10 AIR – QUALITY AND CLIMATE

10.1 INTRODUCTION

1 The Inter Governmental Panel on Climate Change (IPCC) report *Climate Change 2013: The Physical Science Basis,* referred to as the *'Fifth Assessment Report (AR5)'*, presents clear and robust conclusions in a global assessment of climate change science[30]. The report clearly indicates with 95 percent certainty that human activity is the dominant cause of observed warming since the mid-20th century. The *Working Group 1 Report Approved for Policy Makers* has also been published in 2013 and summarises the main findings of the AR5[31]. The *AR5 Report* confirms that warming in the climate system is unequivocal, with many of the observed changes unprecedented over decades to millennia: warming of the climate system is occurring with increased atmospheric and sea temperatures, reduction in snow and ice cover, sea level rise and increasing greenhouse gas concentration in the atmosphere. Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850.

2 Met Éireann's Research Division recently led a major study on the future of Ireland's climate as part of the AR5. The study was a collaborative effort between Met Éireann, University College Dublin (UCD), University College Cork (UCC), National University of Ireland (NUI) Galway, Dublin Institute of Technology (DIT), Trinity College Dublin (TCD), NUI Maynooth, National Biodiversity Centre, *Irish Centre for High-End Computing* (ICHEC) and universities in Germany, UK, Holland and the USA and is published in the Met Éireann led study report *Ireland's Climate: the road ahead* (2013). [32]

3 Climate change impacts may have subsequent effects on wildlife, public health, air pollution, waves, coastal flooding and renewable energy through to the middle of the century. Regard has also been made to the European Commission's *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessmen*t (2013) in the preparation of this chapter. Air quality is essential for human health and well-being and to ensure the maintenance of natural ecosystems. This chapter assesses the potential impacts on air and climate arising from the proposed development.

[30] Stocker, T.F., D. Qin, G.-K. Plattner, L.V. Alexander, S.K. Allen, N.L. Bindoff, F.-M. Bréon, J.A. Church, U. Cubasch, S. Emori, P. Forster, P. Friedlingstein, N. Gillett, J.M. Gregory, D.L. Hartmann, E. Jansen, B. Kirtman, R. Knutti, K. Krishna Kumar, P. Lemke, J. Marotzke, V. Masson-Delmotte, G.A. Meehl, I.I. Mokhov, S. Piao, V. Ramaswamy, D.
Randall, M. Rhein, M. Rojas, C. Sabine, D. Shindell, L.D. Talley, D.G. Vaughan and S.-P. Xie, 2013: Technical Summary. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
[31] IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
[32] *www.met.ie/UserMediaUpl/file/Irelands_Climate_25092013_LR.pdf*

4 The proposed development is expected to have a net positive impact on reducing greenhouse gas emissions through facilitation of further development of renewable energy sources in a cost effective and efficient manner. This will in turn displace energy production from fossil fuels with a consequent reduction in the emission of greenhouse gases, mainly carbon dioxide (CO_2), sulphur dioxide (SO_2) and nitrogen oxides (NOx). It will also help towards reducing Ireland's dependence on fossil fuels for energy production and underpin the achievement of Ireland's agreed European Union (EU) targets with respect to greenhouse gas emissions and renewable energy. As with the majority of large civil engineering projects potential emissions to air are inevitable during the construction phase, arising from construction activities, transport of materials and the use of plant and equipment. However, given the linear nature of the proposed development, as set out in Chapter 6, **Volume 3B** of the EIS**,** and its construction methodology as set out in Chapter 7, **Volume 3B** of the EIS**,** the construction impacts will be localised and relatively short term and should be considered in the context of the long term impact of the development.

5 This chapter should be read in conjunction with Chapter 7, **Volume 3B** of the EIS and **Chapter 13,** of this volume of the EIS.

10.2 METHODOLOGY

6 The proposed project is a linear construction located in the air quality management area Zone D as defined by the Environmental Protection Agency (EPA) in accordance with EU air quality legislation. Background air quality data for Zone D was obtained from the EPA report on *Air Quality in Ireland 2012 – Key Indicators of Ambient Air Quality (2013) a*nd air quality bulletins as published periodically by the EPA and assessed against the *Air Quality Standards Regulations 2011* (S.I. No. 180/2011) which transpose the requirements of the Clean Air for Europe (CAFE) Directive (2008/50/EC).

7 Global Climate information was obtained from the IPCCs AR5. Predicted local climate change information with respect to Ireland was obtained from the Met Éireann led study report *Ireland's Climate: The Road Ahead* (2013).

8 Potential localised air pollution impacts arising from construction of the project have been assessed based on the experience of similar construction projects of this nature and with reference to the Environmental Protection UK (EPUK) guidance document *Development Control: Planning For Air Quality* (2010 Update).

9 Reference is also made to the 2013 EU Guidance on *Integrating Climate Change and Biodiversity into Environmental Impact Assessment*. This guidance recognises the need for action on climate change and biodiversity loss across Europe and around the world. It identifies

the need to fully integrate the combating of and adaptation to climate change, to halt the loss of biodiversity and the degradation of ecosystems. Potential national impacts of climate change on Ireland's biodiversity have been identified in the Met Éireann led study report and are outlined in **Section 10.4.1.** The overall beneficial impact of the project in providing infrastructure to facilitate displacement of greenhouse gas emissions thereby combating climate change is discussed in **Section 10.5.3**.

10.2.1 Policy and Legislative Context and Air Quality Standards

10.2.1.1 European Union Climate Change Policy

10 In acknowledgement of the clear message of the *AR5 Report* in January 2014 the European Commission (EC) presented a framework to drive continued progress towards a low carbon economy in the European Union (EU). Key to the framework is a 40% reduction in greenhouse gas emission by 2030 compared to 1990 levels. To achieve this target it is estimated that:

- The sectors covered by the EU Emission Trading Scheme (ETS), including energy, would have to reduce emissions by 43% compared to 2005; and
- Emissions from the non-ETS sectors would have to reduce by 30% compared to 2005 levels. The effort needed to meet these targets will be shared equitably between Member States.

11 In addition, an EU-level 2030 target for renewable energy is proposed with, at least, 27% of EU energy consumption to come from renewable sources. This renewable energy target does not, however, place binding targets on Member States and is to be reached by the EU as a whole.

12 Further improvements in energy efficiency are also foreseen. However, the role of energy efficiency in the 2030 framework is not as yet known until a review of Directive 2012/27/EU on energy efficiency is undertaken in 2014.

10.2.1.2 National Policy Position on Climate Action & Low Carbon Development

13 In April 2014 the Government published its *National Policy Position on Climate Action & Low Carbon Development for Ireland*[33] which:

- Recognises the threat of climate change for humanity;

[33] *www.environ.ie/en/Environment/Atmosphere/ClimateChange/NationalClimatePolicy.*

- Anticipates and supports mobilisation of a comprehensive international response to climate change, and global transition to a low-carbon future;
- Recognises the challenges and opportunities of the broad transition agenda for society; and
- Aims, as a fundamental national objective, to achieve transition to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050.

14 The wider context for national climate policy includes:

- Existing and future obligations of the State under international agreements;
- The commitment by Ireland to the United Nations Framework Convention on Climate Change (herein after referred to as the Convention), and its ultimate objective of achieving stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system – to be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner;
- The European Union objective which details the necessary reductions, according to the Intergovernmental Panel on Climate Change, by developed countries as a group, to greenhouse gas emissions by 80-95% by 2050 compared to 1990;
- Existing and future obligations of the State under the law of the European Union; and
- The evolution of climate policy within the European Union and at a wider international level under the Convention.

15 The Government also published the final Heads of the *Climate Action and Low-Carbon Development Bill* in April 2014[33]. The objectives of the Bill are to enable Ireland to meet its legally binding non-ETS emissions reduction 2020 target (and any other new EU and international obligations) and to achieve transition to a low-carbon, climate resilient and environmentally sustainable economy in the period up to and including the year 2050.

10.2.1.3 Air Quality Standards

16 To protect human health, vegetation and ecosystems, EU Directives have been adopted which set down air quality standards for a wide variety of pollutants. The current standards are contained in the CAFE Directive (2008/50/EC) (European Parliament (EP) and Council of Europe (CEU), 2008) and the Fourth Daughter Directive (EP & CEU, 2004). These Directives

also include rules on how Member States should monitor, assess and manage ambient air quality.

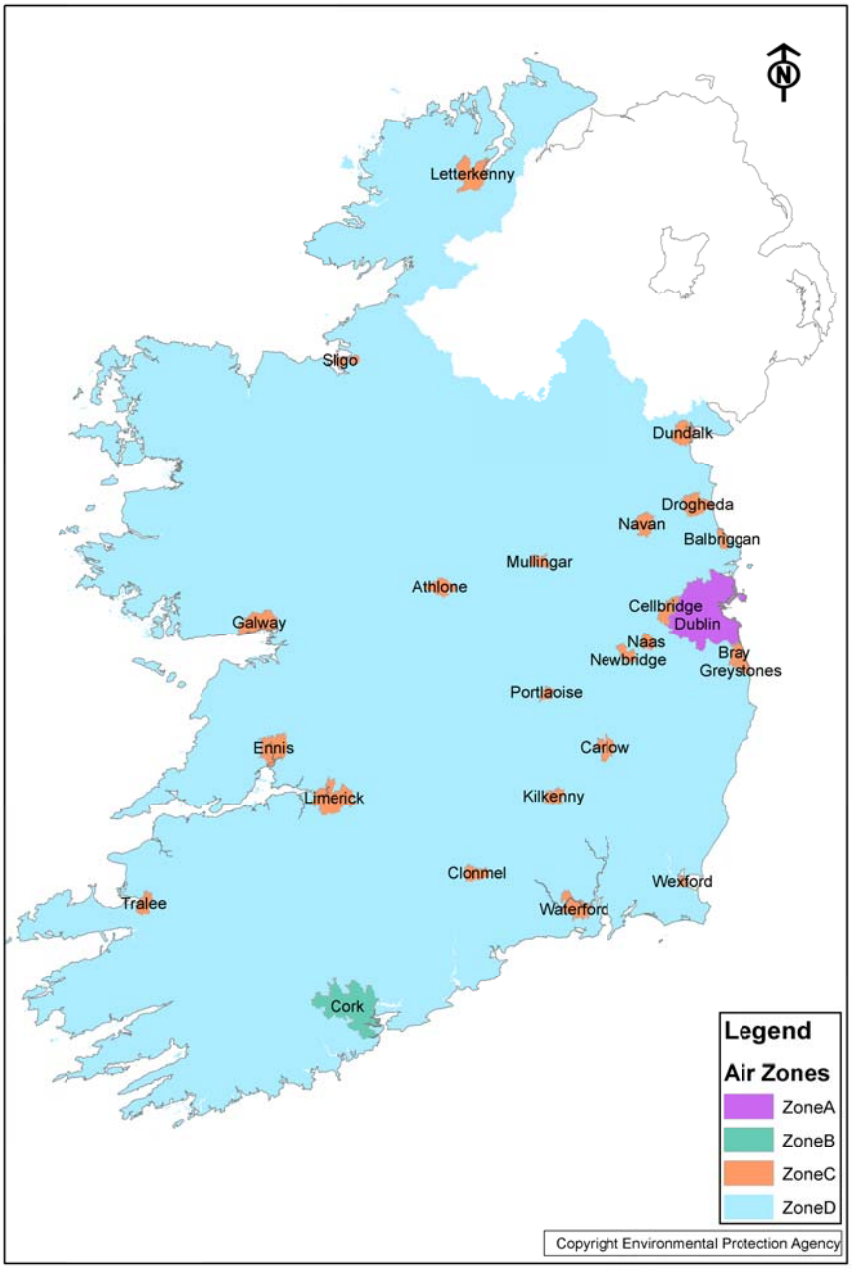
17 The CAFE Directive is an amalgamation of the Air Quality Framework Directive and its subsequent first, second and third daughter Directives.

18 The CAFE Directive was transposed into Irish legislation by the *Air Quality Standards Regulations 2011* (S.I. No. 180/2011). It replaces the *Air Quality Standards Regulations 2002* (S.I. No. 271/2002), the *Ozone in Ambient Air Regulations 2004* (S.I. No. 53/2004) and S.I. No. 33/1999 *Environmental Protection Agency Act, 1992 (Ambient Air Quality Assessment and Management) Regulations*. The Fourth Daughter Directive was transposed by the *Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009* (S.I. No. 58/2009).

19 EU legislation on air quality (CAFE) requires that Member States divide their territory into zones for assessment and management purposes. Ireland is divided into four such zones (refer to **Figure 10.1**) in the Air Quality Standards Regulations (2011). The zones were amended on 1st January 2013 to take account of population counts from the 2011 CSO Census and to align with the coal restricted areas in the 2012 Regulations (S.I. No. 326 of 2012). Zone A is the Dublin conurbation, Zone B is the Cork conurbation, Zone C other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise and Zone D, principally rural, is the remaining area of Ireland. The proposed development which includes counties Cavan and Monaghan is located within Zone D.

20 In conjunction with individual local authorities, the EPA undertakes ambient air quality monitoring at specific locations throughout the country in the urban and rural environment. It prepares an Air Quality Report based on data from 30 monitoring stations and a number of mobile air quality monitoring units. The EPA as the National Reference Laboratory for Air, coordinates and manages the monitoring network. Monitoring stations are located across the country. The EPA published air quality summary bulletins for PM10, Ozone and Nitrogen Dioxide to the end of September 2014 and also provides real time air quality data on its website (www.epa.ie/air/quality/).

21 Air quality standards have been developed and incorporated into Irish statute in order to protect both human health and the ambient environment. These standards are based on International agreements, which identify performance standards and limit the generation of air quality pollutants at a regional, national and global level.



Air Quality in Ireland 2012, Key Indicators of Ambient Air Quality

Figure 10.1: Air Quality Zones in Ireland

(Source: Air Quality in Ireland 2012, EPA)

10.2.1.4 Dust Deposition Standards and Guidelines

22 Currently in Ireland there are no statutory limits for dust deposition. Dust particles in the ambient environment is pervasive, however localised increases in dust particles is usually associated with exposure of soil surfaces, usually through human activities associated with

agricultural practices or construction. Whether dust deposition becomes an issue for the general public is a subjective issue and depends on a variety of factors including the sensitivity of nearby locations, the repetitive nature of any dust deposition occurring and the nature of the dust particulate itself. It is because of these variances and the subjectivity of the issue that there are no statutory limits. The focus for dust control and emissions is on minimising the potential for a nuisance occurring in the first instance and implementing good site practices where practicable.

23 In recent years the TA Luft/VDI 2119/Bergerhoff Method of dust emission monitoring has become the most commonly used method. This method is advocated by both the EPA and the Department of Environment, Community and Local Government (DoECLG). This method involves determining a mass dust deposition rate per unit area over a given time period, using a direct collection pot to standardise dimensions of either glass or plastic. The system benefits from being a direct collection method i.e. less transferring of material and consequent reduction in sampling errors. This method is defined as an internationally recognised standard and has been adopted by the EPA as the method of choice for licensed facilities.

24 The TA Luft/VDI 2119 recommended threshold guideline value is 350mg/m²/day. Below this threshold guideline value dust deposition problems are considered less likely. This is the recommended threshold value normally stipulated by local authorities and the EPA in conditions attached to development consent and Waste Licences.

10.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

25 The types of issues which OHL developments of this nature typically raise in relation to this topic include the potential for impacts on air quality, primarily due to the generation and dispersion of dust but also due to additional emissions from construction vehicles and plant. The positive climatic effects will also be detailed in this chapter. In this regard, this chapter considers the construction, operational and decommissioning phases of the proposed development.

10.4 EXISTING ENVIRONMENT

10.4.1 Climate Change

26 Global warming, and the management of emissions with the potential to contribute to global warming, is increasingly important on a national and international basis. Global warming has numerous potential implications for Ireland's environment, including:

- Greater risk of intense storms and rainfall events leading to greater potential for flooding in rivers and on the coast, where almost all cities and large towns are situated;

- Changes to habitats and eco-systems with changes in the distribution of species; and the possible extinction of vulnerable species;
- Effects on sea levels and river levels;
- Increased stress on water resources, with water shortages in summer in the east and potential for over exploitation; and
- Increased summer temperatures can also impact human health among the susceptible sector of the Irish community, particularly the elderly.

27 Increased atmospheric levels of greenhouse gases are now widely recognised as the leading cause of climate change. This is borne out by the most recent findings of the IPCCs AR5. Some of the key points of the approved summary of the report include:

> *"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased."*
>
> In terms of atmosphere:
>
> *"Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850 (see Figure SPM.1). In the Northern Hemisphere, 1983–2012 was likely the warmest 30-year period of the last 1400 years (medium confidence)".*
>
> In terms of ocean:
>
> "*Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (high confidence). It is virtually certain that the upper ocean (0−700 m) warmed from 1971 to 2010… and it likely warmed between the 1870s and 1971".*
>
> "*…. the rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (high confidence). Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21] m"*
>
> In terms of croysphere:
>
> *"Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent (high confidence)".*

In terms of carbon and other biogeochemical cycles:

"The atmospheric concentrations of carbon dioxide (CO2), methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. CO2 concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification."

"Natural and anthropogenic substances and processes that alter the Earth's energy budget are drivers of climate change".

28 The Met Éireann led study *Ireland's Climate: the road ahead* (2013) carried out global climate model simulations as part of Ireland's contribution to the science underpinning the IPCCs AR5. The Irish study modelled projections for climate change in Ireland indicated the following:

- The observed warming over the period 1981-2010 is expected to continue with an increase of ~1.5 degrees in mean temperatures by mid-century; the strongest signals are in winter and summer. Highest daytime temperatures are projected to rise by up to 2 degrees in summer and lowest night time temperatures to rise by up to 2-3 degrees in winter.

- Milder winters will, on average, reduce the cold related mortality rates among the elderly and frail but this may be offset by increases due to heat stress during summer.

- Winters are expected to become wetter with increases of up to 14% in precipitation by mid-century with summers becoming drier (up to 20% reduction in precipitation). The frequency of heavy rainfall events during winter may increase by up to 20%.

- Changes in precipitation are likely to have significant impacts on river catchment hydrology, such as increased flow and level during higher rainfall events and prolonged periods of low water level in drier summers.

- An overall increase (0-8%) in the energy content of the wind for the future winter months and a decrease (4-14%) during the summer months.

- A small decrease in mean wave heights is expected around Ireland by the end of the century, while in winter and spring, storm wave heights are likely to increase.

- Expected increases in temperature will further affect the ecology such as that of Irish butterflies, in particular.

- Chapter 7 of the Met Éireann led study considers some additional potential impacts of a warmer climate on Irish Wildlife stating that:

  "Spring warming in recent years has had a significant impact on Irish wildlife by advancing the timing of key phenological phases of a wide range of organisms, including trees, birds and insects."

29 The most important long lived greenhouse gases are CO_2, N_2O, and Methane (CH_4). CO_2 arises from a range of sources including the combustion of fossil fuels. According to the EPA, agriculture remains the single largest contributor to overall greenhouse gas emissions in Ireland, at 32.1% of the total, followed by energy (power generation and oil refining) at 20.8% and transport at 19.7%. The remainder is made up by industry and commercial at 14.0%, the residential sector at 11.5%, and waste at 1.8%.

30 The International Kyoto Protocol was devised in 1997 in response to rising emissions of the principal compounds contributing to global warming. The Kyoto Protocol was subsequently ratified by the EU in 2005.

31 Under the burden sharing agreement within the EU, devised to implement the Kyoto Protocol, Ireland agreed to limit emissions between 2008 and 2012 to 13% above 1990 emission levels.

32 Ireland's target, according to the EU Climate Change and Energy Package[34], is to reduce CO_2 emissions by 20% and to increase renewable energy production by 16%. The main policies to be implemented by Ireland are to source 15% of national electricity requirements from renewable energy by 2010 and by 40% by 2020. Other policies include improving the quality and participation in public transport, use of bio-fuels, higher energy conservation in building standards, schemes to improve recovery / recycling of waste streams and better agricultural and forestry management.

33 Key objectives for reductions in greenhouse gases across the agriculture, energy, transport, industrial, forestry and built environment sectors, which will ensure that Ireland can meet its international commitments, are set out in the *National Climate Change Strategy 2007–2012*. This Strategy includes the Government's target of achieving 40% of electricity consumption on a national basis from renewable energy sources by 2020. Achieving this target will potentially contribute significantly to limiting the increase of greenhouse gases in Ireland.

[34] The climate and energy package is a set of binding legislation which aims to ensure the European Union meets its ambitious climate and energy targets for 2020.

34 Under the EU National Emissions Ceiling Directive (2001/81/EC), Member States were required to limit their annual national emissions of SO_2, NOx, volatile organic compounds (VOC) and NH_3 to amounts not greater than the emissions ceilings laid down in Annex 1 of the Directive, by the year 2010 at the latest. Ireland's limits are as follows:

- SO_2 42 kilotonnes;
- NOx 65 kilotonnes;
- VOC 55 kilotonnes; and
- NH_3 116 kilotonnes.

35 Ireland is subject to several conventions and protocols that place limits on, and force reductions in, these emissions.

36 Some key emission reductions have occurred in the energy sector reflecting an increase in the share of renewables in gross electricity consumption. The SEAI publication *Renewable Energy in Ireland 2012*[35] reports that the share of electricity generated from renewable energy sources has increased between 1990 and 2012 from 4.9% to 19.6%. The principal contribution to this transition has come from wind generation.

37 Ireland's combined emissions in 2008, 2009, 2010 and 2011 were 1.77 million tonnes above its Kyoto limit when the EU Emissions Trading Scheme (ETS) and approved Forest Sinks are taken into account.

38 The EPA is also designated under the *National Climate Change Strategy 2007–2012* to prepare annual national emission projections for greenhouse gases relating to key sectors of the national economy. In the latest EPA projection report *Ireland's Greenhouse Gas Emission Projections 2012 – 2030*, (April 2014) the following was stated with respect to the energy sector:

> *"Energy sector emissions comprise emissions from power generation, oil refining, peat briquetting and fugitive emissions. Emissions from power generation accounted for 97% of energy sector emissions in 2012 and are responsible for a similar share of emissions over the projection period.*
>
> *Under the With Measures scenario, total energy sector emissions are projected to decrease by 11% over the period 2013 – 2020 to 11.5 Mt CO2eq. The decrease in emissions is caused by a projected decrease in the use of peat*

[35] http://www.seai.ie/Publications/Statistics_Publications/EPSSU_Publications/Renewable-Energy-in-Ireland-2012.pdf.

and increase in the use of natural gas and renewable fuels for electricity generation. Renewables penetration in 2020 is projected to be 26% under this scenario. The emissions savings associated with increased natural gas and renewable fuels in electricity generation is, however, partially offset by the continued combustion of coal which is projected to be 19% higher in 2020 compared with 2012 in this scenario.

Under the With Additional Measures scenario, total energy sector emissions are projected to decrease by 16% over the period 2012 – 2020 to 11 Mt CO2eq. In this scenario, it is assumed that renewable energy reaches 40% penetration by 2020. The largest renewable energy contribution comes from wind which is estimated to be 62% above that in the With Measures scenario in terms of generation input. This scenario also includes additional expansion of renewable electricity generation from co-firing biomass, the construction of an additional waste to energy incineration plant and the continued development of landfill gas electricity generation and biomass CHP."

39 Overall the projections set out in the EPA report show that Ireland is not on a pathway to a low-carbon economy. Total national greenhouse gas emissions are projected to, at best, decrease by an average of 0.4% per annum up to 2020 if all national policies are implemented and delivered. Furthermore, emissions are projected to increase between 2020 and 2030 (12% in total) with transport a key contributor to this trend in the absence of additional policies and measures.

"There is a significant risk that Ireland will not meet its 2020 EU targets even under the most ambitious emission reduction scenario. These projections shows a cumulative distance to target of 1 – 17 Mt CO2eq for the period 2013-2020 with Ireland breaching its annual limits in 2016-2017.

"Strong projected growth in emissions from transport and agriculture are the key contributors to non-ETS emissions. In 2020 non-ETS emissions will be 5-12% below 2005 levels compared with a 20% reduction target".

40 It is clear that the country still faces considerable challenges in meeting EU 2020 targets and developing a low-carbon emission pathway to 2050. The lower cumulative distance to target assumes that all the targets set out in the Government's *National Energy Efficiency Action Plan* 2009-2020 (NEEAP) and *National Renewable Energy Action Plan* (NREAP) (2010) are achieved.

10.4.2 Ambient Air Quality

41 Clean air is of particular importance to the Irish population's general health and well being. The benefits of a clean natural environment play an important role in reducing the burden of chronic disease. Ireland is fortunate in having a good quality of air relative to other EU Member States as evidenced by the most recent EPA report A*ir Quality in Ireland 2012 - Key Indicators of Ambient Air Quality* (2013).

42 The EPA Air Quality report provides an overview of air quality in Ireland for 2012, based on the data obtained from 29 monitoring stations that form the National Ambient Air Quality Monitoring Network. It includes an assessment of the following pollutants: NOx, SO_2, CO, ozone, particulate matter (PM10, PM2.5 and black smoke), benzene and VOC, heavy metals and polycyclic aromatic hydrocarbons. The EPA Air Quality report concludes that:

> "*Overall, relative to other EU Member States, Ireland continues to enjoy good air quality, with no exceedances for the pollutants measured in 2012. This is due largely to the prevailing clean westerly air-flow from the Atlantic, a small number of large cities and an industrial sector which is relatively clean and well regulated*".

43 To assess air quality the EPA compares the results of air quality monitoring in Ireland to the limit and target values in the latest EU legislation, the CAFE Directive (2008/50/EC) (EP and CEU, 2008) and the Fourth Daughter Directive (EP and CEU, 2004).

44 The air quality in each zone is assessed and classified with respect to upper and lower assessment thresholds based on measurements over the previous five years. As stated above, the proposed development area falls into the area classified as Zone D, a predominately rural area. In this zone ambient air quality is influenced principally by agricultural activity, domestic heating and vehicle emissions.

45 A summary of background air quality for the main pollutants such as NOx, SO_2, CO, PM10 and PM2.5 as assessed by the EPA for Zone D is provided in **Tables 10.1** to **10.6**. The appropriate limit values as derived from the EU CAFE Directive (2008/50/EC) and as transposed into Irish legislation [S.I.No. 180/204] are also provided for comparative purposes.

46 Air quality in Zone D areas is generally very good with low concentrations of pollutants such as NO_2, SO_2, Particulate Matter 10 microns in size (PM10), particulate Matter 2.5 microns in size (PM2.5) and Carbon Monoxide (CO). This is due mainly to the prevailing clean westerly air flow from the Atlantic and the relative absence of large cities and heavy industry. Concentrations of ozone are higher in rural areas than in urban areas due to the absence of the NOx in rural

areas as an ozone scavenger. Ozone is also a transboundary pollutant, with locations on the west coast having the highest concentrations in Ireland.

Table 10.1: EPA Air Quality Monitoring Nitrogen Oxides (NOx)

Limit Threshold Values for NO_X as set out in the 2008 CAFE Directive & S.I. No. 180 Of 2011				**Summary Statistics For Hourly NO_X Concentrations In Ireland In 2012**	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
Human Health	One hour	200 µg/m^3	18 hours per year	**Annual Mean**	4 µg/m^3
Human health Calendar year 40 µg/m3	Calendar year	40 µg/m^3		**Median**	3 µg/m^3
Alert	One hour	400 µg/m^3		**Hourly Max**	77 µg/m^3
Vegetation	Calendar year	30 µg/m^3			
Upper assessment threshold for human health	Calendar year	32 µg/m^3			
Lower assessment threshold for human health	Calendar year	26 µg/m^3			

Table 10.2: EPA Air Quality Monitoring Sulphur Dioxide (SO2)

Limit Threshold Values for SO2 as set out in the 2008 CAFE Directive & S.I. No. 180 Of 2011				**Summary Statistics For Hourly SO2 Concentrations In Ireland In 2012 Zone D**	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
Human health	One Hour	350 µg/m^3			
Human health	One day	125 µg/m^3	3 days per year	**Annual Mean**	3 µg/m^3
Alert	One Hour	500 µg/m^3		**Median**	2 µg/m^3
Vegetation	Calendar year	20 µg/m^3		**Hourly Max**	12 µg/m^3
Upper assessment threshold for human health	One day	75 µg/m^3	3 days per year	**Daily Max**	7 µg/m^3

Limit Threshold Values for SO2 as set out in the 2008 CAFE Directive & S.I. No. 180 Of 2011				Summary Statistics For Hourly SO2 Concentrations In Ireland In 2012 Zone D	
Lower assessment threshold for human health	One day	50 µg/m^3	3 days per year		

Table 10.3: EPA Air Quality Monitoring Carbon Monoxide (CO)

Limit Threshold Values for CO as set out in the 2008 CAFE Directive & S.I. No. 180 Of 2011				Summary Statistics For Rolling 8 hour CO Concentrations In Ireland In 2012 Zone D	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
Human health	8 Hour Average	10 mg/m^3	-	**Annual Mean**	0.2 mg/m^3
Upper assessment threshold for human health	8 Hour Average	7 mg/m^3	-	**Median**	0.2 mg/m^3
Lower assessment threshold for human health	13 Hour Average	5 mg/m^3	-	**Hourly max**	0.9 mg/m^3

Table 10.4: EPA Air Quality Monitoring Ozone

Air Quality Limit Values for ozone set out in the 2008 CAFE Directive And S.I. No. 180 Of 2011				Summary Statistics For Rolling 8 hour Ozone Concentrations In Ireland In 2012 Zone D	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
Human health	Daily maximum 8-hour mean	120 µg/m^3	25 days per year averaged over 3 years	**Annual Mean**	58 µg/m^3
Vegetation	AOT40 accumulated over May-July	18,000 µg/ m^3 averaged over 5 years		**Median**	57 µg/m^3
LTO health	Daily maximum 8-hour mean	120 µg/ m^3		**Max 8 Hour**	136 µg/m^3
LTO vegetation	AOT40 accumulated over May-July	6,000 (µg/m^3).h		**Number of days greater than 120**	3
				Average AOTO40	2240 µg/m^3

Table 10.5: EPA Air Quality Monitoring Particulate Matter (PM10)

Air Quality Limit and Target Values for PM10 as set out by The CAFE Directive And S.I. No. 180 Of 2011				**Summary Statistics For Daily PM10 Concentrations In Ireland In 2012**	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
PM10 limit value	One day	50 µg/m^3	Not to be exceeded on more than 35 days per year	**Annual Mean**	9 µg/m^3
PM10 limit value	Calendar year	40 µg/m^3		**Median**	9 µg/m^3
Upper assessment threshold	One day	35 µg/m^3	Not to be exceeded on more than 35 days per year	**Daily Max**	54 µg/m^3
Lower assessment threshold	One day	25 µg/m^3	Not to be exceeded on more than 35 days per year	**Number of days greater than 50**	1
Upper assessment threshold	Calendar year	28 µg/m3			
Lower assessment threshold	Calendar year	20 µg/m3			

Table 10.6: EPA Air Quality Monitoring Particulate Matter (PM2.5)

Air Quality Limits and Target Values for PM2.5 as set out by The CAFE Directive And S.I. No. 180 Of 2011				**Summary Statistics For Daily PM2.5 Concentrations For Ireland In 2012**	
Objective	***Reference Time Period***	***Limit or Threshold value***	***No. of Allowed Exceedances***		
PM2.5, target value	Calendar year	25 µg/m^3	To be met by 1 January 2010	**Annual mean**	9 µg/m^3
PM2.5, limit value	Calendar year	25 µg/m^3	To be met by 1 January 2015	**Median**	8 µg/m^3
PM2.5, limit value2	Calendar year	20 µg/m^3	To be met by 1 January 2020	**Daily max**	46 µg/m^3
Upper assessment threshold	Calendar year	17 µg/m^3			
Lower assessment threshold	Calendar year	12 µg/m^3			
PM2.5 exposure concentration obligation.		20 µg/m^3	To be met by 1 January 2015		
PM2.5 exposure reduction target	0 - 20 % reduction in exposure (depending on the average exposure indicator in the target reference year) to be met by 2020				

10.4.3 Other Atmospheric Emissions

47 The pollutants SO_2, NOx, VOC and ammonia (NH_3) are responsible for long range transboundary air pollution such as acidification, eutrophication and ground level ozone pollution.

- SO2 is the major precursor to acid deposition, which is associated with the acidification of soils and surface waters and the accelerated corrosion of buildings and monuments. Emissions of SO_2 are derived from the sulphur in fossil fuels such as coal and oil used in combustion activities.
- NOx emissions contribute to acidification of soils and surface waters, tropospheric ozone formation and nitrogen saturation in terrestrial ecosystems. Power generation

plants and motor vehicles are the principal sources of NOx emissions, through high-temperature combustion.

- VOCs are emitted as gases by a wide array of products including paints, paint strippers, glues, and adhesives and cleaning agents. They also arise as a product of incomplete combustion of fuels and as such are a component of car exhaust and evaporative emissions.

- NH_3 emissions are associated with acid deposition and the formation of secondary particulate matter. The agriculture sector accounts for virtually all (over 98%) ammonia emissions in Ireland.

48 Under Article 4.1 of the National Emissions Ceiling Directive (2001/81/EC), Member States are required to limit their annual national emissions of SO_2, NOx, VOC and NH3 to amounts not greater than the emissions ceilings laid down in Annex 1 of the Directive, by the year 2010 at the latest.

49 The transport sector is the principal source of NOx emissions, contributing approximately 55% of the total. The industrial and power generation sectors are the other main source of NOx emissions, each accounting for 12% of emissions with the remainder emanating from the residential / commercial and the agriculture sectors.

50 The agricultural sector accounts for virtually all NH_3 emissions.

51 The main sources of VOC emissions in Ireland are solvent use and transport accounting for 85% of the total. Domestic coal burning in the residential sector is another important but declining source. Reductions corresponding to 48% have been achieved from 1990 with improved emission control for VOCs in motor vehicles has been largely been responsible for the decrease in overall emissions.

10.4.4 Heavy Metals and Organic Pollutants

52 Heavy metals, benzene and polycyclic aromatic hydrocarbons (PAH) were all below the annual limit values in Zone D also. The EPA Air Quality in Ireland Report 2012 (published in 2013) noted however, that domestic fuel burning emissions in rural areas was the main source of particulate matter and poly-aromatic hydrocarbons (PAH). Levels of particulate matter in some smaller towns for example are similar or higher than those in cities, where bituminous coal is banned.

10.4.5 Dust Deposition

53 Owing to the linear nature of the project with isolated areas of activity which are limited in size and the fact that it lies largely in a rural setting, dust deposition monitoring is not considered necessary to inform the existing baseline conditions. Apart from seasonal agricultural activity, dust deposition is unlikely to impact on the ambient environment. The PM10 and PM2.5 monitoring undertaken by the EPA indicates that the ambient air quality in Zone D is below the threshold limit values.

10.5 POTENTIAL IMPACTS

10.5.1 Do Nothing

54 Climate change and local changes in air quality will continue to change in line with prevailing trends in future years.

10.5.2 Construction Phase

55 There will be potential for minor temporary short term impacts on air quality arising from construction transport and construction related activity, including those associated with the construction material storage yard. These potential impacts relate to construction and transport vehicle emissions and localised potential for dust generation.

10.5.2.1 Climate Impacts

56 The impacts on climate change during the construction phase will be non-significant.

10.5.2.2 Dust and Particulate Matter

57 Dust generation will give rise to potential impact on localised air quality for brief periods. During the construction of the proposed development, there will be site preparation and construction activities, both of which have the potential to generate dust. There is therefore some potential for local air quality to be impacted by dust during the construction phase. Dust generated by construction activity can give rise to local nuisance. However, the impact of this will depend largely on climatic factors. For example the potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust also depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations.

58 The primary air quality issue related to construction is dust potentially arising from the following activities:

- General construction activities, including tree lopping and cutting;
- Earth moving and excavation equipment including handling and storage of soils and subsoil material;
- Vehicle movement over hard dry surfaces on the site, particularly freshly laid temporary access tracks; and
- Vehicle movement over surfaces off site contaminated by muddy materials brought off the site.

59 Dust deposition is usually highly localised to areas of activity, with dust particles falling to the ground within several hundred metres of the source. Dust emissions do not cause long term or wide spread changes to local air quality but their deposition on nearby properties and cars has the potential to cause soiling and discolouration.

60 The majority of the releases are likely to occur during the normal construction working hours. However, in the instance of exposed soil produced from significant earthwork activities, there is potential for short term dust generation to occur 24 hours per day depending on weather conditions.

61 Particulate matter can remain suspended in the atmosphere for a longer period and can be transported over a wider area than dust, by wind. It is potentially small enough to be drawn into the lung during breathing, which in sensitive members of the public could cause an adverse reaction. However, given the general good air quality along the construction route and relatively short duration of construction activity at any one location no significant impact from particulate matter is expected.

62 Typical sources of particulate matter during the construction phase are similar in nature to those that give rise to dust. Particulate matter is also released from the engines of site plant, such as compressors, generators etc. whilst they are running.

63 Therefore, occasionally, increased and perceptible localised emissions may occur. There may also be occasions when mechanical breakdown of site plant could cause short term releases of excess particulate matter and short term release may also occur during start up. However with good construction and mitigation practices dust will not impact significantly on air quality.

10.5.2.3 Emissions from Construction Traffic

64 Construction traffic will use local roads to access the working areas with potentially large percentage increases of traffic flow on some local roads, although this is predominantly due to the very low existing flow volumes (see **Chapter 13** of this volume of the EIS). This traffic will be temporary in nature and of short duration and will be dispersed along the proposed alignment. In terms of its potential to cause significant effects on air quality the EPUK guidance document *Development Control: Planning For Air Quality* (2010), identifies the requirement for air quality assessment only where the following criteria are met as otherwise significant air quality effects will be unlikely to occur:

- Road alignment will change by 5m or more; or
- Daily traffic flows will change by 1000 Annual Average Daily Traffic (AADT) or more; or
- Heavy Duty Vehicles (HGV) flows will change by 200 AADT or more; or
- Daily average speed will change by 10km/hr or more; or
- Peak hour speed will change by 20km/hr or more.

65 The proposed temporary construction materials storage yard associated with the construction of the OHL is not a site as per the meaning of the EPUK guidance document but could experience peak traffic flows with high volumes of traffic movements. However, the yard will not be a long-term facility resulting in a permanent increase in HGV traffic and will only be required for the construction period.

66 Additionally the assessment is only required for large, long term construction sites that would generate Heavy Goods Vehicle (HGV) flows of more than 200 movements per day over a period of a year of more. As the numbers of construction vehicles associated with the construction of the transmission line (see **Chapter 13** of this volume of the EIS) are well below the thresholds identified and are considered to be low and temporary in nature at any one construction location, it is considered that impacts to air are non-significant.

10.5.3 Operational Phase

67 During the operational phase there will be no emissions from the towers or OHL and any associated maintenance traffic will be very low with a line inspection by helicopter every year and vehicle access associated with vegetation clearance on a five year cycle.

68 The principal impacts on air quality will be largely positive with respect to climate change arising from increased energy transmission efficiency and displacement of fossil fuel generation through facilitation of renewable energy access to the national grid.

10.5.3.1 Transmission Energy Efficiency

69 The proposed development will consist of an efficient, coordinated and economical system of electricity transmission, which has the long-term ability to meet reasonable demands for the transmission of electricity. Efficient transmission of electricity reduces transmission losses reducing the overall power generation requirement with a net positive benefit of reducing carbon emissions. The proposed development will comprise a major improvement in electricity transmission system infrastructure on the Island of Ireland allowing renewable sources to be utilised on an all-island basis further providing for displacement of fossil fuel power generation on the island as a whole.

70 The proposed development will comprise a major improvement in electricity transmission system infrastructure on the island of Ireland. The improvement in energy infrastructure will facilitate the expansion and incorporation of renewable energy generation into the national grid, transmitting the energy in an efficient manner and facilitating the displacement of energy generation from fossil fuel combustion. This will contribute positivelyto a reduction in national CO_2 emissions associated with the energy sector where this leads to displacement of fossil fuel electricity generation. For example, in 2011 wind energy avoided 2,144 kt of CO_2 (60%), followed by solid biomass 633 kt of CO_2 and hydro 346 kt of CO_2 based on figures published by the Sustainable Energy Authority of Ireland (SEAI). The proposed development will impact positively on Ireland's ability to achieve its EU and National targets with respect to reducing greenhouse gas emissions and expanding energy production from renewable sources.

71 The operation and maintenance of the proposed development will not result in any significant impact on air quality impacts and has been scoped out of this assessment.

10.5.4 Decommissioning Phase

72 The proposed development will become a permanent part of the transmission infrastructure. The expected lifespan of the development is in the region of 50 to 80 years. This will be achieved by routine maintenance and replacement of hardware as required. There are no plans for the decommissioning of the OHL. In the event that part of, or the entire proposed infrastructure is to be decommissioned, all towers, equipment and material to be decommissioned will be removed off site and the land reinstated. Impacts would be expected to be less than during the construction phase and would be of short term duration.

10.6 MITIGATION MEASURES

73 The main potential for impact relates to dust emissions during the construction phase of the project. The most effective way to manage and prevent particulate releases is through effective site management and control of the potential source. Mitigation measures designed to ensure that emissions from these sources are minimised will be set out in detail in the Construction Environmental Management Plan (CEMP), an outline of which is available in in Appendix 7.1, **Volume 3B Appendices** of the EIS.

74 Mitigation measures will be employed on a site specific basis, based on a review of the construction activities involved and their proximity to nearby receptors in each location. The site specific mitigation measures will be employed to ensure that properties within 50m of construction locations will not be subject to significant dust nuisance. This process will focus on the mitigation of dust from activities including site preparation, construction and earthworks. The types of mitigation measures include the following:

- A water bowser will be available to spray work areas, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions; and
- Stockpiled material during the construction phase will be sprayed during periods of dry weather in order to suppress dust migration from the site.

75 The measures described in the outline CEMP are ‘good practice’ measures and are designed to ensure that the construction activities do not generate excessive dust or particulate material release. Employment of such measures will ensure that no significant dust effects occur during project construction.

10.7 RESIDUAL IMPACTS

76 The development will contribute positively to a long term residual impacts on greenhouse gas emissions as it will facilitate further development and connection of renewable energy sources thereby reducing the dependence on fossil fuels with consequent reduction in greenhouse emissions.

77 In terms of dust no significant impacts are predicted following the implementation of good construction practice and implementing the mitigation measures set out in Section 10.6 above.

During adverse weather condition some residual impacts will occur, dependent on wind speed and turbulence during construction, however, it is likely that the impact will be localised in the area immediately surrounding the source and will be of short duration and temporary in nature.

78 Traffic emissions themselves will not give rise to significant air quality effects from vehicular emissions. Construction traffic will contribute to existing traffic levels on the surrounding road network and will have the potential to generate dust. The greatest potential for this to occur will be in the areas immediately adjacent to the principal means of access for construction traffic. In these areas increases in dust generated by vehicle movements and local air pollutant emissions from vehicles may be temporarily elevated during the busiest periods of construction activity, however with the implementation of mitigation measures no significant local air quality effects are predicted.

79 Additional indirect impacts on climate can arise from the production of concrete for tower foundation construction. Emissions associated with the construction traffic for the proposed development have been addressed in this chapter, however there will be additional emissions of CO_2, SO_2 and NOx associated with the use of raw materials for the production of cement for concrete manufacture, its transport, kiln drying of limestone and concrete batching with aggregate materials. These emissions will occur at quarry locations for aggregate and limestone production at the lime kiln location and the concrete batching location. These activities are controlled under licences issued by the relevant local authority where they take place and will not give rise to local air quality impairment. The overall contribution to climate change gases will be negative, but the impact will be very low and will be offset by the positive impact of the displacement of such gases arising through facilitation of renewable energy developments by the proposed transmission infrastructure.

10.8 INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL FACTORS IMPACTS

80 During the construction phase, air and climate impacts will be associated with the construction activities of the project and road traffic impacts. Traffic emissions themselves will not give rise to significant air quality effects from vehicular emissions. With the implementation of mitigation measures no significant local air quality effects are predicted. In addition this chapter should be read in conjunction with Chapter 7, **Volume 3B** of the EIS and **Chapter 13** of this volume of the EIS for a full understanding of the main interrelationships between these environmental topics.

10.9 CONCLUSIONS

81 The proposed development will contribute positively to long term residual impacts on greenhouse gas emissions as it will facilitate further development and connection of renewable energy sources thereby reducing the dependence on fossil fuels with consequent reduction in greenhouse emissions.

82 In terms of dust no significant impacts are predicted following the implementation of good construction practice and implementing appropriate mitigation measures.

83 Traffic emissions themselves will not give rise to significant air quality effects from vehicular emissions.

84 With the implementation of mitigation measures no significant local air quality effects are predicted.