Chapter 7:

Air & Climate

7.1 Introduction

7.1.1 Overview

The purpose of this chapter is to assess the air quality and climate impacts of the proposed development. The following key issues are addressed:

- Impacts of the construction phase on air quality and climate e.g. the construction activities may generate quantities of dust, pollutants, emissions etc;
- Impacts of the operation phase on air quality and climate e.g. traffic emissions resulting from the proposed development etc.

7.1.2 Assessment Methodology

7.1.2.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or 'Air Quality Standards' are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set. Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate European Commission Directive 2008/50/EC which has set limit values for the pollutants SO2, NO2, PM10, benzene and CO. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC) (see **Table 7.1**).

7.1.2.2 Climate Agreements

Ireland is a party to the United Nations Framework Convention on Climate Change (UNFCC) and currently has a binding EU target to reduce greenhouse gas emissions by 20% over 2005 levels by 2020 (Directive 2003/87/EC). This is likely to increase by up to 40% by 2030 in accordance with the current EU 2030 Climate and Energy Policy Framework. The most recent reports from the EPA and the EU indicates that Ireland is unlikely to achieve 2020 EU greenhouse gas reduction targets[1]. Ireland is also a signatory to the Paris COP21 Climate Agreement. This agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C.

7.1.2.3 Gothenburg Protocol

Ireland is a signatory to the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The objective of the Protocol is to control and reduce emissions of Sulphur Dioxide (SO2), Nitrogen Oxides (NOX), Volatile Organic Compounds (VOCs) and Ammonia (NH3). In order to achieve the targets, Ireland was required, by 2010, to have met national emission ceilings of 42kt for SO2 (67% below 2001 levels), 65kt for NOX (52% reduction), 55kt for VOCs (37% reduction) and 116kt for NH3 (6% reduction). European Commission Directive 2001/81/EC, the National Emissions Ceiling Directive, prescribes the same emission limits. Emissions of SO2 and NH3 from the road traffic sector are insignificant accounting for less than 2% of total emissions in Ireland in 2011. Road traffic emissions of Nitrogen Oxides (NOX) and Volatile Organic Compounds (VOCs) are important accounting for 37% and 38% respectively of total emissions of these pollutants in Ireland in 2001 (EPA, 2013A). A National Programme for the progressive reduction of emissions of the four transboundary pollutants is in place since April 2005. A review of the National Programme in 2011 showed that Ireland complied with the emissions ceilings for SO2, VOCs and NH3, but failed to comply

[1] EPA, 2015, Ireland's Greenhouse Gas Emission Projections 2014-2035

with the emission ceiling for NOX. Although emissions from road traffic decreased by 47% over the period 1990 – 2011, NOX levels in 2011 were 2.6 kt above the emission ceiling of 65kt.

Pollutant	*Regulation* note 1	*Limit Type*	*Margin of Tolerance*	*Value*
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	40% until 2003 reducing linearly to 0% by 2010	200 µg/m^3 NO_2
		Annual limit for protection of human health	40% until 2003 reducing linearly to 0% by 2010	40 µg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 µg/m^3 NO + NO_2
Lead	2008/50/EC	Annual limit for protection of human health	100%	0.5 µg/m^3
Sulphur dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 µg/m^3	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
		Annual & Winter limit for the protection of ecosystems	None	20 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	20%	40 µg/m^3 PM_{10}
$PM_{2.5}$ (Stage 1)	2008/50/EC	Annual limit for protection of human health	20% from June 2008. Decreasing linearly to 0% by 2015	25 µg/m^3 $PM_{2.5}$
$PM_{2.5}$ (Stage 2) Note 2	-	Annual limit for protection of human health	None	20 µg/m^3 $PM_{2.5}$
Benzene	2008/50/EC	Annual limit for protection of human health	100% until 2006 reducing linearly to 0% by 2010	5 µg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	60%	10 mg/m^3 (8.6 ppm)

Table 7.1: European Union Ambient Air Quality Standard (Based on Directive 2008/50/EC)

**Note 1: EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC*

**Note 2: EU 2008/50/EC states - 'Stage 2 — indicative limit value to be reviewed by the Commission in 2013 in the light of further information on health and environmental effects, technical feasibility and experience of the target value in Member States'*

7.1.2.4 Methodological Approach

The assessment of air quality has been carried out using a phased approach as recommended by the EPA and UK DEFRA[2]. The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards. In the current assessment, an initial scoping of possible key pollutants was carried out. An examination of recent EPA and Local Authority data in Ireland has indicated that SO_2, smoke and CO are unlikely to be exceeded at locations such as the subject site and thus these pollutants do not require detailed monitoring or assessment to be carried out. However, the analysis did indicate potential issues in regards to Nitrogen Dioxide (NO_2) and PM_{10} at busy junctions in urban centres. Benzene, although previously reported at quite high levels in urban centres, has recently been measured at several city centre locations to be well below the EU limit value.

The scoping assessment has indicated that the pollutants NO_2, CO, PM_{10}, $PM_{2.5}$ and benzene are unlikely to be exceeded in rural areas. Nevertheless, the current assessment has identified the existing baseline levels of these pollutants in the region of the proposed development by analysis of suitable EPA monitoring data. Thereafter, a qualitative assessment on air quality and climate was carried out based on the nature, size and location of the proposed development.

7.1.2.5 Significance Criteria

The impact of the proposed development is assessed in terms of the relative additional contribution of the development, expressed as a percentage of the limit value. Although no relative impact, as a percentage of the limit value, is enshrined in EU or Irish Legislation, the National Roads Authority document *"Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes"* details a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the development. The NRA significance criteria have been adopted for the purposes of this current assessment and are detailed in **Tables 7.2 and 7.3.**

Magnitude of Change	*Annual Mean NO_2 / PM_{10}*	*Days PM_{10} > 50 µg/m^3*
Very Large	Increase / decrease >25%	Increase / decrease >25 days
Large	Increase / decrease 15-25%	Increase / decrease 15-25 days
Medium	Increase / decrease 10-15%	Increase / decrease 10-15 days
Small	Increase / decrease 5-10%	Increase / decrease 5-10 days
Very Small	Increase / decrease 1-5%	Increase / decrease 1-5 days
Extremely Small	Increase / decrease <1%	Increase / decrease <1 days

Table 7.2: Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

[2] UK DEFRA (2009) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(09); UK DETR (1998) Preparation of Environmental Statements for Planning Projects That Require Environmental Assessment - A Good Practice Guide, Appendix 8 - Air & Climate

Absolute Concentration in Relation to Standard[Note 1]	*Change in Concentration*					
	Extremely Small	*Very Small*	*Small*	*Moderate*	*Large*	*Very Large*
Decrease with Scheme						
Above Standard with Scheme	slight beneficial	slight beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Above Standard in Do-min, Below with Scheme	slight beneficial	moderate beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Below Standard in Do-min, but not Well Below	negligible	slight beneficial	slight beneficial	moderate beneficial	moderate beneficial	substantial beneficial
Well Below Standard in Do-min	negligible	negligible	slight beneficial	slight beneficial	slight beneficial	moderate beneficial
Increase with Scheme						
Above Standard in Do-min	slight adverse	slight adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Standard in Do-min, Above with Scheme	slight adverse	moderate adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Standard with Scheme, but not Well Below	negligible	slight adverse	slight adverse	moderate adverse	moderate adverse	substantial adverse
Well Below Standard with Scheme	negligible	negligible	slight adverse	slight adverse	slight adverse	moderate adverse

Table 7.6: Air Quality Impact Significance Criteria

*Note 1: Well Below Standard = <75% of limit value.

7.2 Description of the Existing Environment

7.2.1 Meteorological Conditions

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience significant

variations in pollutant levels under the same source strength (i.e. traffic levels)[3]. Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Oak Park Automatic Weather Station (AWS) which is situated in the grounds of Teagasc, Oakpark Co. Carlow, approximately 23km east of the site. Meteorological data from Oak Park AWS has been examined to identify the prevailing wind direction and average wind speeds over a three-year period. From data collated, the predominant wind direction is south-westerly with an average wind speed of approximately 5m/s.

7.2.2 Trends in Air Quality

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources. Thus, residential exposure is determined by the location of sensitive receptors relative to major roads sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction

7.2.3 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality is the EPA's *Air Quality Monitoring Report 2014* which details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland. Dublin is defined as Zone A and Cork City as Zone B. Zone C is composed of 21 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D. In terms of air monitoring, the area in which the proposed development site is located is categorised as Zone D.

NO_2 monitoring was carried out at four rural Zone D locations at Emo, Co. Laois; Enniscorthy, Co. Wexford; Castlebar, County Mayo and Killikitt, Co. Monaghan. The NO_2 annual mean for the four sites were 3, 13, 8 and 3 $\mu g/m^3$ respectively. Hence long-term average concentrations measured at all locations were significantly lower than the annual average limit value of 40 $\mu g/m^3$. Based on the above information, a conservative estimate of the background NO_2 concentration for the subject site in 2016 is 7 $\mu g/m^3$. The annual mean for hourly SO_2 concentrations at three rural monitoring stations as 4, 2 and 3 $\mu g/m^3$ respectively.

Long-term PM_{10} measurements were carried out at five Zone D locations, with average levels ranging from 9 $\mu g/m^3$ in Kilkitt to 22 $\mu g/m^3$ at Enniscorthy. For $PM_{2.5}$ the values are 13 and 5 $\mu g/m^3$ at Longford and Claremorris respectively. Based on this information, a conservative estimate of the background PM_{10} and $PM_{2.5}$ concentration at the subject site of 13 $\mu g/m^3$ and 9 13 $\mu g/m^3$ in 2016 has been used. Again, these are significantly below the required limit.

The EPA has produced provisional estimates of greenhouse gas emissions for the time period 1990 - 2014. For 2014, total national greenhouse gas emissions are estimated to be 58.21 million tonnes carbon dioxide equivalent (Mt CO2eq). Emissions from Energy (principally electricity generation)

[3] World Health Organization (2000) *Air Quality Guidelines For Europe*

decreased by 1.9% (0.22 Mt CO2 eq) in 2014. This reflects a 2.9% decrease in coal used in conventional fossil fuel fired power stations for electricity generation, and also a decrease in natural gas use of 6.0% in 2014. Electricity generated from renewables increased by 12.6% between 2013 and 2014.

7.3 Description of Likely Impacts

7.3.1 Construction Phase

7.3.1.1 Air Quality

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. Construction vehicles, generators etc., will also give rise to some exhaust emissions but this shall be temporary and minor in significance.

7.3.1.2 Climate

There is the potential of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and NO_2 emissions. Again these will be temporary and minor in significance.

7.3.2 Operational Phase

7.3.2.1 Air Quality

The assessment of baseline air quality in the region of the proposed development has shown that current levels of key pollutants are significantly lower than their required limit values. As set out in **Chapter 13**, the proposed development will give rise to insignificant traffic movements during the operational phase. Due to the size, nature and remote location of the proposed development, road traffic emissions resulting from the proposed development will therefore have a negligible impact on air quality. However, at a strategic level, the generation of c.110 GWh of renewable electricity will lead to significant positive impacts in terms of air quality.

7.3.2.2 Climate

The generation of c.110 GWh of electricity to the national grid will lead to a net reduction in terms of greenhouse gas emissions by displacing fossil fuels. The greenhouse gas reduction benefits from the proposed development is estimated to be 50,000 tonnes of CO_2 Equivalent per annum.

7.3.2.3 Modification of Atmospheric Conditions

The proposed development has the potential to affect wind speed and turbulence in the immediate area of the wind farm with the turbines slowing winds in their path. However, this micro-climate impact will be minor and limited in extent to the immediate area of the wind farm.

7.4 Mitigation & Monitoring Measures

7.4.1 Air Quality

7.4.1.1 Construction Phase

As with all projects, construction activities are likely to generate some dust emissions. A Dust Minimisation Plan will be formulated as part of the Construction Management Plan for the construction phase of the project, (see **Appendix 7.1**).

7.4.1.2 Operational Phase

By displacing fossil fuels, the proposed development will result in a positive impact on regional air quality and Ireland's obligation under EU and national air quality legislation. Thus, no mitigation measures are necessary. Residual impacts will be negligible.

7.4.1.3 Decommissioning Phase

There is the potential for a number of emissions to the atmosphere during the decommissioning of the development. In particular, activities may generate quantities of dust. Required vehicles and machinery will also give rise to some exhaust emissions. With implementation of dust mitigation measures (**Appendix 7.1**) the impact on air quality and climate is likely to be negligible.

Appendix 7.1: Dust Minimisation Plan

A dust minimisation plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. 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 depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within several hundred metres of the construction area.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented. Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.

Vehicles using site roads shall have their speed restricted, and this speed restriction must be enforced rigidly. Indeed, on any un-surfaced site road, this shall be 20km per hour, and on hard surfaced roads as site management dictates. Vehicles delivering material with dust potential shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust. Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

Furthermore, during movement of the soil both on and off-site, trucks will be covered with tarpaulin where necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, the procedures put in place will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movement of these soils will be immediately terminated and satisfactory procedures implemented to rectify the problem before the resumption of the operations.

The dust minimisation plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practise and procedures.