# Chapter 12
# Climate

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# 12. Climate

## 12.1 Introduction

This chapter assesses the potential significant effects on climate resulting from the construction, operation and decommissioning of the Proposed Development.

The chapter assesses the impact of potential emissions from the Proposed Development on air quality against Irish and EU standards. The potential effects of emissions of carbon due to the Proposed Development are assessed in the context of Ireland's national climate change obligations.

The potential effects on air quality due to the Proposed Development are considered separately in **Chapter 11**, *Air Quality*.

## 12.2 Assessment Methodology

This section presents details on relevant guidance and legislation, and the appraisal method for the assessment of impacts to climate from the Proposed Development.

### 12.2.1 Introduction

The assessment methodology has been derived with reference to the most appropriate guidance documents relating to climate which are set out in Section 12.2.2.

The potential effects of emissions of carbon due to the construction, operation and decommissioning of the Proposed Development have been considered in the context of Ireland's national climate change obligations. The climate assessment for the Construction Phase estimates the potential for GHG emissions, i.e., carbon dioxide equivalence ($CO_2e$), for the Proposed Development.

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

As construction materials (primarily concrete and steel) are manufactured using energy intensive practices, the carbon impact has been assessed against the ETS category.

### 12.2.2 Relevant guidelines, policy and legislation

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

The following climate guidance and standards have been consulted for the assessment from Transport Infrastructure Ireland (TII):

- Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) - Overarching Technical Document (TII, 2022a); and
- Climate Assessment of Proposed National Roads – Standard (TII, 2022b).

In addition to specific climate guidance documents, the following guidelines were considered and consulted in the preparation of this assessment:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA, 2022a).

The assessment has made reference to national guidelines, where available, in addition to international standards and guidelines relating to the assessment of GHG emissions and associated climatic impacts from road schemes. These are summarised below:

- National Adaptation Framework (hereafter referred to as the NAF) (DCCAE, 2018a);
- Project 2040 National Planning Framework (DCCAE, 2018b)
- National Development Plan 2021-2030 (DCCAE, 2021a);
- Climate Action Plan 2019 (DCCAE, 2019);
- Climate Action Plan 2021 (DCCAE, 2021b);
- Climate Action Plan 2023 (DCCAE, 2023);
- Department of Transport, Tourism and Sport (DTTAS) Transport – Climate Change Sectoral Adaptation Plan (DTTAS, 2019);
- 2030 EU Climate Target Plan (European Commission, 2021);
- Institute of Environmental Management and Assessment (IEMA) Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition (IEMA, 2022a);
- IEMA EIA Guide to: Climate Change Resilience and Adaptation (IEMA 2020b);
- IEMA Greenhouse Gas Management Hierarchy (IEMA, 2020); and
- Climate Action and Low Carbon Development (Amendment) Act 2021 (the 2021 Climate Act) (No. 32 of 2021);
- Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) - Overarching Technical Document (TII 2022); and
- Climate Assessment of Proposed National Roads – Standard (TII, 2022b).

#### *12.2.2.1 International policy*

The Paris Agreement (UNFCCC 2015), which came into force in 2016, aims to limit global temperature increases to no more than 2°C above pre-industrial levels, with efforts to limit this rise to 1.5°C. Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs comprise the efforts and actions by each country to reduce national emissions and adapt to the impacts of climate change. Each of the EU Member States submit their own NDCs, which contribute to the overall EU NDC.

The European Green Deal, published by the European Commission in December 2019, provides an action plan which aims for the EU to be climate neutral by 2050. On 14 July 2021, the European Commission adopted a series of legislative proposals setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target of at least a 55% net reduction in greenhouse gas emissions by 2030. The package includes revisions to the legislation put forward as part of the Climate and Energy Framework 2021-2030, including the EU Emissions Trading System (ETS), Effort Sharing Regulation, transport and land use legislation.

The EU ETS was launched in 2005 as the world's first international company-level 'cap-and trade' system for reducing emissions of greenhouse gases cost-effectively. The EU ETS regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry.

The sectors of the economy covered by the current ETS must reduce emissions by 61% by 2030 compared to 2005 levels by increasing annual emissions reduction to 4.2% per annum. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and thus includes GHG emissions from transport, residential and commercial buildings and agriculture.

Under this new package of proposals, the Commission is now proposing to reduce emissions under the non-ETS sectors by at least 40%, compared to 2005 levels. The European Climate Law aims to write into law the goal set out in the European Green Deal – for Europe's economy and society to become climate-neutral by 2050.

The 2021 EU Strategy on Adaptation to Climate Change (European Commission, 2021a) sets out the pathway to prepare for the unavoidable impacts of climate change. The aim is that *"by 2050, when we aim to have reached climate neutrality, we will have reinforced adaptive capacity and minimised vulnerability to climate impacts…"* Adaptation refers to measures that can reduce the negative impact of climate change by, e.g., ensuring a project is resilient to future increases in storm frequency and rainfall levels.

#### *12.2.2.2 National policy*

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

The National Development Plan (NDP) 2021-2030 was adopted in 2021 (DCCAE, 2021a) and sets out funding to underpin key Government priorities and will enable a step-change in investment to ameliorate the effects of climate change. The NDP is to work in parallel with the National Planning Framework (Project 2040) (DCCAE, 2018b), which sets out the overarching long-term planning and investment strategy by the Government, to ensure that the investment strategy supports spatial planning.

In May 2019, the Government of Ireland declared a climate and biodiversity emergency. Following on from this, the Government of Ireland's first national Climate Action Plan (CAP) was published in 2019 (DCCAE, 2019). It commits to achieving a net zero carbon energy systems objective for Ireland. In October 2019, the Transport Climate Change Sectoral Adaption Plan was published. The Plan identifies the key vulnerabilities in the transport network and looks to promote greater resilience to safeguard its continued operation. The new Programme for Government Our Shared Future, agreed in June 2020, accelerated the decarbonisation agenda, committing to a 7% average yearly reduction in overall greenhouse gases over the next decade, and to achieving net zero emissions by 2050.

The CAP 2021 (DCCAE, 2021b) sets out a detailed sectoral roadmap to deliver a cumulative reduction in emissions, building on the commitments of the first Climate Action Plan (2019). The core measures for transport focus on accelerating the electrification of road transport, increasing the use of biofuels and a shift to low energy transport modes such as walking, cycling, active travel and public transport. There are measures focused on increasing the 'modal shift' to reduce the fossil fuelled distances taken by car by 10%.

The CAP 2023 (DCCAE, 2023) notes that industry must reduce its carbon emissions from a 2018 baseline of 7 $MtCO_2e$ to 4 $MtCO_2e$ er annum by 2030. Measures set out to achieve this are "decrease in demand for construction materials" and "specify low carbon construction methods and low carbon cement material as far as practicable" for directly procured or supported construction projects from 2023. To meet the level of emissions reduction required by 2025, CAP 23 also notes that government will:

- Actively deliver a series of measures to reduce embodied carbon in construction materials; promote the swapping to lower embodied carbon construction materials wherever possible; and reduce emissions from cement production aligned with the above KPIs;
- Promote alternative construction materials through robust carbon lifecycle assessment of construction projects. Switching from high global warming potential (GWP) materials to low GWP materials, as well as reducing the GWP of individual materials.

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

- Establishes 2050 emissions target;
- Introduces a system of successive 5-year, economy-wide carbon budgets. The first two carbon budgets covering the periods 2021-2025 and 2026-2030 were announced by the Climate Change Advisory Council in 2021 (with a provisional budget from 2031). Following the approval of the Carbon Budgets, Ireland's Sectoral Emissions Ceilings were agreed by Government on 28th July 2022.
- Strengthens the role of the Climate Change Advisory Council in proposing carbon budgets;

- Introduces a requirement to annually revise the Climate Action Plan and prepare a National Long Term Climate Action Strategy at least every decade;
- Introduces a requirement for all Local Authorities to prepare individual Climate Action Plans which will include both mitigation and adaptation measures.

The EU ETS is implemented in Ireland under the European Communities (Greenhouse Gas Emissions Trading) Regulations, SI 490 of 2012, and amendments and European Communities (Greenhouse Gas Emissions Trading) (Aviation) Regulations SI 261 of 2010 and amendments.

#### *12.2.2.3 Local policy*

Under the National Adaptation Frameworks (NAF), which was published in response to the provisions of the Climate Action and Low Carbon Development Act, 2015, all local authorities were tasked with producing a Climate Adaptation Strategy for their functional areas. In response, the Cork County Council (CCC) Climate Adaptation Strategy 2019-2024 was adopted in 2019 (CCC, 2019).

In order to prepare for the challenges of climate change and adapting to its effects, seven high level goals were identified:

- Local adaptation governance and business operations;
- Infrastructure and built environment;
- Land use and development;
- Drainage and flood management;
- Natural environment, built and cultural heritage;
- Community, health and wellbeing; and
- Other sectors and agencies.

The development of these high-level goals is supported by a number of objectives and actions that form that basis of the strategy. The strategy ensures that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of CCC.

### 12.2.3 Categorisation of the baseline environment

A desk-based study of the baseline environment of the Proposed Development area was undertaken in order to inform this assessment and included the following sources:

- Government of Ireland carbon budgets and sectoral emission targets.
- Ireland's Greenhouse Gas Emissions Projections 2021-2040 (EPA, 2022b);
- CCC;
- Department of the Environment, Climate and Communications;
- Met Eireann;
- Environmental Protection Agency (EPA); and
- Sustainable Energy Authority Ireland (SEAI).

### 12.2.4 Impact assessment methodology

#### *12.2.4.1 Construction Phase*

The Proposed Development is anticipated to be constructed in one Construction Phase which will include a number of stages. The likely stages of construction are as follows:

- Stage 1 – Site clearance, access and construction compounds;

- Stage 2 – Utility diversion;
- Stage 3 – Bridge fabrication;
- Stage 4 – Foundation construction;
- Stage 5 – Bridge transportation;
- Stage 6 – Bridge assembly;
- Stage 7 – Bridge erection; and
- Stage 8 – Completion of works.

Refer to **Chapter 5**, *Construction Strategy* for further details on the above stages.

The specifics of the durations and sequence of works will be further informed by the appointed contractor during the tender period in due course. Construction is expected to commence in early 2025, with a duration of approximately 18 months. The development is expected to become operational in 2026.

The assessment of carbon emissions was carried out to determine the likely greenhouse gas emissions ($CO_2e$) predicted due to the Construction Phase of the Proposed Development, relative to Ireland's decarbonisation targets and projections. The construction materials are manufactured using carbon intensive practices, which results in embodied carbon associated with the materials. The assessment considers the material manufacture, the transport of construction materials to site, the construction processes and the construction compound.

The TII Carbon Assessment Tool (hereafter referred to as the TII Carbon Tool) (TII, 2022c) has been used to calculate the embodied carbon of materials in terms of carbon dioxide equivalency ($CO_2e$). The TII Carbon Tool uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (SEAI, 2019), Guidelines for the calculation of land carbon stocks (European Commission, 2010), and Greenhouse Gas Reporting Conversion Factors (UK Government, 2021). The tool has a wide range of applications covering the embodied carbon of infrastructure projects, such as raw material extraction and construction activities.

The University of Bath's (via Circular Ecology) carbon calculator (Version 1.1 November 2019) has been used to calculate the embodied carbon of cement and concrete mixtures in terms of carbon dioxide equivalency ($CO_2e$). The calculator uses data from the Inventory of Carbon and Energy (ICE) Database – Embodied Carbon Model of Cement, Mortar and Concrete (Hammond and Jones, 2011).

For a small number of materials not covered by the TII Carbon Tool and the University of Bath's (via Circular Ecology) carbon calculator, the National Highways England tool version 2.5 is used.

The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that will be used over the Construction Phase. The varying, relevant transport distances have been included in the calculations for the transportation of materials to site.

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

The Construction Phase of the Proposed Development will result in GHG emissions from various sources. The Construction Phase embodied GHG emissions are considered at all construction stages including the following:

- Land clearance activities (including the removal of trees / vegetation);
- Manufacture of materials and transport to site;
- Construction works (including excavations, construction, water usage, personnel travel and project size); and
- Construction waste products (including transport off site).

Detailed information for the Proposed Development including volumes of materials were obtained from the design team for the Proposed Development.

In accordance with TII Climate guidance, the Climate Practitioner must assess:

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

To assess its impact on meeting decarbonisation targets, the results of this assessment have been compared with the Ireland's EPA projected GHG emissions for the 'worst case' construction year (with additional measures), with particular relevance to the ETS sector. The Irish carbon budget for the period 2026-2030 is used to assess the extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050.

It should be noted that Ireland's carbon budgets are based on the emissions directly produced in Ireland. It does not include emissions produced outside of Ireland but arising as a result of activities undertaken within Ireland. At early project stages, the origin of materials may not be known. It is therefore assumed the emissions arising from materials assessed may all potentially contribute to Ireland's carbon budget, as a worst case.

The significance matrix as stated in the TII Climate guidance (TII, 2022a) is shown in **Table 12.1.**

**Table 12.1: Significance criteria – Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) (TII, 2022a)**

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

#### *12.2.4.2 Operational Phase*

There will be occasional maintenance works required during the Operational Phase of the Proposed Development. However, the intensity and duration of the maintenance works will be significantly less than the construction works, generating significantly lower carbon. Therefore, this aspect of the Operational Phase has been scoped out of further assessment.

The Operational Phase has the potential to have a beneficial impact on climate and carbon due to a modal shift away from private car to more sustainable modes of transport. The significance criteria outlined in **Table 12.1** have also been applied to the Operational Phase.

#### *12.2.4.3 Decommissioning Phase*

As outlined in **Chapter 4**, *Description of the Proposed Development*, the design life of the proposed new pedestrian and cyclist bridge is 120 years. During the potential future decommissioning works, the main bridge span and approach spans will be decommissioned by cutting the concrete decking and steel spans into a number of large sections. This will be done either *in situ* or at ground level, with the decking and spans being lifted out by a mobile crane and moveable gantry.

The intensity and duration of decommissioning activities will be less than that associated with the Construction Phase and will generate significantly lower carbon than the construction activities. Therefore, the Decommissioning Phase has been scoped out for further assessment.

#### *12.2.4.4 Vulnerability to climate change*

The vulnerability assessment identifies the impact of a changing climate on a project and receiving environment. The assessment considers a project's vulnerability to climate change and identifies adaptation measures to accommodate climate change impacts. The vulnerability assessment combines the outcomes of the analysis of sensitivity and exposure and aims to identify potential significant climate hazards to the project.

The aim of the sensitivity analysis is to identify which climate hazards are relevant to the specific type of project, irrespective of its location (European Commission, 2021a). The analysis considers the project in a comprehensive manner, looking at the sensitivity of individual components making up the asset (e.g., bridge structure, pavement, drainage etc.,) to relevant climate hazards (flooding, extreme weather events etc.). A sensitivity score is given to each asset category against each climate hazard. **Table 12.2** shows the following definitions and scoring used when assessing sensitivity.

**Table 12.2: Sensitivity criteria - Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) (TII, 2022a)**

| Sensitivity level | Definition | Score |
|---|---|---|
| High sensitivity | The climate hazard will or is likely to have a major impact on the asset category. | 3 |
| Medium sensitivity | It is possible or likely the climate hazard will have a moderate impact on the asset category. | 2 |
| Low sensitivity | It is possible the climate hazard will have a low or negligible impact on the asset category | 1 |

Different geographical locations are exposed to different climate hazards. The aim of the exposure analysis is to identify which climate hazards are relevant to the planned project location, e.g., flooding could represent a significant hazard for a project located next to a river in a floodplain. Therefore, while sensitivity analysis focuses on the type of project, exposure focuses on location.

**Table 12.3** shows the following definitions and scoring used when assessing exposure.

**Table 12.3: Exposure criteria - Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) (TII, 2022a)**

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

The vulnerability assessment combines the outcomes of the sensitivity and exposure analysis with the aim to identify the key vulnerabilities and the potentially significant climate hazards associated with the project to reveal the most relevant hazards. This is intended to form the basis of the detailed climate change risk assessment if deemed necessary.

Vulnerability is simply calculated as the product of sensitivity and exposure (i.e., vulnerability = sensitivity x exposure). **Table 12.4** shows the vulnerability matrix.

**Table 12.4: Vulnerability matrix - Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) (TII, 2022a)**

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

With regards to the next stage of the climate assessment, TII Climate Guidance (TII 2022) notes that if all vulnerabilities are ranked as low in a justified manner, no detailed climate risk assessment may be needed.

## 12.3 Baseline Environment

### 12.3.1 Local Climate

CCC's Climate Adaptation Strategy 2019-2024 was adopted in 2019 (CCC, 2019) and includes a risk register of potential climate events for Cork County, which includes increased risks of:

- Fluvial flooding;
- Heat waves;
- Coastal flooding;
- Pluvial flooding;
- Windstorms;
- Groundwater flooding;
- Coastal erosion; and
- Freezing conditions.

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

The EPA The Status of Ireland's Climate 2020 report (EPA, 2021) includes a number of recent climate observations for Ireland. The report states that the annual average surface air temperature in Ireland has increased by approximately 0.9°C over the last 120 years, with a rise in temperatures being observed in all seasons. This compares with a global average temperature estimated to be 1.1°C above pre-industrial levels. The report indicates that the sea level around Ireland has risen by approximately 2–3 mm per year since the early 1990s. In addition, annual precipitation was 6% higher in the period 1989 to 2018, compared to the 30-year period 1961 to 1990.

The EPA's Climate Change Research Programme carries out relevant and up to date studies on climate change in Ireland (available at www.epa.ie). Analysis of the meteorological records shows that Ireland's climate is changing in line with global patterns.

According to the EPA (www.epa.ie) climate change is expected to lead to the following adverse effects:

- Sea level rise;

- More intense storms and rainfall events;
- Increased likelihood and magnitude of river and coastal flooding;
- Water shortages in summer in the east;
- Adverse impacts on water quality;
- Changes in distribution of plant and animal species; and
- Effects on fisheries sensitive to changes in temperature.

Little Island, County Cork has a temperate maritime climate with mild winters and cool summers. The region experiences a relatively high amount of precipitation, particularly during the winter months. The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed. Recent weather patterns recorded in the area indicate an increase in the frequency and severity of storms, heavy rainfall, and flooding events.

### 12.3.2 Climate pollutants

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

The release of anthropogenic GHGs is altering the Earth's atmosphere resulting in a 'Greenhouse Effect'. This effect is causing an increase in the atmosphere's heat trapping abilities resulting in increased average global temperatures over the past number of decades. The release of $CO_2$ as a result of burning fossil fuels, has been one of the leading factors in the creation of this 'Greenhouse Effect'. The most significant GHGs are $CO_2$, methane ($CH_4$) and nitrous oxide ($N_2O$).

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

Carbon dioxide is considered the primary greenhouse gas due to its abundance in the atmosphere and its long atmospheric lifetime. $CO_2e$, or carbon dioxide equivalency, is a metric used in carbon assessments to express the total GWPs of the different greenhouse gases in terms of the amount of $CO_2$ that would have the same impact over a given period. This allows for easier comparison and quantification of the total greenhouse gas impact of different sources.

### 12.3.3 Baseline emissions

Given the circumstances of Ireland's declaration of a climate and biodiversity emergency in May 2019, and the November 2019 European Parliament approval of a resolution declaring a climate and environment emergency in Europe, in conjunction with Ireland's current failure to meet its EU binding targets under the EU Effort Sharing Regulation, changes in GHG emissions either beneficially or adversely are of more significance than previously viewed prior to these declarations. Thus, the baseline climatic environment should be considered a highly sensitive environment for the assessment of impacts.

In June 2022, the EPA released the report Ireland's Greenhouse Gas Emissions Projections 2021-2040 (EPA, 2022b), which includes total projected emissions and a breakdown of projected emissions per sector under the "With Existing Measures" and "With Additional Measures" scenarios.

Implementation of "Additional Measures" (including those in the 2021 Climate Action Plan) is projected to deliver 28% emission reduction by 2030 compared to the 2018 level, while the implementation of "With Existing Measures" can deliver 9% emission reduction over the same period. This represents a reduction of 3% per annum in emissions over the period with the implementation of the "Additional Measures". The latest greenhouse gas emissions projections show total emissions decreasing from the latest inventory (2020)

levels by 10.5% by 2030 under the "With Existing Measures" scenario and by 28% under the "With Additional Measures" scenario.

**Table 12.5** presents the EPA With Existing Measures and Additional Measures scenarios for 2025 and 2030 for the emissions for the ETS sector.

**Table 12.5: Projected emissions for the ETS sector and total emissions (EPA, 2022b)**

| Projections | Year | ETS Sector (Mt $CO_2e$.) | National Total (Mt $CO_2e$) |
|---|---|---|---|
| **With existing measures** | 2025 | 13.25 | 59.46 |
| | 2030 | 9.61 | 52.55 |
| **With additional measures** | 2025 | 13.06 | 55.31 |
| | 2030 | 8.71 | 42.26 |

Following the approval of the Ireland's carbon budgets from CAP 21, Ireland's sectoral emissions ceilings were agreed by Government on 28th July 2022. The total emissions allowed under each budget is set out below, as well as the average annual reduction for each 5-year period, which sets out Ireland's trajectory towards net zero emissions by 2050:

- 2021-2025: 295 Mt CO2 eq1. This represents an average reduction in emissions of 4.8% per annum for the first budget period;
- 2026-2030: 200 Mt CO2 eq. The represents an average reduction in emissions of 8.3% per annum for the second budget period; and
- 2031-2035: 151 Mt CO2 eq. The represents an average reduction in emissions of 3.5% per annum for the third provisional budget.

There is likely to be a beneficial impact on climate during the Operational Phase due to the potential shift away from private car. Therefore, only the impact of the Construction Phase of the Proposed Development is considered. Potential impacts are compared with reference to the ETS sector.

## 12.4 Potential Impacts

### 12.4.1 Construction Phase

The carbon footprint of the Proposed Development during the Construction Phase is estimated based on an assessment of worst-case carbon equivalents, as outlined in **Table 12.6**. The material volumes comprise estimates provided by the design team for the Proposed Development. The carbon assessment assumes no improvement in the carbon intensity of the production of cement and steel over time. The assessment excludes maintenance, repairs, decommissioning, electrical and mechanical equipment and water use.

The estimated carbon footprint of the Proposed Development during the Construction Phase is **1,390 tonnes $CO_2e$**, as outlined in **Table 12.6**.

The embodied carbon is calculated on the basis that all emissions occur over approximately one year, as a worst-case scenario. The predicted results are compared to the EPA's projected ETS Sector $CO_2e$ emissions in 2030 assuming additional measures (assumed as a worst-case construction year). Refer to **Table 12.7**.

**Table 12.6: Estimated carbon footprint of the Proposed Development**

| Element | Embodied carbon contribution tonnes $CO_2e$ / tonne | Quantity of material (tonnes) | Comment / assumptions | Tonnes $CO_2e$ | Sources (Circular Ecology (CE) / National Highways / TII) |
|---|---|---|---|---|---|
| Concrete | 0.11 | 3,000 | Assumed Density 2.4t/m3. Concrete- Average - 0.11t$CO_2e$/tonne. | 342.5 | TII |

| Element | Embodied carbon contribution tonnes $CO_2e$ / tonne | Quantity of material (tonnes) | Comment / assumptions | Tonnes $CO_2e$ | Sources (Circular Ecology (CE) / National Highways / TII) |
|---|---|---|---|---|---|
| | | | Assumed 50km additional transport (TII assumption). HGV - Rigid Average - 0.998 $kgCO_2e$/km (TII). **12.5 $tCO_2e$** for transport. | | |
| Clause 804 hardcore | 0.00438 | 32,400 | Assumed carbon factor of 0.00438$tCO_2e$/tonne - Virgin Land Won resources (CE). Assumed 50km transport (TII assumption). HGV - Rigid Average - 0.998 $kgCO_2e$/km (TII). **124.5 $tCO_2e$** for transport. | 266.4 | TII/CE |
| Reinforcing steel | 0.604 | 187 | Assumed Plain round steel bar reinforcement- Average carbon factor 0.604$tCO_2$/tonne (TII). Assumed 50km additional transport (TII assumption). HGV - Articulated Average - 1.13 $kgCO_2e$/km (TII). **0.8 $tCO_2e$** for transport. | 113.8 | TII |
| Structural steelwork | 1.55 | 88 | Steel Section (CE) - 1.55$tCO_2e$/tonne. 8t/m3 density steel (National highways). Assumed 50km additional transport (TII assumption). HGV - Articulated Average - 1.13 $kgCO_2e$/km (TII). **0.4 $tCO_2e$** for transport. | 136.8 | TII/National Highways |
| Precast concrete elements | 0.148 | 930 | Pre-Cast Concrete - Ordinary Portland Cement (OPC) concrete - CEM I based - with total cementitious content of 300 kg per $m^3$ of concrete - 0.148$tCO_2e$/tonne. Assumed 50km additional transport (TII assumption). HGV - Articulated Average - 1.13 $kgCO_2e$/km (TII). **3.1 $tCO_2e$** for transport. | 140.7 | TII/CE |
| Embankment fill material | 0.00438 | 5,560 | Assumed carbon factor of 4.38$kgCO_2e$/tonne - Virgin Land Won resources (CE). Assumed 50km transport (TII assumption). HGV - Rigid Average - 0.998 $kgCO_2e$/km (TII). **21.4 $tCO_2e$** for transport. | 45.71 | TII/CE |
| Link footway / cycleway surfacing (75% 804 Subbase) | 0.00438 | 1,448 | Assumed carbon factor of 0.00438$tCO_2e$/tonne - Virgin Land Won | 71.6 | TII/CE |

| Element | Embodied carbon contribution tonnes $CO_2e$ / tonne | Quantity of material (tonnes) | Comment / assumptions | Tonnes $CO_2e$ | Sources (Circular Ecology (CE) / National Highways / TII) |
|---|---|---|---|---|---|
| | | | resources (CE). Assumed 50km transport (TII assumption). HGV - Rigid Average - 0.998 $kgCO_2e$/km (TII). Assume Maintenance every 15-25 years (Approximately 6 replacements in lifetime). **5.6 $tCO_2e$** for transport. | | |
| Link footway / cycleway surfacing (25% Asphalt Surface Course) | 0.055 | 483 | Asphalt Average - 0.055$tCO_2$/tonne (National Highways). Assumed 50km additional transport (TII assumption). HGV - Rigid Average - 0.998 $kgCO_2e$/km (TII). Assume Maintenance every 15-25 years (Approximately 6 replacements in lifetime). **1.9 $tCO_2e$** for transport. | 170.6 | TII/National Highways |
| Excavation Activity | 0.00052 | 4000 | Assumed density 2t/m3. General Excavation - 0.00052$tCO_2e$/tonne (TII). **0 $tCO_2e$** for transport. | 2.1 | TII |
| Excavated Waste | 0.001239 | 4000 | Assumed carbon factor of 1.239$kgCO_2e$/tonne - Aggregate and Soil Off-Site to landfill (TII). Assumed dispose to landfill (reuse offsite not yet assessed), with 50km additional transport (TII assumption). HGV - Rigid Average - 0.998 $kgCO_2e$/km (TII). **15.4 $tCO_2e$** for transport. | 20.3 | TII |
| Site Clearance | 0.439 | 1.06 hectares | 10,600$m^2$ Minor vegetation clearance (0.78ha). General Site Clearance (Transitional Woodland Scrub) - 0.439$tCO_2e$/ha. **0 $tCO_2e$** for transport. | 0.5 | TII |
| Construction Site | 1.05 | Approximately 74 Weeks | Captures Estimated Employee Commuting, plant use and other site operations such as compound activities. Medium Size Construction site (construction cost €1.5m to €5m, between 9 and 15 people permanently on site) - 1.05$tCO_2e$/week (TII). Assumed duration c.74 weeks (approx. 17 months). **0 $tCO_2e$** for transport. | 77.7 | TII |
| | | | **Total** | **1390** | $tCO_2e$ |

**Table 12.7: Estimated carbon output during the Construction Phase**

| | |
|---|---|
| **Estimated $CO_2$ e. Construction Phase (Mt)** | 0.0139 |
| **Projected ETS sector $CO_2$ e. 2030 with additional measures (Mt)** | 8.71 |
| **As % 2030 ETS sector $CO_2$ e. emissions with additional measures** | 0.16 % |
| **Projected total Irish $CO_2$ e. emissions 2030 with additional measures (Mt)** | 42.26 |
| **As % of 2030 total $CO_2$ e. emissions with additional measures** | 0.03% |

The annual carbon emissions from the construction of the Proposed Development are estimated to be 0.16% of the projected ETS Sector $CO_2$e. emissions (with additional measures) in 2030. The carbon emissions from the construction of the Proposed Development are estimated to be 0.03% of Ireland's projected total $CO_2$e. emissions (with additional measures) in 2030. The carbon emissions from the construction of the Proposed Development are estimated to be 0.007% of Ireland's total carbon budget for the 2026-2030 budget period.

In line with the significance criteria set out in **Table 12.1**, the Proposed Development is expected to have a minor, adverse, long-term impact in terms of climate change during the Construction Phase.

### 12.4.2 Operational Phase

As discussed, there will be no significant carbon impacts as a result of the maintenance works required during the Operational Phase.

The Proposed Development will provide an attractive alternative to the private car and promote a modal shift to walking, cycling and public transport. The Proposed Development will also support the delivery of government strategies outlined in the 2023 CAP and the 2021 Climate Act by enabling sustainable mobility and supporting a sustainable transport system. Its aim is to provide enhanced walking and cycling infrastructure in the Cork Region. The Proposed Development will provide connectivity and integration with other public transport services leading to more people availing of public transport, helping to further reduce $CO_2$e emissions.

### 12.4.3 Decommissioning Phase

As discussed, there will be no adverse significant carbon impacts as a result of the Decommissioning Phase of the Proposed Development.

### 12.4.4 Vulnerability to climate change

#### *12.4.4.1 Flood risk*

A Flood Risk Assessment (FRA) has been conducted for the Proposed Development (refer to **Appendix 16.1** in **Volume 4** of this EIAR), which revealed that the primary source of flood risk to the development is coastal. The proposed bridge location falls within Flood Zone A and the 0.5% AEP coastal floodplain on the northern access ramp. A cautious approach was taken, and it was determined that the maximum flood level on the site would be 3.66m OD, with a small section of the northern access ramp expected to be flooded due to its low elevation of 3.40m OD. This was deemed acceptable because the bridge structure is considered "less vulnerable" due to the flood-resistant vegetation on the embankment of the access ramp.

Despite being partially located in Flood Zone A, a Justification Test was performed to ensure that the development complies with the Guidelines. The results of the test indicated that the proposal is suitable for the proposed location, promotes sustainable urban growth, and will not interfere with the floodplain area.

Therefore, the coastal flood risk's impact on the Proposed Development is assessed to be of high exposure and low sensitivity, resulting in low vulnerability.

#### *12.4.4.2 Temperature and extreme weather*

Met Éireann's climate predictions for the future have been published in 'Ireland's Climate: the road ahead' (Met Éireann, 2013), based on four scenarios (RCP2.6, RCP4.5, RCP6.0, and RCP8.5) named after the radiative forcing values for the year 2100 (2.6, 4.5, 6.0, and 8.5 W/m2), with a focus on the medium-low (RCP4.5) and high (RCP8.5) scenarios. The mean temperature is expected to increase by 1°C to 3°C under RCP4.5, rising to 2°C to 4°C under RCP8.5. Warm extremes are expected to increase by 2°C to 3°C under RCP4.5 and up to 5°C under RCP8.5. These increased temperatures may cause construction materials like asphalt / bitumen to heat up. However, since the temperature is projected to increase by only 1°C to 3°C under RCP4.5, it is unlikely to have a significant impact on construction materials.

Therefore, the likelihood of increased temperatures affecting the Proposed Development is assessed to have high exposure with negligible or low sensitivity, resulting in low vulnerability.

## 12.5 Mitigation and Monitoring

### 12.5.1 Mitigation

#### *12.5.1.1 Construction Phase*

There will be mitigation embedded through the design of the Proposed Development including the use of low carbon construction materials, such as the use of recycled aggregate, where practicable.

As ETS carbon allowances for energy intensive industries are regulated by the EPA under the GHG permitting regime, the $CO_2e$. calculated, and shown in **Table 12.7,** are assumed to be incorporated within the projected ETS allowances. ETS allowances are reduced annually, forcing industry to minimise emissions. As improvements in sustainability and recycling measures are progressed throughout the construction industry, it is expected that the embodied carbon calculated as part of this assessment can be taken as a worst case, as with time this figure will improve.

A series of mitigation measures have been incorporated into the construction design with the goal of reducing the embodied carbon associated with the Construction Phase of the Proposed Development. These mitigation measures include:

- The Proposed Development will use low carbon construction materials, such as recycled aggregate, where practicable;
- Where practicable, opportunities for materials reuse will be incorporated within the extent of the Proposed Development;
- Where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport; and
- The Proposed Development will minimise wastage of materials due to poor timing or over ordering on site thus helping to minimise the embodied carbon footprint of the Proposed Development.

#### *12.5.1.2 Operational Phase*

As there are no significant adverse effects on carbon predicted during the Operational Phase, no mitigation measures are proposed.

#### *12.5.1.3 Decommissioning Phase*

As there are no significant adverse effects on carbon predicted during the Decommissioning Phase, no mitigation measures are proposed.

#### *12.5.1.4 Vulnerability to Climate Change*

Other than the employment of good construction management practices, and standard measures to be employed during construction as outlined in the CEMP (refer to **Appendix 5.1** in **Volume 4** of this EIAR), as there are no significant adverse effects associated with climate change vulnerability predicted for the Proposed Development, no additional mitigation measures are proposed.

### 12.5.2 Monitoring

As there are no significant adverse effects on climate predicted during the Construction Phase, Operational Phase or Decommissioning Phase, no monitoring measures are proposed.

## 12.6 Cumulative Impacts

A review of CCC, An Bord Pleanála (ABP) and Department of Housing, Local Government and Heritage (DHLGH) online planning records has indicated that other projects have been permitted or proposed within the surrounding area that may give rise to cumulative impacts in combination with the impacts of the Proposed Development. The list of projects is included in **Chapter 20,** *Cumulative and Interactive Impacts*.

The Proposed Development does not give rise to significant adverse effects on climate. Climate is affected by macro-scale carbon contribution rather than by local effects. Therefore, projects need not necessarily be considered at a local level for the cumulative assessment. As such, no significant cumulative effects to climate are predicted as a result of the Proposed Development in combination with the projects listed in **Chapter 20,** *Cumulative and Interactive Impacts*.

## 12.7 Residual Impacts

Any potential adverse impacts generated during the Construction Phase of the development will be offset by the potential carbon reductions during the Operational Phase. Over the lifespan of the Proposed Development, a beneficial and long-term impact on climate is expected as the Proposed Development will result in a modal shift to walking, cycling and public transport.

There are no significant adverse residual effects associated with climate change vulnerability predicted for the Proposed Development.

## 12.8 References


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