Clifton Scannell Emerson Associates

EIAR Chapter 9 Climate

Suir Island Infrastructure Links

Comhairle Contae Thiobraid Árann
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9.1 Introduction

AWN Consulting Limited has been commissioned to conduct an assessment of the likely impact on climate associated with the proposed Suir Island Infrastructure Links development, Clonmel, Co. Tipperary. A full description of the development can be found in Chapter 2 – Project Description & Planning Policy Context .

9.2 Assessment Methodology

9.2.1 Criteria for Rating of Impacts

Climate Agreements & Policies

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global Greenhouse Gas (GHG) emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas 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* (the Regulation). 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. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050'* (3.(1) of No. 46 of 2015). This is referred to in the Act as the 'national transition objective'. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the 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.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019). The Climate Action Plan 2019 outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2021a) and a third update in December 2022 (Government of Ireland, 2022).

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019, followed by the publication of the Climate Action and Low Carbon Development (Amendment) Bill 2021 (hereafter referred to as the 2021 Climate Bill) in March 2021. The Climate Act was signed into Law on 23rd July 2021, giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act (Government of Ireland, 2021b) is to provide for the approval of plans "for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050". The 2021 Climate Act will also "provide for carbon budgets and a decarbonisation target range for certain sectors of the economy". The 2021 Climate Act defines the carbon budget as "the total amount of greenhouse gas emissions that are permitted during the budget period".

In relation to carbon budgets, the 2021 Climate Action and Low Carbon Development (Amendment) Act states '*A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Climate Change Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on 1st January 2021 and ending on 31st December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')*'. The carbon budget is to be produced for 3 sequential budget periods, as shown in Table 9-1. The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change. In relation to the sectoral emissions ceiling, the Minister for the Environment, Climate and Communications (the Minister for the Environment) shall prepare and submit to government the maximum amount of GHG emissions that are permitted in different sectors of the economy during a budget period and different ceilings may apply to different sectors. The sectorial emission ceilings for 2030 were published in July 2022 and are shown in Table 9-2. Transport has a 50% reduction requirement and a 2030 emission ceiling of 6 $MtCO_{2eq}$[1].

Table 9-1: 5-Year Carbon Budgets 2021-2025, 2026-2030 and 2031-2035

Sector	Reduction Required	2018 Emissions ($MtCO_2eq$)
2021-2025	295 Mt CO_{2eq}	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO_{2eq}	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO_{2eq}	Reduction in emissions of 3.5% per annum for the third provisional budget.

[1] Mt CO_{2eq} denotes million tonnes carbon dioxide equivalent.

Table 9-2: Sectoral Emission Ceilings 2030

Sector	Reduction Required	2018 Emissions ($MtCO_{2eq}$)	2030 Emission Ceiling ($MtCO_{2eq}$)
Electricity	75%	10.5	3
Transport	50%	12	6
Buildings (Commercial and Public)	45%	2	1
Buildings (Residential)	40%	7	4
Industry	35%	7	4
Agriculture	25%	23	17.25
Other (F-Gases, Waste & Petroleum refining)	50%	2	1

In December 2022, CAP23 was published (Government of Ireland 2022). This is the first CAP since the publication of the carbon budgets and sectoral emissions ceilings, and it aims to implement the required changes to achieve a 51% reduction in carbon emissions by 2030. The CAP has six vital high impact sectors where the biggest savings can be made: renewable energy, energy efficiency of buildings, transport, sustainable farming, sustainable business and change of land-use. CAP23 states that the decarbonisation of Ireland's manufacturing industry is key for Ireland's economy and future competitiveness. There is a target to reduce the embodied carbon in construction materials by 10% for materials produced and used in Ireland by 2025 and by at least 30% for materials produced and used in Ireland by 2030. CAP23 states that these reductions can be brought about by product substitution for construction materials and reduction of clinker content in cement. Cement and other high embodied carbon construction elements can be reduced by the adoption of the methods set out in the Construction Industry Federation 2021 report Modern Methods of Construction. In order to ensure economic growth can continue alongside a reduction in emissions, the IDA Ireland will also seek to attract businesses to invest in decarbonisation technologies.

Climate Assessment Significance Criteria

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.

The significance criteria for each assessment are described below.

Significance Criteria for GHGA

The Transport Infrastructure Ireland (TII) guidance document entitled *PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document* (TII 2022a) outlines a recommended approach for determining the significance of both the construction and operational phases of a development. The approach is based on comparing the '*Do Something*' scenario and the net project GHG emissions (i.e. *Do Something – Do Minimum*) to the

relevant carbon budgets (Department of the Taoiseach 2022). With the publication of the Climate Action Act in 2021, sectoral carbon budgets have been published for comparison with the Net CO_2 project GHG emissions from the proposed development. The Transport sector emitted approximately 12 $MtCO_{2eq}$ in 2018 and has a ceiling of 6 $MtCO_{2eq}$ in 2030 which is a 50% reduction over this period (see Table 9-2).

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

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

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

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

Significance is determined using the criteria outlined in Table 9-3 (derived from Table 6.7 of PE-ENV-01104 (TII 2022a)) along with consideration of the following two factors:

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

Table 9-3: GHGA Significance Criteria

Effects	Significance level Description	Description
Significant adverse	Major adverse	• The project's GHG impacts are not mitigated. • The project has not complied with do-minimum standards set through regulation, nor provided reductions required by local or national policies; and • No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate adverse	• The project's GHG impacts are partially mitigated. • The project has partially complied with do-minimum standards set through regulation, and have not fully complied with local or national policies; and • Falls short of full contribution to Ireland's trajectory towards net zero.

Effects	Significance level Description	Description
Not significant	Minor adverse	• The project's GHG impacts are mitigated through 'good practice' measures. • The project has complied with existing and emerging policy requirements; and • Fully in line to achieve Ireland's trajectory towards net zero.
	Negligible	• The project's GHG impacts are mitigated beyond design standards. • The project has gone well beyond existing and emerging policy requirements; and • Well 'ahead of the curve' for Ireland's trajectory towards net zero.
Beneficial	Beneficial	• The project's net GHG impacts are below zero and it causes a reduction in atmosphere GHG concentration. • The project has gone well beyond existing and emerging policy requirements; and • Well 'ahead of the curve' for Ireland's trajectory towards net zero, provides a positive climate impact.

Significance Criteria for CCRA

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

Vulnerability = Sensitivity x Exposure

The vulnerability assessment takes any proposed mitigation into account. Table 9-4 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale. Where residual medium or high vulnerabilities exist the assessment may need to be progressed to a detailed climate change risk assessment and further mitigation implemented to reduce risks.

Table 9-4: 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

9.2.2 Construction Phase

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 9.3). The impact of the proposed development on climate is determined in relation to this baseline. As per the IEMA guidance (2022) where expected emissions will not increase by over 1% compared with the baseline scenario then no further assessment is required as there is no potential for significant impacts to climate.

The impact of the construction phase of the proposed development on climate has been estimated using the Transport Infrastructure Ireland (TII) Carbon Tool (2022b). This tool is specifically designed to account for the embodied emissions associated with TII road and infrastructure developments in Ireland. The assessment commences with the high-level design, through the pre-construction (site clearance) stage, followed by the assessment of the embodied carbon associated with all materials used in the construction of the development, the emissions during the construction phase and additionally emissions related to waste generated during the construction phase. The tool also assesses on-going maintenance associated with the default 60 year lifetime of the road development. For roads, it is generally assumed that end-of-life demolition is not relevant and thus emissions associated with this stage have not been quantified.

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

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

9.2.3 Operational Phase

The operational phase assessment involves determining the vulnerability of the proposed development to climate change. This involves an analysis of the sensitivity and exposure of the development to climate hazards which together provide a measure of vulnerability.

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

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

The baseline environment information provided in Section 9.3, future climate change modelling and input from other experts working on the proposed development (i.e. hydrologists) should be used in order to assess the likelihood of a climate risk.

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

- Spatial boundary: As per PE-ENV-01104 (TII, 2022a), the study area with respect to the GHGA is Ireland's Climate budget. The study area with respect to the CCRA can be considered the

project boundary and its assets. The study area will be influenced by current and future baselines (Section 9.3). This study area is influenced by the input of other experts within the EIAR team;
- Climate hazards: The outcomes of the climate screening i.e. vulnerability assessment and baseline assessment; and
- Project receptors: TII state that the project receptors are the asset categories considered in the climate screening. In addition, any critical connecting infrastructure and significant parts of the surrounding environment e.g. water bodies that should be considered as a part of the indirect, cumulative and in combination impact assessment should also be considered project receptors.

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

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

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

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

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

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

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

Once the sensitivity and exposure are categorised, a vulnerability analysis is conducted by multiplying the sensitivity and exposure to calculate the vulnerability, as shown in Table 9-4.

9.3 Receiving Environment

PE-ENV-01104 (TII, 2022a) 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.

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.

Data published in 2022 (EPA, 2022b) predicts that Ireland exceeded (without the use of flexibilities) its 2021 annual limit set under EU's Effort Sharing Decision (ESD) (EU 2018/842) by 2.71 Mt CO_{2eq} as shown in Table 9-5. The sector with the highest emissions in 2021 was agriculture at 35.3% of the total, followed by transport at 20.3%. Ireland's greenhouse gas emissions increased by 4.7% in 2021 compared to 2020. For 2021 total national emissions (excluding LULUCF) were estimated to be 61,528 kt CO_{2eq} as shown in Table 9-5 (EPA, 2022b).

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, 2022a) and IEMA Guidance (IEMA, 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 CAP23, and future CAPs, alongside binding 2030 EU targets. In order to meet the commitments under the Paris Agreement, 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). 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 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 thus includes GHG emissions from transport, residential and commercial buildings and agriculture.

Table 9-5: Total National GHG Emissions in 2021

Category	2021 Kilotonnes CO_{2eq}	% of Total GHG emissions
Waste	937	1.5%
Energy Industries	10,272	16.7%
Residential	7,040	11.4%
Manufacturing Combustion	4,593	7.5%
Commercial Services	817	1.3%
Public Services	663	1.1%
Transport	10,912	17.7%
Industrial Processes	2,460	4.0%
F-gases	738	1.2%
Agriculture	23,097	37.5%
Total	**61,528**	**100%**

Impacts as a result of climate change will evolve with a changing future baseline, changes have the potential to include increases in global temperatures and increases in the number of rainfall days per year. Therefore, it is expected that the baseline climate will evolve over time and consideration is needed with respect to this within the design of the proposed development.

Ireland has seen increases in the annual rainfall in the north and west of the country, with small increases or decreases in the south and east including in the region where the proposed development will be located (EPA, 2021b). The EPA have compiled a list of potential adverse impacts as a result of climate change including the following which may be of relevance to the proposed development (EPA, 2021b):

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

The EPA's State of the Irish Environment Report (Chapter 2: Climate Change) (EPA, 2020c) notes that projections show that full implementation of additional policies and measures, outlined in the 2019 Climate Action Plan, will result in a reduction in Ireland's total GHG emissions by up to 25 per cent by 2030 compared with 2020 levels. Climate change is not only a future issue in Ireland, as a warming of approximately 0.8°C since 1900 has already occurred. The EPA state that it is critically important for the public sector to show leadership and decarbonise all public transport across bus and rail networks to the lowest carbon alternatives. The report (EPA, 2020c) underlines that the next decade needs to be one of major developments and advances in relation to Ireland's response to climate change in order to achieve these targets and that Ireland must accelerate the rate at which it implements GHG emission reductions. The report states that mid-century mean annual temperatures in Ireland are projected to increase by between 1.0°C and 1.6°C (subject to the emissions trajectory). In addition, heat events are expected to increase by mid-century (EPA, 2020c). While individual storms are predicted to have more severe winds, the average wind speed has the potential to decrease (EPA, 2020c).

TII's Guidance document PE-ENV-01104 (TII 2022a) states that for future climate change a moderate to high Representative Concentration Pathways (RCP) should be adopted. RPC4.5 is considered moderate while RPC8.5 is considered high. Representative Concentration Pathways (RCPs) describe different 21st century pathways of GHG emissions depending on the level of climate mitigation action undertaken.

Future climate predictions undertaken by the EPA have been published in 'Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach (EPA 2020d). The future climate was simulated under both Representative Concentration Pathway 4.5 (RCP4.5) (medium-low) and RCP8.5 (high) scenarios. This study indicates that by the middle of this century (2041–2060). Mid-century mean annual temperatures are projected to increase by 1 to 1.2°C and 1.3 to 1.6°C for the RCP4.5 and RCP8.5 scenarios, respectively, with the largest increases in the east. Warming will be enhanced at the extremes (i.e. hot days and cold nights), with summer daytime and winter night-time temperatures projected to increase by 1 to 2.4°C. There will be a substantial decrease of approximately 50% which is projected for the number of frost and ice days. Summer heatwave events are expected to occur more frequently, with the largest increases in the south. In addition, precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events. Climate change also has the potential to impact future energy supply which will rely on renewables such as wind and hydroelectric power. Wind turbines need a specific range of wind speeds to operate within and droughts or low ground water levels may impact hydroelectric energy generating sites. More frequent storms have the potential to damage the communication networks requiring additional investment to create resilience within the network.

The EPA's Critical Infrastructure Vulnerability to Climate Change report (EPA, 2021b) assesses the future performance of Irelands critical infrastructure when climate is considered. With respect to road infrastructure, fluvial flooding and coastal inundation/coastal flooding are considered the key climate change risks with snowstorm and landslides being medium risks. Extreme winds and heatwaves/droughts are considered low risk to road infrastructure. One of the key outputs of the research was a framework that will provide quantitative risk-based decision support for climate change impacts and climate change adaptation analysis for infrastructure.

9.4 Characteristics of Proposed Development

The proposed development involves the construction of pedestrian bridges, provision of new public open space and a number of other infrastructure elements and ancillary works. A full description of the proposed development is provided in Chapter 2 Project Description & Planning Policy Context of this EIAR document. During the construction stage the main source of climate impacts will be as a result of GHG emissions and embodied carbon associated with construction works, construction materials and transport of the materials to site, waste materials, energy and fuel usage as well as staff transport. During the operational phase vehicle emissions from traffic accessing the site has the potential to release CO_2 and other GHGs which will impact climate. In addition, the vulnerability of the proposed development in relation to future climate change must be considered during the operational phase.

The following describes the primary sources of potential climate impacts which have been assessed as part of this EIAR.

9.5 Impact Assessment

9.5.1 Construction Impacts

The construction phase of the proposed development will result in a number of GHG emissions from various sources. Embodied carbon is carbon dioxide emitted during the manufacture, transport and construction of building materials, together with site activities. As part of the proposed road

development, construction stage embodied GHG emissions have been calculated under the following headings within the TII Carbon Tool (2022b):

- Pre-Construction
- Embodied Carbon of Materials
- Construction Activities
- Construction Waste
- Operational Use
- Maintenance

Transport GHG emissions associated with delivery of materials to site and removal of waste materials off site were included in the calculator. The exact location of the facilities to be used is not known at this stage, for the purposes of this assessment it was assumed that the waste facilities would be located in an approximate 30 km radius from the site. This distance was used in the calculator to account for waste material travel related emissions.

Table 9-6 details the embodied carbon emissions associated with each category within the Carbon Tool. The embodied carbon associated with construction activities is the largest contributor to GHG emissions during the construction phase at 84% of the total. This is primarily due to electricity usage on-site. It is proposed to power the site primarily using mains grid power which is a preferable method compared with portable generators. Embodied carbon of materials and on-going maintenance materials and works over the lifetime of the project make up the significant remainder of the carbon emissions at 11% and 4% respectively.

The results of the assessment have been compared against the 2030 sectoral emissions ceiling of 6 $MtCO_2e$ for the Transport sector. The proposed development will result in total construction phase emissions of 8,299.65 tonnes CO_2e over the 18-month construction period, this amounts to 0.14% of the Transport Sector emissions ceiling for 2030. In the context of total national GHG emissions, Ireland's national GHG emissions in 2021 were 61,528 kt CO_2e (Table 9-5), the project related GHG emissions equate to 0.013% of Ireland's 2021 GHG emissions.

Table 9-6: Greenhouse Gas Assessment

Source	Carbon Emissions (tCO_2e)	% of total
Pre-Construction	9.90	0.1%
Embodied Carbon of Materials	916.52	11.0%
Construction Activities	6,991.08	84.2%
Construction Waste	7.20	0.1%
Operational Use	33.86	0.4%
Maintenance	341.10	4.1%
Total	**8,299.65**	**100.0%**
2030 Sectoral Emissions Ceiling (Transport Sector)	6,000,000	
Total project carbon as % of sectoral ceiling	0.14%	

9.5.2 Operational Impacts

In order 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. The following climate hazards have been considered in the context of the proposed development: flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning, hail, landslides and fog. Wildfire and landslides were not considered relevant to the proposed development due to the project location and have been screened out of the assessment.

The sensitivity of the proposed development to the above climate hazards is assessed irrespective of the project location. Table 9-7 details the sensitivity of the proposed development on a scale of high (3), medium (2) and low (1). Once the sensitivity has been established the exposure of the proposed development to each of the climate hazards is determined, this is the 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 as per Table 9-4. The results of the vulnerability assessment are detailed in Table 9-7 below.

Table 9-7: Climate Change Vulnerability Assessment

Climate Hazard	Sensitivity	Exposure	Vulnerability
Flooding (coastal, pluvial, fluvial)	3 (High)	1 (Low)	3 (Medium)
Extreme Heat	3 (High)	1 (Low)	3 (Medium)
Extreme Cold	3 (High)	1 (Low)	3 (Medium)
Drought	1 (Low)	1 (Low)	1 (Low)
Extreme Wind	2 (Medium)	1 (Low)	2 (Low)
Lightning & Hail	1 (Low)	1 (Low)	1 (Low)
Fog	1 (Low)	1 (Low)	1 (Low)

The proposed development has a worst-case medium vulnerability to flooding, extreme heat and extreme cold. Chapter 7 – Hydrology notes that the locations of the proposed north and south bridge landings have the potential to flood in 1% Fluvial AEP flood events. Flood defence infrastructure is currently in place along the River Suir to prevent flooding within the area which provides protection for the 1% AEP plus 20% Climate Change scenario. Chapter 7 – Hydrology determined that flood risk impacts are not predicted as a result of the proposed development. In addition, the attenuation and drainage designed for the site ensure that flood risk is minimised by allowing additional capacity to deal with increased rainfall events as a result of future climate change. Therefore, flooding on site is not a significant risk.

In relation to extreme temperatures, both extreme heat and extreme cold, these have the potential to impact the building materials and some related infrastructure. However, high quality, durable building materials will be selected for the proposed development. Therefore, extreme temperatures are not considered a significant risk.

9.5.3 Cumulative Impacts

With respect to the requirement for a cumulative assessment PE-ENV-01104 (TII, 2022a) states that *"for GHG Assessment is the global climate and impacts on the receptor from a project are not geographically constrained, the normal approach for cumulative assessment in EIA is not considered applicable*."

However, by presenting the GHG impact of a project in the context of its alignment to Ireland's trajectory of net zero and any sectoral carbon budgets, this assessment will demonstrate the potential for the project to affect Ireland's ability to meet its national carbon reduction target. Therefore, the assessment approach is considered to be inherently cumulative.

9.6 Mitigation and Monitoring Measures

9.6.1 Construction

During the construction phase the following best practice measures shall be implemented on site to prevent significant GHG emissions and reduce impacts to climate:

- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods.
- Ensure all plant and machinery are well maintained and inspected regularly.
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.
- Sourcing materials locally where possible to reduce transport related CO_2 emissions.

9.6.2 Operational

A number of measures have been incorporated into the design of the development in order to mitigate against the impacts of future climate change. For example, adequate attenuation and drainage have been incorporated into the design of the development to avoid potential flooding impacts as a result of increased rainfall events in future years. These measures have been considered when assessing the vulnerability of the proposed development to climate change (see Section 9.5.2).

9.7 Residual Impacts

The proposed development will result in some impacts to climate through the release of GHGs. TII state that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

The primary element of the project is to create 2 no. pedestrian link bridges and promote a direct connection for pedestrians and cyclists between Suir Island, the proposed North Plaza, Raheen Road, Denis Burke Park and the Town Centre. Allowing for good pedestrian and cyclist connections within the town promotes sustainable forms of transport which is beneficial in terms of climate in the long term. Therefore, the purpose of the development is in line with Ireland's net zero trajectory.

Using the significance criteria detailed in Table 9-3 the predicted effect on climate as a result of GHG emissions is short-term, minor adverse and not significant.

In relation to climate change vulnerability, it has been assessed that there are no significant risks to the proposed development as a result of climate change.

9.8 Interactions

Climate change has the potential to lead to increased rainfall in future years which may result in flood impacts and interactions between Hydrology and Land, Soils and Geology. The flood risk for the development was assessed within Chapter 7 – Hydrology, which determined that flood risk impacts are not predicted as a result of the proposed development. In addition, the attenuation and drainage designed for the site ensure that flood risk is minimised by allowing additional capacity to deal with increased rainfall events as a result of future climate change. Therefore it can be determined that there is no significant risk to the proposed development as a result of increased rainfall and climate. No significant interactions between Climate, Hydrology and Land, Soils and Geology is predicted.

Traffic emissions have the potential to impact climate through the release of carbon dioxide (CO_2) emissions and other greenhouse gases (GHGs). This is an interaction between Material Assets – Traffic, Air Quality and Climate. The changes in traffic emissions associated with the proposed development were assessed within Chapter 8 – Air Quality. It was found that the proposed development will result in imperceptible changes in emissions as a result of traffic from the proposed development. Therefore no

significant interactions between Climate and Traffic or Air Quality are predicted. Predicted impacts are long-term, neutral and imperceptible.

There is the potential for interactions between Climate and Material Assets – Waste. There will be quantities of wastes generated as part of the construction of the proposed development which will have an associated embodied carbon which impacts climate. As part of the greenhouse gas (GHG) assessment conducted for the proposed development it was found that construction wastes will contribute an imperceptible amount to the total GHG emissions associated with the development at less than 0.1% of the total. As a result interactions between Climate and Material Assets – Waste are predicted to be short-term, minor adverse and not significant.

No other significant interactions with Climate have been identified.

9.8.1 Interactions with Climate Action Plan 2023

The proposed development will contribute to the decarbonisation measure quoted above by encouraging people to make use of active travel methods by providing an alternative to private vehicle trips taken. With more people making use of active travel transport methods, traffic congestion will be reduced, thus reducing fuel consumption and the emission of greenhouse gasses from idling vehicles. The proposed development will also increase the accessibility to public transport facilities by providing a new bus stop. With increased access to public transport or making the modal shift to active travel methods, residents could experience a reduction in transportation costs compared to private vehicle trips.

The primary element of the project is to create 2 no. pedestrian link bridges and promote a direct connection for pedestrians and cyclists between Suir Island, the proposed North Plaza, Raheen Road, Denis Burke Park and the Town Centre. Allowing for good pedestrian and cyclist connections within the town promotes sustainable forms of transport which is beneficial in terms of climate in the long term. Therefore, the purpose of the development is in line with Ireland's net zero trajectory.

Overall, the proposed development aims to complement climate action plans and decarbonization goals by promoting sustainable transportation options, reducing emissions, and improving public health and urban design.

9.9 Difficulties in Compiling

There were no difficulties in compiling this chapter**.**

9.10 References

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