# 8.0 AIR QUALITY

## 8.1 INTRODUCTION

### *8.1.1 Background*

Despite the ongoing deterioration in air quality on a national level due to the reliance on fossil fuel generated energy, Ireland as a whole is relatively free of air pollution when compared with other more industrialised countries. The combustion of fossil fuels for energy results in the release of several gases which contribute to climate change and acid rain, including carbon dioxide ($CO_2$), sulphur dioxide ($SO_2$) and nitrogen oxides (NOx).

Climate change has begun to manifest itself in Ireland, as it has globally, in recent years with increased air temperatures and changes in precipitation patterns. In 2005, the emissions data estimated that Ireland was 25.4 % above the level for 1990. The most recent emissions data shows that in 2008 we were 23.04 % above the level for 1990 (the base year for Kyoto targets). Ireland's target is to limit the growth of emissions to 13 %, therefore Ireland is still a considerable way off the target, (EPA, Annual Highlights, 2008).

The EU Commission has also imposed targets on Ireland's emissions. These require Ireland to reduce its greenhouse gas emissions by 20 % by 2020, using 2005 figures as a base.

### *8.1.2 Relevant Legislation*

There are various regulatory measures in force for the prevention or control of air pollution, adopted both nationally and by the EC. The Air Quality Framework Directive (96/62/EC) sets out the principles of ambient air quality monitoring, assessment and management and was followed by four daughter directives:

- Air quality 1st Daughter Directive (99/30/EC) deals with sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead.
- Air quality 2nd Daughter Directive (2000/69/EC) deals with carbon monoxide and benzene.
- Air quality 3rd Daughter Directive (2002/3/EC) deals with monitoring of ozone levels.

- Air quality 4th Daughter Directive (2004/107/EC) covers polyaromatic hydrocarbons, arsenic, nickel, cadmium and mercury in ambient air.

The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC) was published in May 2008. It replaced the Framework Directive and the first, second and third Daughter Directives. The fourth Daughter Directive (2004/107/EC) will be included in CAFE at a later stage.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and S.I. No. 33 of 1999.

The fourth Daughter Directive was transposed into Irish legislation by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009).

## 8.2 EXISTING ENVIRONMENT

Air quality in Ireland is generally regarded as good, particularly in rural areas such as the site of the proposed development. Air quality is monitored by EPA stations nationwide. The closest air monitoring station to the proposed wind farm is in Mullingar town; however there is currently no validated data available for air quality at this monitoring station. The closest monitoring station with validated air quality data is located in Ferbane approximately 37km West of the proposed site. Ferbane is in Zone D, one of the four air quality zones in Ireland. Zone D consists of small towns and rural areas of the country.

Air quality in Ferbane was assessed between 11$^{th}$ October 2006 and the 28$^{th}$ March 2007. Monitoring was done by a mobile unit containing monitors for sulphur dioxide, nitrogen oxides, carbon monoxide and $PM_{10.}$ Metals in air were also measured.

The Air Quality Framework Directive states that modelling or objective estimation techniques may be used to assess ambient air quality if levels of the pollutant in question in that zone are below the lower assessment threshold. Continuous monitoring is required if levels exceed the upper assessment threshold. No limit values were exceeded at the Ferbane monitoring station during the assessment period. Concentrations of carbon monoxide, sulphur dioxide, nitrogen dioxide and lead were

below their respective lower assessment thresholds. Levels of $PM_{10}$ exceeded the upper assessment threshold for this parameter. Therefore levels of $PM_{10}$ need to be monitored continuously while levels of CO, $SO_2$, $NO_2$ and lead can be assessed using modelling or objective estimation techniques.

Particulate Matter (PM) less than ten micrometres in size ($PM_{10}$) can penetrate deep into the respiratory system increasing the risk of respiratory and cardiovascular disorders. $PM_{10}$ arises from direct emissions of primary particulate such as black smoke and formation of secondary PM in the atmosphere by reactions of gases such as sulphur dioxide and ammonia. The main sources of primary $PM_{10}$ are incomplete burning of fossil fuels such as coal, oil and peat and emissions from road traffic, in particular diesel engines. Other sources of particulates include re-suspended dust from roads. Natural PM includes sea-salt and organic materials such as pollens. The diverse sources and impacts of PM make it one of the most challenging issues to address.

The CAFE Directive (2008/50/EC) outlines the limit values for $PM_{10}$ mass concentration levels. The $PM_{10}$ daily mean limit of 50 $\mu g/m^3$ should not be exceeded more than 35 times per calendar year and the annual mean $PM_{10}$ limit value is 40 $\mu g/m^3$. Particulate matter ($PM_{10}$) concentrations in Ireland in 2010 were all compliant with the standards introduced. All stations were compliant with the limits which permits no more than 35 daily values greater than the limit value of 50$\mu g/m^3$. Levels were highest in traffic influenced sites in the cities and large urban areas.

Nitrogen oxides ($NO_x$), includes the two pollutants, nitric oxide (NO) and nitrogen dioxide ($NO_2$). Power-generation plants and motor vehicles are the principal sources of $NO_x$, through high temperature combustion. $NO_x$ contributes to the formation of acid rain and is also a recognised ozone precursor. Short-term exposure to $NO_2$ is associated with reduced lung function and airway responsiveness, and increased reactivity to natural allergens. Long-term exposure is associated with increased risk of respiratory infection in children.

Nitrogen Dioxide ($NO_2$) concentrations measured in Ireland in 2010 were compliant with all Directive (CAFE) Directive (2008/50/EC) limit values. The highest annual mean value of 35 $\mu g/m^3$ recorded at Winetavern Street in Dublin was below the limit value of 40 $\mu g/m^3$. There were no exceedances of the hourly limit value which will

permit no more than 18 exceedances greater than 200 μg/m$^3$ in a calendar year (EPA, 2011).

Annual rainfall totals were mostly average for 2012. They ranged from 837.1 mm at Carlow Oakpark to 1530.9 mm at Newport. The closest synoptic station to the proposed Yellow River site is Mullingar which recorded 1024.2 mm of rain in 2012. This level is higher than the latest 30-year annual average (1981-2010) which is 970.9mm. The prevailing wind directions are from the southwest and west.

The energy industry is responsible for over 23 % of all greenhouse gas emissions in Ireland. This is an improvement from the position in the late 1990's when it contributed over 30 % to the emission load. This improvement is largely as a result of switching to cleaner and emission free fuels such as natural gas and renewables (EPA, 2011).

## 8.3 POTENTIAL IMPACTS OF THE DEVELOPMENT

The proposed Yellow River Wind Farm does not contain any element, which will produce greenhouse gaseous emissions or odorous emissions. Indeed the development will contribute to a net national reduction in the emissions of greenhouse and other gases resulting from the combustion of fossil fuels. The Energy sector as a whole in Ireland contributed over 23 % of total greenhouse gas emissions in 2005 (National Climate Change Strategy, 2007-2012).

The gases of main concern are those that contribute to an increase of the Greenhouse Effect (Carbon dioxide, Methane, Nitrous oxide and other Nitrogen oxides) and those that contribute to Acid Rain (principally Sulphur dioxide). The degree to which wind energy reduces levels of emissions depends on the method of electricity generation which it is replacing. The proposed Yellow River Wind Farm will consist of thirty two turbines, each with an overall height of up to 166m.

The hub height of the proposed turbine type will be up to 110m and the rotor diameter up to 112m, which gives an overall blade tip height of up to 166m. The potential output of a turbine is this dimension range is 3MW.

The proposed project aims to generate approximately 252,000 MWhr of electricity per year operating at 30% average capacity. This would be enough to supply up to

50,400 households. This is the equivalent energy production from 53,760 tonnes of oil or 797 tonnes of coal each year. The approximate emissions savings that can be achieved each year through the use of a wind farm equivalent in size to the proposed 96 MW Yellow River Wind Farm, instead of the equivalent output from the current mix of generating fuel in Ireland are as follows:

- 144,000 tonnes of Carbon Dioxide ($CO_2$)
- 4,704 tonnes of Sulphur Dioxide ($SO_2$)
- 528 tonnes of Nitrous Oxide ($NO_x$)
- 16,800 tonnes of ash

The global warming potential of 1 tonne of $NO_x$ is equivalent to 310 tonnes of $CO_2$. As such this proposed wind farm will achieve the removal of approximately 307,680 tonnes of $CO_2$ equivalent.

No appreciable effect on the air quality in the immediate environs of the site is expected from the construction and operation of the proposed development. However, the relative reductions in greenhouse gas emissions in the energy sector will serve to reduce the effects of climate change on a national and global level, albeit at a small scale.

There are other potential impacts associated with the construction phase of the project including dust generation from excavation. These impacts are short term and of a low intensity and are not considered significant.

## 8.4 MITIGATION MEASURES

Sporadic wetting of access tracks and loose stone surface will be carried out during the construction phase to minimise movement of dust particles to the air. Should the production of dust be such that it might be capable of causing nuisance or may be injurious to health and safety of persons on site or nearby residents, the Contractor will be ordered to arrange implementation of appropriate dust control measures which will be agreed with Offaly County Council. Wheel wash facilities will be put in place to reduce the movement of dirt particles out of the site.

It is not envisaged that there will be much construction dirt generated during the construction of the turbine hardstands and foundations. No negative impacts of significance have been identified in this analysis.

A net benefit in terms of the reduction of greenhouse gas emissions in the energy sector can be noted.

## 8.5 CONCLUSION

It is concluded that the proposed development will contribute to a long-term positive impact in terms of air quality and climate.

## 8.6 REFERENCES


**1.** Environmental Protection Agency *Air Quality in Ireland 2007 - Key Indicators of Ambient Air Quality* www.epa.ie

**2.** National Climate Change Strategy 2007-2012 www.environ.ie

**3.** Met Eireann - www.met.ie

**4.** EPA, Environmental Monitoring, Air Quality Data, Offaly

**5.** SEI, *Wind Farms and the Environment*