

IN THE MATTER OF AN APPLICATION TO
AN BORD PLEANÁLA

FOR APPROVAL OF THE FOYNES TO LIMERICK ROAD (INCLUDING
ADARE BYPASS) COMPRISING:

- (I) FOYNES TO RATHKEALE PROTECTED ROAD SCHEME,
2019;
- (II) RATHKEALE TO ATTYFLIN MOTORWAY SCHEME, 2019;
- (III) FOYNES SERVICE AREA SCHEME, 2019.

ABP Ref. ABP-306146-19 and ABP-306199-19

ORAL HEARING

Brief of Evidence

Air Quality and Climate

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1. QUALIFICATIONS & EXPERIENCE

- 1.1 My name is Edward Porter. I hold a Bachelor of Science degree (1st Class (Hons) in Chemistry (1991) from the University of Sussex and a Ph.D. in Chemistry (Air Quality) from University College Dublin (1997). I am a Chartered Chemist and a full member of the Royal Society of Chemistry (C Chem MRSC), a requirement of membership being that I am active in the field of professional chemistry and satisfy the society's requirements with regard to level of qualifications and experience.
- 1.2 I have been active in the field of air quality for 27 years, the last 23 years as an environmental consultant. I have considerable experience in the areas of planning of proposed developments with regard to air quality and climate, assessment of air quality for compliance purposes and air quality mitigation measures in relation to both construction sites and operational developments. I am currently Director of Air Quality and Climate with AWN Consulting.

2. INTRODUCTION

- 2.1 AWN Consulting was engaged in relation to air quality and climate appraisal for the constraints study and the Route Selection report. AWN was also commissioned to conduct a detailed appraisal of the air quality and climate impacts associated with both the construction and operation of the proposed Foynes to Limerick Road (including Adare Bypass), which is presented in Chapter 13 of the EIAR.
- 2.2 As outlined in the EIAR the assessment was carried out using current published national and international guidance and standards as required. Specific guidance documents which were consulted included the European Commission publications "*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*" (2013) and "*Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report*" (2017) and the EPA publication "*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft August 2017*" (2017). Details of the impact assessment methodology employed are outlined in Section 13.3 of Chapter 13 of the EIAR.

3. RECEIVING ENVIRONMENT

- 3.1 The assessment of the receiving environment is outlined in Section 13.4 of the EIAR. In terms of the existing air quality environment, site-specific baseline data and data available from similar environments indicates that levels of nitrogen dioxide (NO₂), carbon monoxide (CO), particulate matter (less than 10 microns and less than 2.5 microns) (PM₁₀ and PM_{2.5}) and benzene are well below the National and European Union (EU) ambient air quality standards. Site-specific results for NO₂ ranged from 5% to 32% of the annual limit value whilst levels of PM₁₀ and PM_{2.5} ranged from 27% to 39% of the applicable limit values. In summary, the baseline assessment of the receiving environment has found that the area currently experiences good air quality.

4. PREDICTED IMPACTS

Operational Phase – Local Air Quality Impacts Along The Route

- 4.1 As outlined in Chapter 13.3 of the EIAR, the air quality assessment has been undertaken using the UK DMRB (Design Manual for Roads and Bridges) air dispersion model. The key inputs into the model are year of operation, annual average daily traffic (AADT), average vehicle speed and receptor locations. Air dispersion modelling was performed at the worst-case receptors located along the existing and proposed route of the Foynes to Limerick Road (including Adare Bypass) based on proximity to the road carriageway.
- 4.2 The impact of traffic-derived emissions from the proposed road development on ambient air quality has been extensively assessed using air dispersion modelling of the proposed road infrastructure for the baseline scenario (2017), the opening year (2024) and design year (2039).
- 4.3 The screening air dispersion modelling study found that predicted concentrations of CO, benzene, NO₂, PM₁₀ and PM_{2.5} were below their respective limit values, at all residential locations including the 22 identified potential worst-case receptors, with the proposed road development in place as outlined in Section 13.5.3.1 and Appendix 13.2 of the EIAR.

Operational Phase – Regional Air Quality Impacts

- 4.4 As outlined in Chapter 13 of the EIAR, the regional air quality assessment investigated the impact of the proposed road development on national emissions of the following pollutants: nitrogen oxides (NO_x), volatile organic compounds (VOCs) and carbon dioxide (CO₂).
- 4.5 With regard to NO_x and VOCs, results indicate that the impact of the proposed road on national emission levels is negligible being less than 0.17% of the relevant emissions ceiling in either the opening or design year as outlined in Section 13.5 of the EIAR.

Operational Phase - Climate Impacts

- 4.6 As outlined in Section 13.3.2.2 of the EIAR, the impact of the proposed road development on greenhouse gas emissions has been determined using the methodology provided in Annex 2 in the UK Design Manual for Roads and Bridges (2018) which is the approved approach as outlined in the TII Guidelines (TII, 2011). With regard to climate, the EIAR results (section 13.5.3.4 of the EIAR) showed that the impact of the proposed development in 2024 will be to increase CO₂ emissions by 0.058% of Ireland's EU 2020 Target. In the design year of 2039, the proposed road development will increase CO₂ emissions by 0.078% of the EU 2020 Target. As a result of these calculations, the climate impact of the proposed road development, as outlined in Chapter 13 of the EIAR, was deemed to be imperceptible and long-term.
- 4.7 The regional assessment for climate impacts was based on the methodology provided in Annex 2 in the UK DMRB (UK Highways Agency 2007) which is in line with TII guidance (TII, 2011) and in line with the guidance outlined in the European Commission publications "*Guidance on Integrating Climate Change and Biodiversity*

into *Environmental Impact Assessment*" (2013) and "*Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report*" (2017) and the EPA publication "*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft August 2017*" (2017). The TII methodology has historically been used routinely for the climate impact of road schemes in Ireland. However, the emission factors in the DMRB are based on the European Environment Agency (EEA) road traffic emissions database, referred to as COPERT III, with the DMRB last updated in 2007. This database does not take account of the recent advances in engine technology and does not accommodate the increasing number of electric vehicles predicted in future years.

- 4.8 Accordingly, in order to address these shortcomings, the climate assessment model used for future year forecasts, has been updated using the Emission Factors Toolkit (Version 10.1, August 2020) which includes Euro 6 emission factors taken from the EEA COPERT 5 emission calculations (September 2016). In addition, the extent of the road network included in the assessment has been expanded to include regional and local road links within the traffic model which were not previously specifically included in the climate assessment. Specifically, the analysis now includes an additional 3,000 links within the study area which were not included in the original assessment. This expanded traffic analysis will ensure that the overall network redistribution of traffic due to the proposed road development is adequately captured.
- 4.9 The above greenhouse gas (GHG) emissions calculations have been updated to take account of the impact of increased electric vehicles in future years based on the electric vehicle targets outlined in the Climate Action Plan 2019 (CAP) which was published by the Department of Communications, Climate Action & Environment (DCCAE) in August 2019.
- 4.10 The CAP outlines the current status across key sectors including electricity, transport, built environment, industry and agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. Given that it is expected there will be 2.64m cars in Ireland by 2030 (National Transport Model Update, December 2019), this equates to approximately 32% of cars being electric vehicles by 2030. As the NCT will not be available to fossil-fuel cars post 2045, it is assumed that there will be 62.6% of electric cars in 2039 based on a linear interpolation between 2030 and 2050 (2050 has been selected conservatively as the latest date when fossil-fuel cars will no longer be in operation).
- 4.11 The additional percentage increase in GHG emissions due to the proposed road development relative to Ireland's 2030 GHG target is also included in Table 4.1. Based on the revised GHG emission calculations, the impact of the proposed road development in 2024 is now 1,211 CO_{2eq} tonnes/annum which is 0.0027% of Ireland's 2030 GHG target. By 2039, taking into account the increase in EVs, the impact of the proposed road development in 2039 is now 1,778 CO_{2eq} tonnes/annum which is 0.0039% of Ireland's 2030 GHG target. This can be compared to the impact for 2024 and 2039 respectively of 22,121 CO_{2eq} tonnes /annum and 29,720 CO_{2eq} tonnes /annum reported previously in the EIAR which equated to 0.048% and 0.065% of Ireland's 2030 GHG target in 2024 and 2039, respectively.

Table 4.1 Annual GHG Emissions For Do Minimum & Do Something Scenarios for the Proposed Road Development in 2024 and 2039

Year	Do Minimum (CO _{2eq} tonnes)	Do Something (CO _{2eq} tonnes)	Difference (CO _{2eq} tonnes)	% Difference (relative to 2030 Target) ^{Note 1}
2024	396,377	397,588	1,211	0.0027%
2039	305,705	307,483	1,778	0.0039%

Note 1 Ireland's 2030 target is the sum of the Emission Trading Scheme (ETS) and non-ETS targets equating to approximately 45,700,000 CO_{2eq}.

- 4.12 In order to add context to these figures, the increase in GHG emissions due to the operation of the proposed road development can be compared to the GHG emissions associated with the construction of a typical 3-bedroom house using traditional construction methods. A study in 2011 (Monahan, 2011) found that the typical GHG emissions associated with the embodied carbon was typically around 50 tonnes CO_{2eq}. Thus, the proposed road development in 2039 will lead to an increase in carbon emissions equivalent to the construction of 35 houses (excluding electricity) and an additional 2 or 3 houses when electricity is taken into account.
- 4.13 Electric vehicles will require electricity to charge batteries some of which will be generated from fossil-fuel sources. By 2039, the renewable fraction of electricity generation is conservatively predicted to be 70% of all electricity generated (based on the CAP target of 70% for renewable electricity generation by 2030). Thus, 30% of the electricity used to charge battery operated electric vehicles will be derived from fossil fuels and will have GHG emissions associated with this.
- 4.14 However, electricity generators form part of the EU-wide Emission Trading Scheme (ETS) and thus greenhouse gas emissions from these electricity generators are not included when determining compliance with the targeted 30% reduction in the non-ETS sector i.e. electricity associated greenhouse gas emissions will not count towards the Effort Sharing Regulation (Regulation (EU) 2018/842). Thus, any necessary increase in electricity generation due to the increase in electric vehicles will have no impact on Ireland's obligation to meet the EU Effort Sharing Regulation.
- 4.15 Shown in Table 4.2 is the GHG emissions associated with the electricity used to charge the electric vehicle batteries. The impact of the electricity in 2039 is 123 CO_{2eq} tonnes/annum which is 0.001% of Ireland's ETS 2030 target.

Table 4.2 GHG Emissions For Do Minimum & Do Something Scenarios for the Proposed Road Development in 2039 Due To Electricity Used To Charge Vehicles

Year	Do Minimum (CO _{2eq} tonnes)	Do Something (CO _{2eq} tonnes)	Difference (CO _{2eq} tonnes)	% Difference (relative to ETS 2030 Target) ^{Note 1}
2039	60,731	60,853	123	0.001%

Note 1 2030 ETS target is set at 43% below Ireland's 2005 ETS allocation. The 2005 allocation was 22.44 million tonnes CO₂. Thus, 2030 target is 12.79 million tonnes CO₂.

- 4.16 In the last two years, several important changes have been implemented, including the Climate Action Plan 2019. For the sake of completeness, it should also be noted that the Draft Climate Action & Low Carbon Development (Amendment) Bill 2020 has been published, as well as Ireland's declaration of a climate and biodiversity emergency in May 2019 and the European Parliament's approval of a resolution declaring a climate and environment emergency in Europe in November 2019. In addition to the policy changes, there has been a significant increase in society's concerns in regard to climate change and the challenges Ireland faces in meeting the EU 2020 and 2030 targets. Thus, the baseline environment should be viewed as a more sensitive environment for the assessment of impacts than that outlined at the time of the EIAR due to the above considerations.
- 4.17 The 'Climate Action Plan' (CAP), published in June 2019, outlines the current status across key sectors including electricity, transport, built environment, industry and agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details 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.
- 4.18 In relation to the transport sector, the CAP identifies the electrification of transport as the most cost-effective abatement opportunity. The CAP outlines a range of targets for electrification of vehicles including:
- Increasing the number of passenger electric vehicles (EVs) on the road to 840,000 by 2030;
 - Achieving a target of 95,000 electric vans and trucks by 2030;
 - Procuring 1,200 low-emission buses for public transport in cities; and
 - Increasing the biofuel blend rate from the current E5 and B5 blends to E10 and B12 in petrol and diesel, respectively.
- 4.19 The CAP has set a transport sector reduction target of 45-50% in GHG emissions relative to 2030, pre-NDP (National Development Plan) projects. In order to achieve this, the Climate Action Plan 2019 proposes the introduction of new legislation to ban the sale of fossil fuel cars from 2030 and to stop granting NCT certificates from 2045 to fossil fuel cars. The Plan foresees that by 2030, 32% of vehicles will be electric vehicles (EV). In addition, at the EU level, carbon emissions from vehicles are continuing to reduce with a target of 130g of CO₂/km applied to new passenger cars since 2015, reducing to 95g of CO₂/km by 2021.
- 4.20 In October 2020, the Climate Action and Low Carbon Development (Amendment) Bill 2020 was published. Whilst, of course, the Bill does not become law unless and until it is enacted, it is noteworthy that its objective is stated as being '*for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050*'.
- 4.21 The National Long Term Climate Action Strategy may include the following:
- Projected greenhouse gas emission reductions and the enhancement of sinks for a minimum of 30 years;

- Projected sector specific greenhouse gas emission reductions and enhancement of removals by sector;
 - Carbon budgets;
 - Decarbonisation targets;
 - Local authority climate action plans; and
 - An assessment of potential opportunities in relevant sectors.
- 4.22 In June 2020, the Government published the '*Programme for Government – Our Shared Future*' (Government of Ireland 2020). In relation to climate, there is a commitment to an average 7% per annum reduction in overall greenhouse gas emissions from 2021 to 2030 (51% reduction over the decade) with an ultimate aim to achieve net zero emissions by 2050. Policies consistent with the CAP include the acceleration of the electrification of the transport system, including electric bicycles, electric vehicles and electric public transport, alongside a ban on new registrations of petrol and diesel cars from 2030. In addition, there will be a policy to ensure an unprecedented modal shift in all areas by a reorientation of investment to walking, cycling and public transport.

Electric Vehicles

- 4.23 The UK policy document "*Net Zero Technical Report*" (Committee on Climate Change (COCC), 2019) contains a detailed pathway for the significant reductions required in the transport sector to meet the overall UK target of net zero emissions by 2050. The UK surface transport sector accounts for 23% of total UK emissions in 2017, which is slightly greater than Ireland (projected to be 20.1% in 2018) (EPA, 2020). However, the policy document is projecting that by switching to sales of EVs solely by 2040, using electricity and hydrogen fuel for buses, encouraging public transport, walking and cycling and making improvements to logistics, the GHG emissions associated with transport can be reduced by 79% by 2050 compared to a 1990 baseline.
- 4.24 The policy document also outlines a "*further ambition scenario*" set of measures including the end of non-zero emission vehicles sales by 2035 with no usage of non-zero emission vehicles after 2049, an increase in rail electrification and more ambitious targets for demand reduction, including reducing car mileage by 10% and reducing HGV mileage by 10%. Combining these, leads to a reduction in GHG emissions from surface transport by 98% by 2050 compared to 1990 (COCC, 2019).

Baseline Climate Environment

- 4.25 It is now clear that Ireland will struggle to meet targets set under Regulation (EU) 2018/842, which has set binding annual greenhouse gas emission reductions from 2012 to 2030. Ireland has been set a 30% reduction in emissions by 2030 compared to 2005 levels under this regulation which translates to approximately 32 Mt CO_{2eq} for Ireland's non-ETS emissions in 2030. This more stringent 2030 limit results in a higher level of impact than that previously assessed and in accordance with EPA guidance, the magnitude of the impact of this proposed road development is now deemed to be of a "medium" level.
- 4.26 As outlined in European Commission publications "*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*" (2013) the

assessment of the impact of the scheme on climate should be context-specific. Within the context of global or EU-wide emissions, the GHG emissions associated with the scheme are small. However, given the various policy changes and the increase in baseline sensitivity in Ireland, in addition to Ireland's failure to meet the targets set in legislation since 2016, and in the absence of specific sectoral budgets for the transport sector, the proposed road development, based on an assessment of both the construction phase and operational phase, has conservatively been determined as likely to have a significant negative impact on carbon emissions and climate. As a result of this conclusion, investigations have been undertaken into additional mitigation measures that could be included in the Schedule of Commitments to further reduce the climate impact of the proposed development. These are outlined in Section 5 of this Brief of Evidence.

- 4.27 This conclusion is in line with the Institute of Environmental Management and Assessment (IEMA) guidance note on "*Assessing Greenhouse Gas Emissions and Evaluating their Significance*" (IEMA, 2017) which advises that all carbon emissions contribute to climate change and in the absence of a defined threshold (e.g. national sector specific targets and trajectories), any increase (or decrease) to carbon emissions may be considered as significant.

Operational Phase – Screening Air Quality Impacts on Sensitive Ecosystems

- 4.28 The impact of NO_x (i.e. NO and NO₂) emissions resulting from the proposed road at the Lower River Shannon cSAC and River Shannon & River Fergus Estuaries SPA was assessed as outlined in Section 13.5 of the EIAR.
- 4.29 It is predicted that the impact of the proposed road development will lead to an increase in nitrogen oxides concentrations within a section of the Lower River Shannon cSAC at the bridge crossing the River Maigue at Islandea / Ardshanbally. However, these concentrations will not have any adverse effect on the designated sites, as assessed in consultation with the project ecologist.

Construction Phase – Air Quality

- 4.30 The greatest potential impact on air quality during the construction phase of the proposed road development is from construction dust emissions and the potential for nuisance dust. Construction dust emissions can come from a variety of sources including construction traffic.
- 4.31 The proposed road development has a number of residential properties along its route, which are within 50m of potential construction activities. A Dust Management Plan including dust minimisation measures have been detailed Appendix 13.3 of Chapter 13 to be implemented during the construction phase. Therefore, fugitive emissions of dust from the site are expected to be insignificant and will not cause any nuisance at nearby houses.

Construction Phase – Climate

- 4.32 In Table 13.10 of the EIAR, the total construction phase carbon emissions, when assessed over the predicted 3-year construction period will reach, at most, 0.05% of Ireland's 2020 emissions target. The predicted impact to climate during the construction phase was deemed short-term, negative but overall not significant.

- 4.33 In the EIAR, the TII Carbon Assessment Tool (Version 1) (TII 2018) was used to determine carbon emissions from the construction and maintenance activities associated with the proposed road development. Since publication of the EIAR, TII has released the TII Carbon Assessment Tool (Version 2) (TII 2020) and thus the embodied carbon calculations have been updated to reflect any changes associated with the updated software.
- 4.34 The total construction phase carbon emissions, when assessed over the predicted 3-year construction period reach, at most, 0.11% of Ireland's 2030 emissions target. The predicted impact to climate during the construction phase is deemed to have a short-term negative impact. The project as a whole, taking into account both the construction and operational phases of the scheme, has been determined as likely to have a significant negative impact on carbon emissions and climate.
- 4.35 The stages of the assessment in the TII Carbon Tool (TII 2020) are shown in Figure 4.1 below. 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 road, 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 there are no emissions associated with this stage.
- 4.36 The TII Carbon Tool (TII 2020) uses emission factors from recognized 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.

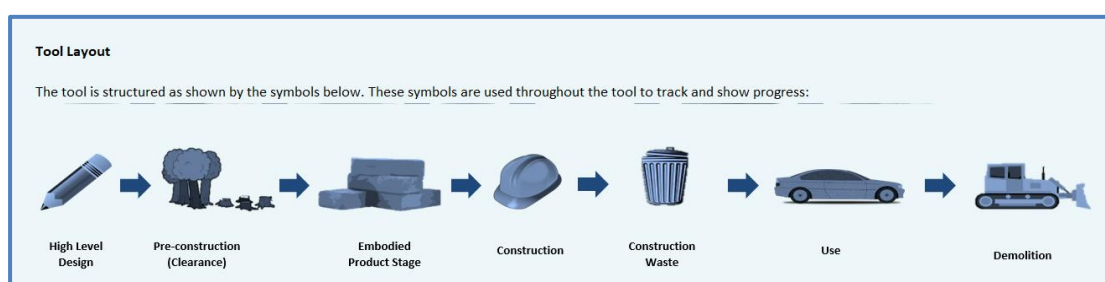


Figure 4.1 TII Carbon Assessment Tool Layout (TII 2020)

- 4.37 Based on the updated TII Carbon Tool (TII 2020), the breakdown of the activities between the different phases of the proposed road development has been assessed. As shown in Table 4.3, the updated assessment indicates that the key phases of the carbon generation are the embodied carbon of the construction materials and the maintenance of these construction materials, which when combined account for over 89% of all carbon emissions. Pre-construction and construction operations, together with construction waste account for 11% of all emissions.

Table 4.3 Carbon Emissions During Construction & Maintenance of the Proposed Road Development

Activity	Tonnes CO _{2eq} / Total
Pre-Construction	1,830
Embodied Carbon	84,549
Construction Activities	19,459
Construction Waste	1,859
Maintenance	97,582
All	205,281

Cumulative Impacts

4.38 Should the construction stage of the proposed road overlap within 350m of the construction of any other proposed developments including further development at Shannon - Foynes Port, then there is the potential for cumulative dust and greenhouse gas impacts, based on the Institute of Air Quality Management (IAQM) guidance (2014). However, in relation to dust, the dust mitigation measures outlined in the mitigation section of Chapter 13 of the EIAR and detailed in Appendix 13.3 will effectively mitigate any potential dust impacts at the nearby sensitive receptors and the impact of construction dust emissions is deemed short-term and imperceptible. In regard to greenhouse gas emissions, the GHG mitigation measures outlined in Section 13.6.1.2 of the EIAR will mitigate any potential cumulative GHG emissions.

Project Need/Justification and Scale

4.39 The National Development Plan (Government of Ireland 2018a) has highlighted the priority areas for future public capital investment in Ireland. In relation to transport, the NDP states (NDP, page 14):

“Maintenance and upgrading of the road network and public transport to protect asset quality and value, meet demand forecast, ease congestion and to meet climate action objectives”.

4.40 The NDP set a target of 500,000 EVs by 2030 (subsequently revised upwards in the CAP to 840,000) and also proposed the ban on the sale of fossil-fuel cars post 2030, the elimination of NCT Certs post 2045 and a range of sustainable transport measures including comprehensive cycling and walking networks for metropolitan areas of Ireland’s cities and expanded greenways. In addition, the NDP plans a comprehensive integrated public transport network for Ireland’s cities connecting more people to more places.

4.41 As referenced above, in June 2020 the Government published the ‘Programme for Government – Our Shared Future’ (Government of Ireland 2020). In relation to climate, there is a commitment to an average 7% per annum reduction in overall greenhouse gas emissions from 2021 to 2030 (51% reduction over the decade) with an ultimate aim to achieve net zero emissions by 2050. Policies consistent with the NDP and CAP include the acceleration of the electrification of the transport system, including electric bicycles, electric vehicles and electric public transport, alongside a ban on new

registrations of petrol and diesel cars from 2030. In addition, there will be a policy to ensure an unprecedented modal shift in all areas by a reorientation of investment to walking, cycling and public transport.

- 4.42 Thus, the reduction in the transport sector of 45-50% in the CAP is framed in the context of a very significant increase in the uptake of EVs over the period 2020 – 2030. There is no indication of a policy to reduce road construction nor to reduce road transport in general. Rather, by ensuring that all cars will be electric by 2045 at the latest and that the electricity grid will have at least 70% renewables by 2030 and net zero emissions by 2050, the sought after reduction in the transport sector will be obtained from technology shifts rather than a policy to reduce mobility and car ownership.
- 4.43 Section 10.3 of the Climate Action Plan also sets out *Measures to Deliver Targets* in relation to the targets set out in section 10.2 for Transport. One of the measures outlined as being critical to the success of achieving the transport targets is Modal Shift. The plan outlines the aim to provide good public transport, cycling and walking infrastructure, so people are less reliant on their cars, and congestion can be reduced.
- 4.44 The proposed development will help facilitate this modal shift by removing congestion and a proportion of the through traffic from towns and villages along the N21 and along the N69. The removal of future congestion within these towns will also allow public transport to function reliably, with improved journey times and improved journey amenity.

5. MITIGATION MEASURES

Construction Phase – Air Quality

- 5.1 An Environmental Operating Plan has been formulated for the construction phase of the project, as part of the implementation of the mitigation strategy.
- 5.2 Measures to be implemented to mitigate the effects of dust emissions from construction activities have been set out in Appendix 13.3 of the EIAR.

Construction Phase – Climate

- 5.3 Greenhouse gas mitigation measures are outlined in Section 13.6.1.2 of the EIAR. These site-specific greenhouse gas mitigation measures during the construction phase of the proposed road development include:
- the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods;
 - minimising waste of materials due to poor timing or over ordering on site will help to minimise the embodied carbon footprint of the site;
 - materials will be reused as much as possible within the extent of the sites, in addition, materials will be sourced locally where possible to reduce the embodied emissions associated with transport;
 - a Construction Stage Traffic Management Plan will be implemented throughout the construction stage to avoid congestion and thus reduce emissions (see Chapter 4 of the EIAR for more details);
 - all plant and machinery will be maintained and serviced regularly.
- 5.4 It was recognised during the design development phase that there was potentially an opportunity to consider a combined road development for the N69 and the N21 of approximately 35km in length, instead of two separate schemes as these routes would have amounted to approximately 52km in length, and that the embodied carbon of the proposed combined road alternative would be significantly reduced.
- 5.5 The proposed road development therefore provides both a Core and Comprehensive Network combined in one development, resulting in a reduction in materials required for construction. Based on the embodied carbon calculation provided in paragraphs 4.32 – 4.37, it is estimated that if both schemes were to be provided, the embodied carbon would have totalled 160,011 tonnes CO_{2eq} over the 3-year construction phase. The proposed development therefore provides a saving of 52,311 tonnes CO_{2eq} of embodied carbon over the 3-year construction period reflecting that the issue of carbon mitigation and sustainable design was integral to the design approach (see Figure 5.1 below). Thus, the proposed road development will lead to total emissions of 107,700 tonnes CO_{2eq} over the 3-year construction period which equates to 0.11% of Ireland's non-ETS 2030 emission target.

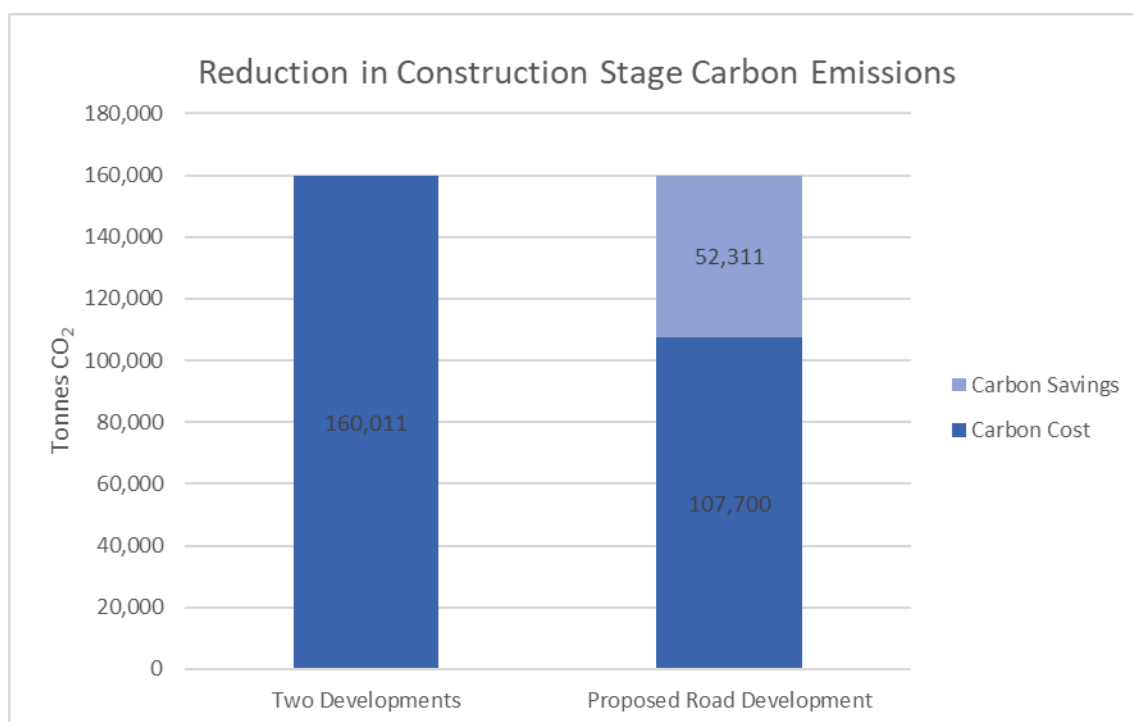


Figure 5.1 Reduction in Construction Stage Carbon Emissions Over The 3-Year Construction Phase

Note: Based on the embodied carbon outputs provided in Paragraphs 4.32 – 4.37

Design Choices

- 5.6 A suite of other design choices has also had a positive impact on sequestration of carbon. Carbon saving has been generated by use of open channel drainage systems, as described in Chapter 4 (Section 4.10) of the EIAR, instead of piped drainage systems, reducing the total volume of concrete required.
- 5.7 Efforts have also been made, insofar as possible, to source infill material from within the proposed cuttings, in order to minimise the volume of material imported from quarries in the region. This has resulted in the reuse of approximately 0.3 million m³ of soil materials that is appropriate for landscaping purposes.

Construction and Operation - Mitigation Measures and Carbon Offsetting

- 5.8 Section 13.6.1.2 of the EIAR has also included mitigation measures for the construction stage of the development to ensure that construction plant will be used in the most efficient manner to reduce carbon emissions. It is stipulated that materials will be ordered carefully to avoid waste and will be re-used where possible. Construction related congestion will be avoided insofar as possible through the implementation of a Traffic Management Plan. Measures have also been included to limit the hours during which bulk materials can be delivered through Adare to site, so as not to add to congestion within Adare village during peak traffic periods.
- 5.9 In addition, the proposed development will see an estimated area of 181 ha planted as per drawings 11.1 to 11.24 of the EIAR. This planting will comprise screen planting (37.2 ha) and specific landscape measures (85.4 ha) to mitigate visual impacts, scrub and mature tree planting as mitigation for barn owls (37.3 ha) and wet woodland and

riparian planting where suitable around attenuation ponds (21.1 ha). Further to this, 45km of hedgerow and treelines will be provided along the development boundaries.

- 5.10 These mitigation measures will not only avoid, eliminate or reduce impacts on sensitive receptors and biodiversity, but the volume of planting will also create carbon sequestration as part of the development which will provide carbon offsetting throughout the operational stage. These plantings will continue to provide carbon sequestration for the lifetime of the project, providing further carbon offsetting to those figures outlined above.
- 5.11 The sequestered carbon saving due to planting of 181 ha, and an additional 9 ha of treeline planting calculated after the publication of the EIAR, has been estimated using data from the UK Forestry Commissions (UK Forestry Commission, 2012). The CO₂ uptake rate for trees vary for different species with for example a thinned oak forest sequestering at a rate of 2.62 tCO_{2eq}/hectare/year, a thinned Sitka spruce forest sequestering at 9.6 tCO_{2eq}/hectare/year and a thinned beech forest sequestering at 3.4 tCO_{2eq}/hectare/year (UK Forestry Commission 2012). Generally, trees have the ability to sequester carbon with the peak CO_{2eq} uptake rate for tree stands of the order of 5 – 20 tCO_{2eq}/hectare/year with CO_{2eq} uptake rates declining with maturity and health (UK Forestry Commission, 2012). Using the lower level of a thinned oak forest sequestering at a rate of 2.62 tCO_{2eq}/hectare/year, the benefit amounts to approximately 30,000 tonnes CO_{2eq} over the 60-year lifetime of the proposed road development. This is equivalent to offsetting 28% of the GHG emissions associated with the construction of the proposed development. In terms of the maintenance phase of the development, the offset equates to 31% of the annual maintenance phase GHG emissions.
- 5.12 In addition to the planting proposed as part of the EIAR, additional areas of planting within the areas to be compulsorily acquired were identified within the Further Information Response and have been included in the Schedule of Commitments to provide further carbon offsetting throughout the life of the project. The two areas of cuttings in the Ardaneer area (Ch.1+500, Section A) and the Mulderricksfield area (Ch.5+100 to Ch.6+450, Section A), which are shown in Figures R11, R11.1, R11.3, R11.4 and R11.7 of the Further Information Response, will be divided into zones with both woodland planting and scrub planting provided, in order to comply with the TII guidance on maintaining clear zones. Figure R11 is reproduced below as Figure 5.2. Scrub planting will be in place in areas within the clear zone (assumed to be 12m from edge of road for EIAR purposes) and woodland will be planted in the remaining areas. The total area to be planted will amount to 10ha. Using a sequestration rate of 2.62 tCO_{2eq}/hectare/year, the benefit amounts to approximately 1,570 tonnes CO_{2eq} over the 60-year lifetime of the proposed road development. This is equivalent to offsetting 1.5% of the GHG emissions associated with the construction of the proposed development. In terms of the maintenance phase of the development, the offset equates to 1.6% of the maintenance phase GHG emissions.

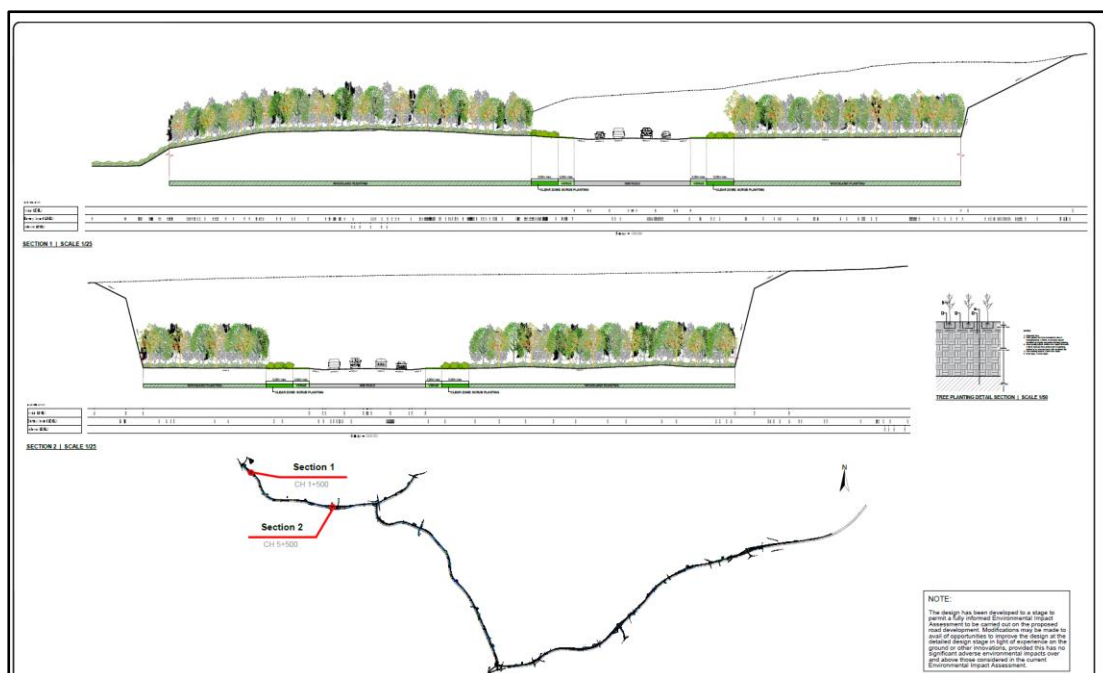


Figure 5.2 Typical Sections and Tree Planting Detail Section (taken from Figure R11 of the Further Information Request).

- 5.13 Further to this, an additional area within the compulsorily acquired lands from Ch.20+600 to Ch.20+900 to the north of the alignment, will be planted with native woodland species, to avail of the benefit afforded for carbon offsetting. Using a sequestration rate of 2.62 tCO_{2eq}/hectare/year, the benefit amounts to approximately 148 tonnes CO_{2eq} over the 60-year lifetime of the proposed road development.
- 5.14 The following additional mitigation measure will also be included in the Schedule of Commitments and will be specified in the contract documents:
- 45,000 m³ of concrete required for structures can utilise cements based on ground granulated blast furnace slag (GGBFS) rather than traditional Portland Cement. This will lead to a saving of approximately 1,200 tonnes CO_{2eq} (a saving of 10% on this item).
- 5.15 The embodied carbon emissions associated with the construction and maintenance of the road are detailed in paragraphs 4.32 – 4.37, which confirm that when assessed over the predicted 3 years construction and 60 years operational lifespan of the project, carbon emissions, on an annual basis, reach at most 0.01% of Ireland's 2030 emissions target. The predicted impact to GHG emissions during the construction and maintenance phase, including the embodied carbon associated with construction materials and follow-up maintenance of the road, is a long-term, negative impact. However, as outlined above, the project as a whole, taking into account both the construction and operational phases of the scheme, has been determined as likely to have a significant negative impact on carbon emissions and climate.

Operational Phase – Air Quality

- 5.16 In relation to design and operational aspects of road developments, emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic

management plans and the use of automatic traffic control systems. Moreover, as the flow of traffic will be smoother and a steady speed maintained, vehicle emissions on the proposed road development will be lower than those experienced in more built-up areas, where higher emissions result from frequent stop-start motions and queuing.

Operational Phase – Climate

- 5.17 Several additional benefits which will arise as a result of the proposed road development, are relevant when assessing the carbon emissions in future years. Fuel usage and associated carbon emissions on the proposed road will be lower than those experienced in more built-up areas, where higher emissions result from frequent stop-start motions and queuing. In particular, Adare Village will benefit from an improvement to air quality, safety, noise, quality of life in general and greater opportunities for active travel as a result of the bypass of the village.
- 5.18 Fuel usage and associated carbon emissions on the proposed road development will be lower than those experienced in more built-up areas, where higher emissions result from frequent stop-start motions and queuing. In addition, a series of national and international actions will mitigate carbon emissions in the future.
- 5.19 The Climate Action Plan 2019 proposes the introduction of new legislation to ban the sale of fossil fuel cars from 2030 and to stop granting NCT certificates from 2045 to fossil fuel cars. The Plan foresees that by 2030 500,000 vehicles on the road (32% of vehicles) will be electric vehicles (EV). In addition, at the EU level, carbon emissions from vehicles are continuing to reduce with a target of 130g of CO₂/km applied to new passenger cars since 2015 reducing to 95g of CO₂/km by 2021.

6. RESPONSES TO SUBMISSIONS / OBJECTIONS

6.1 Overview

6.1.1 Air Quality and Climate issues have been raised in a number of the submissions / objections submitted to An Bord Pleanála with respect to the application. Responses to these air quality and climate issues are included within this Brief of Evidence.

6.1.2 The items raised in relation to the air quality and climate aspects are:

- Construction Phase Dust Emissions;
- Operational Phase Air Emissions; and
- Carbon Emissions.

6.2 Construction Phase Dust Emissions Submissions

Issues Raised in Objections / Submissions

6.2.1 10 no. submissions / objections have been received in respect of air quality, suggesting that insufficient information has been provided in relation to mitigating measures to be undertaken against dust during the construction period but without offering detailed comment in relation to specific situations. This concern was raised in the following submissions SCH-7, 28, 44, 48, 60, 67, 81, 103, 106; FI-2.

6.2.2 12 no. submissions / objections also claimed that air quality - construction stage mitigation and monitoring is inadequate. These include the following submissions / objections: SCH-12, 26, 48, 51, 54, 61, 66, 72, 80, 85, 92, 98.

6.2.3 Submission / objection SCH-63, has also requested the following in relation to Air Quality and Climate:

“A family member residing at the property has a medical condition that may be further enhanced by the activities on the C.P.O. lands. Dust management and monitoring are required during the works.”

Response

6.2.4 As per Appendix 13.3 of Chapter 13, a dust management plan has been formulated for the construction phase of the project, as part of the implementation of the mitigation strategy.

6.2.5 In order to minimise dust emissions during construction, a series of mitigation measures have been outlined below, which will be incorporated in the Schedule of Commitments and will be incorporated in the road construction contract:

- Vehicles exiting the site to make use of a wheel wash facility, prior to entering onto public roads;
- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary;

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;
- Bowers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist.

6.2.6 In response to the submissions / objections listed in paragraphs 5.2.1 and 5.2.2, the dust minimisation measures outlined above will ensure that the air quality impacts during the construction phase will not be significant.

6.2.7 In response to submission / objection 63, and as outlined in Section 13.6.3 of the Air Quality and Climate chapter of the EIAR, monitoring of construction dust deposition at nearby sensitive receptors (residential dwellings) during the construction phase of the proposed road development is proposed to ensure mitigation measures are working satisfactorily.

6.3 Operational Phase Air Emissions Submissions

Issues Raised in the Submissions / Objections

6.3.1 16 no. submissions / objections outlined specific issues in respect of air quality including concern that insufficient information has been supplied in relation to mitigating measures to be undertaken in respect of air emissions during the operational period but without offering detailed comment in relation to specific scenarios.

6.3.2 These included the following submissions / objections:

Submissions: ENV-4, 19, 29

Submissions: SCH-16, 19, 31, 33, 55, 58, 60, 62, 64, 76, 82, 91, 96, 115.

Response

6.3.3 In response to the above listed submissions / objections in relation to the mitigation of air emissions during the operational stage, Section 13.6.2.1 of the EIAR states that:

“Emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems (UK DEFRA, 2016, 2018). The proposed road development will facilitate this change by bypassing heavily congested areas such as Adare village and the new road design will allow for vehicles to travel at optimal speeds”.

6.3.4 The impact of traffic-derived emissions from the proposed road development on ambient air quality has been extensively assessed using air dispersion modelling of the proposed road infrastructure for the opening year (2024) and design year (2039).

6.3.5 The screening air dispersion modelling study found that predicted concentrations of CO, benzene, NO₂, PM₁₀ and PM_{2.5} were below their respective limit values, at all residential locations including the 22 no. potential worst-case receptors identified, with the proposed road development in place as outlined in Section 13.5.3.1 of Volume 2 and Appendix 13.2 of Volume 4A of the EIAR.

6.4 Specific Air Emissions Submissions: Issues Raised in Submissions / Objections

6.4.1 One submission (FI-1) has raised a specific issue in relation to Air Emissions and is responded to in the following paragraphs.

6.4.2 Submission FI-1 raised the following point:

“Even if such a switch to electric vehicles does occur, this does not address.....other forms of car-generated pollution, including micro-plastics released through tyre wear.”

Response

6.4.3 As outlined in Section 13.5.3.1 of the EIAR, the proposed road development will lead to annual mean PM₁₀ concentrations of no more than 40.9% of the ambient limit value for PM₁₀ due to exhaust emissions from the scheme. In relation to potential tyre wear emissions, the TII Guidance (TII, 2011) notes that, although the DMRB model does not account for brake and tyre wear PM emissions, that:

“Where predicted concentrations are well below (<75% of the ambient limit value) the standard/limit value this (i.e. tyre and bear wear) is unlikely to be a significant issue” (TII, 2011)

6.5 Specific Carbon Emissions Submissions: Issues Raised in Submissions / Objections

6.5.1 One submission (FI-2) outlined a general issue in respect to greenhouse gas emissions during both the construction phase and operational phase without offering detailed comment in relation to specific scenarios.

6.5.2 4 no. submissions / objections have raised specific issues in relation to Carbon Emissions and are responded to individually in the following paragraphs. These are submissions / objections: ENV-3, SCH-30, FI-7 and FI-8.

6.5.3 Submission / objection ENV-3 raised the following points:

1. Preliminary consideration of strategic Investment Priorities for the climate and biodiversity loss emergency:

- continued over-scaled road building would represent a misdirection of limited investment resources, when we need to address the accelerating global climate and biodiversity loss emergency

Investment priorities should be:

.....

3. Achieving the required targets for decarbonising electricity generation, heating and transport.

6.5.4 Submission / objection SCH–30 raised the following points:

“

3. No mention of the National Adaptation Framework in Ch.2. It should not be omitted and it's not clear if the road is compliant with this document. Reopening of the rail line would tie in with electrification plans. Truck and HGV electrification are lagging behind cars and will contribute to emissions on the road network.

4. Project is not future proofed as it focuses on current distribution trends from the Port and not on the need to alter them in the future. Alternatives considered is deficient as it doesn't follow the current S.28 Guidance for EIA which takes into account 'Climate change mitigation.'

5. It will have adverse effects on climate change. No calculation of the embodied carbon and associated environmental costs of the roadway. Critical argument in its adoption.

6. No carbon or GHG emission budget in Ch 13. Vague references. The EOP also doesn't mention climate change. Chapter 17 also not adequate.”

Response

6.5.5 As outlined in Section 4 above, the proposed road development has conservatively been determined as likely to have a significant negative impact on carbon emissions and climate.

6.5.6 This conclusion is in line with the Institute of Environmental Management and Assessment (IEMA) guidance note on “*Assessing Greenhouse Gas Emissions and Evaluating their Significance*” (IEMA, 2017) which advises that all carbon emissions contribute to climate change and in the absence of a defined threshold (e.g. national sector specific targets and trajectories), any increase (or decrease) to carbon emissions may be considered as significant.

6.5.7 To put the increase in context, the proposed road development in 2039 will lead to an increase in carbon emissions equivalent to the construction of 35 houses (excluding electricity) and an additional 2 or 3 houses when electricity is taken into account.

6.5.8 Several mitigation measures are relevant when assessing the carbon emissions from the proposed road development in future years. Fuel usage and associated carbon emissions on the proposed road development will be lower than those experienced in more built-up areas, where higher emissions result from frequent stop-start motions and queuing.

6.5.9 In addition, a series of national and international actions will ensure that carbon emissions will be substantially reduced in future years as outlined in Section 5.

6.5.10 As outlined above, it is likely that there will be an annually revised Plan which will require sectoral mitigation measures, within the ceilings of the 5-year carbon budget and sectoral decarbonisation ranges for the relevant period including an annual trajectory decarbonisation target range for each sector. Thus, once specific sectoral

budgets have been allocated, the significance of the proposed road development may be more accurately defined relative to the transport sector budget.

6.5.11 In relation to Submission SCH-30, with regard to the National Adaption Framework, Section 13.4.2 of Volume 2 of the EIAR addresses the plan and refers, amongst other things to the National Mitigation Plan. Since the EIAR was submitted, on 31 July 2020 the Supreme Court overturned the National Mitigation Plan (2017). However, the the National Adaptation Framework, which aims to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts, remains in place as does the Carbon Action Plan, which will reduce GHG emissions in future years, with a number of other strategies currently being proposed.

6.5.12 In Section 13.6.2.2 of the EIAR, it is also noted that Limerick City and County Council Climate Adaptation Strategy 2019 – 2024 (2019) has outlined measures to deal with and reduce the effects of climate change. Climate change mitigation measures are addressed in Section 13.6.2.2 of the EIAR and include a range of measures including:

- The reduction in CO₂ emissions per km through implementation of EU legislation;
- VRT & motor tax rebalancing to favour the purchase of more fuel-efficient vehicles with lower CO₂ emissions;
- The introduction of the biofuels obligation scheme;
- Mandatory vehicle labelling system to provide more information on CO₂ emission level and on fuel economy;
- Details on the National Mitigation Plan and National Adaptation Framework;
- The Renewable Energy Directive specifying a legally binding 10% renewable energy in transport target;
- The Climate Action Plan 2019.

Issue Raised in Submission / Objection

6.5.13 Submission / objection FI-7 raised the following point in response to Limerick City and County Council Further Information Response to ABP, Item 11 - Climate:

“The suggested route is much longer than or of equal length in some limited parts to the existing route.

Response

6.5.14 As outlined in Section 5 above, the design development phase considered a combined road development for the N69 and the N21 of approximately 35km in length, instead of two separate schemes as these routes would have amounted to approximately 52km in length, and that the embodied carbon of the proposed combined road alternative would be significantly reduced. It is estimated that if both schemes were to be provided, the embodied carbon would have totalled 160,011 tonnes CO_{2eq} over the 3-year construction phase. The proposed development therefore provides a saving of 52,311 tonnes CO_{2eq} of embodied carbon over the 3-year construction period reflecting that the issue of carbon mitigation and sustainable design was integral to the design approach:

Issue Raised in Submission / Objection

6.5.15 Submission FI-8 raised the following points

“Contrary to the suggestion by the applicants there is no evidence that this road development will have any impact on the transition to an electric fleet”.

“At present the applicants claim at most 3.7% of traffic volume passing through the existing towns of Adare is HGV and 5.3% of traffic through Mungret is HGV. The actual model shift this new road can possibly divert is relatively minor, which indicates the applicants claimed reduction in greenhouse gas emission to be grossly overestimated”

Response

6.5.16 As outlined in Section 4 above, the Climate Action Plan 2019 (CAP) required the transport sector to achieve ambitious decarbonisation targets. The CAP identifies the electrification of transport as the most cost-effective abatement opportunity. The CAP outlines a range of targets for electrification of vehicles including:

- Increasing the number of passenger electric vehicles (EVs) on the road to 840,000 by 2030;
- Achieving a target of 95,000 electric vans and trucks by 2030;

6.5.17 The CAP also proposes the introduction of new legislation to ban the sale of fossil fuel cars from 2030 and to stop granting NCT certificates from 2045 to fossil fuel cars. The Plan foresees that by 2030, 32% of vehicles will be electric vehicles (EV). Thus, the main driver of the transition to an electric fleet will be due to government legislation. However, when assessing GHG emissions from the proposed road development in the design year, the characteristics of the fleet, including the high percentage of electric vehicles, must be taken into account in the calculations.

6.5.18 In relation to operational phase greenhouse gas emissions, as outlined in Section 4 above, the impact of the proposed road development in 2024 will be 0.0027% of Ireland's 2030 GHG target. By 2039, taking into account the increase in EVs, the impact of the proposed road development in 2039 is 0.0039% of Ireland's 2030 GHG target. Thus, the proposed road development will lead to a small increase in greenhouse gas emissions.

7. CONCLUSION

7.1 The impact of traffic-derived emissions from the proposed road development on ambient air quality has been extensively assessed using air dispersion modelling of the proposed road infrastructure for the baseline scenario (2017), the opening year (2024) and design year (2039).

7.2 The screening air dispersion modelling study found that predicted concentrations of CO, benzene, NO₂, PM₁₀ and PM_{2.5} were below their respective limit values, at all residential locations including the 22 identified potential worst-case receptors, with the proposed road development in place.

- 7.3 The greenhouse gas emission calculations for this proposed road development have been revised based on the latest version of the TII Carbon Assessment Tool, and with refined traffic volumes for comparison between the Do-Minimum and Do-Something scenarios. The material quantities input into the TII Carbon Assessment Tool are outlined above and the operational impact of the proposed road development in 2039, having regard to the proposed policy-based increase in electrical vehicles, is now 1,778 CO_{2eq} tonnes/annum which is 0.0039% of Ireland's 2030 GHG target. The initial construction of, and ongoing maintenance requirements of the proposed road development, will reach at most 0.01% of Ireland's 2030 emissions target on an annual basis.
- 7.4 Based on the determination that the project as a whole, taking into account both the construction and operational phases of the scheme, is likely to have a significant negative impact on carbon emissions and climate, a series of effective mitigation measures have been developed. The mitigation measures have been designed as a combination of measures to prevent, reduce and offset carbon emissions as outlined in Section 4 above.

8. REFERENCES

- Climate Change Advisory Committee (CCAC) (2019). Climate Change Advisory Committee Annual Review 2019
- DCCAE (2017). National Adaptation Plan
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- SEAI (2019). Energy in Ireland 2019
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- UK Highways Agency (2019). Design Manual for Roads and Bridges Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 - Climate
- UNFCCC (1997). Kyoto Protocol to the United Nations Framework Convention on Climate Change adopted at COP3 in Kyoto, Japan, on 11 December 1997

Appendix 1

The following submissions have been responded to in this Brief of Evidence:

Submissions Responded to in this Brief of Evidence	
ENV-	3, 4, 19, 29
SCH-	7, 12, 16, 19, 26, 28, 30, 31, 33, 44, 48, 51, 54, 55, 58, 60, 61, 62, 63, 64, 66, 67, 72, 76, 80, 81, 82, 85, 91, 92, 96, 98, 103, 106, 115
FI-	1, 2, 7, 8