CONTENTS

TABLES

18 CLIMATE CHANGE

18.1 Introduction

This chapter assesses the potential effects on climate change as a result of the Proposed Development.

The Proposed Development comprises an 11-turbine wind farm on a site located within forested and agricultural lands. It also comprises a Grid Connection Route (GCR) for connection to the national grid, and temporary accommodating works along a Turbine Delivery Route (TDR) to the wind farm, to facilitate the delivery of large components from the port of delivery. The GCR and TDR are both assessed in this EIAR and form part of the planning application.

The key components that are described throughout the EIAR are listed below:

- The wind farm which consists of 11 wind turbines (4 turbines across the Eastern Development Area (Eastern DA) and 7 turbines across the Western Development Area (Western DA));
- The grid connection route and underground cables (also referred to as GCR and UGC); and,
- The turbine delivery route (TDR).

The term 'Proposed Development' collectively describes the above three components. Further information about the Proposed Development is presented in **EIAR Chapter 5: Project Description**.

Wind turbines provide an important mechanism for the reduction of carbon dioxide (CO_2), and other greenhouse gas (GHG) emissions into the atmosphere by reducing the consumption of fossil fuel generated mains electricity. However, during their manufacture, construction and decommissioning, wind farms can themselves result in GHG emissions, particularly in such instances as where natural carbon stores, such as peat, are present and potentially impacted by the development.

For this reason, this chapter provides an estimation of:

- the GHG emissions associated with the manufacture, construction, and decommissioning of the Proposed Development;
- the contribution which the Proposed Development would make towards the reduction of emissions, which would otherwise be produced by fossil fuel power generation.

Taken together, these two elements indicate the whole-life "carbon balance" of the Proposed Development, together with an understanding of the "emissions payback" period. Once emissions resulting from the manufacture, construction and decommissioning of the Proposed Development have been "paid back" (offset) by the wind farm, all subsequent wind-generated electricity would displace a similar amount of conventionally generated electricity, thereby contributing to an overall GHG reduction.

Although often colloquially termed “carbon balance”, the assessment includes all GHGs, not just carbon dioxide. The results are presented in tonnes of carbon dioxide equivalent (tCO_2e), where equivalence means having the same warming effect as CO_2 over 100 years.

18.2 Statement of Authority

This chapter was authored by Zack Clarke. Zack is a consultant within Nature Positive’s Carbon and Sustainability team who specialises in greenhouse gas (GHG) assessments, and the climate change and carbon balance elements within Environmental Impact Assessments (EIA). Zack has two year’s experience and has delivered eight Climate chapters for EIAs to date. Holding a Master's degree with distinction in Environmental Economics and Environmental Management, Zack has a detailed knowledge of EIA, carbon accounting, GHG assessments, climate policy, and adaptation and resilience planning.

This chapter was project managed by Dr. Libby Robinson. Libby is a Principal Consultant within Nature Positive’s Carbon and Sustainability team and holds a PhD in Climate Science. She leads the GHG assessment and climate-risk workstreams needed for Environmental Impact Assessments (EIA), Environmental & Social Impact Assessments (ESIA), and a number of other compliance-related projects. Libby has nine years’ experience and has delivered twenty Climate Change chapters for EIAs to date.

18.3 Consultations

Throughout the consultation process, climate change was not raised as a topic by the consultees.

18.4 Methodology

18.4.1 Baseline surveys / Data Gathering

All baseline surveys and data collection were carried out by the respective discipline teams, primarily the teams responsible for collecting data relating to peat disturbance and the felling of forestry.

18.4.2 Assessment Methodology

Whilst the Proposed Development is expected to deliver GHG savings over its lifetime, it could also cause GHG emissions through:

- disturbance of peatland;
- felling of forestry; and
- lifecycle emissions from turbines and other infrastructure.

The GHG assessment of the Proposed Development has been undertaken using the latest version (V1.7.0) of the Scottish Government’s Carbon Calculator Tool, which is the standard way of assessing GHG emissions and savings from onshore windfarm developments. A detailed explanation of the Scottish Government’s Carbon Calculator Tool methodology is found within **Appendix 18.1**. In brief, the calculator uses project-specific data from the construction of the Proposed Development (**Chapter 5: Project Description**) and the receiving environment (**Chapter 6** to **Chapter 17**), particularly with regards to peat disturbance and the felling of forestry. This allows GHG emissions and avoidance to be quantified across the project lifecycle stages (construction, operation, and decommissioning/site restoration). Specific information concerning the embodied emissions of materials, which would account for turbine manufacture and delivery, is assumed directly through the Carbon Calculator.

Calculations are provided for minimum, maximum and expected scenarios, whereby the minimum scenario assumes the lowest energy output and the lowest carbon losses from the Proposed Development, and the maximum assumes highest energy output and highest carbon losses. The expected scenario is based on 11 turbines with an anticipated installed capacity of 5.45MW and capacity factor of 35%.

The GHG emissions and savings are combined to establish the overall (net) GHG effect of the Proposed Development, as well as its carbon payback period.

Results from this assessment are reported below in accordance with IEMA's Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022).

18.4.3 Significance

Given the international urgency of climate change, the sensitivity of the receptor (i.e., the global climate) to fluctuations in GHG emissions is considered 'Very High'. Thus, the level of the significance of effects is determined by the magnitude, and timing, of GHG emissions and the likelihood of avoiding severe climate change. As this Development will contribute significantly to the avoidance of GHG emissions in the short term, it will be greatly beneficial towards the Republic of Ireland's Government's 2030 renewable energy targets.

Aligned with IEMA's Guidance to Assessing GHG Significance (2022), any project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is always significant. In such a scenario, the project substantially exceeds the national net zero requirements and is thus aligned with the goal of the Paris Agreement to limit temperature rise to well below 2°C, aiming for 1.5°C. The Republic of Ireland's legally binding net zero targets (see **Section 18.4.5**) are also aligned with the Paris Agreement. **Table 18.1** presents the significance criteria used for the assessment.

Table 18.1: IEMA's Guidance to Assessing GHG Significance (2022) Framework for assessment of significant effects

Significance	Level	Criteria
Significant	Major adverse	Project adopts a business-as-usual approach, not compatible with the national Net Zero trajectory, or aligned with the goals of the Paris Agreement (i.e., a science-based 1.5°C trajectory). GHG impacts are not mitigated or reduced in line with local or national policy for projects of this type.

Significance	Level	Criteria
	Moderate adverse	Project's GHG impacts are partially mitigated, and may partially meet up-to-date policy; however, emissions are still not compatible with the national Net Zero trajectory, or aligned with the goals of the Paris Agreement.
Not significant	Minor adverse	Project may have residual emissions, but the project is compatible with the goals of the Paris Agreement, complying with up-to-date policy and good practice.
	Negligible	Project has minimal residual emissions and goes substantially beyond the goals of the Paris Agreement, complying with up-to-date policy and best practice.
Significant	Beneficial	Project causes GHG emissions to be avoided or removed from the atmosphere, substantially exceeding the goals of the Paris Agreement with a positive climate impact.

18.4.4 Assumption/Limitations

As water table depth was not measured on-site, values relating to water table depth were taken from Allott et al. (2009), who identified general site water table depths ranging from 26 to 451 mm, associating the variation with site erosion status. Allot et al. (2009) is a reference provided directly within the user guidance of the Scottish Government Carbon Calculator tool, to be used in situations where primary data is unavailable. This range was used as the minimum and maximum values for all water table depth inputs prior to any improvement (with the expected value being the average between the two values).

Based upon experience of previous projects, values following improvement were conservatively assumed to range between a minimum of 0mm, and a maximum of 26mm (the minimum value identified prior to any improvement) with the expected value being the average between the two values.

Any further assumptions and limitations would relate to the data collection process carried out by the discipline teams, which will be expanded upon in the respective chapter.

18.4.5 Statutory and Planning Context

Planning and energy policy and legislation, including national and local policy objectives and legal requirements in relation to climate change, are summarised in **Chapter 4: Project Need and Alternatives Considered** and in a standalone Planning Statement submitted with the EIAR as part of the SID application. Both national and local policy recognise that planning should consider the contributions a proposed development makes towards achieving the climate change targets. Guidance and legislation relating specifically to carbon and GHG emissions are listed below.

Climate Action and Low Carbon Development (Amendment) Act 2021

The Climate Action and Low Carbon Development (Amendment) Act 2021, or the Climate Act 2021, commits the Republic of Ireland to a legally binding target of net-zero GHG emissions no later than 2050, and a reduction of 51% of emissions by 2030 (relative to the 2018 baseline). Under the 2021 Act, Ireland needs to pursue and achieve, by no later than the end of the year 2050, a transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy. The Act also mandates each local authority to develop Climate Action Plans addressing both mitigation and adaptation measures, to be updated every five years. The 2021 Act amends the 2015 Act to significantly strengthen the statutory framework for governance of climate actions to realise Ireland's national, EU and international climate goals and obligations.

Climate Action Plan 2023: Changing Ireland for the Better

The Climate Action Plan 2023 provides a detailed plan for the Republic of Ireland to take decisive action towards achieving 51% reduction in overall GHG emission by 2030 and net-zero GHG emissions no later than 2050, as committed to in the Programme for Government and set out in the Climate Action and Low Carbon Development (Amendment) Act 2021. The Plan, which is the third of its kind since the inaugural 2019 plan and which will be updated annually, places a renewed emphasis on the urgency of climate actions and sets out indicative ranges of emissions reductions for each sector of the economy. Among the most critical measures in the plan is to increase the proportion of renewable electricity to up to 80% by 2030, including an increased target of up to 5 Gigawatts (GW) of offshore wind energy and 9GW of onshore wind energy. Recent agreement on Sectoral Emissions Ceilings has further increased the country's offshore wind target for 2030 from 5GW to 7GW.

Good Practice During Wind Farm Construction, NatureScot et al. (2019)

The SNH, now NatureScot, 'Good Practice During Wind Farm Construction' guidance recognises that one of the key aims of wind farm development is to reduce carbon emissions. However, wind farm developments, through the materials used, during the construction processes employed and the potential emissions from disturbed soils and habitats, do result in carbon emissions.

The guidance recognises that, in some circumstances, the carbon payback of wind farm developments could be significantly affected by the construction methods used and the degree of restoration of the site. The guidance, therefore, seeks to ensure that good practice is adopted to reduce the carbon emissions associated with wind farm development.

Clare County Council's Climate Change Adaptation Strategy 2019-2024

Part of Clare County's Climate Change Adaptation Strategy includes a breakdown of the different adaptation objectives and actions due be taken in order to achieve the county's climate goals. Among these objectives are "[to] support on-land and off-shore renewable energy production by a range of appropriate technologies" and "Encourage proposals for renewable energy developments and ancillary facilities in order to meet national, regional and county renewable energy targets, and to facilitate a reduction in CO_2 emissions and the promotion of a low carbon economy through Planning Policy and land use objectives."

In line with this strategy, the current Clare County Development Plan (2017 – 2023), as well as the draft of the Clare County Development Plan (2024 – 2029), contain a Wind Energy Strategy document highlighting the importance of wind energy, and renewable energy at large, in achieving their climate goals. Included within these strategies are considerations that must be considered with regards to climate for any proposed development, including, but not limited to, a calculation of the carbon impact of any peat disturbance.

18.5 Receiving Environment

Baseline environmental conditions in relation to potential climate change impacts from the Proposed Development include existing carbon stored in the site (such as peat and forestry) that could be impacted by the Proposed Development resulting in CO_2 and other GHG emissions.

Peat and forestry

The Site is broken down into two distinct areas; the Western PDA and the Eastern PDA, comprising of a total land which principally consists of conifer plantation, transitional woodland scrub, mixed forest, pastures, agricultural lands and peat lands. For further information on the peatland habitat within the site, consult EIAR **Chapter 10: Soils and Geology**. For further information on forestry, consult EIAR **Chapter 5: Project Description.**

18.6 Potential Effects of the Proposed Development

18.6.1 Do-nothing Scenario

Under a “do-nothing” scenario, no change would be expected concerning GHG emissions within the Site boundary when compared to the baseline. On a national level, in a scenario where this development does not take place, the proportion of Ireland’s electricity mix contributed through fossil fuel electricity generation would be higher than a scenario with the Proposed Development, which may jeopardise Ireland’s ability to meet its long-term emissions reduction targets.

18.6.2 Predicted Impacts

The results of the carbon balance assessment carried out for the Proposed Development are presented below for each project stage. The project-specific input and output data is contained within **Appendix 18.1**, alongside the detailed methodology of the calculator.

18.6.3 Construction and Decommissioning Phase

Table 18.2 presents the results of the GHG assessment for the manufacture, construction, and decommissioning stages of the Proposed Development. Significant GHG emissions are predicted from soil organic matter, as well as some emissions from the felling of forestry. Total projected emissions are 149,722 tCO_2e.

Table 18.2 Predicted GHG emissions from wind farm manufacture, construction and decommissioning

Source of GHG Emissions/Savings	Estimated GHG emissions (tCO_2e)	% of total
Losses due to turbine manufacture, construction, and decommissioning	56,559	37.7%

Source of GHG Emissions/Savings	Estimated GHG emissions (tCO_2e)	% of total
Losses due to back-up power generation	39,702	26.5%
Losses due to reduced carbon fixing potential	8,710	5.8%
Losses from soil organic matter	19,663	13.1%
Losses due to Dissolved Oxygen Content and Portable Oxygen Content	56	< 1%
Losses due to forestry felling	25,031	16.7%
Total	**149,722**	**100%**

Any post-decommissioning site restoration and enhancement work, such as blocking drainage ditches to promote re-wetting, would be aligned with the Species and Habitat Management Plan (**see EIAR Chapter 7 Biodiversity, Appendix 7.1**) Such activities can incur GHG savings by promoting growth of peat or other natural carbon stores. Other management options may occur during the Habitat Management Planning stage.

Table 18.3 shows the total CO_2 gains due to site improvement during post-decommissioning (tCO_2e).

Table 18.3 Estimated CO2 savings due to Improvement of the Site (tCO2e)

Improvement	GHG Emissions (tCO_2e)	% of total
Change in emissions due to improvement of degraded bogs	0	0%
Change in emissions due to improvement of felled forestry	0	0%
Change in emissions due to restoration of peat from borrow pits	0	0%
Change in emissions due to removal of drainage from foundations and hardstanding	- 5,589	100%
Total change in emissions due to improvements	**- 5,589**	**100%**

Taking into account the predicted GHG emissions from wind turbine manufacture, construction and decommissioning alongside those savings from the improvement of the site, the total net GHG emissions from the Proposed Development are expected to be 144,133 tCO_2e. See Table 18.4.

Table 18.4 Total estimated net GHG emissions from the Proposed Development

	GHG savings (tCO_2e)	GHG emissions (tCO_2e)
Predicted GHG emissions from wind turbine manufacture, construction, and decommissioning	-	149,722
Total CO_2 gains/savings due to improvement of the Site	5,589	-
Total net GHG emissions from wind farm manufacture, construction, decommissioning, and improvement of site	-	144,133

18.6.4 Operational Phase

The operational stage of the Proposed Development has the greatest potential for GHG savings. At this stage, GHG emissions from construction activities will have ceased and operation of the turbines would generate zero-carbon electricity for the remainder of their lifespan.

presents projected annual emissions savings as measured against the grid-mix and fossil fuel-mix of electricity.

Table 18.5 Estimated annual emissions savings against fossil fuel and grid electricity generation mix

GHG savings*	GHG savings (tCO_2e)		
	Expected value	Minimum value	Maximum value
Grid mix electricity generation			
GHG savings per year	35,545	28,175	43,045
Lifetime GHG savings*	1,244,075	986,125	1,506,575
Fossil fuel mix electricity generation			
GHG savings per year	79,404	62,941	96,160
Lifetime GHG savings*	2,779,140	2,202,935	3,365,600
***Operational GHG savings based over a lifetime of 35 years**			

18.6.5 Emissions Payback Period

The emissions payback time can be calculated by dividing the total expected emissions caused by the Proposed Development (144,133 tCO_2e) by expected annual savings from operation (35,545 tCO_2e). This gives a predicted emissions payback of 4.1 years against a representative grid mix (electricity of which the main sources of energy are identical to those used for the National Grid; this could include fossil fuels, renewable energy, etc), and 1.8 years against a fossil-fuel mix electricity generation (electricity that is sourced through the combustion of fossil fuels alone).

Table 18.6: Estimated carbon payback period of the proposed development for a range of capacity factors

	Carbon payback time (years)		
	Expected value	Minimum value	Maximum value
Grid mix electricity generation	4.1	- 0.2	19.8
Fossil fuel mix electricity generation	1.8	- 0.1	8.9

18.7 Mitigation Measures

It has been assumed that all activities during construction, operation and decommissioning would be conducted in accordance with good practice guidance, and as outlined in the CEMP and this EIAR.

Relevant guidance includes:

- Good Practice During Wind Farm Construction, NatureScot et al. (2019); and
- Life Extension and Decommissioning of Onshore Windfarms, SEPA (2016).

All plantation felling occurring during the construction of the Proposed Development will be replanted in secondary locations. The impact on GHG emissions from replanting is not considered by the Carbon Calculator, making this a more conservative estimate. These will be monitored based on the principles set out in the monitoring section in **EIAR Chapter 7: Biodiversity.**

As no adverse effects are predicted, no additional mitigation measures are proposed.

18.8 Assessment of Effects

18.8.1 Net GHG Effect

Given the Proposed Development's projected operational life of 35 years, its total GHG savings are expected to be 1,099,942 tCO_2e, inclusive of construction, operation and decommissioning emissions.

18.8.2 Cumulative Effects

GHG emissions are inherently cumulative, as all emissions have the same impact on the same ultimate receptor (i.e. the global climate). Most developments result in the release of GHGs, and consequently have the potential to result in a cumulative effect. Conversely, renewable energy developments such as this have a net beneficial effect, in that they cause the reduction of GHG emissions.

As the receptor is not geographically constrained it is not appropriate to undertake a conventional cumulative effects assessment.

18.8.3 Summary of Residual Effects

GHG emissions will arise from the manufacture, construction and decommissioning activities, including the loss of peat and forestry, from the construction of turbines and associated infrastructure.

These emissions are projected to be offset 1.8years after the Proposed Development becomes operational against a fossil fuel mix of electricity, or 4.1 years against a grid-mix of electricity. The Proposed Development is predicted to deliver total emissions savings of 1,099,942 tCO2e over its 35-year operational lifetime, against grid mix electricity generation, and 2,635,007 tCO2e against fossil fuel mix electricity generation.

The overall impact is considered to represent a Significant and Positive effect, and contribute to long-term climate change mitigation. Consequently, the Proposed Development contributes towards the Republic of Ireland's emissions reduction targets as set out in the Climate Action and Low Carbon Development (Amendment) Act 2021.

A summary of effects for each phase is presented in Table 1.1.1. It should be noted that IEMA's Guidance to Assessing GHG Significance (2022) Framework for assessment of significant effects, which forms the significance criteria used throughout this chapter, is intended to assess the significance of a project as a whole, as opposed to individual project phases. The overall significance of the Proposed Development is **Beneficial and Significant.**

Table 18.7: Summary of Assessment of Effects – Climate Change

Potential Effect	Beneficial / Adverse / Neutral	Extent (Site / Local / National / Transboundary)	Short term/ Long term	Direct / Indirect	Permanent / Temporary	Reversible / Irreversible	Significance of Effects (according to defined criteria)	Proposed Mitigation	Residual Effects (according to defined criteria)
Construction Phase									
GHG Emissions	Adverse	Transboundary	Long term	Direct	Permanent	Irreversible	Minor adverse and Not Significant	All activities during the construction phase will be in-line with best practice, with the full scope of mitigation measures outlines in the CEMP and this EIAR	Minor adverse and Not Significant
Operational Phase									
GHG Emissions	Beneficial	Transboundary	Long term	Direct	Permanent	Irreversible	Beneficial and Significant	As this phase is expected to have a positive effect, not further mitigation is proposed	Beneficial and Significant
Decommissioning Phase									
GHG Emissions	Adverse	Transboundary	Long term	Direct	Permanent	Irreversible	Minor adverse and Not Significant	All activities during the decommissioning phase will be in-line with best practice	Minor adverse and Not Significant

18.9 References

IEMA (2022) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.

NatureScot et al. (2019) Good Practice during Wind Farm Construction, Fourth Edition; A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland, and Historic Environment Scotland. Available at https://www.nature.scot/doc/guidance-good-practice-during-wind-farm-construction

Scottish Government Carbon Calculator Tool (2023) https://informatics.sepa.org.uk/CarbonCalculator/index.jsp

Department of the Environment, Climate and Communications (2022), Climate Action Plan 2021: Securing out future. Available at: https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/

Department of the Environment, Climate and Communications (2021), Climate Action and Low Carbon Development (Amendment) Bill 2021. Available at: https://www.gov.ie/en/publication/984d2-climate-action-and-low-carbon-development-amendment-bill-2020/

SEPA Guidance regarding Life Extension and Decommissioning of Onshore Windfarms; 2016. Available at: https://www.sepa.org.uk/media/219689/sepa-guidance-regarding-life-extension-and-decommissioning-of-onshore-windfarms.pdf

United Nations Framework Convention on Climate Change (2015) Adoption of the Paris Agreement, 21st Conference of the Parties, Paris: United Nations. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

Clare County Council (2019), Climate Change Adaptation Strategy 2019 – 2024. Available at: https://www.clarecoco.ie/services/environment/publications/clare-climate-change-adaptation-strategy-2019-2024-33843.pdf