RECEIVED: 29/01/2026

Contents

INTRODUCTION **1**
Background 1
Scope of Work 1
Consultations / Consultees 2
Contributors / Author(s) 2
Limitations / Difficulties Encountered 2
LEGISLATIVE FRAMEWORK / POLICY CONTEXT **2**
Wexford County Council Climate Action Plan 2024-2029 3
RECEIVING ENVIRONMENT **4**
Climate Environmental Baseline 4
IMPACT ASSESSMENT **7**
Methodology 7
Development Vulnerability Assessment 9
Greenhouse Gas Emissions Assessment 9
MITIGATION **10**
Project Adaptation against Expected Climate Change Effects 10
Future Reduction of GHG Emissions 10
Accidents, Malfunctions and Unplanned Events 11
MONITORING **11**
Project Adaptation against Expected Climate Change Effects 11
GHG Emissions 11
FIGURES **12**
APPENDICES **13**
Appendix 9-A: Legislative Framework/Policy Context 13
Appendix 9-B: Development Vulnerability Assessment Methodology 24
Appendix 9-C: Development Vulnerability Assessment 27

Tables

Table 9-1 Climate Impacts Projections: 30-Year Overview 5
Table 9-2 Johnstown Castle Meteorological Station Mean Monthly Temperature Averages °C (2022-2025) & Rosslare 30-year Long Term Averages (1978-2007) 6

RECEIVED: 29/01/2026

Table 9-3 Johnstown Castle Meteorological Station Mean Monthly Precipitation (2022-2025) & Rosslare 30-year Long Term Averages (1978-2007) 7
Table 9-4 GHG Estimated Emissions Calculations 9
Table 9-5 Mitigation Measures Related to Climate Change Adaptation 10
Table 9-6 Mitigation Measures Related to GHG Reduction Programme 10

Figures

Figure 9-1 Windrose for Johnstown Castle Meteorology Station 12

RECEIVED: 29/01/2026

Introduction

Background

9.1 This Chapter of the Environmental Impact Assessment Report (EIAR), prepared by SLR Consulting Ireland, addresses the potential effects of the proposed development on climate. The proposed development is located across Ballynamonabeg, Ballymacoonoge and Glentire townlands, Ballaghkeen, Co. Wexford. The application site is located within a rural area referred to as 'The Ballagh', located c. 1 km southeast of Ballaghkeen and c. 9 km southeast of Enniscorthy.

9.2 The proposed development comprises:

- Continued use of the existing sand & gravel pit for completion of extraction and restoration (c. 4 hectares) under planning permission ref. 20191259);
- Extension to the existing sand & gravel pit over an extraction area of c. 10.9 hectares;
- Extraction to final level two metres above the groundwater table;
- Screening berms and operational landscaping;
- Continued processing of sand & gravel using permitted mobile screening plant located on the pit floor;
- Continuance of use of the existing permitted access and internal access road to / from the R744 regional road;
- Continuance of use of existing permitted ancillary facilities: Office, portaloo, storage container, wheelwash and fuel storage tank;
- Phased and final restoration of the lands to agricultural use;
- Proposed duration c. 18 years plus 2 years for final restoration, total permission duration of 20 years;
- Within an overall planning application area of c. 23.2 hectares.

9.3 The proposed hours for operations (extraction, processing and haulage) at the site will be 08.00 hours to 18.00 hours Monday to Friday only, and there will be no operations on Saturday, Sunday or Public Holidays. These are the same as currently permitted under P. Ref. 20191259.

9.4 The permitted development has a maximum annual extraction rate output of 200,000 tonnes per year. Typically, the extraction rate will range from 150,000 to 200,000 tonnes per year, depending on market demand. Based on the maximum annual extraction rate and a 24-tonne HGV load, the proposed development will generate c. 8,333 trips per annum. The development will also generate some light vehicular traffic, principally by employees and visitors travelling to and from the site. Further information on the proposed development, site activities, environmental management systems and controls at the application sites are provided in EIAR Chapter 2.

Scope of Work

9.5 The following sections of this Chapter describe the potential climate change impacts associated with the proposed sand and gravel pit extension development. The following issues are addressed separately:

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- climate change legislative framework / policy context;
- analysis of evolving environmental baseline trends;
- identifying climate change concerns in relation to proposed development;
- assessing effects (cumulative effects and uncertainty);
- identifying alternatives and mitigation measures; and
- identifying monitoring and adaptive management.

Consultations / Consultees

9.6 In preparing this Environmental Impact Assessment Report an initial pre-planning consultation meeting was sought between officials of Wexford County Council and the Applicant. A pre-planning consultation meeting was held with the Planning Department, Wexford Co. Council on the 18th November 2025 (Ref. 20250386).

9.7 Following a review of published development plans and site surveys, it was considered that there was no requirement for any further formal external consultations to be carried out in respect of climate for the purposes of this assessment. There was however consultation with other specialist contributors to this EIA Report.

Contributors / Author(s)

9.8 This chapter of the EIAR was prepared by Niamh Doyle - an EIA co-ordinator with SLR Consulting Ireland. Niamh has a BSc in Zoology (2019), a MSc in Environmental Science (2021) and 2 years of experience in the preparation of EIARs for a wide range of projects, including quarries, transport upgrades and sustainable housing developments.

Limitations / Difficulties Encountered

9.9 There are currently no published guidelines and established methodology providing specifically for assessment of climate impacts from quarrying activities in Ireland. This Chapter of the EIAR has therefore been prepared based on general cross-sectoral guidance.

Legislative Framework / Policy Context

9.10 In recent years, there has been increasing public awareness about the implications of past, ongoing, and continued future emissions of greenhouse gases on the earth's climate. The effects of climate change will potentially have a significant impact on local communities and national populations across the world. The ever-increasing awareness and acceptance of this reality has, in recent years, prompted significant public policy development around emissions and climate change.

9.11 An overview of the legislative framework and policy context which informs this assessment of potential climate impacts associated with the proposed development at the Ballagh is presented in **Appendix 9-A**. This provides background detail in respect of the following:

- National Policy on Adaption to Climate Change
  - Sectoral Adaption Plans
  - Local Level Adaption
  - The Climate Action Plan 2025 (CAP 2025)
  - Climate Action and Low Carbon Development (Amendment) Act, 2021

RECEIVED: 29/01/2026

- Regulation / Control of Greenhouse Gas Emissions
  - Paris Agreement (2015)
  - Kyoto Protocol (2008-2012)
  - EU 2021-2030 Targets for non-ETS sector emissions- Effort Sharing Regulations
  - Energy White Paper (2015)
- Future Management of Flood Risk
- EIA Directive 2014/52/EU
- Published Guidelines
  - Guidance on Integrating Climate Change and Biodiversity into EIA
  - Assessing Greenhouse Gas Emissions and Evaluating their Significance
  - Climate Change and Major Projects
  - Sector Planning Guidelines for Climate Change Adaption
  - Local Authority Strategy Development Guidelines

Wexford County Council Climate Action Plan 2024-2029

9.12 Wexford County Council are taking proactive steps by adopting a Climate Action Plan (2024)[1] to build resilience and respond effectively to the threats posed by climate change. The Climate Action Plan 2024-2029 is in line with the Government's overall National Climate Objective, which seeks to pursue and achieve, by no later than the end of 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy. The Plan builds on Wexford County Council's Climate Change Adaptation Strategy 2019-2024[2] and ongoing work by the Council's Climate Action Steering Group in conjunction with the South East Energy Agency.

9.13 The core targets of Wexford County Council's Climate Action Plan are:

- 51% reduction in the Council's greenhouse gas emissions by 2030
- 50% improvement in the Council's energy efficiency by 2030

9.14 In addition, the Plan includes a range of climate adaptation actions, aimed at improving the resilience of the County to the impacts of climate change as well as a range of mitigation actions, to reduce future impact on the climate. These are presented across 5 core Action Areas:

- **Governance and Leadership** "Foster Governance, Leadership and Partnerships for Climate Action".
- **Built Environment and Transport** "Achieve Carbon Emission Reductions and Energy efficiency targets for 2030 through our built environment and transport".
- **Natural Environment and Green Infrastructure** "Protect and enhance the natural environment in County Wexford to support biodiversity, mitigate against climate change and reduce the negative impacts of climate change".

[1] Wexford County Council Climate Action Plan | Wexfordcoco.ie

[2] Wexford County Council Climate Change Adaptation Strategy 2019 – 2024 | Wexfordcoco.ie

- **Communities, Resilience and Transition** "Mobilise Climate Action, increase resilience and a just transition in Local Communities".
- **Sustainability and Resource Management** "Create and enhance a culture of prevent, reduce, reuse, and recycle of resources to promote a circular economy".

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Receiving Environment

Climate Environmental Baseline

Regional Context

9.15 Observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising sea level are unequivocal evidence of warming of the climate system globally. Global mean temperature has increased compared with pre-industrial times for land and oceans. Most of the observed increase in global average temperatures is very likely due to increases in anthropogenic greenhouse gas concentrations. According to an ongoing temperature analysis led by scientists at NASA's Goddard Institute for Space Studies (GISS)[3], the average global temperature on Earth has increased by 1.19° C (2.14° Fahrenheit) from the 1951 – 1980 average.

9.16 In future years, landmasses are expected to warm more than the oceans at northern middle and high latitudes. Despite possible reductions in average summer precipitation over much of Europe, precipitation amounts exceeding the 95th percentile are very likely in many areas; thus, episodes of severe flooding may become more frequent despite the general trend towards drier summer conditions. In an ensemble-based approach using outputs from 20 global climate models (GCMs), the Mediterranean, north-east and north-west Europe are identified as warming hot spots but with regional and seasonal variations in the pattern and amplitude of warming. Regional climate models (RCMs) also project rising temperatures for Europe until the end of the 21st century, with an accelerated increase in the second half of the century.

9.17 For precipitation, the larger-scale summer pattern shows a gradient from increases in Northern Scandinavia to decreases in the Mediterranean region. By contrast, increases in wintertime precipitation primarily north of 45°N are a consistent feature of RCM projections over Europe, with decreases over the Mediterranean. Overall, then, there are consistent projections of change for northern and north-west Europe, including Ireland.

9.18 Ireland has a typical maritime climate, with relatively mild and moist winters and cool, cloudy summers. The prevailing winds are south-westerly in direction. The climate is influenced by warm maritime air associated with the Gulf Stream which has the effect of moderating the climate, and results in high average annual humidity across the country. The area of least precipitation is along the eastern seaboard of the country, in the rain shadow of the Leinster uplands.

9.19 Mean seasonal temperature will change across Ireland. Several studies have applied selected IPCC Special Reports on Emissions Scenarios (SRESs) to model climatic changes across Ireland at a regional scale. Despite the different methods and scenario combinations used, there is agreement in projected changes in temperature for Ireland. However, there are more disparities in the magnitude and sign (i.e., +/-) for the precipitation changes projected for the island.

[3] NASA, "World of Change: Global Temperatures".

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9.20 **Table 9-1** summarises climate impact projections for Ireland, estimates of projections confidence are derived from published projection data from the Environmental Protection Agency (EPA) Research Report 164 - Local Authority Adaptation Strategy Development Guidelines[4].

Table 9-1 Climate Impacts Projections: 30-Year Overview[4]

Variable	Summary	Confidence	Projected Changes
Sea Levels Rise	Strong increase	High	Projections of sea level rise to 2100 suggest a global increase in the range of 0.09-0.88m with a mean value of 0.48m. For 2050, it is reasonable to assume a sea level rise in the region of 25cm above present levels. It should be noted that due to a limited understanding of some important effects that contribute to rates of increase, these estimates of sea level rise may prove optimistic, and estimates of up to 4-6m have been projected by some models.
Storm Surge	Strong increase	Medium	An increase in the number of intense cyclones and associated strong winds are expected over the north-east Atlantic. By the 2050s, storm surge heights in the range of 50-100cm are expected to increase in frequency for all coastal areas with exception of the southern coast.
Coastal Erosion	Moderate increase	Low	Currently approximately 20% of Ireland's coastline is at risk of coastal erosion, particularly areas of the south and east coast and in isolated areas on the west coast. Rates of increase will be determined by local circumstances; however, it is expected that areas of the south-west are likely to experience the largest increase.
Cold Snaps / Frost	Moderate decrease (winter/night)	High	By mid-century, minimum temperatures during winter are projected to increase by ~2 °C in the southeast and ~2.9 °C in the north. This change will result in fewer frost days and milder night-time temperatures.
Heatwaves	Strong increase (summer)	High	Seven significant heatwaves (defined as 5+ days @ >25 °C) have been recorded in Ireland over the past 30 years, resulting in approximately 300 excess deaths. By mid-century, a projected increase in summer maximum daily temperature of approximately 2°C will likely intensify heatwaves, with maximum temperatures increasing and heatwave duration lengthening.
Dry Spells	Strong increase (summer)	Medium	There have been eight periods of insignificant rainfall in Ireland in the past 40 years. Of these, the events of 1976, 1995 and 2018 were the most severe, averaging 52, 40 and 54 days in duration respectively across Irish rainfall stations. An approximate 20% decrease in summer precipitation in many areas is strongly indicated under a high emissions scenario. This decrease is likely to result in progressively longer periods without significant rainfall, posing potentially severe challenges to water sensitive sectors and regions.
Extreme Rainfall	Strong increase (winter)	Low	Heavy precipitation days (in which more than 20 mm of rain falls) are likely to increase in frequency in winter. By the 2050s an increase in the number of heavy precipitation days of around 20% above the level of 1981-2000 is projected under both low-medium and high emissions scenarios. This may have serious consequences for flood risk in sensitive catchments.
Flooding	Moderate increase (winter)	Low	An Irish Reference Network of hydrometric stations has been established to assess signals of climate charge in Irish hydrology. This network has detected an increasing trend in high river flows since 2000. Projections of future flows are beset by uncertainty at the catchment scale, but a broad signal of wetted winters and drier summers is evident across several independent studies.

[4] EPA Research Report 164 - Local Authority Adaptation Strategy Development Guideline, 2016

Variable	Summary	Confidence	Projected Changes
Wind Speed	Minor increase (winter)	Medium	Observed wind speed over Ireland has not changed significantly in recent times, but it is anticipated that the distribution of wind will alter slightly in future, with winters marginally windier and summers marginally less so. Though the average wind speed is anticipated to change in only a minor way over the coming decades, the frequency of extreme windstorms is expected to increase due to alterations in the origin and track of tropical cyclones.

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Local Context

9.21 The weather station at Johnstown Castle (c. 19 km south of the site) is the nearest weather station to the application site and is referenced for the monthly meteorological data (2022-2025). However, long term data is not available for this weather station so 30-year Long Term Average (1978-2007) data from the weather station at Rosslare (c. 24 km southeast) has been presented. These weather stations are considered representative of conditions experienced at the application site.

Temperature

9.22 The moderating influence of the Atlantic Ocean is felt throughout Ireland. The annual mean temperature for different areas in Ireland varies between mountainous regions, lowlands, and the coast. Mean daily temperatures at Rosslare averaged over the 30-year period 1978-2007 were typically between 6.3 to 15.7 °C with mean daily minimum temperatures typically between 4.1 to 12.9 °C, and daily maximum temperatures typically between 8.5 to 18.5 °C. Recent annual (2022-2025) mean temperatures are also provided in **Table 9-2** and show comparative results to the long term 30-year averages.

Table 9-2 Johnstown Castle Meteorological Station Mean Monthly Temperature Averages °C (2022-2025) & Rosslare 30-year Long Term Averages (1978-2007)

	Mean temperature in degrees Celsius												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2025	5.4	6.9	8.3	10.1	12.4	14.6	16.8	16.6	13.2	11.7	9	8	11.1
2024	5.7	7.9	7.8	9.4	12.5	13.1	14.6	15	13.3	11.6	9.4	7.8	10.7
2023	6.5	7.7	7.5	9.1	12.6	15.6	15.2	15.9	15.3	11.7	8.7	8	11.2
2022	6.4	7.4	7.7	8.6	12.1	13.6	16.4	16.7	14	12.7	9.7	5.6	10.9
LTA[5]	6.5	6.3	7.5	8.8	11.1	13.6	15.5	15.7	14.2	11.6	9	7.4	10.6

9.23 The east of Ireland, which is sheltered from Atlantic frontal systems, is sunnier than the west. The sunniest months are May and July. The LTA annual mean for daily duration recording of sunshine for the area around Rosslare[6] is 4.3 hours. December is typically the dullest month, with 1.8 hours of mean daily duration. May is the sunniest month, with 6.9 hours of mean daily duration, explained largely by its long days and finer weather.

[5] 30-Year Averages (1978-2007)
[6] 30-Year Averages (1978-2007)

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Wind

9.24 Results from the synoptic meteorological station at Johnstown Castle, located approx. 19 km south of the application site over the period 2002-2020, indicate that the main wind direction is from a south-westerly direction, with an annual incidence of 49.3 % for winds between 200° and 280°; refer **Figure 9-1**. The lowest frequency is for winds blowing from the east and south-east direction. Moderate to high winds (>2 m/s) occur 91.5 % of the time.

Rainfall / Precipitation

9.25 Recent annual (2022-2025) and the long-term average (1978-2007) mean rainfall records are provided in **Table 9-3**.

9.26 During the period 1978-2007, long-term monthly rates of precipitation were between c. 50 mm and c. 110 mm at the Rosslare station, with winter months receiving the heaviest amounts. The mean of the Met Eireann records (1978-2007) indicates that average annual rainfall around Rosslare is approximately c. 906 mm / year.

Table 9-3 Johnstown Castle Meteorological Station Mean Monthly Precipitation (2022-2025) & Rosslare 30-year Long Term Averages (1978-2007)

	Total rainfall in millimetres												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Monthly (M) / Annual (A) Average
2025	153.8	121.1	30.2	104.9	23	78.7	57.2	40	161.3	132.9	237.3	182.5	110.2 (M)
2024	110.8	136.2	153.7	132.9	76.8	39.9	58.5	68.7	108.4	112	96.4	81.8	98.0 (M)
2023	93.2	7.4	149	50.9	41.8	48.5	124.7	87.5	178.4	265	96.7	152.2	107.9 (M)
2022	22.7	96.8	90.1	39.2	62.1	72.5	24.4	32.2	123.1	159.3	163.5	110.7	83.1 (M)
LTA[7]	88.4	70.8	69.1	59.1	55.7	54.9	49.9	71.6	75	109.3	100.9	100.8	905.5 (A)

Impact Assessment

Methodology

9.27 In Ireland some sectors have independently begun the process of identifying key vulnerabilities for their activities. The report by the Irish Academy of Engineering, Ireland at Risk Critical Infrastructure – Adaptation for Climate Change (The Irish Academy of Engineering, 2009) and the report by the Heritage Council and Fáilte Ireland (the National Tourism Development Authority), Climate Change, Heritage and Tourism, Implications for Ireland's Coast and Inland Waterways (ed. Kelly and Stack, 2009) are examples of initiatives of this kind.

9.28 Other research work on adaptation in specific sectors has been carried out or commissioned by other Government Departments/bodies such as the OPW, CoFoRD (programme of competitive forest research for development research programme, etc. (e.g., CLIMADAPT)).

[7] 30-Year Averages (1978-2007)

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9.29 A National Climate Change Vulnerability Scoping Study (Sweeney and Coll, 2012) was undertaken to identify first generation vulnerabilities for Ireland based on a sensitivity analysis across key sectors. The analysis identified a clustering of impacts and their importance in relation to an assessment of likely resilience by sector. The assessment methodology used was an impacts-first, science-first classical approach. The priority sectors identified are biodiversity and fisheries; water resources and the built coastal environment; forestry and agriculture.

9.30 As each sector develops its sectoral adaptation plan (under the Climate Action and Low Carbon Development Act Amendment Act 2021), detailed vulnerability and risk analysis will be required. Some preliminary work has been undertaken on costing the impacts of climate change in Ireland. This is now being supported by more detailed analysis of the current and future costs of flood risk management.

9.31 The implementation of adaptation is being supported by the development of a suite of guidelines, tools, and approaches. These include the Local Authority Adaptation Strategy Development Guideline; and the Irish climate information platform "Climate Ireland", which includes data, information, tools, and approaches for local level adaptation decision making. Work is ongoing to develop sectoral decision-making tools and supports.

9.32 There are no specific tools developed for assessing climate change for extraction industry. The Climate Change and Major Project guidelines on how to make investments resilient to climate change provides a methodology for undertaking a vulnerability and risk assessment.

9.33 Climate change adaptation and mitigation are to be increasingly integrated in the preparation and approval of proposed development. Adaptation seeks to ensure adequate resilience of proposed development to the adverse impacts of climate change based on Vulnerability. Mitigation seeks to reduce the emissions of greenhouse gases.

Development Vulnerability

9.34 The aim of the vulnerability assessment is to identify the relevant climate hazards foreseen at the development location. Main steps include identifying and combining the sensitivity and exposure of the project which will describe the vulnerability, while the risk will be determined by likelihood and impact. Adaptation through project options, appraisal, and planning will depend on the assessed project vulnerability and risk.

9.35 Timescale for the project vulnerability and risk assessment shall correspond to the lifespan of the project. During the lifespan, there could be significant changes in frequency and intensity of weather events due to climate change, which should be considered. Detailed methodology charts for development vulnerability assessment are presented in **Appendix 9-B**.

Greenhouse Gases Emissions

9.36 All projects have the potential to emit greenhouse gas (GHG) emissions to atmosphere during the construction, operational and decommissioning phase of the development. Direct GHG emissions may be caused by operational activities and project commissioning/ decommissioning. Indirect GHG emissions may be due to increased demand for energy and indirect GHG generating activities. Indirect GHG activities linked to the development projects may include transport, space heating of buildings / offices or loss of habitats that provide carbon sequestration, (e.g., through land-use change).

9.37 The significance of a project's GHG emissions should be based on its net impact, which may be positive or negative. Where GHG emissions cannot be avoided, the significance of a project's emissions shall be reduced by mitigation or project design. Where GHG emissions

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remain significant but cannot be reduced further approaches to compensate project emissions should be considered.

9.38 Currently in Ireland, there is no set methodology to evaluate significance criteria or a defined threshold for GHG emissions for the mineral extraction industry. Due to the inconsistences between the different methods and their assumptions for assessment, there is no single agreed method by which to assess a project carbon budget. The method of assessment varies according to the type and scale of the development.

9.39 Due to a lack of guidelines and an established methodology, the assessment of significance of the GHG emissions is based on whether the development's GHG emissions cumulatively represent a considerable contribution to the global atmosphere and whether the development as continued or extended will replace existing development that would have a higher GHG profile.

9.40 Where the GHG emissions cannot be avoided, the mitigation should aim to reduce the development emissions at all stages.

Development Vulnerability Assessment

9.41 The aim of the vulnerability assessment is to identify the relevant climate hazards for the project at the foreseen location. A development vulnerability assessment for the proposed development is presented in **Appendix 9-C.**

9.42 Based on the development vulnerability assessment, measures to improve the resilience of the project to extreme rainfall, flash flood, storms, and winds are required.

Greenhouse Gas Emissions Assessment

9.43 For the purposes of this climate assessment, GHG emissions have been calculated for the proposed development based on an estimated annual energy use at the proposed development site.

9.44 The proposed development maximum annual extraction rate will be c. 200,000 tonnes of sand and gravel. On the basis of a 24-tonne load per HGV, this would correspond to c. 8,333 trips per annum. It has been assumed that maximum distance travelled for one trip will be 200 km (i.e. return to / from principal markets).

9.45 Total annual GHG emissions for the proposed development are presented in **Table 9-4** below.

Table 9-4 GHG Estimated Emissions Calculations

Type	Annual Value	Distance Travelled (km)	Conversion factor	Calculated CO_2e kg	Total annual CO_2e kg
Traffic (Movements)	8,333 trips	200	0.65975[a]	1,099,539	
Energy (Site Operations)	60,000 litres [b]		2.57082[c]	154,249	
Total					1,253,789

[a] Conversion factor for 2025 for Scope 1 Protocol for Freighting goods: All HGVs.

[b] Assumed 250 litres / day of diesel consumed for 240 working days / annum.

[c] Conversion factor for 2025 for Scope 1 Protocol for Fuels: Diesel (average biofuel blend).

9.46 Based on a calculated total annual emission of 1,253,789 CO_{2e} kg (1,254 CO_{2e} tonnes) and a comparison to Ireland's 2024 emissions value of 53.8 million tonnes of CO_{2e}, it is assessed that the proposed development would represent a maximum of just 0.002% of Ireland's annual CO_{2e} emissions for the duration (i.e. insignificant).

9.47 Based on the scale and extent of the proposed site operations, GHG emissions are assessed as not making a significant contribution to the global atmosphere.

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Mitigation

9.48 Mitigation is designed to increase the resilience of the development, or wider environmental receptors, to climate change and focuses on increasing ability to absorb climate related shocks.

Project Adaptation against Expected Climate Change Effects

9.49 In the context of climate change, measures to increase the adaptive capacity of the proposed development and disaster risk reduction strategies can be developed with a view to reducing vulnerability and increasing its resilience. Significant incidents related to the climate change that affect operation of the proposed development should be recorded for future analysis.

9.50 Based on a development vulnerability assessment (refer to **Appendix 9-C**) measures to improve the resilience of the project to extreme rainfall, flash flood, storms, and winds are considered. **Table 9-5** details specific mitigation measures for the proposed development relating to climate change adaptation.

Table 9-5 Mitigation Measures Related to Climate Change Adaptation

Main Concerns Related to:	Proposed Alternatives or Mitigation Measures
Extreme Rainfall, Flash Flood	Development scheme layout avoids mapped flood hazard areas.
Storms and Winds	Implement procedures to facilitate operational shutdown where required during extreme weather conditions.
	Ensure the selection, design, operation, and maintenance of plant and equipment meets required standards.
Risk Reduction Mechanism	Secure and maintain insurance for site assets and operations.

Future Reduction of GHG Emissions

9.51 **Table 9-6** details specific mitigation measures for the site in respect of the GHG reduction programme.

Table 9-6 Mitigation Measures Related to GHG Reduction Programme

Main Concerns Related to:	Proposed Alternatives or Mitigation Measures
Direct GHG emissions	Continue the practice of using energy efficient machinery, including use of biodiesel. Consider future use of electric plant & machinery where practical.
GHG emissions related to transport	Unnecessary equipment / transport journeys should be avoided by management of transport and travel demands. Equipment should not be left in unnecessary idling mode.

Main Concerns Related to:	Proposed Alternatives or Mitigation Measures
	Consider future use of electric vehicles.

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Accidents, Malfunctions and Unplanned Events

9.52 Accidents, malfunctions, and unplanned events refer to events or upset conditions that are not part of any activity or normal operation of the proposed development planned by the Applicant. Even with the best planning and the implementation of preventative measures, the potential exists for accidents, malfunctions, or unplanned events to occur during the proposed extraction.

9.53 Many accidents, malfunctions and unplanned events are, however, preventable and can be readily addressed or prevented by good planning, design, emergency response planning, and mitigation. In terms of climate change impact, the following unplanned events could influence the local area:

- Flood events;
- Storm events

9.54 The proposed development site is not located in an area at risk from flooding, refer to the assessment of flood risk provided in Chapter 7. Mitigation measures as set out above will minimise any impacts from storm events.

9.55 In relation to climate change, the impacts of any unplanned events are negligible.

Monitoring

Project Adaptation against Expected Climate Change Effects

9.56 A plan shall be developed to ensure preparedness for adaptation against climate change. Provision shall be made for a periodic review of the plan and evaluation of progress on adaptation measures where these are considered necessary.

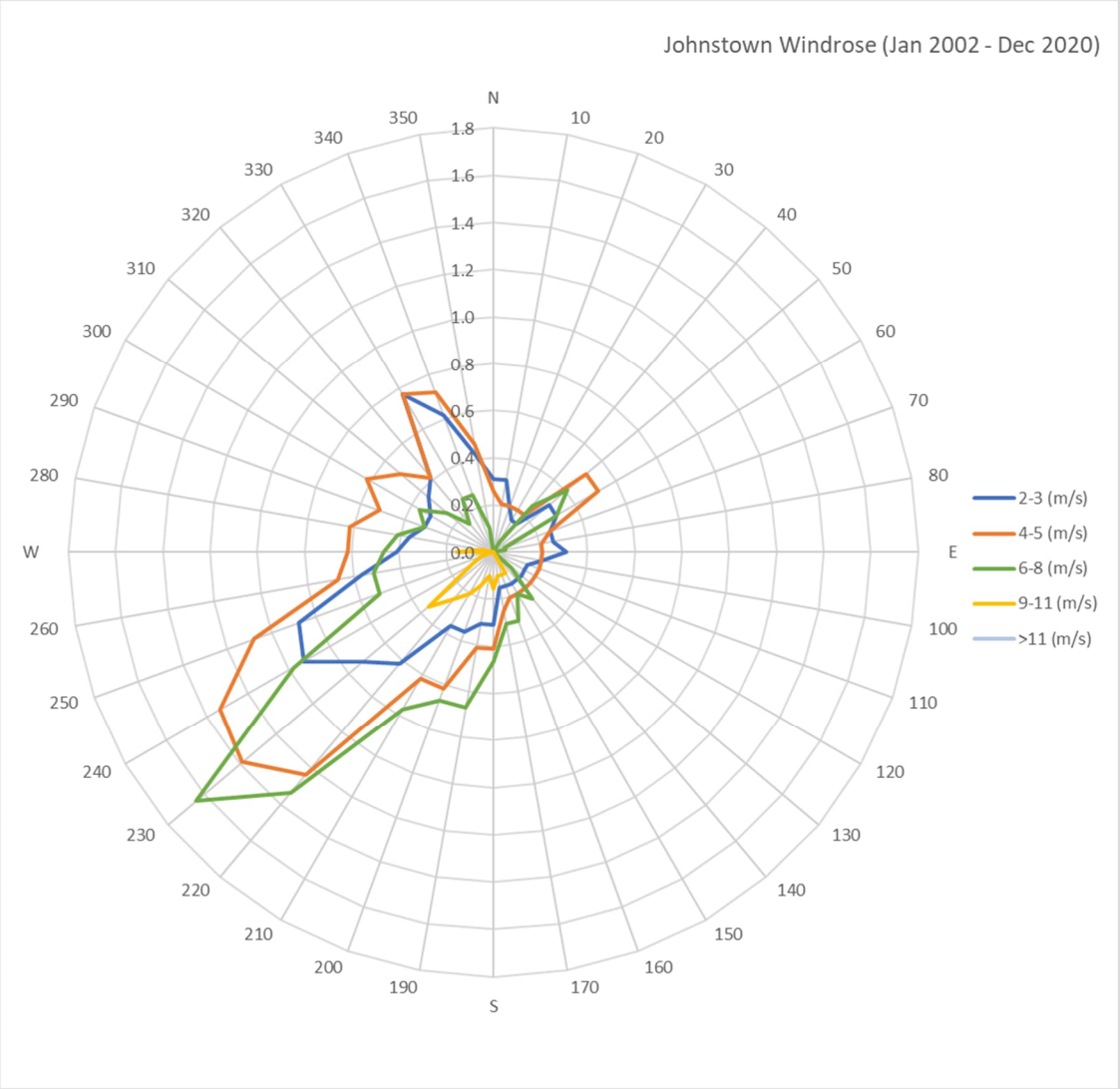
GHG Emissions

9.57 The proposed GHG reduction measures and GHG emissions will be monitored and reviewed on an annual basis.

Figures

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Figure 9-1 Windrose for Johnstown Castle Meteorology Station



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Appendices

Appendix 9-A: Legislative Framework/Policy Context

Appendix 9-B: Development Vulnerability Assessment Methodology

Appendix 9-C: Development Vulnerability Assessment

Appendix 9-A:

Legislative Framework / Policy Context

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Introduction

9.A.1 In recent years, there has been increasing public awareness about the implications of past, ongoing, and continued future emissions of greenhouse gases on the earth's climate. The implications of such change will potentially have significant impact on local communities and national populations across the world. The ever-increasing awareness and acceptance of this reality has, in recent years, prompted significant public policy development around emissions and climate change.

9.A.2 An overview of the legislative framework and policy context which informs this assessment of the potential climate impacts of the proposed development is presented herein below.

National Adaptation to Climate Change

9.A.3 The Irish National Policy Position on Climate Action and Low Carbon Development establishes the fundamental national objective of achieving transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out the context for the objective; clarifies the level of GHG mitigation ambition envisaged; and establishes the process to pursue and achieve the overall objective. Specifically, the National Policy Position envisages that policy development will be guided by a long-term vision based on:

- an aggregate reduction in carbon dioxide (CO_2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors.
- in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

9.A.4 The evolution of climate policy in Ireland will be an iterative process based on the adoption by Government of a series of national plans over the period to 2050. Greenhouse gas mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through National Mitigation Plans and National Climate Change Adaptation Frameworks. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals, and at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

9.A.5 The Climate Action and Low Carbon Development Act 2015[8] was enacted in December 2015. The Act identified and provided for the development and submission to Government of national mitigation and adaptation plans. It also established the institutional and governance framework within which these plans can be developed and implemented on a cyclical basis.

9.A.6 The Department of Communications, Climate Action and Environment (DCCAE) published a National Adaptation Framework (NAF) in January 2018[9]. The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts.

9.A.7 The NAF builds on the work already carried out under the National Climate Change Adaptation Network (NCCAF, 2012). Under the NAF several Government Departments will be required to prepare sectoral adaptation plans in relation to a priority area that they are

[8] Irish Statute Book: Climate Action and Low Carbon Development Act (2015)

[9] Gov.ie: National Adaptation Framework (NAF) (2018)

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responsible for. Local authorities are required to prepare local adaptation strategies NAF also aims to improve the enabling environment for adaptation through ongoing engagement with civil society, the private sector and the research community.

9.A.8 The Climate Action and Low Carbon Development (Amendment) Act 2021[10] was signed into law by the President of Ireland on the 23rd of July 2021 enacting the pursuit of a higher level of climate action targets and ambition over the next decades including for the local government sector. The Act provides for approval of plans, by the government, towards achieving the National Climate Objective. The National Climate Objective refers to the transitioning of the country to a climate resilient, biodiversity rich, environmentally sustainable, and climate neutral economy by no later than 2050. The Act introduces the development of carbon budgets and sectoral emission ceilings covering successive five-year periods up to 2050. The Act states that carbon budgets for the purpose of achieving the National Climate Objective shall be proposed by the Climate Change Advisory Council and approved by government for a five-year period with new budgets introduced for each subsequent 5-year period thereafter. The first two carbon budget cycles will be aimed towards achieving a 51% reduction in greenhouse gas emissions by the end of 2030, using 2018 as the baseline year.

9.A.9 The Act also tasks the government with the development of a National Long-Term Climate Action Strategy, covering a minimum period of 30 years, and a National Adaptation Framework. The Long-Term Climate Action Strategy will be updated every 5 years taking account of how the country is progressing towards the National Climate Objective. Additionally, the government is required to update the Climate Action Plan on an annual basis.

9.A.10 Within 12 months of the enactment of the Act, local authorities were requested by the Minister to prepare and make Local Authority Climate Action Plans. These Plans are to highlight the mitigation and adaptation measures that will be adopted during the next 5-year period. Local Authority Climate Action Plans are to be consistent with the most recently approved Climate Action Plan and National Adaptation Framework and have regard for the most recently approved Long-Term Climate Action Strategy, the most recently approved Sectoral Adaptation Plans, the National Planning Framework, and any current Climate Change Policies. Local authorities are to cooperate with adjoining local authorities in the development of their Climate Action Plans. A further provision of the Bill provides that the Minister may issue guidelines in respect of the content and preparation of the local authority climate action plans and that local authorities shall comply with these guidelines.

9.A.11 The Climate Action and Low Carbon Development (Amendment) Act 2021 also included an amendment of Section 10(2) (n) of the Planning and Development Act 2000 whereby; to reduce anthropogenic greenhouse gas emissions as well as addressing adaptation requirements, County Development Plans will need to take account of Local Authority Climate Action Plans.

A.1.1 Sectoral Adaptation Plans

9.A.12 The 2024 National Adaptation Framework (NAF) requires the development of Sectoral Adaptation Plans (SAPs) for 13 key sectors. The first round of the adaptation plans was produced in 2019, followed by the second round in 2025, and these plans are due to be reviewed at least once every five years. The SAPs are a key deliverable of the NAF and set out actions across the 13 sectors to ensure that Ireland's society, ecosystems, infrastructure,

[10] Gov.ie: Climate Action and Low Carbon Development (Amendment) Bill (2021)

RECEIVED: 29/01/2026

economy, and competitiveness are resilient to the impacts of climate change. The sectors are:

- Agriculture, Forestry and Seafood - Department of Agriculture, Food, and the Marine;
- Biodiversity - Department of Housing, Local Government and Heritage;
- Built & Archaeological Heritage - Department of Housing, Local Government and Heritage;
- Communications Networks - Department of Culture, Communications and Sport;
- Electricity and Gas Networks - Department of Climate, Energy and the Environment;
- Flood Risk Management – Office of Public Works;
- Health - Department of Health;
- Transport - Department of Transport;
- Tourism - Department of Enterprise, Tourism and Employment; and
- Water Quality and Water Services Infrastructure - Department of Housing, Local Government and Heritage.

9.A.13 The aggregate and extractive industries were not specifically required under the National Adaptation Framework (NAF) to prepare sectoral adaptation plans in line with the requirements of the Climate Action and Low Carbon Development Act.

9.A.14 Government Departments must develop statutory sectoral adaptation plans in accordance with the NAF and with a six-step adaptation planning process described in Sectoral Planning Guidelines for Climate Change Adaptation[11]. This Department published the guidelines for the use of the sectors required to prepare statutory sectoral adaptation plans under the Framework. The guidelines aim to ensure that a coherent and consistent approach to adaptation planning will be adopted by the key sectors in Ireland. Completed plans could include actions that:

- Mainstream adaptation into key sectoral plans and policies;
- Identify and understand the key vulnerabilities, risks, and potential opportunities facing specific sectors, as well as major risks cross-cutting different sectors;
- Ensure climate-proofing of strategic emergency planning;
- Identify and collect information on the costs and benefits of adaptation within specific sectors;
- Build capacity within sectors to withstand the impacts of climate change;
- Identify and address key research gaps within their sector;
- Improve coordination with the local government sector;
- Include a consideration of Just Resilience, the use of Nature-based solutions, and avoiding maladaptation as a key principle;
- Ensure cooperation on cross-cutting issues including Coastal, Built Environment, Urban Environment, Health Impacts and Disaster Risk Reduction, as well as cooperation on cascading risks across sectors;

[11] Department of Climate, Energy and the Environment: Sectoral Planning Guidelines for Climate Change Adaptation, (2018)

RECEIVED: 29/01/2026

- Develop appropriate monitoring, evaluation, reporting, and learning systems within sectors; and
- Plan for the coordination of the implementation phase of the SAPs with input from key stakeholders.

A.1.2 Local Level Adaptation

9.A.15 The National Adaptation Framework identifies the critical role to be played by local authorities in addressing climate change adaptation. This will effectively build on their existing expertise and experience as first responders in emergency planning scenarios. Under the NAF each local authority will also be developing their own adaptation strategies in line with guidelines developed for the sector.

9.A.16 The NAF explores how local authorities might adopt a joint or regional approach to adaptation planning. In January 2018, the DCCAE entered into a five-year financial commitment of €10m to establish four Climate Action Regional Offices (CAROs). Building on a business case prepared by the local government sector itself, this commitment recognises the significant obligation which has been placed on local government to develop and implement its own climate action measures, as well as the need to build capacity within the sector to engage effectively with climate change – both in terms of mitigation and adaptation.

9.A.17 The Climate Action Regional Offices are being operated by a lead local authority in four different regions that have be grouped together based on a climate risk assessment with a focus on the predominant risk(s) in each geographical area. The four Climate Action Regional Offices are:

- Atlantic Seaboard North CARO;
- Atlantic Seaboard South CARO;
- Eastern & Midlands CARO; and
- Dublin Metropolitan CARO.

9.A.18 County Wexford is part of the Eastern & Midlands CARO.

9.A.19 The establishment of these offices will enable a more coordinated engagement across the whole of government and will help build on the experience and expertise which exists across the sector.

A.1.3 The Climate Change Action Plan 2025 (CAP25)

9.A.20 Published in April 2025, CAP25 is the third statutory annual update to Ireland's Climate Action Plan under the requirements of the Climate Action and Low Carbon Development (Amendment) Act 2021. The Plan lays out a roadmap of actions which will ultimately lead to meeting the national climate objective of pursuing and achieving, by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy. It aligns with the legally binding economy-wide carbon budgets and sectoral emissions ceilings that were agreed by Government in July 2022.

9.A.21 Climate Action Plan 2025 builds upon the Climate Action Plan 2024 by refining and updating the measures and actions required to deliver the carbon budgets and sectoral emissions ceilings. The Plan provides a roadmap for taking decisive action to halve Ireland's emissions by 2030 and achieve climate neutrality by no later than 2050, as committed to in the Climate Action and Low Carbon Development (Amendment) Act 2021.

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9.A.22 The Plan sets out current and future actions in order to implement climate policy in Ireland and contribute too Ireland's national climate objectives. In relation to local authorities, the Plan states that local and national government will:

- Implement the actions set out in the Local Authority Climate Action Plans, and monitor and report on progress;
- Establish the Decarbonising Zone (DZ) Advisory Group and support delivery of accelerated climate actions in DZs across the country;
- Continue to support the Climate Action Regional Offices (CAROs) in the delivery of their work programme to effectively support local government to lead transformative change and measurable climate action across our cities and counties;
- Operate the National Mirror Group which has been established to support the participating cities of Cork, Dublin and Galway under the EU Climate Neutral and Smart Cities Mission;
- Roll out the national climate training and capacity building programmes for local government staff and elected members across a number of sectoral areas.

Regulation / Control of Greenhouse Gas Emissions

9.A.23 Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which together provide an international legal framework for addressing climate change.

9.A.24 In December 2015, an ambitious legally binding, global agreement on climate change was agreed in Paris. The Paris Agreement aims to restrict global temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. It aims to increase global ability to adapt to the adverse impacts of climate change and to foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten sustainable food production. It also seeks to achieve a balance between anthropogenic emissions by sources, and removals by sinks, of greenhouse gases in the second half of this century.

9.A.25 The first Irish National Mitigation Plan[12] represents an initial step to set us on a pathway to achieve the level of decarbonisation required. It is a whole-of-Government Plan, reflecting the central roles of the key Ministers responsible for the sectors covered by the Plan – Electricity Generation, the Built Environment, Transport and Agriculture, as well as drawing on the perspectives and responsibilities of a range of other Government Departments.

9.A.26 The measures that will be implemented through the plan will lay foundations for transitioning Ireland to a low carbon, climate resilient and environmentally sustainable economy by 2050. To support this ongoing work, the Plan also includes over 100 individual actions for various Ministers and public bodies to take forward.

9.A.27 Emissions reduction measures and actions set out in this National Mitigation Plan are aligned with and build upon commitments made in the 2015 Energy White Paper. This paper will be guided by the following strategic objectives:

- policy will contribute to reductions in Ireland's greenhouse gas emissions and enhancement of sinks in a manner that achieves the optimum benefits at least cost
- a stable and predictable policy and regulatory framework will be underpinned by rigorous analysis and appraisal, supported by strong research and analytical capacity

[12] Department of Climate Energy and the Environment – National Mitigation Plan, (2017)

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- the Government will pursue investment, innovation, and enterprise opportunities towards building a competitive, low carbon, climate-resilient and environmentally sustainable economy; and
- the citizen and communities will be at the centre of the transition.

A.1.4 COP 30

9.A.28 The 30th UN Climate Change Conference (COP30) was held from 10-21 November 2025 in Belém, Brazil. At COP30, the EU pushed the international community to strive for bolder action to cut emissions and adapt to the impact of the climate crisis. At COP28, in the United Arab Emirates (UAE) in 2023, countries agreed for the first time about the need to "transition away from fossil fuels in energy systems". At COP30, the EU renewed its commitment to the COP28 pledges to transition away from fossil fuels, triple renewable energy capacity and double energy efficiency by 2030.

A.1.5 Paris Agreement

9.A.29 The Paris Agreement which entered into force on 4 November 2016 aims to tackle 95% of global emissions through 188 Nationally Determined Contributions (NDCs) which will increase in ambition over time. Ireland's contribution to the Paris Agreement will be via the NDC tabled by the EU on behalf of its Member States. This is a binding target for an overall reduction of at least 40% in greenhouse gas emissions by 2030 (relative to 1990 levels). The target will be delivered by the EU by 2030 through reductions in the Emissions Trading Scheme (ETS) and non-ETS sectors of 43% and 30% respectively (relative to 2005).

A.1.6 Kyoto Protocol (2008 – 2012)

9.A.30 The Kyoto Protocol[13] operationalizes the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets.

9.A.31 The EPA has overall responsibility for the national greenhouse gas inventory in Ireland's national system, which was established in 2007 under Article 5 of the Kyoto Protocol. The EPA Office of Evidence and Assessment (OEA) performs the role of inventory agency in Ireland and undertakes all aspects of inventory preparation and management as well as the reporting of Ireland's submissions annually in accordance with the requirements of Regulation (EU) 2018/1999 of the European Parliament and of the Council and the UNFCCC.

9.A.32 Ireland currently accounts for GHG emissions under the Kyoto Protocol. The Kyoto Protocol required Ireland to limit total national greenhouse gas emissions to 314.2 Mtonnes of CO_{2eq} over the five-year period 2008 – 2012 which is equivalent to 62.8 Mtonnes of CO_{2eq} per annum. The Kyoto Protocol limit is calculated as 13% above Ireland's 1990 baseline value which was established and fixed at 55.61 Mtonnes of CO_{2eq} following an in-depth review of Ireland's 2006 greenhouse gas inventory submission to the UNFCCC[14].

A.1.7 EU 2021-2030 Effort Sharing Regulations Targets

9.A.33 The Effort Sharing Regulation establishes for each EU Member State a national target for the reduction of greenhouse gas emission by 2030 in the following sectors: domestic transport (excluding aviation), buildings, agriculture, small industry and waste. In total, the emissions covered by the Effort Sharing Regulation account for almost 60% of total domestic EU emissions.

[13] The Kyoto Protocol to the United Nations Framework Convention on Climate Change, (1998)
[14] Ireland's Sixth national Communication under the United Nations Framework Convention on Climate Change

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9.A.34 Initially adopted in 2018[15], the Regulation was amended in 2023[16]. With their new national targets Member States will collectively contribute to an emission reduction at EU level, in the Effort Sharing sectors, of 40% compared to 2005 levels. The revision was adopted as part of a package of proposals aimed at reducing the EU's emissions by 55% by 2030 (compared to 1990 levels) and deliver the European Green Deal.

9.A.35 As per Annex I of the Effort Sharing Regulations, the greenhouse gas emissions reduction by 2030 in relation to 2005 levels required for Ireland has increased from the old target of 30% (set in 2018) to a new target of 42% (set in 2023).

A.1.8 2015 Energy White Paper

9.A.36 The White Paper on Energy Policy, Ireland's Transition to a Low Carbon Energy Future 2015-2030, published in 2015, sets out a framework to guide energy policy in the period to 2030. The White Paper recognises that a radical transformation of our energy system is required to meet our national, EU and international climate objectives and sets a course for an energy sector where the State will provide the supports that enable consumers to become active energy citizens. It posits a policy approach where our energy system will change from one that is almost exclusively led by Government and utilities to one where individuals and communities are agents of change in the way Ireland generates, transmits, stores, conserves and uses energy. It sets out a vision, a framework and over 90 actions for Irish energy policy up to 2030 as we transition to a low carbon society and economy by 2050.

Future Management of Flood Risk

9.A.37 The Office of Public Works (OPW) undertook the National Catchment-based Flood Risk Assessment and Management (CFRAM) Programme in consultation with the Local Authorities and supported by external engineering consultants.

9.A.38 The CFRAM Programme is the mechanism established to facilitate future adaptation to climate change. It provides for long-term flood risk management in Ireland and the embedment of flood risk assessment in the future development of capital projects. The future scenario flood maps produced under the CFRAM Programme will facilitate this approach, inform other industrial sectors, and provide a valuable resource for local adaptation planning and sustainable land use management and planning.

EIA Directive 2014/52/EU

9.A.39 Directive 2014/52/EU[17] of the European parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment had to be transposed into national law by 16 May 2017, necessitating changes in laws, regulations, and administrative provisions across several legislative codes.

9.A.40 Key changes introduced in the 2014 Directive (in Annex IV - Information referred to in Article 5(1) – Information for the Environmental Impact Assessment Report) and the national transposing regulations (the European Union (Planning and Development)(Environmental Impact Assessment) Regulations, S.I. No. 296 of 2018) include a requirement for information on the impact of a project on climate (for example the nature and magnitude of

[15] Regulation (EU) 2018/842 of the European Parliament and of the Council

[16] Regulation (EU) 2023/857 of the European Parliament and of the Council

[17] Directive 2014/52/EU of the European Parliament and of the Council

greenhouse gas emissions) and the vulnerability of the project to climate change to be provided in the Environmental Impact Assessment Report.

RECEIVED: 29/01/2026

Published Guidelines

A.1.9 Guidance on Integrating Climate Change and Biodiversity into EIA (EC, 2013)[18]

9.A.41 EU Guidelines provide recommendations on how to integrate climate change and biodiversity in Environmental Impact Assessment (EIA). The need for action on climate change and biodiversity loss is recognised across Europe and around the world. The guidelines include an explanation as to why climate change and biodiversity are so important in EIA, present the relevant EU-level policy background, provide advice on how to integrate climate change and biodiversity into selected stages of the EIA process. The annexes provide sources of further reading and links to other relevant information, data, and tools.

A.1.10 Assessing Greenhouse Gas Emissions and Evaluating their Significance, 2nd Edition (IEMA, 2022)[19]

9.A.42 IEMA Guidance provides information to assist practitioners with addressing greenhouse gas (GHG) emissions assessment and mitigation in statutory and non-statutory Environmental Impact Assessment (EIA). It is a revision of the 2017 IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance and it complements IEMA's earlier guide on Climate Change Resilience and Adaptation and builds on the Climate Change Mitigation and EIA overarching principles. The requirement to consider this topic has resulted from the 2014 amendment to the EIA Directive.

A.1.11 Climate Change and Major Projects (EC, 2016)[20]

9.A.43 This publication provides guidance for assessing vulnerability and risk from Climate Change for major projects funded by the European Regional Development Fund (ERDF) and the Cohesion Fund and listed in the concerned operational programmes.

A.1.12 Sectoral Planning Guidelines for Climate Change Adaptation (Department of Climate, Energy and the Environment, 2024)[21]

9.A.44 The guidelines aim to ensure that a coherent and consistent approach to adaptation planning is adopted by the key sectors in Ireland. Sectors preparing sectoral adaptation plans under the NAF are required to prepare their plans in line with the process described in these guidelines while also being aware of the overall requirements regarding the development of sectoral adaptation plans.

[18] European Commission, 'Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment', (2013)

[19] IEMA, 'Assessing Greenhouse Gas Emissions and Evaluating their Significance', 2nd Edition, (2022)

[20] European Commission, 'Climate Change and Major Projects', (2016)

[21] Department of Climate, Energy and the Environment, 'Sectoral Planning Guidelines for Climate Change Adaptation', (2024)

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A.1.13 Local Authority Adaptation Strategy Development Guidelines (Department of Climate, Energy and the Environment, 2018)[22]

9.A.45 Guidance was produced to provide a consistent and coherent process for local authorities in helping them develop local adaptation strategies and contain information on the process of developing an adaptation strategy:

- provide background information on what adaptation entails and provides the rationale behind implementing a local scale adaptation strategy
- outline the initial steps required in launching a strategy development process, describing key roles and who can fulfil them, and setting out important factors to consider in the early stages of strategy development
- explains how to assess the role that weather extremes and periods of climate variability currently play within the local jurisdiction, and it describes why doing so is a fundamental element of working towards a more climate-resilient future
- moves from the present to the identification of future climate risks, describing a staged risk assessment process and positioning the adaptation strategy within more detailed risk assessments undertaken during shorter term decision-making processes such as statutory plan-making
- based on the risk assessment process undertaken determination of adaptation goals and objectives and the types of adaptation actions that are available and outlines how each might be identified, assessed, prioritised and implemented is described
- outlines the steps required to move from a phase of planning to one of implementation, and it explains the importance of monitoring and evaluation in ensuring that the strategy is achieving its anticipated adaptation objectives.

[22] Department of Climate, Energy and the Environment, 'Local Authority Adaptation Strategy Development Guidelines', (2018)

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Appendix 9-B:

Development Vulnerability Assessment Methodology

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Development Vulnerability Assessment Methodology

9.B.1 The scale for assessing the likelihood of a climate hazard is presented in **Table 9 B-1**. The output of the likelihood analysis is an estimation of the likelihood for each of the essential climate variables and hazards.

Table 9 B-1 Scale of Likelihood of Climate Hazard

Term	Qualitative	Quantitative
Rare	Highly unlikely to occur	5%
Unlikely	Unlikely to occur	20%
Moderate	As likely to Occur	50%
Likely	Likely to Occur	80%
Almost certain	Very likely to occur	95%

9.B.2 The scale for assessing the potential impact of a climate hazard is presented in **Table 9 B-2**. The impact analysis provides an assessment of the potential impact of each of the essential climate variables and hazards.

Table 9 B-2 Example Table for Climate Hazard Impact Analysis

Risk Areas	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational					
Safety and Health					
Environment					
Social					
Financial					
Reputation					

9.B.3 The matrix for assessing the sensitivity of project to climate hazards is presented in **Table 9 B-3**. The sensitivity is summarised, along with the ranking of the relevant climate variables and hazards relating to the project.

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Table 9 B-3 Example Table for Sensitivity of Project to Climate Hazards

	Extreme rainfall, flood, flash flood	Heath	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels
On site assets									
Inputs – Water									
Inputs - Energy									
Outputs - product									
Transport links									

9.B.4 The matrix for assessing exposure of a project to climate hazards is presented in **Table 9 B-4**. The exposure analysis ranks climate variables and hazards as low, medium, or high based on current and future climate.

Table 9 B-4 Example Table of Exposure of the Project to Climate Hazards

	Extreme rainfall, flood, flash flood	Heat	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels
Current Climate									
Future Climate									

9.B.5 An example of the vulnerability of a project to climate hazards is presented in **Table 9 B-5**. The vulnerability combines the sensitivity and the exposure analysis.

Table 9 B-5 Example Table for Vulnerability Analysis of Project to Climate Hazards

Sensitivity	Exposure (Current & Future Climate)		
	Low	Medium	High
Low			
Medium			
High			

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Appendix 9-C:

Development Vulnerability Assessment

Development Vulnerability Assessment

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9.C.1 The likelihood analysis of the proposed development to climate hazards is presented in **Table 9 C-1**.

9.C.2 The proposed development has been assessed to be moderate affected by extreme rainfall, flash (pluvial) flood, storms, and winds. The proposed development would be unlikely affected to cold spells, landslides, and snow. The proposed development would not be affected by heat, drought, wildlife fires, freeze–thaw damage or rising sea level.

Table 9 C-1 Analysis of Likelihood of Climate Hazards

	Extreme rainfall, flash flood	Flood	Heat	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze –thaw damage	Rising sea levels
Rare			✓	✓	✓				✓	✓
Unlikely		✓					✓	✓		
Moderate	✓					✓				
Likely										
Almost certain										

9.C.3 **Table 9 C-2** shows the climate hazard impact analysis of the proposed development. It was assessed that climate hazards will have major impacts on health and safety, the environment and financial areas, moderate impacts on asset damage and engineering, operational, social and reputation areas.

Table 9 C-2 Climate Hazard Impact Analysis

Risk Areas	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational			✓		
Safety and Health				✓	
Environment				✓	
Social			✓		
Financial				✓	
Reputation			✓		

9.C.4 **Table 9 C-3** below assesses the sensitivity of the project to climate hazard. It was assessed that site assets, energy inputs and transport links are of high sensitivity to extreme rainfall,

flood, flash floods, storms, and winds; water inputs will be highly sensitive to droughts. On site assets will be medium sensitive to cold spells and snow and freeze–thaw damage. Transport links will be medium sensitive to cold spells and snow.

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Table 9 C-3 Sensitivity of Project to Climate Hazards

	Extreme rainfall, flash flood	Flood	Heat	Drought	Wildlife Fires	Storms and winds	Landslides	Cold Spells and snow	Freeze–thaw damage	Rising sea levels
On site Assets	High	Low	Low	Low	Low	High	Low	Med	Med	Low
Inputs - Water	Low	Low	Low	High	Low	Low	Low	Low	Low	Low
Inputs - Energy	High	Low	Low	Low	Low	High	Low	Low	Low	Low
Transport Links	High	Low	Low	Low	Low	High	Low	Med	Low	Low

9.C.5 In **Table 9 C-4**, the exposure of the planned development to climate hazards was assessed. In the current climate, the exposure of the development to extreme rainfall, flood, flash flood, storms and winds has been assessed to be medium. In the future, the development was assessed to have high exposure to rainfall, flash flood, storms, and winds.

Table 9 C-4 Exposure of the Development to Climate Hazards without Mitigation

	Extreme rainfall, flash flood	Flood	Heat	Drought	Wildlife Fires	Storms and Winds	Landslides	Cold Spells and Snow	Freeze –thaw damage	Rising sea levels
Current Climate	Medium	Low	Low	Low	Low	Medium	Low	Low	Low	Low
Future Climate	High	Low	Low	Low	Low	High	Low	Low	Low	Low

9.C.6 **Table 9 C-5** shows the vulnerability analysis of the project to climate hazards; it combines the sensitivity and the exposure analysis. The project was assessed to be most vulnerable to extreme rainfall, flash flood, storms and winds.

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Table 9 C-5 Vulnerability Analysis of Project to Climate Hazards

Sensitivity	Exposure (Current & Future Climate)		
	Low	**Medium**	**High**
Low	Flood, Heat, Wildlife Fires, Landslides, Rising sea levels		
Medium	Cold Spells and snow, Freeze–thaw damage		
High	Drought	Extreme rainfall, flash flood (current), Storms and winds (current)	Extreme rainfall, flash flood (future), Storms and winds (future)

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