Chapter 13
Climate

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13. CLIMATE

13.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) assesses the likely climate impacts and the impact of climate change risks on the West Clare Railway Greenway Section 1 Kilrush to Kilkee (hereafter referred to as the 'proposed development').

The proposed development comprises a walking and cycling amenity along the general route of the abandoned West Clare Railway between Kilrush and Kilkee in County Clare, connecting towns and villages along the route. A full description of the proposed development is outlined in Chapter 2 'Description of the Proposed Development' of this Environmental Impact Assessment Report (EIAR).

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

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

This chapter was prepared by Ciara Nolan. Ciara is a Principal Environmental Consultant in the Air Quality & Climate section of AWN Consulting. She holds a BSc in Energy Systems Engineering from University College Dublin and has also completed an MSc in Applied Environmental Science at UCD. She is a Member of the Institute of Air Quality Management (MIAQM) and the Institution of Environmental Sciences (MIEnvSc). She has over 9 years of experience in undertaking air quality and climate assessments. She specialises in the fields of air monitoring, air quality & climate assessments for EIA and air dispersion modelling. Ciara has undertaken detailed climate assessments for various projects at EIA stage in line with the requirements in the National Climate Action Plan and Section 15 obligations under the Climate Action and Low Carbon Development Act. Project types include residential, commercial and infrastructure developments (road, utility connections) as well as industrial developments and renewable energy projects. She has undertaken air quality and climate impact assessments for transportation schemes, primarily regional and national road schemes, from constraints, through to route selection and EIAR stage.

13.2 Guidance, Legislation and Policy

In common with all environmental legislation, in Ireland climate legislation is driven primarily by international agreements or European Directives that are then transcribed into domestic law by the Government of Ireland. This is then interpreted through European and domestic policy instruments that clarify aspects, objectives, targets and requirements described in the legislation.

13.2.1 Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on climate are summarised below. In addition to specific climate guidance documents, the following guidelines were considered and consulted in the preparation of this chapter:

- EPA (2022) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the Environmental Protection Agency (EPA) Guidelines)*; and
- European Commission (2017) *Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report*.

The assessment has referred to national guidelines where available, in addition to international standards and guidelines relating to the assessment of climate impacts. These are summarised below:

- BSI (2023) *Carbon Management in Infrastructure and Built Environment - PAS 2080* ;
- Transport Infrastructure Ireland (TII) (2024) *Environmental Impact Assessment of Rural Cycleways (Offline & Greenway) – A Practical Guide (PE-ENV-01109)*;
- Environmental Protection Agency (2025) *National Climate Change Risk Assessment*;
- Environmental Protection Agency (2024a) *National Climate Change Risk Assessment (NCCRA), Technical Guidance on Sectoral Assessment*;
- International Organization for Standardization (ISO) (2021) *ISO 14091:2021. Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment*;
- Institute of Sustainability and Environmental Professionals (ISEP) (2022) (formerly known as Institute of Environmental Management & Assessment (IEMA)) *Environmental Impact Assessment Guide to: Assessing GHG Emissions and Evaluating their Significance* ;
- ISEP (2020a) *Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation*;
- ISEP (2020b) *GHG Management Hierarch*y ;
- ISEP (2010) *Principles Series: Climate Change Mitigation & EIA*;
- European Commission (2021a) *Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027*
- Transport Infrastructure Ireland (TII) (2022) *Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document PE-ENV-01104*;
- TII (2025a) *TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document GE-ENV-01106.*

13.2.2 Legislation

The **United Nations Paris Agreement** (United Nations, 2015) treaty binds signatory nations to a commitment to hold global average temperature increase well below 2°C above pre-industrial levels with efforts to limit the increase to 1.5°C below pre-industrial levels. Signatories commit to Nationally Determined Contributions (NDCS) which are self- defined climate pledges made by countries in response to climate change, which also includes the direction of finance. Adaptation to the adverse impacts of climate change and lowering greenhouse gas emissions should be undertaken in an equitable manner so as not to disadvantage populations on lower incomes or those most at risk from climate change.

Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (European Parliament and Council, 2021) follows from the Paris Agreement and writes into EU law the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. The law also sets the intermediate target of reducing net greenhouse gas (GHG) emissions by at least 55% by 2030, compared to 1990 levels. These targets are also applied to member states.

Directive 2014/52/EU 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 (European Parliament and Council, 2014) acknowledges that climate change will play a crucial role in the sustainable development of society. Directive 2014/52/EU requires assessment of the impact of specific types of new development on the climate. There is a requirement for the quantification of greenhouse gases from a development, and an assessment of the risk posed to specific types of new development by the adverse effects of climate change.

The **Climate Action and Low Carbon Development Act 2015** (Government of Ireland, 2015) (hereafter referred to as 'the 2015 Act') enables Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050*'. This is referred to in the 2015 Act (as amended) as the '*national transition objective*'. The 2015 Act (as amended) made provision for a national mitigation plan, and a national adaptation framework. In addition, the 2015 Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

Section 15 of the 2015 Act, sets out the duties imposed by certain bodies, including local authorities and An Coimisiún Pleanála. This section was amended by the 2021 Climate Action and Low Carbon Development (amendment) Act and states:

"(1) A relevant body shall, in so far as practicable, perform its functions in a manner consistent with—

(a) the most recent approved climate action plan,

(b) the most recent approved national long term climate action strategy,

(c) the most recent approved national adaptation framework and approved sectoral adaptation plans,

(d) the furtherance of the national climate objective, and
(e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State.".

The **Climate Action and Low Carbon Development (Amendment) Act 2021** (Government of Ireland, 2021) (hereafter referred to as 'the 2021 Act') provides the framework for Ireland to achieve a climate resilient and climate neutral economy by the end of the year 2050. The 2021 Act allows for the setting of carbon budgets and sectoral emissions ceilings to apply to sectors of the economy whilst promoting climate justice and just transition to the climate resilient and climate neutral economy. Carbon budgets are determined based on the requirements for reductions in GHG described in EU Regulation 2018/842 and EU Regulation 2018/842. The Climate Action and Low Carbon Development (Amendment) Act 2021 should be read together with the Climate Action and Low Carbon Development Act 2015, and together are referred to in this report as the "Climate Act".

13.2.3 Policy

The **European Green Deal** published by the European Commission in December 2019, provides an action plan which aims for the EU to achieve climate neutrality by 2050. The EU Green Deal highlights a reduction in emissions of 55% in comparison to 1990 levels by 2030 and 90% by 2040. The deal outlines plans for a just and fair transition to a climate neutral society though funding and social investment, carbon pricing, the Emissions Trading Scheme, green industry, the circular economy and stakeholder engagement in the processes at every level.

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…"

The latest iteration of the Government of Ireland's Climate Action Plan (CAP25) (Government of Ireland, 2025a) was published in 2025 updating many of the suggested measures and actions required to achieve carbon budgets and sectoral emissions ceilings from CAP24 (Government of Ireland, 2024a). Both CAP24 and CAP25 should be read together. The plans taken together provide the roadmap for halving Ireland's emissions by 2030 and achieving carbon neutrality by 2050. CAP25 details the 5-year carbon budget periods, shown in Table 13-1, and the Sectoral Emissions Ceilings, shown in Table 13-2, as required by the Climate Act. CAP26 was due to be published in April 2026 but at the time of writing was not yet available. This assessment has referenced the most recent CAP available at the time of writing, CAP25.

Table 13-1 5-Year Carbon Budgets

Budget Period	Carbon Budget	Reduction Required
2021-2025	295 Mt CO_2e	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO_2e	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO_2e	Reduction in emissions of 3.5% per annum for the third provisional budget.

Table 13-2 Sectoral Emission Ceilings 2030

Sector	Baseline ($MtCO_2e$)	Carbon Budgets ($MtCO_2e$)		2030 Emissions ($MtCO_2e$)	Indicative Emissions % Reduction in Final Year of 2025 – 2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Electricity	10	40	20	3	75
Transport	12	54	37	6	50
Built Environment – Residential	7	29	23	4	40
Built Environment – Commercial	2	7	5	1	45
Industry	7	30	24	4	35
Agriculture	23	106	96	17.25	25
Other (F-gases, waste, petroleum refining)	2	9	8	1	50
Land Use, Land-use Change and Forestry (LULUCF)	5	*Reflecting the continued volatility for LULUCF baseline emissions to 2030 and beyond, a new approach aligned with the EU LULUCF Regulation has been adopted.*			
Total	68				
Unallocated Savings	-	-	26	-5.25	-

Sector	Baseline ($MtCO_2e$)	Carbon Budgets ($MtCO_2e$)		2030 Emissions ($MtCO_2e$)	Indicative Emissions % Reduction in Final Year of 2025 – 2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Legally Binding Carbon Budgets and 2030 Emission Reduction Targets	-	295	200	-	51

The **Long-Term Strategy on Greenhouse Gas Emissions Reductions** (Government of Ireland, 2023) provides the indicative pathways beyond 2030 on how Ireland will transition towards carbon neutrality by 2050. The strategy is intended to bridge the gap between the short-term objectives of the Climate Action Plans and the longer-term objectives of EU Climate Law and Ireland's National Climate Objective.

The **National Planning Framework (First Revision)** (Government of Ireland, 2025b) specifies policies relevant for the proposed development:

- National Policy Objective 1: Ensure that all plans, projects and activities requiring consent arising from the National Planning Framework are subject to the relevant environmental assessment requirements including SEA, EIA, SFRA and AA as appropriate.
- National Policy Objective 37: Ensure the integration of safe and convenient alternatives to the car into the design of our communities, by prioritising walking and cycling accessibility to both existing and proposed developments, and integrating physical activity facilities for all ages
- National Policy Objective 69: Reduce our carbon footprint by integrating climate action into the planning system in support of national targets for climate policy mitigation and adaptation objectives, as well as targets for greenhouse gas emissions reductions as expressed in the most recently adopted carbon budgets.

13.2.3.1 Climate Change Vulnerability Policy

The **Second National Adaptation Framework (NAF)** (Government of Ireland, 2024b), published in June 2024 under the Climate Action and Low Carbon Development Act 2015, outlines a comprehensive, whole-of-government and whole-of-society approach to climate adaptation. Its core objective is to enhance Ireland's resilience to a wide range of climate risks, including extreme weather events, flooding, drought, biodiversity loss, sea level rise, and rising temperatures.

Building on the principles of a "Just Transition", the NAF introduces the concept of "Just Resilience'', envisioning a climate-resilient Ireland that ensures fairness, equity, and inclusivity in adaptation planning and implementation. It promotes reduced reliance on fossil fuels, the expansion of electrified and accessible public transport, and the integration of sustainability and climate resilience across all sectors. These include energy, water, wastewater, agriculture, transport, health, built environment, and biodiversity, with a strong emphasis on mainstreaming adaptation practices into policy, planning, and operations.

With respect to the transport sector, the second NAF highlights several potential climate impacts and risks and adaptation measures:

- Projected extreme precipitation may increase pluvial and fluvial flooding, impacting the transport sector with service disruptions, hazardous travel conditions, bridge scour and infrastructure deterioration. Flooding may also affect active travel routes such as cycleways and footpaths, reducing accessibility and safety.

- Intensified windstorms may disrupt transport hubs, causing delays and cancellations, and affecting transport networks with fallen trees and debris. Active travel corridors could also be blocked, creating hazards for pedestrians and cyclists.
- Sea level rise and intensified storms may significantly impact transport infrastructure in low-lying coastal areas, eroding coastlines and estuaries. Coastal walking and cycling paths are particularly vulnerable to damage or loss.
- Heatwaves and drought may degrade transport infrastructure, affect road surfaces and rail networks, and require temperature control measures in hubs. For active travel, prolonged heat events may necessitate shaded rest areas, hydration points, and heat-resilient surfacing to maintain safe conditions for walking and cycling.

As part of the 2024 NAF, there is a requirement for development and publication of sectoral adaptation plans (SAP) for 13 key sectors. 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, economy, and competitiveness are resilient to the impacts of climate change.

The SAP for the transport sector was published in November 2025 - **Transport Sectoral Adaptation Plan (T-SAP II) 2025 – 2030** (Government of Ireland, 2025b). Table 13 of the Transport SAP details the prioritised climate impacts for active travel networks. This includes risk ratings for both RCP4.5 and RCP8.5 for the short-term (Year 2030), medium-term (Year 2050) and long-term (Year 2100). The primary impacts are coastal erosion, fluvial flooding and changes in precipitation and pluvial flooding. Coastal, pluvial or fluvial flooding can make walking and cycling paths impassable at times. New infrastructure is built with good drainage in place, however, the SAP states that the risk is expected to increase in the future with projected changes in winter precipitation and more heavy rainfall.

Cycle and walking paths along the coastline are at significant risk of coastal erosion due to wave action, storm surges, and rising sea levels, which may undermine path foundations and cause sections to collapse. Specifically, the Transport SAP states:

> "*Many greenway tracks in Ireland have been built on former railway lines, located in rural areas, where earthwork has not been properly maintained as these have been out of use for a long period. When soil becomes saturated quickly due to prolonged or intense rainfall, the structural integrity of railway embankments, which are often made of loose or compacted materials, can be compromised. Conversely, periods of drought can dry out the soil, causing it to shrink and crack. These cracks can create unstable conditions, where the earthworks lose cohesion and may result in sudden failure, resulting in serious safety risks*."

The **National Climate Change Risk Assessment Main Report (NCCRA)** was published in June 2025 (EPA, 2025a). The NCCRA was required to be developed under Action 457 from the 2021 CAP (Government of Ireland, 2021). Action 457 seeks to "Further develop Ireland's national climate change risk assessment capacity to identify the priority physical risks of climate change to Ireland'. The NCCRA uses definitions of the risk determinants from the Intergovernmental Panel on Climate Change (IPCC) Risk Framework (IPCC, 2023):

- **Hazard** - the potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.
- **Exposure** - the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.

- **Sensitivity** - refers to the degree to which a system or asset is affected by climate hazards. It reflects how vulnerable something is to changes such as temperature extremes, flooding, or drought, based on its physical, functional, or ecological characteristics.
- **Vulnerability** - the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity.
- **Risk** - the potential for adverse consequences for human or ecological systems.

Compilation of the NCCRA was undertaken using scenarios from the fifth Intergovernmental Panel on Climate Change Assessment Report (AR5). The NCCRA used a high concentration scenario resulting a predicted average global temperature increase of 4.3°C by 2100 (RCP8.5) generally accepted as an extreme worst-case scenario, and a moderate scenario (RCP4.5) where emissions are predicted to peak by 2040 and then decline resulting in an average global temperature increase of between 2.5°C and 3°C. Both scenarios are considered conservative for Ireland as they assume that emissions targets are not met.

13.2.3.2 Local Authority Policy

The Clare County Council Climate Action Plan 2024 – 2029 (Clare County Council, 2024) outlines Clare County Council's goals to mitigate GHG emissions and plans to prepare for and adapt to climate change.

Action T1 of the Clare County Council Climate Action Plan is to "*Increase active travel and* electric *vehicle infrastructure across County Clare towards the advancement of sustainable, accessible, and safe mobility*". Advancing the delivery of the West Clare Railway Greenway is action T1.2.

The Clare County Council Climate Action Plan 2024-2029 highlights the risks that climate change poses to the county, these include increases in the risk of river, pluvial, and coastal flooding and coastal erosion. The risk of these hazards is likely to increase in the future because of changes in both hazard frequency as a result of climate change and impact due to changes in exposure and vulnerability. Heatwaves and droughts are expected to occur more frequently due to climate change and with a greater impact on County Clare in the future.

13.3 Methodology

13.3.1 Aspects Relevant to this Assessment

Construction and operational greenhouse gas (GHG) emissions have been assessed with respect to the proposed development. During the construction phase, embodied carbon associated with construction materials, transport of materials, clearance, demolition and excavation of existing land, construction waste and disposal routes will be calculated, as these activities have the potential to impact climate through the release of CO_2 and to a lesser extent, other greenhouse gases (GHGs). Impacts to climate are assessed against Ireland's obligations under the EU 2030 GHG targets and sectoral emissions ceilings.

During the operational phase, maintenance activities, electricity usage and vehicle use both contribute to GHG emissions and will be calculated as part of this assessment. In addition, the vulnerability of the proposed development in relation to future climate change must be considered during the operational phase. The proposed development has been designed to minimise the impact on climate where possible in reference to measures within the Climate Action Plan 2025 (Government of Ireland, 2025) and other relevant policy.

GHG emissions reductions in relation to a modal shift from vehicle use have not been quantified for the purpose of this assessment, but are discussed in this chapter and elsewhere in the EIAR in terms of potential benefits of the proposed development.

13.3.2 Study Area

Climate impacts are assessed at a national level and in relation to national targets and sectoral emission ceilings. The study area for climate is the Republic of Ireland.

In relation to climate change vulnerability, the study area comprises the proposed development assets and is confined to the boundary of the proposed development.

13.3.3 Greenhouse Gas Assessment Methodology

As per the EU guidance document Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission, 2013) the climate baseline is first established with reference to EPA data on annual GHG emissions (see Section 13.4.1).

13.3.3.1 Construction Phase

The GHG assessment has been conducted following the Transport Infrastructure Ireland (TII) guidance document entitled PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document (TII, 2022). The GHG assessment accounts for various components relating to the proposed development during different life stages to determine the total impact on climate. Embodied carbon refers to the sum of the carbon needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site.

To provide a consistent approach to GHG assessments, TII have developed the Carbon Assessment Tool (TII 2025) for carbon accounting. PE-ENV-01104 (TII 2022) states that the Climate Practitioner shall use the TII Carbon Tool for the calculation of emissions arising from the construction and maintenance of a proposed project. The tool uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013), the Inventory of Carbon and Energy (ICE) V4.0 database and the Sustainable Energy Authority of Ireland (SEAI), which can be applied to a variety of developments. The tool aligns with PAS 2080.

The assessment followed the lifecycle stage terminology consistent with widely used industry standards (based on BS EN 15978:2011, BS EN 15804:2012):

Stage A1 – A3: Product Carbon The carbon emissions generated at this stage arise from extracting the raw materials from the ground, their transport to a point of manufacture and then the primary energy used (and the associated carbon impacts that arise) from transforming the raw materials into construction products.

Stage A4 – A5: Construction Carbon These carbon impacts arise from transporting the construction products to site, and their subsequent processing and assembly into the building.

Stage B1 – B5: In Use Carbon – use of the building (B1), maintenance (B2), repair (B3), replacement (B4) and refurbishment (B5).

Stage B6, B7, B8: In Use Phase operational use energy (B6), water (B7) and user utilisation of infrastructure (B8).

Stage C1 – C4: End of Life Carbon The eventual deconstruction and disposal of the existing building at the end of its life takes account of the on-site activities of the demolition contractors.

No 'credit' is taken for any future carbon benefit associated with the reuse or recycling of a material into new products.

Stages A1 to A5 (Product Carbon and Construction Carbon) and B2 (Maintenance) to B5 (Refurbishment) have been included in this assessment. Due to the nature of the proposed development, Stage B1 (Building Use) is likely insignificant and has therefore been scoped out. There are no significant buildings included as part of the proposed development, there will be some minor built elements such as toilets which are considered insignificant. Stage B8 (User Utilisation of Infrastructure) includes operational phase user emissions associated with traffic and opportunities for modal shift. These impacts are not expected to be significant and have therefore been scoped out as per TII guidance (2025b), see Section 13.3.3.2. Stage B6 (operational energy use) and B7 (operational water use) have been excluded as the proposed development is not expected to require significant energy during operation, energy use is limited to lighting which is limited to the trailheads. The proposed development is also unlikely to require large quantities of water during its operation as there are no significant operational water uses proposed, therefore the B6 and B7 emissions are considered insignificant. It is assumed that end-of-life demolition (Stage C1 – C4) is not relevant, or likely, due to the nature of the proposed development and thus these stages have been scoped out of the assessment. A list of assumptions can be found in Table 13-5.

The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that would be used over the entire construction and maintenance phase. The TII Carbon Assessment Tool (TII 2025a) has been commissioned by TII to assess GHG emissions associated with road, rail and greenway infrastructure projects and thus is the appropriate tool for use on the proposed development. The goal of the tool is to assist project development as a decision-making tool that drives lower carbon infrastructure and to facilitate the integration of environmental issues into infrastructure planning, construction and operation. This engagement aims to ensure carbon savings are made and to assist in aligning the project to Ireland's CAP goal of Net Zero Carbon by 2050.

The proposed development is expected to have a construction phase of approximately 16 - 24 months. For the purposes of this assessment 24 months (2 years) has been chosen as a conservative approach. An operational phase lifespan of 120 years has been used in this assessment based on guidance from EN17472:2022 Sustainability of construction works - Sustainability Assessment of Civil Engineering Works - Calculation Methods (BSI 2022).

The assessment has been divided into the following categories:

- Pre-Construction – this includes site clearance works and land-use change.
- Embodied Carbon of materials – this includes the quantities of construction materials required for the proposed development, e.g., steel, concrete, asphalt and aggregates.
- Construction Activities – GHG emissions associated with excavation works, water use, fuel usage.
- Construction Waste – GHG emissions associated with demolition and construction waste materials.
- Transport – GHG emissions from transport of materials to site and transport of waste materials to a waste facility. Worker travel to site is also included in this category.
- Maintenance – GHG emissions associated with ongoing maintenance of the proposed development over an assumed 120-year operational lifespan. This is based on the default maintenance cycles in the TII Carbon Tool.
- Operational Phase Land-Use Change – GHG emissions associated with land-use change due to landscaping and vegetation planting resulting in increased carbon sink potential.

Material quantities, wastes quantities and transport volumes as well as energy and fuel usage were supplied by the project team and incorporated into the TII Carbon Tool in order to complete the assessment.

13.3.3.2 Operational Phase

Material Maintenance & Operational Land-Use Change

The TII Carbon Tool (TII, 2025) includes for ongoing maintenance and replacement of materials over the lifetime of the proposed development. These are default values based on the assumed 120-year lifespan of the proposed development.

Operational phase land-use change is as a result of landscaping planting along the proposed route, this offsets some of the GHG emissions associated with land-clearance activities. The planting includes c.14.76 ha which has been categorised as 'transitional woodland scrub' in the TII Carbon Tool, as this is the most appropriate land-use type.

Traffic Emissions

Emissions from road traffic associated with the operational phase of the proposed development have the potential to emit carbon dioxide (CO_2) which will impact climate.

The TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2025b), states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment, and also the climate assessment. While the guidance is specific to infrastructure projects the approach can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5 m or greater.

The proposed development is a greenway route, which provides facilities for pedestrians and cyclists. As a result, the proposed development is not predicted to cause a significant change in road traffic The change in traffic was reviewed against the above TII screening criteria, and it was determined that a detailed assessment could be screened out as none of the criteria are met. There is no potential for significant impacts to climate from operational phase traffic emissions associated with the proposed development. Construction phase traffic is assessed and included within the TII Carbon Tool (TII, 2025a) as discussed above.

Utilisation of Infrastructure – Modal Shift

The proposed development will allow for a modal shift from private vehicles to active travel. As this is not expected to be a significant change, it has not been quantified as part of the assessment however it is noted the proposed development will result in a reduction in GHG emissions in the long-term due to less traffic on the road. Potential uses include as a tourism amenity as the proposed development is located between two popular tourism areas in County Clare. Additionally, the proposed development will provide active travel facilities for locals in the area; the proposed development route is in close proximity to Moyasta National School and would provide an opportunity for staff and students to travel to school by walking or cycling.

The modal shift and other associated benefits to the local community have been assessed in the EIAR in Chapter 6 Population and Chapter 7 Human Health.

13.3.3.3 Significance Criteria for GHGA

PE-ENV-01104 (TII 2022) outlines a recommended approach for determining the significance of both the construction and operational phases of a development.

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

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

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

The criteria for determining the significance of effects are a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors (i.e. Ireland's National GHG targets). In relation to climate the project will be assessed against the recommended TII significance determination. This takes account of any embedded or committed mitigation measures that form part of the design which should be considered.

TII (TII, 2022) states that professional judgement must be considered when contextualising and assessing the significance of a project's GHG impact. TII reference the ISEP guidance (ISEP, 2022) which states that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

The ISEP 2026 Supplementary Guidance on Assessing Greenhouse Gas Emissions And Evaluating Their Significance (ISEP, 2026) states that significance should be judged not just on the absolute magnitude of emissions from a project, but also the degree to which these are mitigated. The degree of mitigation should be judged relative to an applicable 1.5°C or net zero compatible trajectory. This is aligned with the TII PE-ENV-01104 guidance (TII, 2022)

Significance is determined using the criteria outlined in
Table 13-3 (derived from Table 6.7 of PE-ENV-01104 (TII, 2022)) along with consideration of the following two factors:

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

Table 13-3 Significance Criteria for GHGA

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

Ireland's carbon budgets can also be used to contextualise the magnitude of GHG emissions from the proposed development (TII, 2022). The approach is based on comparing the net proposed development GHG emissions to the relevant carbon budgets (Government of Ireland, 2025). With the publication of the Climate Action Act in 2021 and the Climate Action Plan 2025, sectoral carbon budgets have been published for comparison with the net GHG emissions from the proposed development over its lifespan.

The aim of the carbon budgets is to ensure we are on a trajectory to meet the National Climate Objective of Net Zero by 2050.

13.3.4 Climate Change Risk Assessment Methodology

As per PE-ENV-01104 (TII, 2022), an initial screening of risk during the operational phase is conducted. This is carried out by determining the sensitivity of proposed development assets (i.e. receptors) and their exposure to climate change hazards.

The proposed development asset categories must be assigned a level of sensitivity to climate hazards. PE-ENV-01104 (TII, 2022) provides the list of asset categories and climate hazards

to be considered. The asset categories will vary for development type and need to be determined on a development-by-development basis.

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

First an initial screening of physical hazards is carried out based on the proposed site location. This is a qualitative screening which intends to only proceed with relevant hazards (e.g., sea level rise is not an applicable hazard to inland areas or wildfire is not considered a hazard in an urban location). Following this, all-relevant hazards are assessed on their exposure under future climate change.

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

- **High Sensitivity** - The climate hazard will or is likely to have a major impact on the asset category. This is a sensitivity score of 3.
- **Medium Sensitivity** - It is possible or likely the climate hazard will have a moderate impact on the asset category. This is a sensitivity score of 2.
- **Low Sensitivity** - It is possible the climate hazard will have a low or negligible impact on the asset category. This is a sensitivity score of 1.

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

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

Once the sensitivity and exposure are categorised, a vulnerability analysis is conducted by multiplying the sensitivity and exposure to calculate the vulnerability.

13.3.4.1 Significance Criteria for CCRA

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

Vulnerability = Sensitivity x Exposure

The vulnerability assessment takes any proposed mitigation into account. Table 13-4 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale.

TII guidance (TII, 2022) and the EU technical guidance (European Commission, 2021a) note that if all vulnerabilities are ranked as low in a justified manner, no detailed climate risk

assessment may be needed. Therefore, the impact from climate change on the proposed development can be considered as not significant.

However, where residual medium or high vulnerabilities exist the assessment may need to be progressed to a detailed climate change risk assessment and further mitigation implemented to reduce risks. An assessment of construction phase CCRA impacts is only required according to the TII guidance (TII, 2022) if a detailed CCRA is required.

Table 13-4 Climate Change Vulnerability Matrix

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

The screening and Climate Change Vulnerability Assessment detailed in Section 13.5.3.2 did not identify any residual medium or high risks to the proposed development as a result of climate change. Therefore, a detailed CCRA for the construction and operational phase were scoped out.

Although the proposed development is likely to be exposed to potential weather extremes due to climate change during the construction phase, the potential length of the construction phase and its transient nature means that a CCRA for the construction phase can be scoped out. However, best practice mitigation against climate hazards during construction is still recommended as outlined in Section 13.7.1.

13.3.5 Difficulties encountered

The proposed development is still in the design stage and therefore materials used, construction and operational activities are subject to change. Data assumptions for the GHG assessment are set out in Table 13-5. All assumptions follow a conservative approach.

Table 13-5 GHG Assessment Assumptions

GHG Assessment Category	Elements Considered
Materials	Materials for fill, pavements, structures, signs, fences, etc. Concrete use assumed a 50% granulated blast furnace slag (GGBS) replacement as a lower carbon material choice. Bitumen-based material use has been reduced as part of the proposed development design and is an embedded mitigation measure.
Material transport	Kms travelled by HGVs during construction phase based on assumed transport of fill materials to site.
Clearance and demolition	Site preparation and clearance
Land use change and vegetation loss	Land use change from removal of 'natural grassland', 'peat bog' and 'mixed forest' has been quantified as per information available from project team.
Excavation	General excavation.
Construction energy	On-site gasoline/diesel fuel use associated with site plant and machinery. No information available on energy usage for site offices.

GHG Assessment Category	Elements Considered
Construction worker travel to site	Kms travelled by construction workers, assumed all transport was via private car.
Construction/Operational waste disposal	Data for excavated material assessed. Half of excavated material is assumed to be re-used on site. Remaining material is disposed of off-site, assuming to landfill.
Construction/Operational waste transport	Assumed 100km distance to licensed waste facility for waste disposal provided by project team.
Construction water	Data provided by project team based on similar scale project.
Maintenance	Material maintenance and replacement assumed over the typical 120-year lifespan
Landscaping and vegetation	Data provided by project team.
Operational energy	No data provided – assumed scoped out due to minimal energy requirements. Lighting will be in the form of energy efficient LEDs and limited to the trailheads.
Operational phase modal shift	The reduction in GHG emissions associated with the modal shift due to the project has not been quantified or included within the TII Carbon Tool. The proposed development will allow for a modal shift from private vehicle use to active travel thereby reducing GHG emissions in the long-term throughout it's operation.

13.4 Receiving Environment

PE-ENV-01104 (TII, 2022) states that a baseline climate scenario should identify, consistent with the study area for the project, GHG emissions without the project for both the current and future baseline. Climate impacts are assessed at a national level and in relation to national targets and sectoral emission ceilings. The study area for climate is the Republic of Ireland, and the baseline is determined in relation to this study area.

Ireland declared a climate and biodiversity emergency in May 2019 and in November 2019 there was European Parliament approval of a resolution declaring a climate and environment emergency in Europe. This, in addition to Ireland's current failure to meet its EU binding targets under Regulation 2018/842 (European Union, 2018) results in changes in GHG emissions either beneficial or adverse being of more significance than previously considered prior to these declarations.

13.4.1 Current GHG Baseline

Data published in March 2026 (Environmental Protection Agency, 2026), indicates that Ireland exceeded, without the use of flexibilities, its 2024 annual limit set under EU's Effort Sharing Decision (ESD) (EU 2018/842) by 3.93 $MtCO_2e$. However, the reported emissions for 2024 represent the second consecutive year in which Ireland's emission were below 1990 levels by 4.2%. Emissions Trading Scheme emissions have decreased by 49.7% or 11.1 $MtCO_2e$ compared to 2005 and Effort Sharing Regulation emissions decreased by 10.2% or 5 $MtCO_2e$. Ireland is now a net 2,020 $ktCO_2e$ distant from its target under the Effort Sharing Regulation.

The EPA estimate that 2024 total national GHG emissions, excluding LULUCF, have decreased by 1.9% on 2023 levels to 53.93 $MtCO_2e$, with an 8.8% reduction in electricity industries alone. This was driven by an increase in generation from renewables in 2024 by 1.6% and the complete phase-out of peat for electricity generation. Manufacturing combustion and industrial processes decreased by 4.4% to 6.2 $MtCO_2e$ in 2024 due to declines in fossil fuel usage. The sector with the highest emissions in 2024 was agriculture at 36.2% of the total,

followed by transport at 20.9%. For 2024, total national emissions (including LULUCF) were 58.74 $MtCO_2e$ (Table 13-6).

The current estimates of National greenhouse gas emissions (including LULUCF) in 2024 are 12.6% below 2018 levels, at considerable variance from the National Climate ambition of a 51% reduction by 2030. The data indicate that from 2021 to 2024 Ireland has used 85.2% of the 295 $MtCO_2e$ Carbon Budget for the five-year period 2021-2025. This leaves 17.5% of the budget available for 2025, requiring a substantial 14.8% annual emissions reduction across all sectors for 2025 to stay within the budget.

Figures for 2025 emissions are due to be provisionally published by the EPA in July 2026. The final 2025 emissions outturn will determine whether the first carbon budget (2021 to 2025) has been exceeded and, consequently, may necessitate adjustments to the subsequent carbon budget period for 2026 to 2030 in accordance with national carbon budgeting arrangements under the Climate Action and Low Carbon Development (Amendment) Act 2021.

Table 13-6 Trends in Total National GHG Emissions 2021 – 2024

Sector *Note 1*	2021	2022	2023	2024	Total Budget (Mt CO_2e) (2021-2025)	% Budget 2021-2025 Used	Annual Change 2023 to 2024
Electricity	9.88	9.68	7.56	6.95	40	85.19%	-8.11%
Transport	11.19	11.88	11.93	11.78	54	86.66%	-1.26%
Buildings (Residential)	6.71	5.62	5.23	5.48	29	79.47%	4.84%
Buildings (Commercial and Public)	1.42	1.38	1.34	1.44	7	79.69%	8.05%
Industry	7.25	6.81	6.46	6.18	30	89.00%	-4.37%
Agriculture	21.97	21.78	20.72	20.45	106	80.11%	-1.33%
Other *Note 2*	1.82	1.85	1.75	1.65	9	78.45%	-5.82%
LULUCF	2.87	2.47	2.96	2.51	-		
Total including LULUCF	**63.11**	**61.48**	**57.96**	**56.45**	**295**	**81.01%**	**-2.61%**

Note 1 Reproduced from latest emissions data from the EPA (EPA, 2025).

Note 2 Other includes Petroleum refining, F-Gases and Waste (emissions from solid waste disposal on land, solid waste treatment (composting and anaerobic digestion), wastewater treatment, waste incineration and open burning of waste).

13.4.2 Future GHG Baseline

The future baseline with respect to the GHGA can be considered in relation to the future climate targets which the assessment results will be compared against. In line with TII (TII, 2022) and ISEP Guidance (ISEP, 2022) the future baseline is a trajectory towards net zero by 2050, "*whether it* [the project] *contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

The future baseline will be determined by Ireland meeting its targets set out in the CAP25, and future CAPs, alongside binding 2030 EU targets. The European Union (EU) enacted 'Regulation (EU) 2018/842 on binding annual GHG emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013' (hereafter referred to as the Regulation) (European Union, 2018) to meet the commitments under the Paris Agreement.

The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. The Regulation was amended in April 2023, and Ireland must now limit its ETS and non-ETS greenhouse gas emissions by at least 42% by 2030. The ETS is an EU-wide scheme which regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and includes GHG emissions from transport, residential and commercial buildings and agriculture.

In May 2025, the EPA released the report Ireland's Greenhouse Gas Emissions Projections 2024-2055 (EPA, 2025b), which includes total projected emissions and a breakdown of projected emissions per sector under the 'With Existing Measures' and 'With Additional Measures' scenarios. The EPA projections indicate that currently implemented measures (With Existing Measures) will achieve a reduction of 10% on 2005 levels by 2030, significantly short of the 42% reduction target. If measures in the higher ambition (With Additional Measures) scenario are implemented, EPA projections show that Ireland can achieve a reduction of 22% by 2030, still short of the 42% reduction target.

The EPA GHG emissions projections report for 2024 - 2055 (EPA, 2025b) indicate that the first Carbon Budget (2021-2025) of 295 $MtCO_2e$ is projected to be exceeded by between 8 to 12 $MtCO_2e$. The second budget is now projected to be exceeded by a significant margin of 77 to 114 $MtCO_2e$, including carryover from the first Carbon Budget.

13.4.3 Current CCRA Baseline

The region of the proposed development has a temperate, oceanic climate, resulting in mild winters and relatively cooler summers when compared with continental Europe. This baseline data is derived from the European Centre for Medium-Range Weather Forecasts (ECMWF) ERA5 data reanalysis (ECMWF, 2023) which includes observed data from individual meteorological weather stations across Ireland from 1950-2023. This data is reanalysed to model a complete picture of Ireland's historical climate. This method has been chosen to ensure data can be analysed at the daily level and harmoniously compared with future scenarios. The baseline time-period referred to for the *Current CCRA Baseline* assessment was from 1991-2020 and is specific to County Clare and the location of the proposed development in question.

Figure 13.1 below shows the climatology for the 30-year baseline period from 1991 to 2020 indicating the wettest months are from October through to January with December (126mm) being the wettest on average. August is also markedly wetter than other months at ~107mm on average. Spring and Summer (Feb-Jun) are markedly drier compared to the wettest months with average monthly precipitation 83mm-99mm respectively. The driest month on average was April (83mm), with March through to May also experiencing lower than average rainfall (~87mm average). Ireland and County Clare's precipitation patterns are strongly influenced by its oceanic climate, with the wettest months typically coinciding with periods of frequent low-pressure Atlantic storm systems. In the cases of July and August however, this may be a factor of convection and frontal rainfall, whereby warm continental summer air is pressed against colder air moving across the Atlantic.

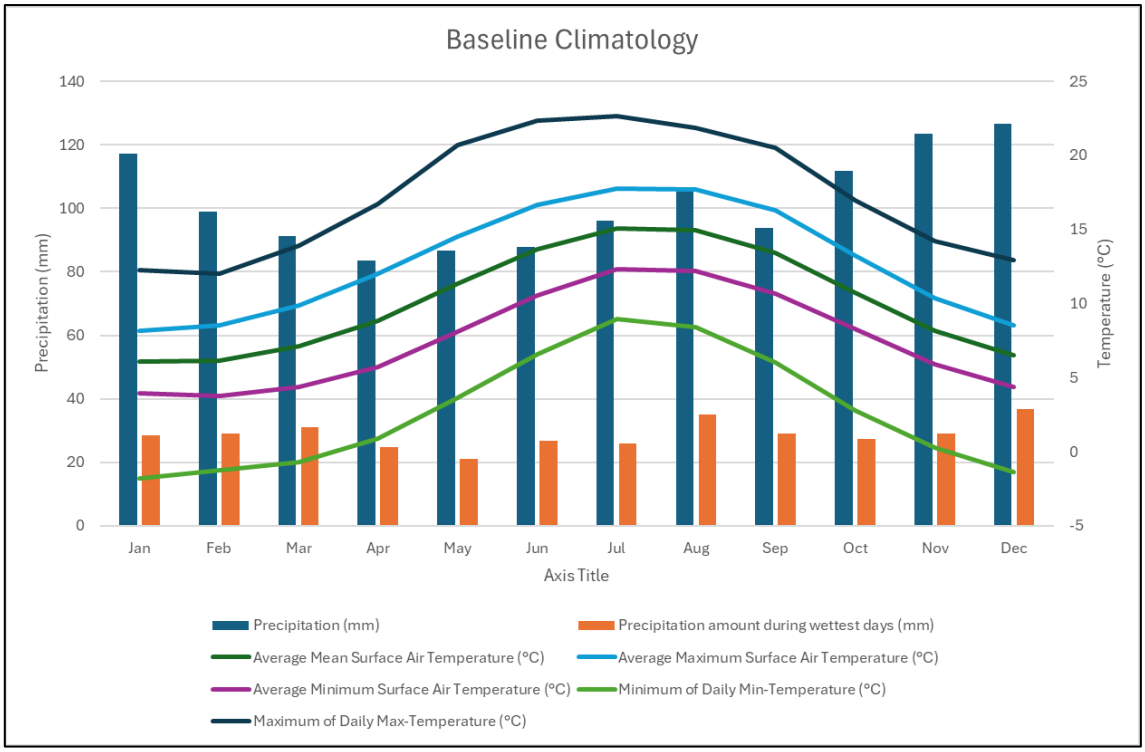

Figure 13.1 Baseline Climatology (County Clare) 1991-2020

July was the warmest month with a mean temperature of 15°C with average mean surface temperatures across the summer months (July – August) >13°C. July is also the warmest month for maximum daily temperatures (22°C) which showcases the higher value ranges recorded during a particular month. A cross June – September average maximum daily temperatures exceed 16°C.

January and February are the coldest months with average mean surface air temperatures of 6.1°C and average minimum temperatures of 3.8 – 3.9°C. For daily minimum temperatures which reference the lowest range values (10th percentile range) of the data, January (-1.8°C) and February (-1.3°C) also remain the coldest with marginal difference. Several other winter and early spring months (November - April) also experience daily minimums of below 0°C.

Historical records show Clare has experienced several severe storms, with wind speeds exceeding 100 km/h, including a record set during Storm Éowyn in January 2025, which reached 142 km/h in Galway. Storm activity is concentrated in winter (December–February), with an average of eight named storms annually (Met Éireann, 2025). Analysis of data from Shannon Airport (1990 - 2020) (Met Eireann, 2026) indicates a mean 10m wind speed of 9.1 knots (17 km/hr) and maximum gusts ≥86 knots (159 km/h).

Overall, the baseline climatology for the area of the proposed development and Clare region shows evidence of high rainfall across the year. Mild winters with average minimums >3°C and relatively mild summers with average maximums of 17°C however, this maximum is not significant for regular extreme heat or prolonged drought impacts.

13.4.4 Future CCRA Baseline

Climate Change Impacts and Projections for Ireland

Ireland is already experiencing increased annual rainfall in the north and west, with more variable patterns in the south and east including the area of the proposed development (EPA, 2021). Key risks identified by the EPA relevant to the proposed development include:

- Increased likelihood of more frequent and intense North Atlantic low-pressure systems bringing high rainfall and high winds.
- More intense rainfall periods which may lead to pluvial flooding and elevated fluvial levels.
- Longer dry spells and increased temperatures.

Climate Modelling and Planning

International best practice and national policy such as the NCCRA (2024), and Transport Infrastructure Ireland (TII, 2022) recommends using two emission scenarios to project future climate change. This includes a moderate and high emission scenarios (RCP4.5 and RCP8.5) for future planning. These Representative Concentration Pathways (RCPs) reflect varying levels of global climate mitigation and are explained below.

- RCP 4.5 (a 'moderate' scenario) represents an approximate 2.4°C increase in global average temperatures (1.7-3.2°C). It assumes moderate mitigation efforts leading to stabilisation of emissions by mid-century and is generally aligned with current policies for emission reduction.
- RCP 8.5 (a 'worst case' / high emissions scenario) represents an approximate 4.3°C increase in global average temperatures (3.2-5.4°C) and assumes continued high emissions with minimal mitigation. This high-end scenario is useful for understanding potential impacts of current emission trends continue. Consequently, this scenario will result in the highest level of physical risk for Ireland, and therefore the greatest requirement for adaptation.

This climate change assessment uses the latest climate change projections standardised and bias corrected for Ireland available through the EPA and the TRANSLATE project (EPA, 2025b). Baseline climatology is derived from Climate Ireland TRANSLATE project using a baseline period of 1976-2005. This baseline period differs from the *Current CCRA Baseline* of 1991-2020 due to the variation in sources, with Climate Ireland utilising a baseline of 1976-2005.

13.4.4.1 Key Findings from Future Climate Change Projections

Projected changes include:

- Overall mean temperatures increasing 1.0°C and 1.4°C by mid-century under RCP4.5 and RCP8.5 respectively.
- Summer rainfall is decreasing while winter rainfall increases sharply, attributing to an overall increase in rainfall annually for the proposed development location.
- Fewer cold winter nights and more frequent short heatwaves (≥5 days >25°C).
- Increased likelihood of extended dry spells and possible drought which may elevate the risk of wildfire.
- Increased likelihood of more storms which may increase the risk of flooding due to deluge of rainfall which may be a factor in increased Max 1-day projections (+10mm).

Table 13-7 Site Specific - Future Climate Change Summary of Projections under both RCP scenarios for 2050 period (2040-2070)

Climate Hazard	Indicator	Baseline	RCP4.5	RCP8.5
			(2040-2070)	(2040-2070)
Temperature	*Mean temp (°C)*	10.6	11.5	12.0
	Mean Max temp (°C)	13.7	14.6	15.0

Climate Hazard	Indicator	Baseline	RCP4.5	RCP8.5
			(2040-2070)	(2040-2070)
	Mean Min temp (°C)	7.4	8.5	8.9
	Average Max temp annual (°C)	24.5	27.0	27.5
Precipitation and Flooding	*Annual precipitation (mm)*	1141.3	1176 (+35)	1199 (+58)
	Max 1-day (mm)	33	39 (+6)	40 (+7)
Storms and high winds	*Number of Storms Qualitative (Description)*	On Average 8 named storms annually with speeds exceeding 100km/hr Note 1	Winter storm frequency is projected to increase, with a possible extension of the storm season. While the intensity of individual storms cannot be accurately projected, wind speeds are likely to remain above 100 km/hr.	
	90th percentile of Average Max Gust (Knots) Note 2	61		
Drought	*Absolute Drought*	Rare	Marginal increase	Increased Likelihood
	(≥15 days with less than 1mm)			
Wildfire	*Qualitative (Descriptive*	Several wildfires have occurred across Ireland	Rising temperatures and prolonged dry spells are increasing key wildfire risk factors, elevating overall vulnerability.	
Lightning	*Qualitative (Descriptive)*	Occurring during summer periods	This hazard may modestly increase in the future due to more favourable conditions, such as rising temperatures and extended warm periods beyond the traditional summer season	

Source: EPA Climate Ireland Translate Projections
Note 1: Data from Met Éireann
Note 2: Historical data from Met Eireann for Shannon Airport (Met Eireann, 2026)

Impacts resulting from climate change hazards will evolve and have the potential to include increases in global temperatures and increases in the intensity and frequency of rainfall days per year combined with increases in the intensity and frequency of low-pressure systems in the north Atlantic during the winter storm period. Therefore, it is expected that the climate over the proposed development in Clare will evolve over time and consideration is needed with respect to this within the design of the proposed development.

13.5 Description of Potential Impacts

13.5.1 'Do Nothing' Scenario

In the Do-Nothing scenario, the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc). The Do-Nothing scenario is considered neutral in terms of the climate assessment. Due to the nature of the proposed development, the benefits of active travel, such as the modal shift from GHG emitting vehicle

use, health related benefits and tourism potential will not be applicable in the Do-Nothing scenario.

13.5.2 Greenhouse Gas Assessment (GHGA)

13.5.2.1 Construction Phase

Based on the online TII Carbon Tool (TII, 2025a), the different activities associated with the construction phase of the proposed development have been assessed. As shown in Table 13-8, the construction phase of the proposed development is predicted to result in 7,711 tCO_2e. This is equivalent to an annualised (over 2-year construction period) total of 3,856 tCO_2e. Emissions are annualised as the proposed development's construction is predicted to occur over a 2-year period and the national emissions targets are targets per year.

The assessment results indicate that the key elements associated with GHG generation during the construction phase of the proposed development are the embodied carbon of the construction materials which make up approximately 35% of the total GHG emissions as well as fuel use for construction plant and machinery which makes up approximately 22% of total GHG emissions.

Embodied carbon of materials has been considered as part of the proposed development design and an embedded mitigation measure is to utilise concrete with a 50% granulated blast furnace slag (GGBS) replacement as a lower carbon material choice. Additionally, bitumen-based material use has been reduced as much as possible in the proposed design. Where possible excavated material will be re-used on site, it is assumed for the purposes of the GHG calculations that up to half of excavated material will be reused on-site which will reduce the need for export of all excavated material off-site and import of fill material. These embedded design measures have been included within the GHG assessment calculations.

13.5.2.2 Operational Phase

Operational phase GHG emissions over the 120-year lifespan (Table 13-8), are predicted to be 3,728 tCO_2e. This is equivalent to an annualised (over 120-year lifespan) total of 31.1 tCO_2e.

User Emissions (B8) associated with the modal shift with the proposed development in place have been scoped out in terms of quantifying the impacts and have therefore not been calculated as part of this assessment (see Section 13.3.3.2 for details). Opportunities to further promote the modal shift are discussed in more detail in Section 13.6.2.

Operational phase materials maintenance is the highest proportion of operational phase emissions at 28.9% of total emissions.

The proposed development is predicted to have total construction and operational phase emissions of 11,440 tCO_2e or 95.3 tCO_2e annually over the 120-year lifespan.

Table 13-8 Proposed Development GHG Assessment Results

Category		Elements Considered	Emissions (tCO_2e)	% of Total	Sector
A5	**Pre-Construction**	Site clearance works	2.1	0.02%	Industry
A5		Land use change due to site clearance	490.6	4.3%	LULUCF

Category		Elements Considered	Emissions (tCO_2e)	% of Total	Sector
A1-A3	**Embodied Carbon (Materials)**	Asphalt, concrete, aggregate, steel	4,007	35.0%	Industry
A4	**Material Transport**	HGV movements associated with material deliveries	161	1.4%	Transport
A5	**Construction Activities**	Excavation	35.1	0.31%	Industry
A5		Water use	0.14	0.001%	Other (including waste and wastewater)
A5		Gasoil/diesel use for construction plant and machinery	2,569	22%	Energy industries (including electricity generation)
A5		Construction worker travel to site	431	4%	Transport
A5	**Construction Waste**	Recycling of mixed construction & demolition wastes, aggregates, concrete etc.	12	0.1%	Other (including waste and wastewater)
A5	**Construction Waste Transport**	HGV movements associated with waste transported off-site	2	0.02%	Transport
Total Construction Phase			**7,711**		
Total Construction Phase Emissions annualised over 2-year construction phase			**3,856**		
B2-B5	**Maintenance**	Maintenance materials over 120-year lifespan	3,311	28.9%	Industry
B2-B5		Maintenance plant use over 120-year lifespan	842	7.4%	Industry
	Land-use change	Landscaping and vegetation planting	-424	-3.7%	LULUCF
Total Operational Phase			**3,728**		
Total Operational Phase Emissions annualised over 120-year lifespan			**31.1**		
Total Lifecycle GHG Emissions			***11,440***		
Total Lifecycle GHG Emissions annualised over 120-year lifespan			***95.3***		

13.5.2.3 GHGA Summary

The GHG emissions from the proposed development as a total cannot be compared against one specific sector 2030 carbon budget. The emissions are broken down into different assessment categories and these must be compared separately to the relevant sectoral emissions budget. The predicted GHG emissions (as shown in Table 13-8) have been

averaged over the full lifespan of the proposed development to give the predicted annual emissions to allow for direct comparison with national annual emissions and targets.

In Table 13-9, GHG emissions have been compared against the carbon budget for the industry, transport, electricity, and waste sectors in 2030 (Government of Ireland, 2025), against Ireland's total GHG emissions in 2024, against Ireland's EU 2030 target of a 42% reduction in non-ETS sector emissions based on 2005 levels (27.7 Mt CO_2e) (set out in Regulation EU 2018/842 of the European Parliament and of the Council).

The estimated total GHG emissions, when annualised over the 120-year proposed development lifespan, are a small fraction of the national targets and sectoral budgets.

Table 13-9 Annualised Proposed Development GHG Emissions Relative to Sectoral Budgets and GHG Baseline

Target/Sectoral Budget (tCO_2e)		Annualised Proposed Development GHG Emissions (tCO_2e)		% of Relevant Target/Budget
Ireland's 2024 Total GHG Emissions (existing baseline)	57,640,000	Total GHG Emissions	95.3	0.0002%
Non-ETS 2030 Target	27,722,000	Total GHG Emissions	95.3	0.0003%
2030 Sectoral Budget (Industry Sector)	4,000,000	Total Industry Emissions	68.3	0.0017%
2030 Sectoral Budget (Transport Sector)	6,000,000	Total Transport Emissions	5.0	0.0001%
2030 Sectoral Budget (Energy Industries (including electricity generation))	3,000,000	Total Electricity Emissions	21.4	0.0007%
2030 Sectoral Budget (Waste Sector, including wastewater)	1,000,000	Total Waste Emissions	0.10	0.00001%

13.5.2.4 GHGA Significance of Effects

The TII guidance (TII, 2022) and ISEP guidance (2022, 2026) states that the following two factors should be considered when determining significance:

- 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.

Therefore, prior to mitigation, any impact to climate as a result of GHG emissions is considered significant.

13.5.3 Climate Change Risk Assessment (CCRA)

13.5.3.1 Construction Phase

A detailed CCRA of the construction phase has been scoped out. However, consideration has been given to the proposed development's vulnerability to the following climate change hazards with best practice mitigation measures proposed in Section 13.6.1.

- Flood Risk due to increased precipitation, and intense periods of rainfall. This includes fluvial and pluvial flooding.
- Increased temperatures potentially causing water scarcity and prolonged periods of hot weather.
- Reduced temperatures resulting in ice or snow and [possible hazard to working conditions].
- Major Storm Damage, including wind damage and coastal flooding from storm surge.

13.5.3.2 Operational Phase

To determine the vulnerability of the proposed development to climate change the sensitivity and exposure of the development to various climate hazards must first be determined. Table 13-10 presents the initial qualitative climate hazards screening relevant to the proposed development. A number of climate hazards have been screened out of the assessment due to the proposed development location.

Table 13-10 Climate Hazard Screening

Climate-related Hazard	Hazard Screening Rationale	Screening
Extreme Heat temperatures	High temperatures are a key consideration for both construction and long-term operation of the proposed project. Historical data shows rising temperatures in Ireland. Heat and thermal expansion can damage buildings, materials, and road surfaces, and affect the lifecycle of assets.	Screen in
Extreme Cold Temperature	Snow and ice events pose significant risks to health, safety, and site operations. Road access may be disrupted, and low temperatures can affect assets such as fuel tankers, workers, and infrastructure. Freeze-thaw cycles may cause cracking in concrete and road surfaces, requiring snow clearance and ice management.	Screen in
High precipitation and pluvial flooding	Surface water remains a key vulnerability for any proposed development during both construction, and operational phases due to the sensitivity of construction materials, site access, and site assets to water exposure.	Screen in
Fluvial flooding	Sections of the proposed development are within Flood Zone A as per the site-specific Flood Risk Assessment completed by Roughan & O'Donovan Consulting Engineers and therefore the risk of fluvial flooding has been included in the assessment.	Screen in
Drought	Droughts have occurred across Ireland, previously impacting water supply. Future reductions in water availability would not directly impact the proposed development and its operation. At detail design stage, appropriate plant species will be selected that are suitable for the site conditions and able to withstand the climate and conditions of the west coast of Ireland. A preliminary planting strategy is included within Chapter 8 Biodiversity. The emphasis will be on inclusion of native species that are tolerant to exposure and drought-resistant.	Screen out
Wildfire	Wildfire is a risk for the proposed development due to it's location. The ThinkHazard! Tool developed by the GFDRR (GFDRR, 2025) indicates that County Clare is considered of medium risk from wildfire. This means that there is between a 10% and 50% chance of experiencing weather that could support a hazardous wildfire that may poses some risk of life and property loss in any given year. Data from the EPA research report *'Quantification of the Area of Land Burned and Habitats Affected by Wildfires in Ireland,*	Screen in

Climate-related Hazard	Hazard Screening Rationale	Screening
	2015–2021, and the Resulting Emissions' indicates that there have been a number of wildfires in County Clare over the period 2015 – 2021.	
High winds and storms	While the site itself isn't significantly elevated, existing and proposed assets and design components may be exposed to high winds. Historically, Ireland has experienced several notable storm events including Storm Éowyn and Storm Darragh (2024), which caused widespread damage across Ireland. These storms often bring heavy rainfall and flood warnings, increasing overall risk.	Screen in
Fog	Fog is not considered a significant hazard for the proposed development, as it does not involve road transport, aviation, or activities requiring high visibility.	Screen out
Lightning	The proposed design is not elevated, and no extra risk is considered above what already exists under the existing design codes of the site.	Screen out
Landslides and Subsidence	The Geological Society of Ireland (GSI) landslide susceptibility mapping database (GSI, 2025) was reviewed to determine the low risk from landslides at the proposed development location.	Screen out
Sea level rise and coastal flooding	The proposed development is located on the coast and therefore may be at risk from coastal flooding (see SSFRA for further information).	Screen in
Coastal erosion	The proposed development is located on the coast and therefore may be at risk from coastal erosion.	Screen in

Climate Change Vulnerability Assessment

The sensitivity and exposure of the proposed development to the screened in climate hazards must first be established to then determine the vulnerability of the proposed development to climate change. Flooding (fluvial and pluvial), extreme heat, extreme cold, extreme wind, wildfire, and coastal flooding and coastal erosion have been considered as climate hazards in the context of the proposed development.

The sensitivity of the proposed development to the climate hazards is assessed irrespective of the project location. Table 13-11 details the sensitivity of the proposed development on a scale of high (3), medium (2) and low (1). Once the sensitivity has been determined, the exposure of the proposed development to each of the climate hazards is determined, this reflects on the possible likelihood of the climate hazard occurring at the project location and is also scored on a scale of high (3), medium (2) and low (1). The product of the sensitivity and exposure is then used to determine the overall vulnerability of the proposed development to each of the climate hazards. The results of the vulnerability assessment are detailed in Table 13-11.

Table 13-11 Climate Change Vulnerability Assessment

Climate Hazard	Sensitivity	Exposure	Vulnerability
Flooding (Fluvial, Pluvial)	1 (Low)	2 (Medium)	2 (Low)
Sea level rise and coastal flooding	1 (Low)	2 (Medium)	2 (Low)
Coastal erosion	1 (Low)	1 (Low)	1 (Low)
Extreme Heat	1 (Low)	2 (Medium)	2 (Low)

Climate Hazard	Sensitivity	Exposure	Vulnerability
Extreme Cold	1 (Low)	1 (Low)	1 (Low)
Extreme Wind	1 (Low)	2 (Medium)	2 (Low)
Wildfire	1 (Low)	2 (Medium)	2 (Low)

The sensitivity and exposure of the area was determined with reference to online databases and tools, including the EPA Climate Ireland data (EPA, 2023) and the ThinkHazard! tool developed by the GFDRR (2025), and with input from the various discipline specialists on the project team. It was concluded that the proposed development does not have any significant vulnerabilities to the identified climate hazards as described in the below sections. All vulnerabilities are classified as low.

Flooding (Fluvial & Pluvial)

A detailed Site-Specific Flood Risk Assessment (SSFRA) was undertaken by Roughan & O'Donovan Consulting Engineers and was reviewed in order to inform this assessment. The following are the key points from the SSFRA in relation to potential flood risk.
The greenway is classified as Less Vulnerable Development in relation to fluvial flood risk as per the SSFRA. The surfacing of the greenway will not significantly increase runoff rates in the area or impact existing flow paths. A short section of the existing railway in urban Kilkee is subject to fluvial flood risk from the Atlantic Stream and will be protected from the 1% AEP flood by the Kilkee FRS.

The proposed trailheads are classified as Less Vulnerable Development in relation to fluvial flood risk as per the SSFRA.

According to the SSFRA the location of the Coast Guard carpark is designated as Flood Zone A and the CFRAM flood extent maps indicate a that small portion of the carpark is within the 1% AEP floodplain of the Atlantic Stream. The refurbishment will retain the surface levels of the existing carpark and will not increase impermeable surface areas locally. There will not be an increase in surface runoff and an increase in the capacity of the existing stormwater network is not required. There will be no increase in the risk of pluvial flooding and no reduction in storage capacity in the area. In operation the carpark surface will benefit from the protection of the Kilkee FRS. The Kilkee FRS has been designed for the 1 in 100 year AEP with an additional 20% allowance for climate change.

The proposed river bridges and culverts are considered to be local transport infrastructure and are classified as 'Less Vulnerable' development. The proposed structures are within Flood Zone C and are not considered at risk of fluvial flooding. In the case of the river bridges to comply with the requirements of the Section 50 consent process the design soffit levels will be set above the 1% AEP. The design levels will include an allowance for Climate Change, being built to a minimum flood level of 3.2 mOD, and include a freeboard to account for modelling uncertainties. The proposed retaining walls are classified as less vulnerable development.

The risk of fluvial flood risk to the proposed development is categorised as 'Low' based on the above information from the SSFRA. The levels of the proposed development are primarily fixed by the location of the existing railway. The SSFRA was undertaken for the present day scenario which identified that some areas of the proposed development route, as well as locations in Moyasta are within the present day flood plains for fluvial and coastal flooding, as a result no additional factor for future climate change was applied. As the proposed development is categorised as 'Less Vulnerable Development', periodic flooding of some areas was deemed acceptable, particularly due to the project constraint of the levels being set

by the existing railway. Where feasible the proposed development has been raised to a minimum flood level of 3.2 mOD.

Future increases in rainfall due to climate change may elevate the risk of surface water (pluvial) flooding. The drainage design for the greenway assumes surface water will drain over the edge of the greenway route. Trailheads will drain to filter drains and bio-retention areas which will be sized accordingly for the area being drained based on the present day scenario. Therefore, pluvial flood risk is categorised as low.

Sea Level Rise and Coastal Flooding

Approximately 23% of the existing railway is subject to coastal flood risk. The proposed offline sections of the greenway will not impact coastal flood risk locally, or are to be constructed within coastal Flood Zone C.

The proposed greenway route has been assessed for coastal flood risk using the current climate scenario ICPSS flood extent maps for the 0.5% and 0.1% AEP events for the present day scenario. The proposed greenway will not significantly raise the surface level of the existing railway and will largely retain existing water course crossings and drainage infrastructure along the route. Hence the online sections of the proposed greenway will not impact existing local drainage patterns or surface water flow paths.

The bridges are located within the coastal flood zone of the Mouth of the Shannon Coastal Waterbody (CWB). The design soffit levels of the bridges will be set above the 1% AEP levels of the Termon East river. The design levels will include an allowance for Climate Change and a freeboard to account for modelling uncertainties, being built to a minimum flood level of 3.2 mOD. The bridges will not impact the flood regime on the river. The design soffit levels of the bridges will be set above the 0.5% AEP of the Mouth of the Shannon CWB.

The proposed trailhead site and a short section of offline greenway at Moyasta are subject to mixed coastal and fluvial flooding. It is proposed that the carpark and offline greenway section be constructed using flood resilient materials at existing ground levels. This will prevent flood damage to the trailhead and offline greenway section and prevent an increase in flood risk to the surrounding area.

Based on the information in the SSFRA the risk of coastal flooding to the proposed development is considered 'Low'.

Coastal Erosion

The EPA on the Climate Ireland website (EPA, 2023) state that approximately 20% of Ireland's coast is at risk of coastal erosion. The coasts most susceptible to coastal erosion are those composed of unconsolidated (soft) sediment and these areas are most common on Ireland's eastern and southern coasts.

In relation to County Clare,10-20% of the coastline is currently deemed at risk from erosion (EPA, 2023). Projected climatic changes will have a significant impact on rates of coastal erosion in Ireland. In combination, projected increases in relative sea level and in the intensity of coastal storms will have significant and lasting effects on coastal morphology. Changes in the occurrence of more intense coastal storms are projected to have a greater impact on rates of coastal erosion than relative sea level rise (EPA, 2023).

In relation to the area of the proposed development, the OPW Coastal Erosion mapping was reviewed. This includes areas of projected erosion for the 2050 period. Based on this information, the proposed development is not within an area of projected coastal erosion. However, increasing sea levels may increase erosion rates in the future.

The proposed development includes buffer distances between the greenway and the coast, primarily by following the old railway line. Overall, the vulnerability of the proposed development to coastal erosion is 'Low'.

Extreme Temperatures (Heat & Cold)

In relation to extreme temperatures, both extreme heat and extreme cold, these have the potential to impact the building materials and some related infrastructure. The design will consider, at detailed design, projected climate variations, including periods of extreme heat and cold, to ensure resilience, user comfort, and durability. Materials and structural elements will comply with CIBSE Guide A, Eurocode EN 1991-1-5, and TII standards, with components specified to withstand a temperature change to accommodate thermal movement through appropriate expansion joints and fixings.

Materials will be selected at detailed design for durability under temperature extremes, including pavement and surfacing with low thermal expansion and UV resistance in line with TII specifications, and steel and concrete components designed to Eurocode standards for thermal stress.

The scheme integrates user comfort features such as rest areas along the route.

The likelihood of extreme cold events in the future is projected to decrease reducing their overall exposure and risk. Extreme heat (+30°C) is equally unlikely and the design of the proposed development has incorporated these considerations with thresholds for materials accommodating these extremes.

This, in addition to the proposed design specifications indicates that both extreme temperatures (cold and heat) are not considered a significant risk.

High Winds and Storms

In relation to extreme winds, there are no large-scale buildings proposed as part of the proposed development which may be susceptible to high winds. Structural elements such as bridges and signage will be designed at detailed design stage to withstand wind loads in accordance with Eurocode EN 1991-1-4 (Actions on Structures – Wind Actions) and Transport Infrastructure Ireland (TII) standards, ensuring safety and stability during storm events.

Wind exposure to landscaping and vegetation has been considered in the design. At detail design stage, appropriate plant species will be selected that are suitable for the site conditions and able to withstand the climate and conditions of the west coast of Ireland and minimise the potential for impact from fallen trees and debris on active travel users.

The selection of native species allows for the inclusion of well-adapted species selected for their proven tolerance to local soil and climatic conditions. A Landscape Strategy has been developed for the proposed development as outlined in Chapter 15 of this EIAR, Landscape & Visual Impact Assessment.

A Management and Maintenance Plan is included in Volume 4 of this EIAR which includes maintenance requirements to be implemented during operation of the greenway, including measures required to ensure drainage infrastructure is kept free of debris.

Wildfire

The ThinkHazard! Tool developed by the GFDRR (GFDRR, 2025) indicates that County Clare is considered of medium risk from wildfire. This means that there is between a 10% and 50% chance of experiencing weather that could support a hazardous wildfire that may poses some

risk of life and property loss in any given year. Rising temperatures and prolonged dry spells are key wildfire risk factors.

The Clare County Council Climate Action Plan 2024-2029 (CCC, 2024) which is a more specific review of climate risks, does not identify wildfire as a current or future risk for the county. However, increased heatwave events and drought conditions are predicted in future years.

As part of the proposed development there will be breaks in hedgerows at field and access gates which will reduce the risk of fire spreading in these areas.

The areas of the development in proximity to Kilkee and Kilrush are at reduced risk to wildfire due to their more built up area. Provided adequate breaks in vegetation are included within the development design the risk of significant wildfire is low.

Summary

Overall, the proposed development has at most, low vulnerabilities to the identified climate hazards. Therefore, no detailed risk assessment is required.

13.5.3.3 CCRA Significance of Effects

With design mitigation in place, there are no significant risks to the proposed development due to climate change. In accordance with the EPA Guidelines (EPA, 2022), the significance of effect of the impacts to the proposed development due to climate change during the operational phase are ***direct, long-term, negative*** and ***not significant***.

13.6 Mitigation Measures

13.6.1 Construction Phase

Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. During the construction phase the following best practice measures shall be implemented on site to prevent significant GHG emissions and reduce impacts to climate:

- Where possible, existing structures associated with the old railway (bridges, culverts, etc.) will be retained and demolition avoided to negate additional GHG emissions being released
- The alignment design endeavours to follow the natural topography and utilise existing embankments and ballast associated with the old railway where possible, to minimise waste and reduce imported materials
- Existing fencing along boundaries will be retained where possible to reduce the need for new fencing
- Vegetation clearance will be minimised through the retention of vegetation along existing boundaries where possible
- In areas of peat, floating construction is proposed ('No-dig' solutions)
- Site-won material will be re-used on site, specifically in relation to earthworks, where feasible, excavated materials will be re-used as fill. The GHG assessment calculations have assumed that 50% of excavated material will be reused as fill material on site as an embedded design mitigation measure to reduce GHG emissions.
- Re-use and recycling of materials on site as opposed to disposal and landfill will be prioritised in line with TII's Sustainability Implementation Plan and Circular Economy Guidance.

- As Clare County Council and TII are public bodies, the procurement process will align with the *Green Public Procurement Strategy and Action Plan 2024 – 2027* (Government of Ireland 2024c). This requires public bodies to seek to procure goods, services and works with a reduced environmental impact throughout their life cycle.
- A suitably competent contractor will be appointed who will undertake waste audits detailing resource recovery best practice and identify materials can be reused/recycled.
- Idling of on-site or delivery vehicles will not be permitted, even over short periods.
- All plant and machinery will be well maintained and inspected regularly.
- Waste of materials due to poor timing or over ordering on site will be minimised and will aid to minimise the embodied carbon footprint of the site.
- Materials will be sourced locally where possible to reduce transport related GHG emissions. Additionally, the use of efficient haul routes will reduce transport-related GHG emissions.
- Material choices and quantities will be reviewed during detailed design, to identify and implement any lower embodied carbon options, where feasible (e.g., recycled aggregates, sustainably sourced timber, low-carbon concrete).
- Lower embodied carbon concrete will be utilised with a carbon intensity equivalent or better than concrete with a 50% granulated blast furnace slag (GGBS) replacement.
- Existing road signage and public lighting will be maintained or re-used where feasible to reduce the need for completely new construction.
- During the construction phase lighting will only illuminate work areas when necessary and lighting will be restricted to working hours.
- A whole-life Carbon Management Plan aligned to PAS 2080 will be implemented to inform the detailed design, build and operation.

13.6.2 Operational Phase

The following mitigation measures are proposed for the operational phase in order to minimise the impact to climate.

- Lower carbon maintenance materials will be the preferred choice throughout the lifetime of the development. Routine monitoring of all infrastructure will be undertaken in line with best practice to ensure timely repairs and effective maintenance, thereby maximising the full lifecycle value of all assets.
- The proposed development has been designed to reduce the impact on climate change through the promotion and opportunity for active travel (walking and cycling). Opportunities to integrate the proposed development with public transport hubs, such as bus stops, specifically those at the trailhead in Moyasta and near the trailhead in Kilrush will help to support multimodal journeys and reduce reliance on fossil-fuel vehicles.
- Provide secure bike parking at trailheads and rest areas along the route as well as wayfinding to make cycling more attractive.
- Promote active travel campaigns to shift commuter habits and reduce car dependency. This may include active travel campaigns for local schools, for example the proposed greenway route is in close proximity to the Moyasta National School.
- Green infrastructure has been incorporated into the proposed development through the inclusion of tree planting and vegetation along the route to capture carbon. Additionally, the proposed SuDS features will manage stormwater naturally which reduces the need for energy-intensive drainage systems. A Management and Maintenance Plan is included in Volume 4 of this EIAR which includes maintenance requirements to be

implemented during operation of the greenway, including measures required to ensure drainage infrastructure is kept free of debris.

- Lighting will utilise low emission LEDs during operation and will be limited to trail heads in Kilrush and Moyasta.

In relation to climate change vulnerability the proposed development has incorporated a number of measures into its design to reduce the risk of climate change, these are discussed in detail in Section 13.5.3.2 and include:

- To address climate change vulnerability and risk of flooding, the proposed development will incorporate features to slow runoff and promote infiltration.
- The design has accounted for extreme wind events. Bridge structures will be engineered to meet standards for high wind speeds and have been designed in accordance with the Eurocodes EN1991/1/5 and Irish NA. Soil stability measures are included in the design for new embankments.
- Building materials will consider, at detailed design, projected climate variations, including periods of extreme heat and cold, to ensure resilience, user comfort, and durability. Materials and structural elements will comply with CIBSE Guide A, Eurocode EN 1991-1-5, and TII standards.
- Appropriate plant species have been selected that are suitable for the current site conditions with consideration of future climate changes where necessary. The proposed plant species will be able to withstand the climate and conditions of the west coast of Ireland.

13.7 Monitoring

13.7.1 Construction Phase

Monitoring and reporting of the embodied carbon in the construction phase will be conducted. The aim of monitoring will be to seek further ways to minimise climate impacts. Monitoring will include contractual obligations, in line with the most recent Climate Action Plan and sectoral targets, for the successful tenderer to ensure that the proposed development stays in line with updated aims. Commitments to monitor GHG emissions during the construction phase will also be secured through the final Construction Environmental Management Plan (CEMP). Monitoring will include embodied carbon of construction materials, water usage, power and fuel usage, and waste generation (including reuse and recycling rates). Where monitoring shows that the proposed development is not meeting its targets, further mitigation will be put in place.

Monitoring should also include reviewing potential for extreme weather events which may cause damage during construction. Contractors' Environmental Management System (EMS) will include measures to address risks during such events i.e. flooding.

13.7.2 Operational Phase

Ongoing monitoring and reporting of embodied carbon of maintenance materials throughout the operational lifetime of the proposed development will be undertaken. As with the construction phase, the aim of monitoring will be to seek further ways to minimise climate impacts.

13.8 Residual Effects

13.8.1 Greenhouse Gas Assessment

The TII guidance (2022) states that the significance of GHG emissions and the impact to climate should be assessed as a whole for all project phases (construction and operation).

The measure of impact is how the proposed development contributes to or impedes the ability of Ireland to reach carbon neutrality by 2050 as described in Section 13.3.3.3. This is stated in the TII guidance (2022) which references the ISEP 2022 guidance which states *"Significance should be judged not just on the absolute magnitude of emissions from a project, but also the degree to which these are mitigated. The degree of mitigation should be judged relative to an applicable 1.5°C or net zero compatible trajectory*".

The proposed development is predicted to result in 11,440 tCO_2e during the construction and operational phases (see Table 13-8). This equates to 95.3 tCO_2e when annualised over the proposed development 120-year lifetime.

The proposed development will facilitate a modal shift and provide facilities for active travel which will result in a reduction in GHG emissions over the 120-year lifetime, which would otherwise have been released from vehicle use. However, this positive impact has not been quantified as part of this assessment as it would not be of great enough magnitude to create a net positive impact to GHG emissions from the proposed development.

As outlined in Section 13.6.1 and Section 13.6.2 mitigation measures have been proposed in order to reduce GHG emissions and thus the impact to climate. The mitigation measures proposed are aligned with standard best practice and include additional measures beyond current regulatory requirements. The level of mitigation described in Section 13.6 has been considered when determining the significance of the proposed development's GHG emissions.

According to the TII significance criteria described in Section 13.3.3.3 and Table 13-3, the significance of the GHG emissions during the construction and operational phase is minor adverse.

The ISEP GHG guidance (ISEP, 2022) (which has been embraced by the TII Guidance (TII, 2022) in Section 6.7.2) defines minor adverse as follows:

> *"A minor adverse not significant impact is described with: A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a minor adverse effect that is not significant. The project may have residual impacts but is doing enough to align with and contribute to the relevant transition scenario. A 'minor adverse' or 'negligible' non-significant effect conclusion does not necessarily refer to the magnitude of GHG emissions being carbon neutral (i.e. zero on balance) but refers to the likelihood of avoiding severe climate change and achieving net zero by 2050. A 'minor adverse' effect or better is a high bar and indicates exemplary performance where a project meets or exceeds measures to achieve net zero earlier than 2050."*

The proposed development aligns with the following GHG significance criteria as per Table 13-3:

- The project's GHG impacts are mitigated through 'good practice' measures.
- The project has complied with existing and emerging policy requirements; and
- Fully in line to achieve Ireland's trajectory towards net zero.

In accordance with the EPA guidelines (EPA, 2022), the above significance equates to a GHG emissions impact that is a ***direct*** impact due to its presence, ***long-term*** as a result of the estimated lifetime of the infrastructure and residency time of GHG emissions in the atmosphere, ***negative*** due to the emission of GHGs and ***slight*** due to the minor contribution

of GHG emissions towards the national target, post mitigation. In EIA terms this effect is considered ***not significant***.

13.8.2 Climate Change Risk Assessment

In relation to climate change vulnerability, it has been assessed that there are no significant risks to the location and structures of the proposed development as a result of climate change. The residual effect of climate change on the proposed development is considered ***direct*** due to receptors presence, ***long-term*** due to the proposed development's lifespan, ***negative*** as climate hazards can cause damage to infrastructure and ***not significant*** due to the low vulnerability of the proposed development to the effects of climate change, once mitigation has been considered. Overall, this is considered to be not significant in EIA terms.

13.8.3 Compliance with Section 15 of the Climate Action and Low Carbon Development Act 2015

Section 15 of the 2015 Act, sets out the duties imposed by certain bodies, including local authorities and An Coimisiún Pleanála. This section was amended by the 2021 Act and states:

"(1) A relevant body shall, in so far as practicable, perform its functions in a manner consistent with—

(a) the most recent approved climate action plan,

(b) the most recent approved national long term climate action strategy,

(c) the most recent approved national adaptation framework and approved sectoral adaptation plans,

(d) the furtherance of the national climate objective, and

(e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State.".

This chapter demonstrates how the proposed development is consistent with the objectives of Section 15 of the 2015 Act (as amended). The EIAR has carried out a greenhouse gas emissions assessment and assessed the proposed development's resilience/adaptation to climate change.

- Greenhouse Gas Emissions Assessment – This assessment considers the proposed development's GHG emissions over its lifetime. The assessment analyses these emissions in the context of the relevant carbon budgets, targets and policies to ensure consistency with the most recent approved climate action plan and the most recent approved national long term climate action strategy, and with measures in furtherance of the national climate objective. This complies with subsections 15 (1) (a), (b), and (d) of the Act.
- Climate Change Vulnerability Assessment – This assessment identifies the impact of a changing climate on the proposed development and receiving environment in the context of the most recent approved national adaptation framework and approved sectoral adaptation plans. The assessment considers the proposed development's vulnerability and adaption to climate change and identifies adaptation measures to increase resilience, as discussed in Section 13.5.3.2. This covers sections 15(1)(c) and (e) of the Act.

The above measures pursue the furtherance of the national climate objective and the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State as far as practicable as required by section 15(1)(d) and(e) of the Acts.

13.9 References

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