KWF Grid Connection EIA 2023 Report

Volume C2: EIAR 2023 Main Report

Chapter 11: Climate

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August 2023

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List of Abbreviations

CAP23	Climate Action Plan 2023
CCRA	Climate Change Risk Assessment
EPA	Environmental Protection Agency
EC	European Commission
GGEA	Greenhouse Gas Emissions Assessment
GHGs	Greenhouse Gases
IEMA	Institute of Environmental Management & Assessment
KWF	Knocknamona Windfarm
kWhrs	Kilowatt hours
TII	Transport Infrastructure Ireland
tCO_2e	Tonnes of Carbon Dioxide equivalent

Glossary of Terms

Term	Definition
Embodied emissions / embodied energy	These are defined as the energy consumed by all of the processes associated with the production of a development, from the mining and processing of natural resources to manufacturing, transport and product delivery
CO_2eq	This is defined as the 'carbon dioxide equivalent'. It is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2eq signifies the amount of CO_2 which would have the equivalent global warming impact
Capacity Factor	Is how much electricity a power plant actually produces compared to how much it would produce if it operated at full nameplate capacity 100% of the time. Expressed as a % of full nameplate capacity.

Term	Definition
EU ETS	The EU Emissions Trading System which is part of the EU's policy to combat climate change and its key tool for reducing greenhouse gas emissions cost-effectively. It is the world's first major carbon market and remains the biggest one.
Mt	Mt refers to Megatonne values. 1 Mt = 1 Million Tonnes
RE-E	Renewable Energy – Electricity. Electricity generated from a renewable source.

Glossary of General Terms

KWF Grid Connection (the subject development)	Underground cabling, additional plant and apparatus in the existing Woodhouse Substation, the construction a new link road, the widening of an existing forestry road and the use of the existing entrance and windfarm road network at Woodhouse Windfarm.
Authorised Knocknamona Windfarm	Not Constructed - Knocknamona Windfarm authorised in 2016 (ABP-PL 93.244006); Amendments to Knocknamona Windfarm to provide for larger turbines authorised in September 2022 (ABP-309412-21) and Junction & Bend Widening Works to facilitate turbine component access through the windfarm site entrance at Knocknaglogh Lower authorised in December 2022 (ABP-314219-22)
Whole Project	KWF Grid Connection with Authorised Knocknamona Windfarm

11 Environmental Factor: Climate

11.1 Introduction to the Climate Chapter

11.1.1 What is Climate?

Climate is defined as the average weather over a period of time. Climate change is a significant change in this average weather. Climate change is a natural phenomenon but in more recent years has accelerated as a result of human activities through the release of greenhouse gases (GHGs). These GHGs are altering the Earth's atmosphere resulting in a 'Greenhouse Effect'. This is causing an increase in the atmosphere's heat trapping abilities, resulting in increased average global temperatures (global warming) over the past number of years. The release of carbon dioxide as a result of burning fossil fuels, has been one of the leading factors in the creation of this 'Greenhouse Effect'.

11.1.2 Overview of Climate Change in the Environment

Scientists are detecting a stronger link between the planet's warming and its changing weather patterns. Though it can be hard to pinpoint whether climate change intensified a particular weather event, the trajectory is clear — climate change is already affecting the entire world, with extreme weather conditions such as drought, heat waves, heavy rain, floods and landslides becoming more frequent, including in Europe. Other consequences of the rapidly changing climate include rising sea levels, ocean acidification and loss of biodiversity. Ireland has directly experienced the extreme weather events of flooding, drought and extreme snow fall. But many other countries have experienced much worse heat waves and flooding. The shift in climate is bringing profound shifts of desertification, rising sea levels, displaced population, profound challenges to the natural world and economic and social disruption. We are close to a tipping point where these impacts will sharply worsen. Decarbonisation is now a must if the world is to contain the damage and build resilience in the face of such a profound challenge

In 2022 the UN describes climate change as "*the defining issue of our time and we are at a defining moment. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale*"

Ambitious national renewable energy generated electricity (RE-E) targets, which by 2021 had reached 80% for RE-E by 2030, were first set by an Irish Government in the White Paper **Ireland's Transition to a Low Carbon Energy Future 2015 – 2030.** This set out a vision for transforming Ireland's fossil fuel-based energy sector into a clean, low carbon system by 2050.

Ireland's Climate Action and Low Carbon Development (Amendment) Act 2021[1], (the 2021 Climate Act), was signed into law in 2021. The purpose of the 2021 Climate Act is to provide for the approval of plans "*for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050*".

The Climate Action Plan 2023 (CAP23)[2] is the second update to Ireland's Climate Action Plan 2019 and the

[1] Climate Action and Low Carbon Development (Amendment) Act 2021
https://www.irishstatutebook.ie/eli/2021/act/32/section/15/enacted/en/html
[2] https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021 and following the introduction of the 2022 Sectoral Emission Ceilings and economy wide carbon budgets. CAP23 is structured to identify key measures in each sector of the economy. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 and reiterates Ireland's international commitments to achieving international goals.

11.1.3 SENSITIVE ASPECTS of Climate

Any receptor in the receiving environment which could be affected by a development is a Sensitive Aspect.

11.1.3.1 Sensitive Aspects included for detailed evaluation in this Topic Chapter

The following Sensitive Aspect is **included for detailed evaluation in this topic chapter** as it is likely or there is potential, for this Sensitive Aspect to be affected by the KWF Grid Connection:

Sensitive Aspect No. 1	**Climate**	Section 11.2

The above listed Sensitive Aspect is evaluated in Section 11.2 of this Chapter.

11.1.3.2 Sensitive Aspects excluded from further evaluation

No Sensitive Aspects were excluded from this topic chapter.

11.1.4 The Authors of this Climate Chapter

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11.1.5 Sources of EIAR Information

The following sources of information were used to gather information on the baseline environment and evaluate impacts, including cumulative impacts.

Table 11.1: Sources of EIAR Information

Type	Information Source
Consultation	No feedback was received in relation to Climate from consultees See Chapter 3: The Scoping Consultations, and Appendices for further details.
Legislation, Regulation, Policy	• EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources • Effort Sharing Regulation (EU 2018/842) • Climate Action Plan 2023 (CAP23) (Government of Ireland December 2022) • European Commission, 2013 Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment • Government of Ireland White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015 – 2030'

Type	Information Source
	• Waterford City & County Council Climate Change Adaptation Strategy 2019 – 2024 • Waterford City & County Development Plan 2022-2028: Chapter 9 Climate Action, Biodiversity & the Environment • Climate Action and Low Carbon Development (Amendment) Act 2021 (Government of Ireland 2021) • Carbon Budgets (Department of the Taoiseach 2022) Available at https://www.gov.ie/en/publication/9af1b-carbon-budgets/
Guidelines	• Transport Infrastructure Ireland (TII) (2022) PE-ENV-01104: Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document • Institute of Environmental Management & Assessment (IEMA) (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance • Environmental Protection Agency (EPA 2022a) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports
Desktop	• EPA Greenhouse gas emissions and projections Online. Accessed on https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/ on 16th May 2023 • Climate Change Advisory Council Carbon Budget Technical Report October 2021 • EPA (2021) Ireland's Greenhouse Gas Emissions Projections 2020-2040 In co-ordination with and by review of the other EIA Report Chapters as follows: Chapter 8: Land & Soils Chapter 12 – Material Assets (Roads & Built Services) Chapter 5: Description of Development: Section 5.5 Cumulative Descriptions Review of Authorised Knocknamona Windfarm Planning Docs • Knocknamona Windfarm Revised EIS 2015 • Amendment to Knocknamona Windfarm – Larger Turbines Revised EIAR 2021 • Junction & Bend Widening Works Screening for EIA 2022 Available in EIAR 2023 Volume F: Reference Documents
Fieldwork	No fieldwork was required

11.1.6 Methodology used to Describe the Baseline Environment and to Evaluate Impacts

The Climate impact assessment is based on the methodology set out within the Transport Infrastructure Ireland (TII) guidance document entitled *PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document* (TII, 2022a). This is the first published national guidance document in relation to climate assessments. While the methodology set out within this document is specific to TII infrastructure projects the assessment approach can be applied to any development that may impact climate.

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

- Greenhouse Gas Emissions Assessment (GHGA) – Quantifies the GHG emissions from a project over its lifetime. The assessment compares these emissions to relevant carbon budgets, targets and policy to contextualise magnitude.
- Climate Change Risk Assessment (CCRA) – Identifies the impact of a changing climate on a project and receiving environment. The assessment considers a projects vulnerability to climate change and identifies adaptation measures to increase project resilience.

11.1.6.1 Significance Criteria for Evaluating the Magnitude of an Impact

Significance Criteria for GHGA

The Transport Infrastructure Ireland (TII) guidance document entitled *PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document* (TII 2022a) outlines a recommended approach for determining the significance of both the construction and operational phases of a development. The approach is based on comparing the '*Do Something*' scenario and the net project GHG emissions (i.e. *Do Something – Do Minimum*) to the relevant carbon budgets (Department of the Taoiseach 2022). With the publication of the Climate Action Act in 2021, sectoral carbon budgets have been published for comparison with the Net CO_2 project GHG emissions from the proposed development. The Electricity sector emitted approximately 10.5 $MtCO_2eq$ (million tonnes of Carbon Dioxide equivalent) in 2018 and has a ceiling of 3 $MtCO_2eq$ in 2030 which is a 75% reduction over this period.

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

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

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

Transport Infrastructure Ireland (TII 2022a) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. In line with IEMA Guidance (IEMA, 2022), TII state that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*". A project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect. Where the fundamental reason for a proposed project is to combat climate change (e.g. a wind farm or carbon capture and storage project) and this beneficial effect drives the project need, then it is likely to be significant.

Significance is determined using the criteria outlined in Table 11-2 below (derived from Table 6.7 of PE-ENV-01104 (TII 2022a)) along with consideration of the following two factors:

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

Table 11-2 Greenhouse Gas Assessment Significance Criteria

Effects	Significance level Description	Description
Significant adverse	Major adverse	• The project's GHG impacts are not mitigated. • The project has not complied with do-minimum standards set through regulation, nor provided reductions required by local or national policies; and • No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate adverse	• The project's GHG impacts are partially mitigated. • The project has partially complied with do-minimum standards set through regulation, and have not fully complied with local or national policies; and • Falls short of full contribution to Ireland's trajectory towards net zero.
Not significant	Minor adverse	• The project's GHG impacts are mitigated through 'good practice' measures. • The project has complied with existing and emerging policy requirements; and • Fully in line to achieve Ireland's trajectory towards net zero.
	Negligible	• The project's GHG impacts are mitigated beyond design standards. • The project has gone well beyond existing and emerging policy requirements; and • Well 'ahead of the curve' for Ireland's trajectory towards net zero.
Beneficial	Beneficial	• The project's net GHG impacts are below zero and it causes a reduction in atmosphere GHG concentration. • The project has gone well beyond existing and emerging policy requirements; and • Well 'ahead of the curve' for Ireland's trajectory towards net zero, provides a positive climate impact.

Significance Criteria for CCRA

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

Vulnerability = Sensitivity x Exposure

The vulnerability assessment takes any proposed mitigation into account. Table 11-3 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale. Where residual medium or high vulnerabilities exist the assessment may need to be progressed to a detailed climate change risk assessment and further mitigation implemented to reduce risks.

Table 11-3 Climate Change Vulnerability Matrix

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

11.1.6.2 Greenhouse Gas Assessment Methodology

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established with reference to EPA data on annual GHG emissions. The impact of the proposed development on climate is determined in relation to this baseline. As per the IEMA guidance (2022) where expected emissions will not increase by over 1% compared with the baseline scenario then no further assessment is required as there is no potential for significant impacts to climate.

The impact of the construction phase of the proposed development on climate has been estimated using the Transport Infrastructure Ireland (TII) Carbon Tool (2022b). This tool is specifically designed to account for the embodied emissions associated with TII road and infrastructure developments in Ireland but can be used for other project types. The assessment commences with the high-level design, through the pre-construction (site clearance) stage, followed by the assessment of the embodied carbon associated with all materials used in the construction of the development, the emissions during the construction phase and additionally emissions related to waste generated during the construction phase.

The TII Carbon Tool (TII, 2022b) uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013). The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that will be used over the entire construction phase. The outputs are expressed in terms of tCO_2e (tonnes of carbon dioxide equivalent).

Information on the material quantities, site activities, land clearance, and construction traffic were input into the carbon tool. This information was used to determine an estimate of the GHG emissions associated with the development. Detailed information regarding all of the proposed construction materials was not available at the time of this assessment and will be specified at the detailed design stage. Best estimates have been used in this assessment to provide an estimate of the GHGs associated with construction materials.

The embodied GHG emissions have been calculated under the following headings within the TII Carbon Tool (2022b):

- Pre-Construction
- Embodied Carbon of Materials
- Construction Activities
- Construction Waste

The pre-construction includes land clearance and any demolition activities. There are no demolition works associated with the proposed development. There is the requirement for some land clearance works for the new grid connection infrastructure. As per Section 5.3.1 of Chapter 5, in total construction works areas will be located on 3.6 hectares of land, as follows; Knocknamona Substation compound (0.47ha), forestry road (1.09ha), scrub (0.30ha), farm track (0.01ha), existing Woodhouse Windfarm Road (0.60ha), under Public Road L6074 (0.01ha), grassland (0.07ha) and existing Woodhouse Substation compound (1.05ha). There is no forestry felling required for KWF Grid Connection.

The construction materials were added to the Tool in order to quantify their embodied carbon and included: cabling and pipework, fencing, concrete and crushed stone. The emissions associated with the transport of these materials to site was also included. The estimated number of loads are detailed in Section 5.2.1.6 of Chapter 5.

Construction activities included excavation works with up to 1860m^3 of soils, subsoils and rock excavated from the cable trench, footprint of the new Link Road, and along the existing forestry road widening. This excavated material will be temporarily stored beside the works area and will be used to backfill the cable trench and reinstate the works. Construction activities also include worker travel to site. It was assumed the staff would be from the Region within 100km of the site. It was assumed that a maximum of 20 staff would be required for the construction phase which would last approximately 4 months.

This information was all input into the TII Carbon Tool and the resulting GHG emissions are estimated to be 212 tCO_2e. This is equal to 0.0071% of the 2030 Electricity sectoral emissions ceiling of 3 $MtCO_2e$.

11.1.6.2.1 Cumulative Greenhouse Gas Assessment Methodology

The 2022 IEMA guidance states that "*When considering the cumulative assessment, all global cumulative GHG sources are relevant to the effect on climate change. As a result the effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed. This is due to the fact that there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other*". As the proposed development facilitates the delivery of renewable electricity from the consented KWF development the cumulative impact of the two developments has been considered. The documents submitted as part of the KWF planning application were reviewed as part of this assessment in order to determine the impact of both the KWF and the KWF grid connection on climate.

11.1.6.3 Climate Change Vulnerability Assessment

The vulnerability assessment involves an analysis of the sensitivity and exposure of the development to climate hazards which together provide a measure of vulnerability.

PE-ENV-01104 (TII, 2022a) states that the CCRA is guided by the principles set out in the overarching best practice guidance documents:

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

The baseline environment information, future climate change modelling and input from other experts working on the proposed development (i.e. hydrologists) should be used in order to assess the likelihood of a climate risk.

The initial stage of an assessment is to establish a scope and boundary for the assessment taking into account the following criteria:

- Spatial boundary: As per PE-ENV-01104 (TII, 2022a), the study area with respect to the GHGA is Ireland's Climate budget. The study area with respect to the CCRA can be considered the project boundary and its assets. The study area will be influenced by current and future baselines. This study area is influenced by the input of other experts within the EIAR team;
- Climate hazards: The outcomes of the climate screening i.e. vulnerability assessment and baseline assessment; and
- Project receptors: TII state that the project receptors are the asset categories considered in the climate screening. In addition, any critical connecting infrastructure and significant parts of the surrounding environment e.g. water bodies that should be considered as a part of the indirect, cumulative and in combination impact assessment should also be considered project receptors.

Technical guidance on the climate proofing of infrastructure in the period 2021-2027 (European Commission, 2021a) outlines an approach for undertaking a climate change risk assessment where there is a potentially significant impact on the proposed development due to climate change. The risk assessment assesses the likelihood and consequence of the impact occurring, leading to the evaluation of the significance of the impact. The role of the climate consultant in assessing the likelihood and impact is often to facilitate the climate change risk assessment process with input from the design team or specific specialists such as hydrology.

The climate screening risk assessment or vulnerability assessment is carried out by determining the sensitivity and exposure of the project to climate change. Firstly the project asset categories must be assigned a level of sensitivity to climate hazards irrespective of the project location (example: Sea level rise will affect seaport projects regardless of specific location). PE-ENV-01104 (TII, 2022a) provide the below list of asset categories and climate hazards to be considered. The asset categories will vary for project type and need to be determined on a project by project basis.

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

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

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

category. This is a sensitivity score of 1.

Once the sensitivities have been identified the exposure analysis is undertaken. The exposure analysis involves determining the level of exposure of each climate hazard at the project location irrespective of the project type for example: flooding could be a risk if the project location is next to a river in a floodplain. Exposure is assigned a level of High, Medium or Low as per the below criteria.

- **High exposure:** It is almost certain or likely this climate hazard will occur at the project location i.e. might arise once to several times per year. This is an exposure score of 3.
- **Medium exposure:** It is possible this climate hazard will occur at the project location i.e. might arise a number of times in a decade. This is an exposure score of 2.
- **Low exposure:** It is unlikely or rare this climate hazard will occur at the project location i.e. might arise a number of times in a generation or in a lifetime. This is an exposure score of 1.

Once the sensitivity and exposure are categorised, a vulnerability analysis is conducted by multiplying the sensitivity and exposure to calculate the vulnerability, as shown in Table 11-4.

Using the TII criteria above the proposed development can be considered highly sensitive to the following climate hazards: flooding and landslides. The proposed development is considered of low sensitivity to other climate hazards as the cables will be buried underground once constructed and the electrical equipment will be installed in a secured existing substation with other such equipment surrounding.

In order to determine the exposure of the proposed development to the identified climate hazards the following sources were consulted: OPW flood mapping, GSI landslide susceptibility mapping and the GFDRR *Think Hazard!* online tool. In addition, input from the relevant chapter authors on these topics was reviewed. Section 5.4 of Chapter 5 also contains details on the vulnerability of the development to climate change.

As per Section 5.4 of Chapter 5, the proposed development is located within Flood Zone C – where the probability of flooding is low (less than 0.1% or 1 in 1,000). Additionally, no flood events have been recorded within or in the vicinity of the site. It was determined by Hydro Environmental Services (HES) during the preparation of the Water Chapter 9 that flooding is not a risk at the proposed development site given its upland location, lack of surface waterbodies and no watercourse crossings on the grid route. Therefore, the exposure for flooding can be categorised as Low.

In relation to landslides, there are no historic landslide events within the area of the proposed development according to the GSI mapping. Ground stability was also examined by Hydro Environmental Services (HES) during the preparation of the Land & Soil Chapter 8. The vulnerability of the proposed development to landslides was considered extremely unlikely due to the absence of peat and inherent stability of the subsoils on the site. Therefore, the exposure of the proposed development to landslides can be categorised as Low.

Table 11-4 details the vulnerability of the proposed development to climate change hazards. Overall, no significant vulnerabilities were identified and no further assessment was required.

Table 11-4 Climate Change Vulnerability Assessment

Climate Hazard	Sensitivity	Exposure	Vulnerability
Flooding (coastal, pluvial, fluvial)	3 (High)	1 (Low)	3 (Medium)
Extreme Heat	1 (Low)	1 (Low)	1 (Low)

Extreme Cold	1 (Low)	1 (Low)	1 (Low)
Drought	1 (Low)	1 (Low)	1 (Low)
Extreme Wind	1 (Low)	1 (Low)	1 (Low)
Landslides	3 (High)	1 (Low)	3 (Medium)
Lightning & Hail	1 (Low)	1 (Low)	1 (Low)
Fog	1 (Low)	1 (Low)	1 (Low)

11.1.7 Certainty and Sufficiency of the Evaluation/Information

Information on the Baseline Environment has been complied based on information from the EPA. Data on Ireland's GHG emissions from 1990 to 2021 has been reviewed in order to identify the projected trends in the baseline and receiving environments. The EPA has published finalised data for Ireland's GHG emissions up to 2020 and provisional data for 2021 levels of GHG emissions.

There were no limitations or difficulties encountered in compiling the details of the baseline environment for the KWF Grid Connection.

11.2 Sensitive Aspect No.1: Climate

This Section 11.2 provides a description of the baseline environment and an evaluation of the likely impacts of KWF Grid Connection, both alone and cumulatively, on **Climate**.

11.2.1 Description of the BASELINE ENVIRONMENT for Climate

This Section 11.2.1 comprises the identification of the Study Area for direct or indirect effects and for cumulative effects, and a description of the context, character, importance and sensitivity of Climate. Trends or changes in the baseline environment; likely evolution of climate policy in Ireland and expected receiving environment are also identified.

11.2.1.1 STUDY AREA for Climate

Study areas relate to areas which could be affected by impacts from KWF Grid Connection, whether direct impacts from the KWF Grid Connection on its own or cumulative impacts from KWF Grid Connection and other projects or activities. For the environmental topic Climate both study areas encompass the Irish State as impacts to Climate are assessed at a National level in reference to National targets and objectives.

Table 11-5: Study Area for Climate

KWF Grid Connection Study Area (direct or indirect effects)	Cumulative Study Area
Study Area Extent: Irish State	Study Area Extent: Irish State
Justification for Study Area Extent: As per PE-ENV-01104 (TII, 2022a), the study area with respect to greenhouse gas emissions is Ireland's Climate budget. Any climatic effects, if significant will have the potential to impact Ireland's commitments and targets under various EU Climate Agreements and other international agreements and National Legislation on Climate Action.	Justification for Study Area Extent: As per PE-ENV-01104 (TII, 2022a), the study area with respect to greenhouse gas emissions is Ireland's Climate budget. Any climatic effects, if significant will have the potential to impact Ireland's commitments and targets under various EU Climate Agreements and other international agreements and National Legislation on Climate Action.
Relevant development stage Construction stage Justification: Emissions of GHGs may be released during the construction of the KWF Grid Connection, primarily through embodied energy in construction materials, and vehicle and machinery emissions.	Relevant development stage Construction and operational stages Justification: Emissions of GHGs may be released during the construction of the KWF Grid Connection in conjunction with Authorised Knocknamona Windfarm, primarily through embodied energy in construction materials and vehicle and machinery emissions. During the operational phase the KWF Grid Connection will facilitate the production of renewable energy to the national grid.

11.2.1.2 Description of the BASELINE CONTEXT and CHARACTER of Climate

11.2.1.2.1 Baseline for KWF Grid Connection Study Area (Climate)

The world's climate is changing rapidly with temperatures increasing faster in the last 50 years, than in any other 50-year period in the last 2000 years. Human influence has warmed the atmosphere, ocean and land, leading to widespread and rapid change, including changes to our weather system.

According to The Status of Ireland's Climate 2020 (EPA)[3] in Ireland

- **Greenhouse Gas emissions have continued to rise** - Atmospheric concentrations of carbon dioxide, methane and nitrous oxide are the highest observed since measurements began. Background carbon dioxide (CO_2) concentrations reached 414 ppm in 2020 - which is approximately a 50% increase compared to pre-industrial levels. Methane (CH_4) concentrations are at 1940 ppb - which is approximately a 170% increase compared to pre-industrial levels. Nitrous oxide (N_2O) concentrations are now above 330 ppb - which is approximately a 20% increase compared to pre-industrial levels.
- **Annual average amounts of precipitation are increasing** - Annual precipitation was 6% higher in the period 1989 to 2018, compared to the 30-year period 1961 to 1990. The decade 2006 to 2015 was the wettest on record.
- **Aerosols** - Atmospheric levels of sulfur over the 35-year period 1980 - 2015, as measured at Valentia Observatory, Co. Kerry show an approximately 80% reduction, highlighting the success of regulation and technological advances.
- **Annual average air temperature is rising** - The annual average surface air temperature in Ireland has increased by approximately 0.9°C over the last 120 years, with a rise in temperatures being observed in all seasons. Fifteen of the top 20 warmest years on record have occurred since 1990. The length of warm spells has increased slightly over the last 60 years.
- **Sea levels continues to rise** - Satellite observations indicate that the sea level around Ireland has risen by approximately 2-3mm/year since the early 1990s. Analysis of sea level data from Dublin Bay suggests a rise of approximately 1.7mm/year since 1938 which is consistent with global average rates.
- **The ocean is becoming more acidic** - Measurements in the surface waters to the west of Ireland between 1991 and 2013 indicate an increase in ocean acidity which threatens calcifying species such as corals, shellfish and crustaceans.
- **The ocean is getting warmer** - the average sea surface temperature at Malin Head over the 10 years between 2009 and 2018 was 0.47°C above the 1981-2010 mean.
- **River flows** - There is an increase in flows across most of the country. However, there is evidence in recent years of an increase in potential drought conditions, especially in the east.
- **Land Cover** - Land cover observations since 1990 show increases in the area covered by both artificial surfaces and forests and a decrease in wetland areas which include peatlands.
- **Vegetation Fires**- Between 4,000 and 6,000ha are burned annually, with most fires occurring between March and June each year. Upland heaths and blanket bogs have the strongest association with fires.
- **Above Ground Biomass** - The total volume of trees and hence carbon sequestered in forest increased by 38% between 2006 and 2017.

[3]https://www.epa.ie/publications/research/climate-change/The-Status-of-Ireland%C2%B4s-Climate-2020_Draft_Final_Updated.pdf

11.2.1.2.2 Irelands Greenhouse Gas 1990-2021 Inventory data (updated April 2023)

Summary extract from EPA Latest Emissions Date - the extract below presents final 1990-2021 Inventory data (updated April 2023) and the EPA's latest 2021-2030 projections estimates (updated June 2022). Ireland's latest greenhouse gas (GHG) emissions 1990-2021 are final figures based on the SEAI's energy balance provided in October 2022

The EU's Effort Sharing Regulation (EU 2018/842) sets 2030 targets for emissions outside of the Emissions Trading Scheme (known as ESR emissions) and annual binding national limits for the period 2021-2030. Ireland's target is to reduce ESR emissions by 30% by 2030 compared with 2005 levels, with a number of flexibilities available to assist in achieving this.

Ireland's Environmental Protection Agency (EPA) assesses compliance with the EU Effort Sharing Regulation. Ireland's ESR emissions annual limit for 2021 was 43.48 Mt CO2eq. This value is the allowable national total emissions less emissions generated by stationary combustion and aviation operators which are within the EU's emissions trading scheme. Ireland's 2021 greenhouse gas ESR emissions were 46.77 Mt CO_2eq, this is 3.29 Mt CO_2eq more than the annual limit for 2021. This indicates that Ireland is not in compliance with its 2021 Effort Sharing Regulation annual limit, exceeding the allocation by 1.38 Mt CO_2eq after using the ETS flexibility.

The latest projections (March 2022) indicate that Ireland can achieve overall Effort Sharing Regulation (ESR) compliance over the period 2021 to 2030 **assuming full implementation of the 2021 Climate Action Plan and the use of the flexibilities available**. The ESR provides two flexibilities i) use of ETS allowances and ii) credit from action undertaken in the land use, land use change and forestry.

11.2.1.2.3 Baseline for the Cumulative Study (Climate)

KWF Grid Connection is required in order the export the RE-E from Knocknamona Windfarm (not yet constructed) to the National Grid connection point at Woodhouse Substation. Knocknamona Windfarm will generate 96,000,000 kWhrs of RE-E annually for the operational life of the windfarm – usually 35 years. This RE-E generation will offset 36,000 tonnes of CO_2e per annum, that would otherwise be generated by fossil fuel plant in Ireland.

No additional information – the Cumulative Study Area is the same as the KWF Grid Connection Study Area.

11.2.1.3 IMPORTANCE of Climate

As per EU Directive 2014/52/EU "*Climate change will continue to cause damage to the environment and compromise economic development. In this regard, it is appropriate to assess the impact of projects on climate (for example greenhouse gas emissions) and their vulnerability to climate change*". This is referenced within the EPA document 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (2022) and climate is one of the environmental factors that must be considered as part of an EIAR.

11.2.1.4 SENSITIVITY of Climate

The sensitivity of the environmental factor Climate can be determined by reference to the criteria of IEMA in their guidance document 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (IEMA, 2022). In relation to GHG emissions these are assessed against compliance with national and sectoral targets and ceilings. Ireland declared a climate and biodiversity emergency in May 2019 and in November 2019 there was European Parliament approval of a resolution declaring a climate and environment emergency in Europe. These declarations, in conjunction with Ireland's current failure to meet its EU binding targets under

Regulation 2018/842 results in any changes in GHG emissions either beneficially or adversely being of more significance than previously viewed prior to these declarations. Climate, as the receptor, therefore, has a **high sensitivity**, given the severe consequences of global climate change and the cumulative contributions of all GHG emission sources. This is in line with the approach within the IEMA guidance (IEMA, 2022).

11.2.1.5 POLICY TRENDS in the Baseline Environment

11.2.1.5.1 Climate Action and Low Carbon Development (Amendment) Act 2021

Ireland's Climate Action and Low Carbon Development (Amendment) Act 2021[4], (the 2021 Climate Act), was signed into law in 2021. The purpose of the 2021 Climate Act is to provide for the approval of plans "*for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050*". The 2021 Climate Act also provides for a 51% reduction in greenhouse gases by 2030 compared to 2018 levels, and puts in place a rigorous governance structure, including a system of carbon budgeting, sectoral emissions ceilings, a national adaptation framework, sectoral adaptation plans and annually updated Climate Action Plans, to ensure that Ireland achieves its national, EU and international climate commitments in the near and long-term. The 2021 Climate Act defines the carbon budget as "*the total amount of greenhouse gas emissions that are permitted during the budget period*".

In relation to carbon budgets, the 2021 Climate Act states '*A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Climate Change Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on the 1 January 2021 and ending on 31 December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')*'. The carbon budget is to be produced for 3 sequential budget periods. The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change. In relation to the sectoral emissions ceiling, the Minister for the Environment, Climate and Communications (the Minister for the Environment) *shall prepare and submit to government the maximum amount of GHG emissions that are permitted in different sectors of the economy during a budget period and different ceilings may apply to different sectors.* The sectorial emission ceilings for 2030 were published in July 2022.

11.2.1.5.2 Carbon Budget for 2021-2030

Ireland's first carbon budget programme has been approved by the Government and adopted by both Houses of the Oireachtas. A carbon budget represents the total amount of emissions, measured in tonnes of CO_2 equivalent (CO_2e), that may be emitted by a country or a region during a specific time period. The carbon budget programme, comprising three 5-year budgets (2021-2025; 2026-2030; and 2031-2035), came into effect on 6 April 2022. Carbon budgets for each period is proposed by Ireland's Climate Change Advisory Council. The sectorial emission ceilings for 2030 were published in July 2022. Electricity has a 75% reduction requirement and a 2030 emission ceiling of 3 $MtCO_{2e}$[5](million tonnes of Carbon Dioxide equivalent)

11.2.1.5.3 Climate Action Plan 2023

The Climate Action Plan 2023 (CAP23)[6] is the second update to Ireland's Climate Action Plan 2019 and the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021 and

[4] Climate Action and Low Carbon Development (Amendment) Act 2021
https://www.irishstatutebook.ie/eli/2021/act/32/section/15/enacted/en/html
[5] Mt CO_{2eq} denotes million tonnes carbon dioxide equivalent.
[6] https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

following the introduction of the 2022 Sectoral Emission Ceilings and economy wide carbon budgets. CAP23 is structured to identify key measures in each sector of the economy. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 and reiterates Ireland's international commitments to achieving international goals.

In CAP23, targets are given for 2025 and 2030, as well as 2031-2035. Achieving these goals will require no less than a national transformation in how we work, travel, heat our homes, source our energy and use our land. To achieve the targets set out in CAP23, considerable investment is needed to reach emission reduction goals – the National Development Plan sets out a public investment total of €165 billion over the period 2021 to 2030. The actions to deliver on the CAP23 ambition will be supported by a robust governance structure that now includes Ireland's first carbon budget programme and Sectoral Emissions Ceilings.

The CAP23 action plan highlights six vital high-impact sectors, each with an associated emissions reduction target to assist Ireland in achieving its 2030 and 2050 climate goals. The six sectors comprise Renewables; Commercial and Residential Buildings; Travel; Farming; Business and Landuse. In relation to renewable electricity (RE-E), **CAP23 lays out a plan to increase the proportion of RE-E to up to 80% by 2030 with targets of 9GW from onshore wind**, 8GW from solar and at least 5GW of offshore energy by 2030.

According to CAP23, the increase in RE-E on the system to 80% "*will not just reduce our emissions from electricity, it will allow us to electrify other sectors such as transport and heat and reduce our emissions in these sectors too. Achieving further emissions reductions between now and 2030 requires a major step up in how we accelerate and increase the deployment of renewable energy to replace fossil fuels, deliver a flexible system to support renewables, and manage electricity demand".*

In 2022, onshore wind energy provided one-third (34%) of the country's electricity requirement through over 4130MW of installed RE-E capacity. Clearly reaching 9000MW of onshore capacity will be a challenge but will result in considerable benefits.

As recently as 6th September 2022, Marie Donnelly - Chair of the Climate Change Advisory Council, called for an increase in on-shore windfarms as soon as possible as part of the national effort to combat the high energy prices and security of supply issues that the European region faces due to the Russian invasion of Ukraine and the consequent effects on the flow of gas from Russia.

11.2.1.6 The 'Do Nothing Scenario' (the Environment if the Development is not carried out)

If the KWF Grid Connection does not proceed, the renewable generation for Knocknamona Windfarm will not be transported to the National Grid and the subsequent benefits of GHG offsets will not occur. The baseline environment will only change in line with the trends of CO_2eq emissions increasingly outstripping the successes achieved to date in increasing the amount of RE-E on the grid system.

11.2.1.7 Description of the RECEIVING ENVIRONMENT for Climate

The receiving environment is the likely state of the baseline environment at the time of construction/operation/decommissioning as relevant i.e. current baseline environment + likely evolution thereof.

Under the Ireland's Climate Action Plan 2023, the Government is targeting 80% renewable energy generation in Ireland by 2030. The target is for 9000 MW to be generated by onshore wind, a doubling of existing capacity. The trend in Ireland in this decade is to continue to develop the on-shore wind industry.

11.2.2 EVALUATION OF IMPACTS to Climate

In this Section, the direct or indirect impacts and the cumulative impacts of KWF Grid Connection on Climate are described.

11.2.2.1 Potential Impacts Evaluated for Climate

A conceptual site model exercise was carried out to identify potential impacts through the examination of the specific pathways between the project (source) and the sensitive aspect (receptor).

The potential for impacts was **examined in the absence of mitigation measures**, and **based on the description of development, standard construction methodologies, construction activities and operational activities as described in Chapter 5**: **Description of the Development**.

The potential impacts which were evaluated are listed in the 1st column of the table below. As summarised in the table below, **no significant adverse effects are likely to occur**.

Table 11-6: Evaluation of Potential Impacts to Climate

Potential Impacts which were evaluated	Relevant Stage of KWF Grid Connection	Direct Impact of KWF Grid Connection	Cumulative Impact of KWF Grid Connection and Authorised Knocknamona Windfarm	Cumulative Whole Knocknamona Windfarm Project Impact
Increases in GHG Emissions from embodied emissions and emissions from vehicles and machinery	Construction	**Minor adverse, non-significant impact**	**Beneficial** and **Significant**	**Significant, Beneficial**
Increase in Renewable Electricity Generation	Operation	**No Impact**	**Beneficial** and **Significant**	**Beneficial** and **Significant**

The evaluation summary in Table 11.6 for 'Increases in GHG Emissions from embodied emissions and emissions from vehicles and machinery' is detailed in the following table;

Table 11-7: Climate - Increases in GHG Emissions from embodied emissions and emissions from vehicles and machinery

Impact Source	**Vehicles and machinery, construction materials**
Impact Pathway (between Source and Sensitive Aspect)	Air
Brief Impact Description	Impacts to Climate will occur from the embodied carbon dioxide in site materials, construction activities, material transport to site and worker travel to site. The sources of GHG emissions are quantified in Section 11.1.6.2 above. The GHG emissions were calculated using the online TII Carbon Tool and the total construction phase GHG emissions are estimated to be 212 tCO_2eq over the construction period. These emissions will directly impact Climate. Operational phase impacts will occur due to vehicle GHG emissions from maintenance personnel accessing the site. These were deemed negligible as they will be infrequent in nature (approx. 2 no. staff up to four times per year).
Project Stage:	Construction, Operational
A: Direct/Indirect Impacts of KWF Grid Connection	The development will have **a minor adverse, non-significant impact** because: • The proposed development will lead to an increase in GHG emissions of 212 tCO_2eq. This is 0.0071% of the Electricity Sectoral ceiling for 2030. As per the IEMA guidance all new GHG emissions can contribute to a negative environmental impact. However, the IEMA and the TII guidance states that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050".* • As per the TII significance criteria in Table 11-2 above, the project has used best-practice construction methodologies to reduce impacts and as the proposed development is to facilitate the delivery of renewable electricity to the national grid from the Authorised Knocknamona Windfarm, the project is in line with Ireland's trajectory towards net-zero by 2050. Thus, the GHG emissions are considered minor adverse and non-significant.
B: : Cumulative Impact of the Whole Project - KWF Grid Connection with the authorised	The cumulative impact will be **Beneficial** and **Significant** because: • When the emissions of KWF Grid Connection and Authorised Knocknamona Windfarm are combined, cumulative emissions have been calculated at 4,093 tonnes CO_2eq. However, these construction stage emissions will be offset by the production of renewable electricity once the Authorised Knocknamona Windfarm

Knocknamona Windfarm	is operational. Guidance from IEMA states that "*The significance of a project's emissions should be based on its net impact over its lifetime*". • As the cumulative development is consistent with a trajectory towards net zero by 2050 and the fundamental reason for the project is to combat climate change, the impact to climate is considered **Beneficial and Significant** as per the TII criteria in Table 11-8 below.

The evaluation summary in Table 11-6 for 'Increase in Renewable Electricity Generation' is detailed in the following table;

Table 11-8: Climate - Increase in Renewable Electricity Generation

Impact Source	No source for KWF Grid Connection. Renewable electricity (RE-E) production by Authorised Knocknamona Windfarm (which will connect to the National grid via KWF Grid Connection)
Impact Pathway (between Source and Receptor)	Air/National and European Policy
Brief Impact Description	KWF Grid Connection does not have the potential to directly impact Climate through increasing RE-E production - the KWF Grid Connection itself will not generate electricity, however its purpose is to transport electricity from the Authorised Knocknamona Windfarm to the National Grid.
Project Stage:	Operation
A: Direct/Indirect Impacts of KWF Grid Connection	**No Impact** because: • The KWF Grid Connection itself will not generate renewable electricity and therefore will not positively contribute in itself to Climate action.
B: Cumulative Impact of the Whole Project - KWF Grid Connection with the authorised Knocknamona Windfarm	Indirect cumulative impact will be **Beneficial and Significant** because: • KWF Grid Connection will indirectly cause positive effects to climate as the purpose of the grid connection is to transport the electricity produced by Authorised Knocknamona Windfarm to the National Grid. • The 8 No. turbines of the Authorised Knocknamona Windfarm will generate approximately 96 million kWh of RE-E per annum. As per Chapter 5 Section 5.5.1.2.5, Authorised Knocknamona Windfarm will avoid the emission of 36,000 tonnes of greenhouse gases per annum which would have resulted from generating the same amount of electricity by fossil fuel plant. 96million kWh is enough to supply 22,857 houses (equivalent to 53% of the houses in Waterford City & County) with green, emission free electricity. The increased availability of renewable electricity sources will reduce GHG emissions from fossil fuel burning for energy production every year for the lifetime of the windfarm. • Climate is considered a High Sensitivity receptor. As per the TII and IEMA significance criteria a project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant. Where

	the fundamental reason for a proposed project is to combat climate change (e.g. a wind farm or carbon capture and storage project) and this beneficial effect drives the project need, then the impact is significant. • The impact of the whole project (Knocknamona Windfarm and KWF Grid Connection) will therefore be a beneficial and significant impact (see criteria in Table 11-2). • Knocknamona Windfarm and the proposed facilitating KWF Grid Connection will support Ireland's renewable energy target of 80% electricity production from renewables by 2030.

11.3 Summary of the Climate Chapter

The Climate chapter examines the effects of the KWF Grid Connection development on the release of greenhouse gases (GHGs). GHGs are altering the Earth's atmosphere resulting in a 'Greenhouse Effect'. The release of carbon dioxide as a result of burning fossil fuels, has been one of the leading factors in the creation of this 'Greenhouse Effect'. Ireland is committed to UN and European climate agreements and Ireland's 2021 Climate Act provides for a 51% reduction in GHGs by 2030 compared to 2018 levels. The Electricity sector emitted approximately 10.5 million tonnes of Carbon Dioxide equivalent in 2018 and has a ceiling of 3 million tonnes in 2030 which is a 75% reduction over this period. The targets as expressed in the Carbon Action Plan 2023 is for an increase in the proportion of renewable electricity on the system to up to 80% by 2030 with targets of 9GW from onshore wind, which is a doubling of the existing installed capacity.

In relation to the topic **Climate**, this chapter evaluated the negative effects of increase in GHGs during the construction and operation of the development on Ireland's carbon budgets; and the positive effects on the Carbon Budget of offsetting the GHGs that would be produced by conventional fossil fuel generation of electricity through renewable electricity production from Knocknamona Windfarm which is a consequence of the KWF Grid Connection development.

Summary Result of the Evaluation

Increases in GHG Emissions from embodied emissions from construction materials and activities and emissions from vehicles and machinery during construction and operation, are evaluated as **minor adverse and non-significant**. (Table 11-7 above)

Increase in Renewable Electricity generation from the windfarm and thus offset electricity generation by fossil fuel sources, is evaluated as **Beneficial and Significant** (Table 11-8 above).

Related Documents

Non-Technical Summary of this chapter can be found in Volume C1: Non-Technical Summary: Section 11

Figures for Climate chapter

No Figures for Chapter 11

Appendices for Climate chapter

No Appendices for Chapter 11

11.4 Reference List

Effort Sharing Regulation (EU 2018/842)

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