial Mapping (NIFM) has also been completed to consider future climate scenarios where the potential effects of climate change can increase rainfall. The NIFM for the Present Day Scenario have mapped flood zones in the immediate vicinity of the Proposed Wind Farm site. Low and medium probability river flood zones are mapped along the Aughnaglanny River as it flows along the eastern boundary of the Proposed Wind Farm site. These flood zones do not extend far beyond the mapped channel of the watercourse at this location and hence do not encroach significantly within the Site itself.

However, further downstream, along the Aughnaglanny River, present day low and medium probability river flood zones are mapped more extensively beyond the mapped channel of the river as it progresses towards the Multeen [east] River. Additionally, low and medium probability NIFM river flood zones are mapped downstream of the Site, along the lower reaches of the Lackenacoombe stream. Fluvial flood zones are also mapped further downstream of the Proposed Wind Farm site along the Multeen River as far as the River Suir

Catchment Flood Risk Assessment and Management (CFRAM) mapping has not been completed for the area of the Proposed Wind Farm. The closest mapped CFRAM fluvial flood zones for the present-day scenario are mapped along the River Suir ~20km downstream of the Proposed Wind Farm site. No CFRAM mapping has been completed on the Multeen River or its tributaries.

[42] https://www.epa.ie/our-services/monitoring--assessment/climate-change/climate-ireland/impact-of-climate-change-on-ireland/climate-hazards/coastal-flooding.
[43] *EPA (2005) Climate Change Regional Climate Model Predictions for Ireland* <https://www.epa.ie/publications/research/climate-change/climate-change-regional-climate-model-predictions-for-ireland-.php>

Therefore, from a fluvial flood risk perspective, the Proposed Wind Farm site is located Flood Zone C where there is a low risk of fluvial flooding

Furthermore, the Proposed Wind Farm site is not located within any GSI mapped historic or modelled groundwater flood zones. Also, based on the CFRAM rainfall (pluvial) flood mapping, surface water ponding/flooding is not a notable issue at the Proposed Wind Farm site

NIFM and CFRAM fluvial flood zones are also mapped along the Proposed Grid Connection cable route at major watercourse crossing locations, but this potential flooding has no consequence for the Proposed Grid Connection cable due to the underground nature of the cabling. The Proposed on-site 110kV Substation element of the Proposed Grid Connection within the Proposed Wind Farm site is located in Flood Zone C (low risk) as described above.

The FRA concludes the Proposed Wind Farm as well as Proposed on-site 110kV Substation can be categorised as "Highly Vulnerable Development", while the Proposed Grid Connection underground cable is a "Water Compatible Development" due to the subsurface nature of the sealed/insulated electrical cable. However, the proposed infrastructure is located outside of areas mapped as Flood Zones and therefore the Proposed Project is appropriate from a flood risk perspective. The overall risk of flooding posed at the Proposed Project is estimated to be very low. A low risk would typically relate to the probability of being impacted by a 1000-year flood (*i.e.* the entire area of the Proposed Project footprint is located in fluvial Flood Zone C). The flooding risk at the Proposed Project has an estimated Annual Exceedance Probability (AEP) of <0.1%.

Wind and Storms

Future climate and weather predictions indicate a slight reduction in mid-century (2041 – 2060) average wind speeds around Ireland (-2.47% for RCP 8.5 high emissions scenario compared to the 1981 – 2000 baseline), with these decreases being more pronounced during the summer months[44]. Predictions also point towards less frequent, but more intense storm activity around Ireland. However, there is uncertainty with regard to future predictions for storms, and it is expected that the trends observed in the frequency and intensity of storms will continue to be influenced by natural variability. Additionally, future trends are difficult to predict due to a low confidence in attributing historic trends in storms to climate change. However, ongoing changes in the climate may potentially affect storms with cumulative effects on wind.

Projections indicate a decrease in average and extreme wave heights towards the end of the century, but an increase in the frequency and severity of storm surges in coastal regions of western Ireland, particularly in winter months[45]. Storm surge levels over a 20-to-30-year return period are anticipated to increase by up to 9cm by 2100[46].

11.3.2.3 Greenhouse Gas Emissions Projections

In its approach to decarbonisation, the EU has split greenhouse gas emissions into two categories, the Emissions Trading System (ETS) emissions and the non-ETS emissions. Emissions from electricity generation and large industry in the ETS are subject to EU-wide targets which require that emissions from these sectors be reduced by 42% by 2030, relative to 2005 levels. Within the ETS, participants are required to purchase allowances for every tonne of emissions, with the amount of these allowances declining over time to ensure the required reduction of 42% in greenhouse gas emissions is achieved at EU-level[47].

[44] https://www.climateireland.ie/impact-on-ireland/future-climate-of-ireland/windspeed/
[45] https://www.epa.ie/publications/research/climate-change/research-339-high-resolution-climate-projections-for-ireland-.php
[46] https://www.climateireland.ie/impact-on-ireland/future-climate-of-ireland/waves--surges/
[47] *Department of the Environment, Climate and Communications (2023) - Climate Action Plan 2024* https://www.gov.ie/en/publication/79659-climate-action-plan-2024/

Emissions from all other sectors, including agriculture, transport, buildings, and light industry are covered by the EU Effort Sharing Regulation (ESR[48]). This regulation established binding annual greenhouse gas emission targets for Member States for the period 2021–2030. Please see Section 11.2.1 above and Section 1.1.1.10 of Appendix 11-1 for further details on the EU ESR.

Considerable progress has been made in the decarbonisation of the Electricity Sector, with emissions falling 22% between 2022 and 2023. This reduction in emissions is due to an increase in the share of renewable electricity generation, from 38.6% to 40.7% from 2022 to 2023, with wind energy accounting for 33.7% of electricity supply.[49]

The Environmental Protection Agency (EPA) publish Ireland's greenhouse gas emission projections and at the time of writing, the most recent report, *'Ireland's Greenhouse Gas Emissions Projections 2024-2055'*[50] was published in May 2025. The report includes an assessment of Ireland's progress towards achieving its emission reduction targets out to 2030 set under the ESR.

The EPA has produced two scenarios in preparing these greenhouse gas emissions projections: a "With Existing Measures" (WEM) scenario and a "With Additional Measures" (WAM) scenario. These scenarios forecast Irelands greenhouse gas emissions in different ways. The WEM scenario assumes no additional policies and measures, beyond those already in place by the end of 2023. This is the cut off point for which the latest national greenhouse gas emission inventory data is available, known as the 'base year' for projections. The WAM scenario has a higher level of ambition and includes government policies and measures to reduce emissions such as those in Ireland's Climate Action Plan 2025 that are not yet implemented. As implementation of policies and measures occurs, they will be migrated into the WEM Scenario. Please note, CAP25 is not specifically referenced in this report as it had yet to be published during the preparation phase of the 2024-2055 projections. A review was undertaken and there are no significant additional measures in CAP25 therefore no major omissions in these projections.

The EPA Emission Projections Update notes the following key trends:

- Ireland is not on track to meet the 51% emissions reduction target by 2030 (as compared to 2018 levels) based on most up to date EPA projections which include many of Climate Action Plan 2024 measures
- The first two carbon budgets (2021-2030), which aim to support achievement of the 51% emissions reduction goal, are projected to be exceeded by a significant margin
  - Carbon Budget 1 to be exceeded by a margin of 8 to 12 $MtCO_2eq$
  - Carbon Budget 2 to be exceeded by a margin of 77 to 114 $MtCO_2eq$ (with carryover from Carbon Budget 1)
- Sectoral emissions ceilings for 2025 and 2030 are projected to be exceeded by the Buildings, Electricity, Industry and Transport Sectors and met by the Other sector
  - Please note, a direct comparison of emissions in the Agriculture sector against its Sectoral Emission Ceiling is not longer viable due to significant refinement of the Agriculture inventory
- From 21.4 $MtCO_2eq$ in 2018, total emissions from the Agriculture sector are projected to be between 18.0 and 21.6 $MtCO_2eq$ in 2030 (a 16% reduction in WAM and 1% increase in WEM)
  - Without full implementation of all planned policies and measures, there will be a net increase in emissions in this sector by 2030.
- Transport emissions are projected to decrease from 12.3 $MtCO_2eq$ in 2018 to between 9.7 $MtCO_2eq$ and 11.2 $MtCO_2eq$ in 2030 (a 9 to 21% reduction).
- From 10.6 $MtCO_2eq$ in 2018, emissions from the Energy Industries sector are projected to decrease to between 3.4 and 4.4 $MtCO_2eq$ in 2030 (a 59 to 68% reduction)

[48] *Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris There was a significant drop in emissions from the Energy Industries sector between 2022 and 2023 (down 2.1 Mt CO2eq or 21.4%). This reduction in emissions was partly due to a 12-fold increase in the amount of imported electricity (9.5% of electricity supply in 2023), in combination with an increase in the share of renewable energy from 38.6% in 2022 to 40.7% in 202Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance)*
[49] *Department of the Environment, Climate and Communications (2025) - Climate Action Plan 2025*
[50] *EPA (2025) Ireland's Greenhouse Gas Emissions Projections 2024-2055*

- Renewable energy generation at the end of the decade is projected to range from 60 to 68% of electricity generation
- Emissions from the Energy Industries sector are projected to decrease by between 57 and 62% over the period 2022 to 2030
  - Renewable energy generation at the end of the decade is projected to range from 69 to 80% of electricity generation
- Total emissions from the LULUCF sector are projected to increase over the period 2018 to 2030 by between 1.5 and 3.8 $MtCO_2eq$ (an increase of 39 to 95%)
- Ireland is not projected to meet its EU target, set under the Effort Sharing Regulation, of a 42% emissions reduction by 2030 (compared to 2005) even with flexibilities applied
  - Under the WEM Scenario Ireland is projected to receive a 9.5% emission reduction from 2005 levels by 2030
  - Under the WAM Scenario Ireland is projected to achieve a 21.7% emission reduction from 2005 levels by 2030

11.3.3 Summary

As outlined in the preceding sections, Ireland is and will continue to experience climate change in line with global trends, with current projections indicating that these effects will intensify in the coming decades. The design of the Proposed Project has considered the potential climate change effects under both the baseline and future environment, and it is considered that the Proposed Project will not be negatively impacted by climate change, nor will it have a negative impact on climate change over its 35-year design horizon.

Further information on the vulnerability of the Proposed Project to major accidents and natural disasters is detailed in Chapter 16 Major Accidents and Natural Disasters.

11.4 Calculating Carbon Losses and Savings from the Proposed Project

11.4.1 Background

In addition to the combustion of fossil fuels, greenhouse gases are also released through natural processes such as the decomposition of organic material (which is composed of carbon). Bogs and peatlands are known to store large amounts of carbon. There is no peat present within the Proposed Wind Farm.

As detailed in Section 8.3.3 in Chapter 8 of this EIAR: Land, Soils and Geology, the Proposed Wind Farm site is largely mapped to be underlain by poorly drained mineral soils derived from mainly non-calcareous parent materials (AminPD). Smaller areas further on the north of the Site are mapped to comprise deep well drained mineral (Mainly acidic) soils (AminDW) and shallow well drained (mainly acidic) soils (AminSW). These soils are also sparsely mapped along the boundaries of the Proposed Wind Farm site on the east, west and south. Alluvium soil is mapped along the Lackenacoombe Stream and Glasheenyreagha Stream within the Proposed Wind Farm site and also along the Aughnaglanny River and Multeen River to the east and west of the Site respectively; there is no peat mapped at or locally to the Site. For this reason, the carbon balance between the use of a renewable energy and the loss of carbon stored in the peat is not assessed in this section of the EIAR.

Please note that in line with the Department of Agriculture, Food, and the Marine, Forest Service's published policy[31] on granting felling licences for wind farm developments, areas cleared of forestry for access roads, and any other wind farm-related uses will have to be replaced by replanting at an alternative site or sites. The Forest Service policy requires replacement or replanting on a hectare-for-hectare basis for the footprint of the infrastructure developments. The estimated 51.6 hectares of Conifer plantation

[31] *Department of Agriculture, Food and the Marine (2020). Forest Service <https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/publications/tree-felling-licences/>*

(WD4) that will be felled within and around the Proposed Wind Farm along with existing treeline boundaries is not subject to a LFL (Limited Felling License) from the Forestry Service and will be replanted within the Site as detailed in Section 6.5.2 of Chapter 6 Biodiversity and Appendix 6-1 BMEP. Therefore, the losses associated with tree felling are not included in the carbon loss assessment provided in Section 11.4.3.1.

Carbon dioxide is released in the manufacture and transportation of turbines and construction materials to the Site, as well as throughout the construction process and therefore a carbon loss/saving calculation for the Proposed Project has been undertaken (Section 11.4.3).

11.4.2 Methodology for Calculating Losses

A methodology for calculating carbon losses was published in June 2008 by scientists at the University of Aberdeen and the Macauley Institute with support from the Rural and Environment Research and Analysis Directorate of the Scottish Government, Science Policy and Co-ordination Division. The document, '*Calculating Carbon Savings from Wind Farms on Scottish Peat Lands'*, was developed to calculate the impact of wind farm developments on the soil carbon stocks held in peat. This methodology was refined and updated in 2011 based on feedback from users of the initial methodology and further research in the area. The web-based version of the carbon calculator, which supersedes the excel based versions of the tool, was released in 2016. Please note, the web-based version of the carbon calculator is currently not available, the Macauley Institute has supplied a worksheet of the calculator (Version 2.14.0) which has been used to complete the following carbon loss assessment. The tool provides a transparent and easy to follow method for estimating the impacts of wind farms on the carbon dynamics of peatlands. Previously guidance produced by Scottish Natural Heritage in 2003 had been widely employed to determine carbon payback in the absence of more detailed methods.

Given the absence of peat, the Proposed Project will not give rise to any impact on peat habitat. The Macauley Institute methodology states that the total volume of peat impacted by the construction of a wind farm is strongly correlated to the extent of the peatland affected by drainage at a site. Therefore, in calculating the carbon loss/saving of the Proposed Project, all potential carbon losses associated with constructing a wind farm on peatland environments were discounted. The carbon losses as a result of the manufacture, transportation and erection of the proposed turbines were included in the calculation.

The outputs of the Macauley Institute web-based carbon calculator are included in Appendix 11-2 of this EIAR, '*Carbon Calculations'.*

In addition to the Macauley Institute methodology described above, where possible, carbon emissions or losses associated with embodied carbon of materials used in the construction, operational and decommissioning phase of the Proposed Project have been identified. Embodied carbon refers to the emissions associated with procuring, mining, and harvesting raw materials, the transformation of those materials into construction products, transporting them to site, installation of these materials during a construction phase, and the subsequent replacement, removal, and disposal of these materials upon decommissioning.[52]

The full life cycle and embodied carbon of the Proposed Project turbines have been taken account of in the Macauley Institute model. The emissions associated with the embodied carbon, along with the construction phase transport movements, of the remaining features of the Site are considered using the Transport Infrastructure Ireland (TII) Carbon Tool (TII 2022)[53]. The TII Carbon Tool is customised for road and light rail projects in Ireland, using emission factors from recognised sources during the construction, maintenance and operation of TII projects in Ireland.

Section 15.1 in Chapter 15 of this EIAR outlines traffic generation numbers relative to quantum of materials required for the construction of the Proposed Project, the details of which have been utilised to determine the emissions associated with these activities and are included in Appendix 11-2.

[52] *Irish green Building Council – What is embodied carbon?* <https://www.igbc.ie/what-is-embodied-carbon/>
[53] *Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document* https://www.tiipublications.ie/library/GE-ENV-01106-01.pdf

11.4.3 Carbon Losses and Savings Calculations

11.4.3.1 Carbon Losses

The Scottish Government online carbon calculator[54] was used to assess the impacts of the Proposed Project in terms of potential carbon losses taking into account drainage, habitat improvement, forestry felling and site restoration. The online calculator is pre-loaded with information specific to the CO_2 emissions from the United Kingdom's electricity generation plant, which is used to calculate emissions savings from proposed wind farm projects in the UK. However, due to the availability of Irish specific carbon intensity emission factors for the Irish electricity generation plant, available from the SEAI website[55], the CO_2 emissions savings from the Proposed Project have been calculated separately from the online carbon calculator as set out in Section 11.4.3.2 below.

In relation to embodied carbon and associated transport movements of all other ancillary elements of the Proposed Project, the TII Carbon Tool has been utilised to assess the impacts of the Proposed Project in terms of potential carbon losses in relation to construction phase transport emissions and embodied carbon.

A copy of the outputs is provided as Appendix 11-2 of this EIAR, *'Carbon Calculations'*. Where available and relevant, site-specific information was inserted into the online carbon calculators. Otherwise, default values were used.

The main CO_2 losses due to the Proposed Project are summarised in Table 11-5.

Table 11-5 CO2 Losses from the Proposed Project

Origin of Losses	CO_2 Losses (tonnes CO_2 equivalent)	
	Expected	Maximum
Losses due to turbine life (e.g., manufacture, construction, decommissioning)	74,556	75,864
Losses due to backup	56,419	57,329
Losses from reduced carbon fixing potential	2,524	4,302
Losses associated to forestry felling	23,860	24,523
Losses associated with embodied carbon in construction materials	4,582	4,582
Losses associated with traffic and transport movements	300	300
Total	**162,241**	**166,900**

The worksheet models and online tools calculate that the Proposed Project will give rise to 162,241 tonnes of CO_2 equivalent losses over its 35-year life. Of this total figure, the Proposed Wind Farm turbines directly account for 74,556 tonnes, or 45%. Losses due to backup account for 56,419 tonnes, or 34%. losses from reduced carbon fixing potential accounts for 1.5% or 2,524 tonnes. Losses due to embodied carbon accounts for 4,582 tonnes or 3% and losses due to construction phase transport emissions accounts for 0.2% or 245 tonnes.

[54] *Scottish Government online Carbon Calculator. Available at: https://www.gov.scot/publications/carbon-calculator-for-wind-farms-on-scottish-peatlands-factsheet/*
[55] https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors

The figure of 2,524 tonnes of CO_2 arising from ground activities associated with the Proposed Project is calculated based on the entire Proposed Project footprint being "Acid Bog", as this is one of only two choices the model allows (the other being Fen). The habitat that will be impacted by the Proposed Project footprint comprises predominantly agriculture rather than the acid bog assumed by the model that gives rise to the 2,524 tonnes and therefore the actual CO_2 losses are expected to be lower than this value.

The values discussed above are based on the assumption that no biodiversity enhancement activities will take place as part of the Proposed Project. As detailed in Appendix 6-1, a Biodiversity Management and Enhancement Plan (BMEP) for the Proposed Wind Farm has identified enhancement activities such as the protection and maintenance of species rich grassland habitat within the Proposed Wind Farm site, native woodland management and riparian woodland planting and linear connectivity. Taking into account the habitat enhancement that will take place, the actual CO_2 losses for reduced carbon fixing potential are expected to be lower than the values detailed in Table 11-5, over the lifetime of the Proposed Project.

The figure of 4,582 tonnes of CO_2 arising from the embodied carbon of construction materials associated with the Proposed Project is calculated based the types of materials available in the TII Carbon tool such as, concrete, steel, cement and granular fill, and assumes that each HGV or LGV will be carrying material at its full capacity. The figure of 300 tonnes of CO_2 arising from transport movements associated with construction activities of the Proposed Project is calculated based on the assumption that material will be imported locally or from a port/city location where applicable. Details on the assumptions made for the modelling of embodied carbon and construction phase transport emissions are included in Appendix 11-2.

The values discussed above are based on the assumption that the hydrology of the Proposed Project and habitats within the Site are not restored on decommissioning of the Proposed Wind Farm after its expected 35-year proposed operational life. As detailed in the Decommissioning Plan, Appendix 4-6, the wind turbines and met mast will be dismantled and removed off-site. It is not intended to remove the concrete foundations from the ground as it is considered that its removal will be the least preferred options in terms of having potential effects on the environment. The associated foundations will be backfilled and covered with soil material and reseeded. The underground electrical cabling connecting the turbines to the Proposed on-site 110kV Substation will be removed from the cable ducts. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance. The cable materials will be transferred to a suitable recycling or recovery facility. Taking into account the proposals incorporated in the Decommissioning Plan, the actual CO_2 losses are expected to be lower than the values detailed in Table 11-5.

11.4.3.2 Carbon Savings

According to the model described above, the Proposed Project will give rise to total losses of 162,241 tonnes of carbon dioxide.

A simple formula can be used to calculate carbon dioxide emissions reductions resulting from the generation of electricity from wind power rather than from carbon-based fuels such as peat, coal, gas and oil. The formula is:

$$CO_2 \text{ (in tonnes)} = \frac{(A \times B \times C \times D)}{1000}$$

where: A = ... The rated capacity of the wind energy development in MW

B = ... The capacity or load factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc.

C = ... The number of hours in a year

D = ... Carbon load in grams per kWh (kilowatt hour) of electricity generated and distributed via the national grid.

For the purposes of this calculation, the rated capacity of the Proposed Wind Farm is assumed to be 86.8 MW (based on 14 No. 6.2 MW turbines).

A capacity factor of 0.36 (or 36%) has been used for the Proposed Project.[36]

The number of hours in a year is 8,760.

A conservative figure for the carbon load of electricity generated by natural gas in Ireland was sourced from Sustainable Energy Authority Ireland's (SEAI) Conversion and Emissions Factors for Publication worksheet.[37] The emission factor for electricity generated in Ireland in 2023 was 229.9 gCO_2/kWh.[38]

The calculation for carbon savings is therefore as follows:

$$CO_2 \text{ (in tonnes)} = \frac{(86.8 \times 0.36 \times 8{,}760 \times 229.9)}{1000}$$

$$= 62{,}931 \text{ tonnes per annum}$$

Based on this calculation, **62,931** tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Wind Farm. Over the proposed 35-year lifetime of the development, therefore **2,202,585** tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.

Based on the Scottish Government carbon calculator as presented above in Section 11.4.3.1, approximately 162,241 tonnes of CO_2 will be lost to the atmosphere due to changes in the soil and ground conditions and due to the construction and operation of the Proposed Project. This represents **7.5%** of the total amount of carbon dioxide emissions that will be offset by the Proposed Wind Farm. The 162,241 tonnes of CO_2 that will be lost to the atmosphere due to changes in soil and ground conditions and due to the construction and operation of the Proposed Project will be offset by the Proposed Wind Farm in approximately **31.5** months (2.6 years) of operation.

As detailed in Section 11.4.3 above, habitat enhancement and management activities will take place as part of the Proposed Project. As detailed in Section 4.3.1.7 of this EIAR, the estimated 51.6 hectares of forestry will be felled as part of the Proposed Project. In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for access roads, and any other wind farm-related uses will have to be replaced by replanting at an alternative site or sites. The replacement of the 51.6 hectares of forestry can occur anywhere in the State subject to licence. Areas within the Proposed Wind Farm site have been selected for biodiversity enhancement measures as part of the Proposed Project and to enhance the Proposed Wind Farm site for species and habitats known to occur within the Proposed Wind Farm site. Please see Appendix 6-1 for further detail on enhancement measures. These activities, over the lifetime of the Proposed Project has the potential to give rise to carbon savings.

11.5 Likely Significant Effects and Associated Mitigation Measures

11.5.1 'Do-Nothing' Effect

If the Proposed Project were not to proceed, the opportunity to further significantly reduce emissions of greenhouse gases, including carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide (SO_2)

[36] *Eirgrid, 2022 Enduring Connection Policy 2.3 Constraints Report for Solar and Wind <https://cms.eirgrid.ie/sites/default/files/publications/ECP-2.3-Solar-and-Wind-Constraints-Report-Assumptions-and-Methodology-v1.1.pdf> The Proposed Project is located within the H2 wind region for Ireland with an associated capacity factor of 32%.*
[37] *Conversion and Emission Factors for Publication (2023) https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/SEAI-conversion-and-emission-factors.xlsx*
[38] *SEAI have published the provisional 2023 emission factor for electricity generation in Ireland as 229.9 gCO2/kWh. Please note that this is a provisional value that may change.*

from fossil fuels to the atmosphere would be lost. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol, the Paris Agreement, and EU law would also be lost. This would be a long-term slight negative effect.

11.5.2 Construction Phase

11.5.2.1 Greenhouse Gas Emissions

Proposed Wind Farm

The construction of turbines and associated foundations and hard-standing areas, meteorological mast, access roads, temporary construction compounds, underground cabling, borrow pits, spoil management areas, site drainage and all ancillary works and apparatus, will require construction materials (such as cement), and the operation of construction vehicles and plant on and off-site, and the transport of workers to and from the Proposed Wind Farm. Greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides, associated with the production of construction materials, and operation of vehicles and plant will arise as a result of the construction activities. This will result in a short-term slight negative impact, which is not significant, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. Mitigation measures to reduce this effect are presented below.

Some potential long-term imperceptible negative effects will occur due to the removal of carbon fixing vegetation and habitat, however, that has been avoided where possible by the design and layout of the Proposed Wind Farm, which has ensured the utilisation of as much of the existing roads within the Site as possible to gain access to the proposed turbine locations and minimise the construction of additional roads. This will result in a long-term imperceptible negative impact, which is not significant, given the quantity of greenhouse gases that will be emitted to the atmosphere.

Proposed Grid Connection

The construction of the Proposed on-site 110kV Substation and 110kV underground cabling connecting to the existing Killonan 110kV substation will require the operation of construction vehicles and plant on and off-site, and the transport of workers to and from the Proposed Grid Connection underground cabling route.

Greenhouse gas associated with vehicles and plant, such as carbon dioxide, (CO_2), carbon monoxide, and nitrogen oxides will arise as a result of construction activities. This will result in a short-term slight negative impact, which is not significant, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. Mitigation measures to reduce this impact are presented below.

Transport to Site

The transport of turbines and construction materials to the Site, which will occur on specified routes only (see Section 4.4 in Chapter 4 of this EIAR), will also give rise to greenhouse gas emissions associated with the transport vehicles and exhaust emissions. This will result in a short-term slight negative impact, which is not significant, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. Mitigation measures to reduce this effect are presented below.

Waste Disposal

Construction waste will arise from the Proposed Project, mainly from excavation and unavoidable construction waste including material surpluses, damaged materials and packaging waste. This potential impact will be short-term and slight only, given the quantity of greenhouse gases associated with the generation and management of these waste streams that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. Waste management will be carried out in accordance

with *Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects* (2021) produced by the EPA.

Please refer to Section 4.3.4.7 of Chapter 4 of this EIAR and Section 3.8 of the Construction and Environmental Management Plan (CEMP) (Appendix 4-3) for detailed processes on waste management during the construction phase of the Proposed Project.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while on-site, thereby minimising any emissions that arise.
- When stationary, delivery and on-site vehicles will be required to turn off engines.
- Turbines and construction materials will be transported to the Site on specified routes only unless otherwise agreed with the Planning Authority. Please see Chapter 15 Material Assets for details.
- It is intended to obtain the majority of materials for the construction of the Proposed Wind Farm from the proposed on-site borrow pits (with some material being imported from local licenced quarries as needed). This will significantly reduce the number of delivery vehicles accessing the Site, thereby reducing the amount of emissions associated with vehicle movements.
- A Construction and Environmental Management Plan (CEMP) (Appendix 4-3) will be in place throughout the construction phase.
- The CEMP (Appendix 4-3) includes a Waste Management Plant (WMP) which outlines the best practice procedures that will occur during the construction phase relating to waste material.
    - The WMP outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Project. Disposal of waste will be seen as a last resort.
    - Section 4.3.4.7 of Chapter 4 for this EIAR refers to the methodology that will be utilised to manage on-site waste. This waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor,
    - The MRF facility will be local to the Proposed Project site to reduce the amount of emissions associated with vehicle movements.
- Where applicable, low carbon intensive construction materials will be sourced and utilised on-site.

Residual Effects

Following implementation of the mitigation measures above, residual effects of greenhouse gas emissions arising from the construction phase of the Proposed Project will have a short-term imperceptible negative effect. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate.

When considering these greenhouse gas emissions within the context of the national Electricity Sector Emissions Ceilings detailed in Section 11.2.2, Carbon Budget 1 (2021-2025) has an Electricity Sector budget of 40 MtCO2eq. and Carbon Budget 2 (2026-2030) has an Electricity Sector budget of 20 MtCO2eq for large-scale deployment of renewables. As detailed in Section 11.4.3.2, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Wind Farm. Therefore, while there will be greenhouse gas emissions associated with the construction of the Proposed Project, this will take place under the Electricity sector emissions ceiling and will be offset by the operation of the Proposed Wind Farm within its operational life.

Significance of Effects

Based on the assessment above there will be no significant effects.

11.5.3 Operational Phase

11.5.3.1 Greenhouse Gas Emissions

Proposed Wind Farm

The Proposed Project will generate energy from a renewable source. As detailed in Section 11.4.3.2 above, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Wind Farm. For the purposes of this EIAR, a rated output of 6.2MW per turbine has been chosen to calculate the anticipated power output of the Proposed Project, which would result in an estimated output of 86.8MW, displacing approximately 62,931 tonnes of carbon dioxide per annum from traditional carbon-based electricity generation. This will have a long-term significant positive impact on climate.

Some potential long-term slight negative impacts that may occur during the operational phase of the Proposed Project are the release of carbon dioxide to the atmosphere due to maintenance and monitoring activities and the removal of carbon fixing vegetation and habitat, as well as associated drainage. With respect to transport volumes, there will only be an average of 3 trips made to the Site by car or light goods vehicle per day.

Proposed Grid Connection

While there will be approximately 3 trips made to the Proposed Wind Farm by car or light goods vehicle per day from maintenance and monitoring crews on-site for maintenance activities, this will be less than those needed at the Proposed Grid Connection during the operational phase. Therefore, impacts relating to emissions from maintenance and monitoring along the Proposed Grid Connection Route infrastructure throughout the operational phase will be less than that detailed in section '*Proposed Wind Farm*' above and less than those impacts described in Section 11.5.2.1 above.

Transport to and from the Site

In the unlikely event that a turbine blade is damaged and must be replaced during the operational phase, the impacts described in Section 11.5.2.1 will be the same. Emissions resulting from routine maintenance at Proposed Wind Farm site are included in the section '*Proposed Wind Farm*' above.

Waste Disposal

Waste is not proposed to be generated on the Site during the operational phase, any waste that does arise will be minimal and any impact will be short-term and imperceptible. Waste management will be carried out in accordance with '*Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects'* (2021) produced by the EPA.

Mitigation

- Ensure that all maintenance and monitoring vehicles will be maintained in good operational order while on-site, and, when stationary, be required to turn off engines thereby minimising any emissions that arise.
- As detailed in Appendix 6-1, a BMEP, for the Proposed Wind Farm has identified biodiversity enhancement and management activities such as the protection and maintenance of species rich grassland habitat within the Proposed Wind Farm site, native woodland management and riparian woodland planting and linear connectivity.

Residual Effect

Following implementation of the BMEP outlined above, the loss of carbon fixing vegetation over the lifetime of the Proposed Project will be partially offset by the BMEP; using the precautionary principle, this will have a potential long-term imperceptible negative effect on Climate. However, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Wind Farm. Therefore, while there will be greenhouse gas emissions associated with the operation of the Proposed Project, through the use of monitoring and maintenance vehicles, this will be offset by the operation of the Proposed Project within the 35-year operational life.

Long-term moderate positive residual effect on Climate as a result of reduced greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant effects.

11.5.4 Decommissioning Phase

The wind turbines proposed as part of the Proposed Project are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the equipment may be replaced with a new technology, subject to planning permission being obtained, or the Proposed Wind Farm will be decommissioned fully.

Upon decommissioning of the Proposed Wind Farm, the wind turbines and the meteorological mast would be disassembled. All above ground turbine and mast components would be separated and removed off-site for recycling. Turbine and mast foundations would remain underground and would be covered with soil material and reseeded. Leaving the foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant temporary environment nuisances such as noise, dust and/or vibration. Proposed Wind Farm roadways will be used during the operational phase by farm machinery and will be useful for ongoing farming operations at the Site and therefore will be retained post decommissioning to facilitate these activities.

The underground electrical cabling connecting the turbines to the Proposed on-site 110kV Substation will be removed from the cable ducts. The cabling will be pulled from the cable ducts using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at the original cable jointing pits which will be excavated using a mechanical excavator and will be fully re-instated once the cables are removed. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance. The cable materials will be transferred to a suitable recycling or recovery facility.

The Proposed Grid Connection infrastructure, including the Proposed on-site 110kV Substation, will remain in place as it will be part of the Electricity Grid under the ownership and control of the ESBN/EirGrid.

Any impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential impacts.

A Decommissioning Plan has been prepared (Appendix 4-6). The Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will agree with the competent authority at that time. The potential for effects during the decommissioning phase of the Proposed Wind Farm has been fully assessed in the EIAR.

11.6 Cumulative Assessment

The potential for impact between the Proposed Project, and other relevant developments has been carried out with the purpose of identifying what influence the Proposed Project (Proposed Wind Farm and Proposed Grid Connection combined) will have on the surrounding environment when considered cumulatively and in combination with relevant existing permitted or proposed projects and plans in the vicinity of the Site, such as other wind energy developments, extractive industries, battery energy storage systems, forestry etc. The developments considered as part of the cumulative effect assessment are described in Section 2.9 and presented in Appendix 2-5 of this EIAR.

11.6.1 Construction Phase

During the construction phase of the Proposed Project and the construction of other permitted or proposed projects and plans in the area as set out in Section 2.9 in Chapter 2 of this EIAR, that are yet to be constructed, there will be greenhouse gas emissions arising from production of construction materials (such as cement), and the operation of construction vehicles and plant. These will be restricted to the duration of the construction phase, and as such will give rise to emission over a short-term duration. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent, imperceptible, negative cumulative effect on Climate.

11.6.2 Operational Phase

The nature of the Proposed Project is such that, once operational, it will have a long-term, moderate, positive impact on climate. However, as noted above, the Proposed Project will offset the **162,241** tonnes of CO_2 associated with the construction and operational phase that will be lost to the atmosphere (Section 11.4.3.2) in approximately **31.5** months (2.6 years) of operation.

Exhaust emissions during the operational phase of the Proposed Project will be minimal, relating to the use of maintenance vehicles on-site, and therefore there will be no measurable negative cumulative effect with other developments on climate.

When considering these greenhouse gas emissions within the context of the Electricity Sector Emissions Ceilings detailed in Section 11.2.2, Carbon Budget 1 (2021-2025) has an Electricity Sector budget of 40 MtCO2eq. and Carbon Budget 2 (2026-2030) has an Electricity Sector budget of 20 MtCO2eq for large-scale deployment of renewables. As detailed in Section 11.4.3.2, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Wind Farm. Therefore, while there will be greenhouse gas emissions associated with the construction of the Proposed Project, this will take place under the Electricity sector emissions ceiling and will be offset by the operation of the Proposed Project within its operational life. Thus, there will be no cumulative effects arising on climate from the Proposed Project and other permitted or proposed projects in the area as set out in Section 2.9 in Chapter 2 of this EIAR.

11.6.3 Decommissioning Phase

The works required during the decommissioning phase are described in Section 4.10 in Chapter 4: Description of the Proposed Project. Any cumulative impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential cumulative effects.

11.7 EIA Classification Table

Table 11-6 EIA Classification Table

Topic	Pre-Mitigation Effect	Mitigation Section Reference	Residual Effect	Significance
Construction Phase				
Greenhouse Gas Emissions	Long-term, Imperceptible, Negative	Section 11.5.2.1	Permanent, Imperceptible, Negative	Not Significant
Operational Phase				
Greenhouse Gas Emissions	Long-term, Significant, Positive	Section 11.5.3.1	Long-Term, Moderate, Positive	Not Significant
Decommissioning Phase				
Greenhouse Gas Emissions	Long-term, Imperceptible, Negative	Section 11.5.2.1	Permanent, Imperceptible, Negative	Not Significant