14 AIR QUALITY AND CLIMATE CHANGE

14.1 INTRODUCTION

This chapter describes the likely significant effects the construction, operation and decommissioning of the Carrownagowan wind farm project will have on air quality and climate. For a full description of the project and the proposed development please refer to section 2.3 of Chapter 2.

14.1.1 Scope of Assessment

The scope of the assessment concerns itself with the construction, operation and decommissioning of the proposed project.

Elements of the project are discussed under appropriate sections of this chapter.

There will be offsite replanting of trees (see Chapter 2 for full details) to replace those felled to accommodate Wind Farm infrastructure. The replanting will ensure no net loss of carbon sequestering trees. Any machinery used in the harvesting of the trees will have a negligible impact on local air quality, significantly less than any plant and machinery used during the Wind Farm construction phase. These replanting activities have been scoped out from further assessment.

The potential impact of the Wind Farm construction, operation and decommissioning phases are described in the following sections.

14.1.2 Methodology

At a local level the existing air quality was characterised. The nature, scale and duration of the construction works was examined and its potential to significantly impact on local air quality assessed. Mitigation measures are described to minimise the potential effects.

The local climate was characterised based on 30 year averages measured at a representative weather observatory. The compatibility of the project with the 2019 national Climate Action Plan (CAP) was examined.

14.1.3 Assessment Criteria

14.1.3.1 Air Quality

In the EU, directives set down Air Quality Standards to protect health, vegetation and ecosystems. The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC) was published in May 2008 and was transposed into Irish legislation by the Air Quality Standards Regulations **2011** (S.I. No. 180 of 2011).

There will be some pollutants named in the CAFÉ directive arising from plant and machinery exhaust emissions. These include carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter (PM_{10}). However, these emissions will be minor and temporary, will be quickly dispersed and will not exceed the limit values set out in the CAFÉ Directive 2008/50/EC (**Appendix 14-1**).

There is greater potential for temporary nuisance to occur as a result of fugitive dust from the excavation and transport of soil and materials during construction. The National Roads Authority

(NRA) has published guidance for assessing dust impacts at a local level from road construction ('*Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes*').

Table 14-1 provides a list of distances at which dust could be expected to result in a nuisance from construction sites for impacts such as soiling, particulate matter $(PM)_{10}$ deposition and vegetation effects. These distances present the potential for dust impact with standard mitigation in place. The proposed Wind Farm is considered a moderate construction site.

Table 14-1 Assessment Criteria for the impact of dust from construction with standard mitigation in place

Source		Potential distance for significant effects (distance from source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation**
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

14.1.3.2 Climate Change

In order to demonstrate that the carbon savings will significantly out-weigh any potential carbon losses a methodology made available by the Scottish Government (2019) in tabular spreadsheet format titled *Calculating carbon savings from wind farms on Scottish peatlands* was applied to this development.

This 'carbon calculator' is the Scottish Government's tool provided to support the process of determining the carbon impact of wind farm developments in Scotland. The purpose of the tool is to assess, in a comprehensive and consistent way, the carbon impact of wind farm developments. This is done by comparing the carbon costs of wind farm developments with the carbon savings attributable to the wind farm.

As there is no comparable Irish version it is considered appropriate to adopt the Scottish methodology which has been tried and tested and subject to audit by the Scottish Environmental Protection Agency.

14.1.3.3 Draft Revised Wind Energy Development Guidelines (Draft WEDGS) 2019

Although still in draft format, regard was given to the 2019 Draft WEDGS and the information contained therein concerning air and climate change. The document states the following regarding the potential impact on Climate.

It is recommended that consideration of carbon emissions balance is demonstrated when the development of wind energy developments requires peat extraction.

Section 14.3.3.2 describes the carbon emissions balance of developing the wind farm on peatland.

14.1.4 Statement on Limitations and Difficulties Encountered

It is not possible to quantify exactly what impact the proposed development will have on Climate Change and Air Quality beyond the site boundary. However, it has been possible to determine the significance of the impact. It is universally accepted that replacing fossil fuel generated electricity with wind generated and other forms of renewable electricity has a positive rather than negative effect nationally and globally on air quality and climate. The information provided in this chapter is considered sufficient to enable an informed decision to be made on the potential impacts of the project on air quality and climate.

14.2 EXISTING ENVIRONMENT

The proposed wind farm is located in East Co. Clare on the north-western slopes of Slieve Bearnagh. The site is approximately 4 km northeast of the village of Broadford, 7km north-west of Killaloe and 2.5 km south of the village of Bodyke, at its closest point. Lough Derg lies approximately 4 km to the east of the proposed development area (**Figure 14-1**). The works areas along the turbine delivery route are close to the site, lying northwest of Slieve Bearnagh, and south of Bodyke. The 25km grid route extends from the wind farm to Ardnacrusha. Refer to Chapter 2, section 2.3 for details.

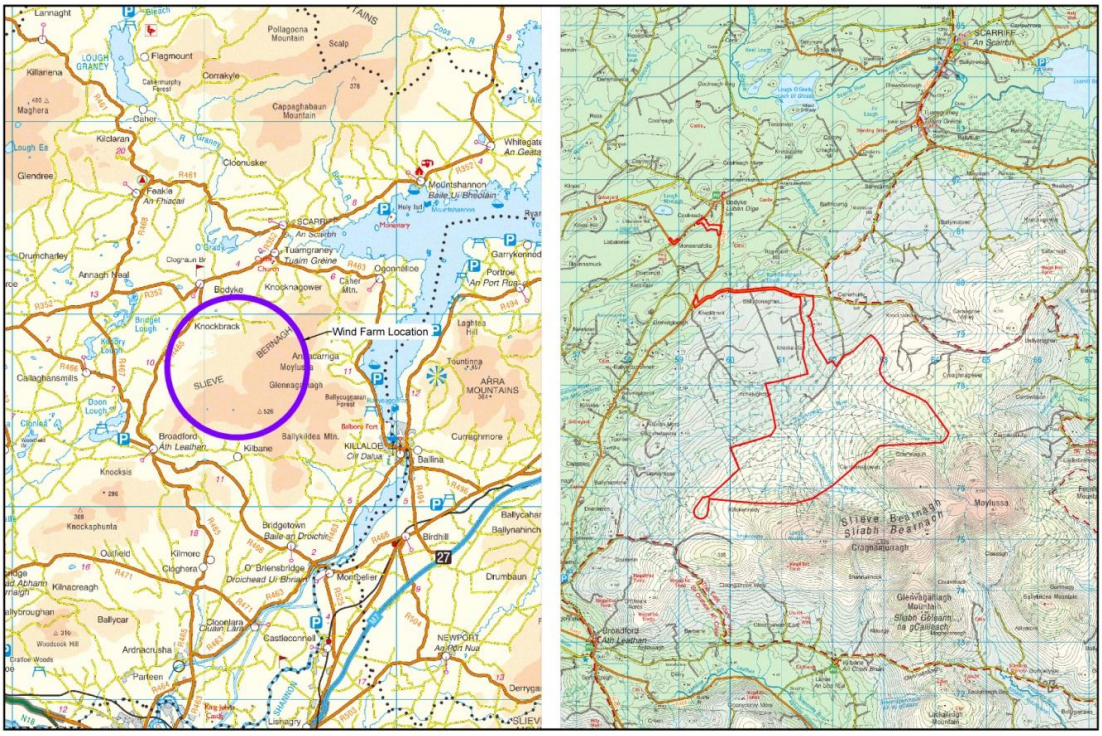

Figure 14-1 Proposed site location

There are several large urban centres within approximately 27 km of the proposed development site, the largest of which is Limerick City which lies approximately 20km to the south (population 94,192, CSO 2016). The town of Ennis (population 25,276, CSO 2016) lies approximately 27 km west and the town of Nenagh (population 8,968, CSO 2016) is located approximately 25 km to the east. Along with local traffic (CO_2, NOx), agricultural practices on nearby farmland (CH_4) and Coillte operations (CO_2, NOx) i.e. machinery used for tree felling, these urban centres are the largest nearby potential sources of pollution.

Representative Environmental Protection Agency (EPA) ambient air quality data has been used to characterise the existing air quality in the area. The sensitive receptors include houses and ecologically sensitive areas.

14.2.1 EPA Air Quality Index for Health (AQIH)

The Environmental Protection Agency's (EPA) Air Quality Index for Health (AQIH) is a number from one to ten that describes the current air quality in a region. There are six regions as follows: Dublin, Cork, Large Towns (>15,000 population), Small Towns (5,000 – 15,000 population), Rural East and Rural West.

The AQIH is based on measurements of five air pollutants all of which can harm health. The five pollutants are:

- Ozone gas
- Nitrogen dioxide gas
- Sulphur dioxide gas
- $PM_{2.5}$ particles and
- PM_{10} particles

The AQIH is calculated on an hourly basis using representative sampling from each region. Each region is ranked 1 – 10, with 1 being 'Good' and 10 being 'Very Poor' based on the worst case pollutant in that region. A ranking of 10 means the air quality is 'Very Poor' and a ranking of 1 – 3 inclusive means that the air quality is 'Good'.

There is no accompanying health message for at risk groups and the general population in areas classed as Good. Outdoor activities can be enjoyed as usual.

In areas of Fair to Poor air quality i.e. AQIH ranking 4 to 10 certain types of outdoor activity should be restricted or avoided for at risk individuals and the general population depending on the AQIH ranking.

The AQIH is calculated every hour. The index was accessed via the EPA's website (https://gis.epa.ie/EPAMaps/) on the 4nd September 2020. The air quality for the region where the Wind farm is proposed (Rural West AQIH Region 6) is currently ranked as '2 - Good'. Refer to **Figure 14-2.**

Figure 14-2 Existing Air Quality Index for Health (AQIH) (www.epa.ie)

The nearest air quality station to the site is in the Peoples Park. Limerick City. This station monitors Nitrogen Dioxide (NO_2), Ozone (O_3), and Particulate Matter (PM_{10}, $PM_{2.5}$) and is located in an Urban Area.

The Limerick station updates every 8 to 24 hours with the calculated Air Quality Index for Health (AQIH). As of September 4th, 2020, the air quality index characterised by this station was classified as 'Good'.

14.2.2 Global Climate

Climate change is considered in a global rather than local context. Every year, the World Meteorological Organisation (WMO) issues a Statement on the State of the Global Climate[1]. It is based on data provided by National Meteorological and Hydrological Services and other national and international organisations. Some of the key messages in the WMO *Statement of the State of the Climate 2019* are as follows:

- Global mean temperature for January to October 2019 was 1.1±0.1°C above pre-industrial levels. 2019 is likely to be the 2nd warmest year on record. The past five years are now almost certain to be the five warmest years on record, and the past decade, 2010-2019, to be the warmest decade on record. Since the 1980s, each successive decade has been warmer than any preceding decade since 1850.
- Global atmospheric concentrations of greenhouse gases reached record levels in 2018 with carbon dioxide (CO2) reaching 407.8±0.1 parts per million, 147% of pre-industrial levels. Measurements from individual sites indicate that concentrations of CO_2 continued to increase in 2019. Methane and nitrous oxide, both important greenhouse gases, also reached record levels.

[1] https://library.wmo.int/doc_num.php?explnum_id=10108

- In May of 2019 the Mauna Loa Observatory in Hawaii, which has tracked atmospheric CO_2 levels since the late 1950s detected 415.26 parts per million (ppm) CO_2 in the atmosphere. The last time Earth's atmosphere contained this much CO_2 was more than three million years ago.
- The ocean absorbs over 90% of the heat trapped in the Earth system by rising concentrations of greenhouse gases. Ocean heat content, which is a measure of this heat accumulation, reached record levels again in 2019.
- In autumn 2019, the global mean sea level reached its highest value since the beginning of the high-precision altimetry record (January 1993).
- Extreme heat conditions are taking an increasing toll on human health and health systems. Greater impacts are recorded in locations where extreme heat occurs in contexts of aging populations, urbanisation, urban heat island effects, and health inequities. In 2018, a record 220 million vulnerable persons over age of 65 were exposed to heatwaves, compared with the average for the baseline of 1986-2005, breaking the previous record set in 2015 by 11 million.

14.2.2.1 National Oceanic and Atmospheric Administration Monthly Report August 2020

According to the National Oceanic and Atmospheric Administration monthly Climate Report for August 2020, the years 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2010, 2005 (tied) and 1998 are the hottest 10 years on record.

The report states the Northern Hemisphere had its warmest summer on record in 2020, surpassing both 2019 and 2016, which were previously tied for hottest. The months of June, July and August were 1.17 degrees C above the 20th-century average.

The report notes that the 2020 season has seen an exceptionally high number of named storms, reaching the letter V (Vicky) as of Monday 14 September. Vicky is the earliest 20th Atlantic named storm on record. The old record was set by Vince on October 9, 2005. The season lasts until 30 November. Only the name Wilfred remains.

14.2.2.2 United in Science Report 2020

The United in Science 2020 report, the second in a series, is coordinated by the World Meteorological Organization (WMO), with input from the Global Carbon Project, the Intergovernmental Panel on Climate Change, the Intergovernmental Oceanographic Commission of UNESCO, the UN Environment Programme and the UK Met Office. It presents the very latest scientific data and findings related to climate change to inform global policy and action. Key findings in the report include:

- Atmospheric CO_2 concentrations showed no signs of peaking and have continued to increase to new records. Benchmark stations in the WMO Global Atmosphere Watch (GAW) network reported CO_2 concentrations above 410 parts per million (ppm) during the first half of 2020.
- CO_2 emissions in 2020 will fall by an estimated 4% to 7% in 2020 due to COVID-19 confinement policies.
- During peak lockdown in early April 2020, the daily global fossil CO_2 emissions dropped by an unprecedented 17% compared to 2019.

- By early June 2020, global daily fossil CO_2 emissions had mostly returned to within 5% (1%–8% range) below 2019 levels, which reached a new record of 36.7 Gigatonnes (Gt) last year, 62% higher than at the start of climate change negotiations in 1990.
- The world is set to see its warmest five years on record and is not on track to meet agreed targets to keep global temperature increase well below 2 °C or at 1.5 °C above pre-industrial levels.

14.2.3 Local Climate

There are a total of 25 synoptic stations located throughout Ireland. These stations are operated by Met Éireann. The parameters measured and recorded at these stations include rainfall, temperature, wind speed and direction, relative humidity, solar radiation, clouds, atmospheric pressure, sunshine hours, evaporation, and visibility.

The nearest synoptic station to the proposed Carrownagowan development site is Shannon Airport. The climate of the proposed wind farm is best represented by data collected at this station. The average monthly precipitation, rainfall, and wind speeds for the 30 year period between 1981 and 2010 are summarised in **Table 14-2** below.

Table 14-2 Shannon Airport 1981-2010 Averages

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
mean temperature	6	6.2	7.8	9.5	12	15	16	16	14	11.2	8.3	6.3	10.7
SUNSHINE (hours)													
mean daily duration	1.6	2.3	3.2	5.1	5.8	5.2	4.5	4.5	3.9	2.9	2	1.4	3.5
RAINFALL (mm)													
mean monthly total	102	76	79	59	65	70	66	82	76	105	94	104	978
greatest daily total	38.2	29	28	40	25	41	40	51	52	36.9	27	41	52.3
WIND (knots)													
mean monthly speed	10.3	10	10	9	8.9	8.5	8.5	8.2	8.4	9.2	9.1	9.4	9.1
max. gust	75	80	65	62	59	51	52	55	62	71	66	83	83
WEATHER (mean no. of days with..)													
snow or sleet	2.3	2.3	1.4	0.5	0	0	0	0	0	0	0.1	1.3	8
hail	3.6	3.3	3.4	2.2	1.2	0.1	0.1	0.1	0.3	0.9	1.1	2.4	18.6
thunder	0.9	0.5	0.4	0.3	0.5	0.5	0.8	0.4	0.2	0.4	0.4	0.5	5.7
fog	3.3	2	2.1	1.9	1.5	1.4	1.4	2	2.9	2.9	3.9	4.2	29.6

14.3 LIKELY SIGNIFICANT EFFECTS

14.3.1 Do Nothing Scenario

If the proposed development were not to proceed, an opportunity to offset Greenhouse Gas Emissions (GHG) emissions from fossil fuel based energy sources would be lost. The potential for Ireland to reach its renewable energy targets set out in the National Climate Action Plan and to contribute to climate change mitigation would be reduced.

Emissions of CO_2, NO_x and SO_2 from coal, oil and gas fired power plants that would otherwise have been displaced will continue, resulting in a continued deterioration in air quality.

Poor air quality in our urban centres is a growing concern. As stated on the EPA's website: *The WHO estimates show that more than 400,000 premature deaths are attributable to poor air quality in Europe annually. In Ireland, the number of premature deaths attributable to poor air quality is estimated at 1,180 people and is mainly due to cardiovascular disease. The World Health Organisation (WHO) has described air pollution as the 'single biggest environmental health risk'*.

This can be categorised as a likely indirect long term significant negative effect.

14.3.2 Construction Phase

During the construction phase there will be emissions from vehicle exhausts. The movement of machinery, construction vehicles and the use of generators during the construction phase will generate exhaust fumes containing predominantly carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter (PM_{10}).

There will be dust generated from moving and transporting soil and materials in and around the construction site and on public roads. Weather conditions will play an important role in the quantity of dust generated. The potential for fugitive dust emissions is greatest during periods of prolonged dry weather.

14.3.2.1 Dust Emissions

Using the NRA criteria listed in **Table 14-1**, the construction of the wind farm can be characterised as a moderate-sized construction site. Therefore, dust is unlikely to cause an impact at sensitive receptors beyond 50 m of the source, with standard mitigation measures in place. There is a minimum separation of 500 m between the nearest dwelling and major construction element, i.e. borrow pit (refer to **Figure 14-3**), therefore dust is unlikely to be a significant impact at the nearest dwellings. Standard mitigation measures for dust prevention and control are presented in **Section 14.4**.

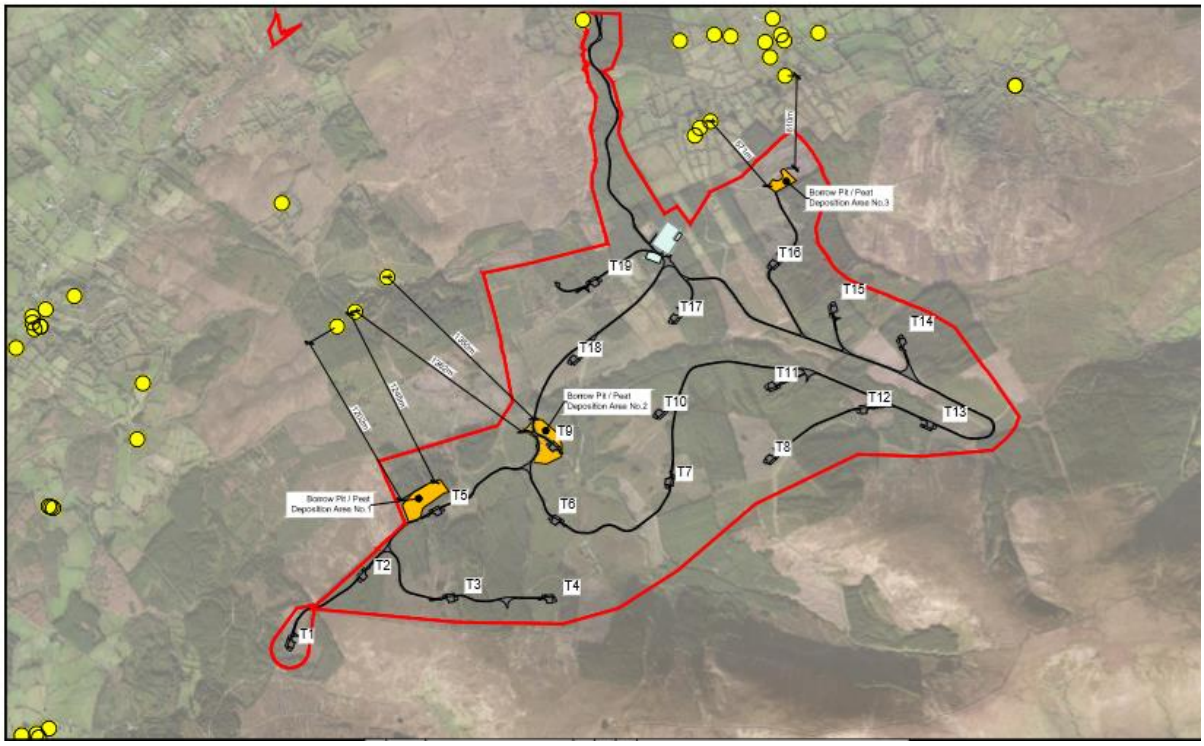

Figure 14-3 Wind Farm Infrastructure and Nearest Dwellings

14.3.2.2 Vehicle Emissions

Exhaust emissions from construction and delivery vehicles during construction are unlikely to have an adverse impact on local air quality and will not impact significantly on local, regional or national Air Quality Standards given the scale of plant and machinery involved, the high levels of dispersion, and the limited extent and duration of the works.

Overall there will be no significant impact on air quality and climate at sensitive receptors for the short term duration of the construction phase.

14.3.3 Operational Phase

14.3.3.1 Air Quality

Once operational, there will be no direct emissions to the atmosphere from the Wind farm. The CO_2 offset by the Wind farm will further assist Irelands CO_2 reduction commitments under the Paris Agreement and Ireland's Climate Action Plan 2019. The electricity generated will displace electricity from coal, oil and gas fired power plants, thus reducing emission from these power plants.

In the context of this project contributing to the commitments in the Climate Action Plan, there will be a long-term significant positive effect on human health.

14.3.3.2 Compatibility with Climate Policy and Targets

In terms of local policy, the 2017 - 2023 Clare County Development Plan states that Clare County Council *will facilitate the development of energy sources which will achieve low carbon outputs*.

In recognition of the need to limit global temperatures, the Paris Agreement came into existence in 2015. It follows on from the Kyoto Protocol with the intention of accelerating progress towards

decarbonisation, climate resilient and sustainable societies. The primary aim of the Paris Agreement is to limit global temperature rise to well below 2 degrees Celsius.

Under the agreement Ireland has committed to renewable energy targets for 2020 including a target of 40% electricity to come from renewable sources. The Government's 2019 CAP highlights the fact that in 2017, 30.1% of electricity was produced from renewable sources and that rising demand for electricity will make meeting the 2020 target of 40% unlikely.

The Carrownagowan Wind Farm is aligned with current energy and climate policy, aims and objectives, which primarily seek to increase the production of electricity from renewable sources (refer to **Section 14.3.3.3**)

14.3.3.3 2019 Climate Action Plan

To help meet the required level of emissions reduction by 2030, the CAP sets a target of up to 8.2 Giga Watts (GW) total of increased onshore wind capacity. By its very nature, the proposed wind farm will contribute to achieving this target and move Ireland one step closer towards decarbonisation and ultimately a net zero GHG emissions society.

The proposed development is fully compatible with the provisions relating to renewable energy set out in the CAP, summarised as follows:

- The project will contribute directly to the CAP commitment that 70% of national electricity will come from renewable sources by 2030, up from 30%.
- The project will contribute directly towards meeting Ireland's renewable energy production targets by 2030 and 2040.
- The project will contribute directly to the specific objectives for onshore wind capacity in Ireland by 2025 and 2030.
- The project will contribute directly to the objectives of the CAP through the provision of grid connection infrastructure to support the renewable energy output.
- The technology to be used is recognised as a least cost technology by the CAP.

The project will lead to a reduction in greenhouse gas emissions by using a least cost technology recognised in the CAP. The development will provide approximately 224,694 MWh per year of renewable electricity to the national grid.

14.3.3.4 Carbon Savings and Losses from the Wind Farm

Once operational, the electricity generated by the wind farm will displace electricity that would otherwise have been produced by burning fossil fuels. This will also displace the associated greenhouse gas emissions. However, there will be some carbon losses due to the manufacturing process of the wind turbines and the drainage and excavation of organic soil/ peat during the construction phase.

Bogs and peatlands thrive under waterlogged conditions. Under such anaerobic conditions, organic material does not readily decompose, therefore, the carbon content of the material remains in-situ. This is often referred to as a carbon sink.

The drainage and excavation of undisturbed peat will lead to the drying out and therefore decomposition of organic material and release of CO_2 into the atmosphere.

While there is peat across the site, it is not by definition a fen or acid bog. The site is highly modified and has been drained to facilitate commercial forestry. The hydrological regime across the site has already been significantly altered.

In order to demonstrate that the carbon savings will significantly outweigh any potential carbon losses a methodology made available by the Scottish Government in an excel worksheet titled *Calculating carbon savings from wind farms on Scottish peatlands* was applied to this development.

As mentioned earlier, this is an established methodology which has been approved by the Scottish government and Scottish Environmental Protection Agency (EPA). Submissions made by the developers using this tool are regularly audited by the Scottish EPA. In the absence of an Irish equivalent, it is considered appropriate to use this tool for the proposed development.

Clear felling of forestry is required to facilitate the turbines and associated infrastructure, including the roads to facilitate access and the substation. These trees may be felled earlier than originally planned because of the Wind Farm. The carbon losses over the lifetime of the Wind Farm are calculated from the area to be felled and the average carbon that would have been sequestered annually. Any felled forestry will be replanted resulting in no net loss.

The theoretical worst case carbon losses due to the proposed Wind Farm are presented in **Table 14-3**. The results are theoretical worst case as the site is not an undisturbed acid or fen bog, rather commercial forestry. The actual results will be much lower than those calculated.

Table 14-3 CO2 Losses due to Wind Farm

Source	CO_2 Losses (tonnes CO_2 equivalent)
Losses due to turbine manufacture, construction & decommissioning	76,329
Losses due to reduced plant fixation	2309
Losses due to leaching	3503
Losses from soil organic matter	51078
Losses due to felling forestry	26534
Total	**196,795**

The calculations show 159,754 tonnes of CO_2 equivalent losses over the Wind Farm's 30 year life span. 76,329 tonnes CO_2 equivalent or 48% of the losses come from the turbine life. The remainder accounts for 83,425 tonnes or 52% of the CO_2 equivalent losses. The early felling of the forestry accounts of 26,534 tonnes CO_2 equivalent losses or 17% of the total.

The calculation spreadsheet uses counterfactual emissions factors to calculate the payback period. There is no clear guidance on the appropriate emission factors to use in Ireland. A grid mix emission factor of 0.375 t CO2 MWh-1 sourced from the SEAI document *Energy Related CO_2 emissions in Ireland 2005 to 2018* was used as the counterfactual emissions factor. This resulted in a payback time of 1.8 years (Refer to **Volume III, Appendix 14-2**).

14.3.4 Decommissioning Phase

The scale of works involved during the decommissioning phase will primarily involve the dismantling and removal of the Wind Farm infrastructure off-site and the dust generating activities will be greatly reduced when compared to the construction phase. Similarly, emissions from plant and machinery exhausts will be lower than anticipated for the construction phase. Where possible materials will be recovered and recycled minimising the energy required for disposal.

14.3.5 Cumulative Effects

There will be no carbon dioxide or any other GHG emissions once the Wind Farm is operational, with the exception of occasional operational and maintenance vehicles exhausts. This effect will be imperceptible. Therefore, there will be no measurable adverse cumulative effect with other developments.

Should this Wind Farm and other renewable electricity generation projects become operational, the combined beneficial cumulative effects will be greater than those described in this chapter. The tonnes of CO_2 emissions avoided and the improvement to air quality, especially in our towns and cities will be greatly enhanced.

The potential cumulative impact with other renewable energy projects will be a long term significant positive effect on air quality and climate.

As there is no emission to atmosphere there will be no cumulative impact to air quality with ongoing forestry operations. The forestry felled early to facilitate construction will be replaced and existing on site forestry operations will carry on as normal throughout the lifetime of the wind farm.

14.4 MITIGATION MEASURES

It is recommended that best practice is adhered to during the construction phase in order to minimise fugitive dust emissions in particular.

Outlined below is a series of mitigation measures and good working practices to ensure that any potential impacts during the construction phase are minimised and to ensure there will be no adverse impact on the receiving environment. The mitigation measures have been sourced from National and International best practice guidance documents for the implementation of dust management plans such as;

- '*Control of Dust from Construction and Demolition Activities'*, UK British Research Establishment (BRE).
- '*Environmental Good Practice on Site'*, Construction Industry Research and Information Association (CIRA).
- '*Environmental Management Plans'*, Institute of Environmental Management and Assessment (IEMA).
- '*Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan'* National Roads Authority of Ireland (NRA).

14.4.1 Construction Phase

14.4.1.1 Dust Generation

Construction phase generated dust will be minimised by the following measures, which are also incorporated into the site specific Construction and Environmental Management Plan (Volume III, Appendix 3-1):

- The use of water as a dust suppressant, e.g. a water bowser to spray access tracks and crane hardstanding areas during any extended dry periods when fugitive dust emissions could potentially arise;
- Public roads will be inspected regularly for cleanliness and cleaned as necessary;
- All loads entering and leaving the site will be covered during dry periods if dust becomes a nuisance on site;
- Control of vehicle speeds passing over access roads and crane hardstanding areas within the site;
- Wheel wash facilities will be implemented at the site entrance from the public road to facilitate removal of any material collected by vehicles entering or leaving the site and preventing its deposition on public roads;
- Site stockpiling of materials will be designed and laid out to minimise exposure to wind;
- Daily site inspections will take place to examine dust measures and their effectiveness.

14.4.1.2 Construction Traffic Emissions

Construction traffic emissions will be reduced using the following measures:

- Ensure regular maintenance of plant and equipment. Carry out periodic technical inspection of vehicles to ensure they perform most efficiently;
- Implementation of the Traffic Management Plan (Volume III, Appendix 3-4) to minimise congestion; and
- All site vehicles and machinery will be switched off when not in use - no idling.
- The majority of aggregate materials for the construction of the Wind Farm will be obtained from on-site borrow pits. This will reduce the number of delivery vehicles to site, thereby reducing the amount of emissions associated with vehicle movements.

14.4.1.3 Minimising Impacts on Peat as a carbon sink

The 2006 Wind Energy Development Guidelines are currently being revised and a draft version of the replacement Wind Energy Development Guidelines (WEDG) was published in December 2019. There is no timeline on the publication of the finalised document and at the time of writing, the 2006 Guidelines remain in force until the new WEDGs are published in final form.

The draft WEDGS include construction guidelines to minimise impacts on peat. Although the guidelines are not yet finalised, the key points are considered standard practice in the optimum design of a wind farm, where the goal is always to avoid or minimise impacts to peat. The interaction of a number of chapters of the EIAR also serves to reduce impacts on peatlands and this includes the Biodiversity, Water, and Land and Soils Chapters.

14.4.2 Operational Phase

The proposed Wind Farm will displace 2,825,310 tonnes of CO_2 over its lifetime. This is a long term beneficial effect. There will be a small amount of CO_2 emissions to atmosphere due to potential decomposition of organic material because of the drainage and excavation of peaty soil. As demonstrated through worst case calculations, this will be off-set very quickly over the life of the Wind Farm. Any reduction in carbon sequestration because of the early felling of forestry to facilitate wind farm infrastructure will also be quickly off-set. Any trees felled will be re-planted in another location resulting in no net loss.

It is not expected that any negative impacts to the climate will occur during the operational phase, therefore no mitigation measures are required.

14.4.3 Decommissioning Phase

Impacts resulting from the decommissioning phase are expected to be similar in nature, but smaller in scale in comparison to the construction phase. Therefore, similar mitigation measures such as those related to dust and construction vehicles are recommended.

14.5 RISK OF MAJOR ACCIDENTS AND DISASTERS

Given the temporary nature of the construction stage and the scale of the proposed project, as well as the environmental protection measures that will be implemented from the outset, the risk of disasters (typically considered to be natural catastrophes e.g. very severe weather event) or accidents (e.g. fuel spill, traffic accident, peat slide) is considered low.

A review of the national flood hazard mapping website http://www.floodmaps.ie/View/Default.aspx) indicates there is no history of flooding in the site. Notwithstanding this, in the case of the occurrence of a severe weather event such as flooding during construction, construction work will cease.

Best construction practice including that for Health and Safety will be employed to minimise the risk of any accidents occurring. All work on site will be carried out in compliance with the Health and Safety Act 2005, the Health and Safety (Construction) Regulations 2013 and all relevant Legislation and Work Practice to ensure that the construction areas, site environs and public roads remain safe for all users.

During the operational life of the wind farm, particularly in the context of climate change, there is the potential for increased storm events and severe weather. Wind turbines are designed for specific wind parameters and will shut down during high wind speed events. Therefore, the potential effects of climate change on the operational development may involve curtailment where the turbines will be restricted from operation due to severe winds but does not present a likely risk of a major accident and disaster.

14.6 RESIDUAL IMPACTS

Once operational, there will be no negative residual air quality impacts. The operation of the Wind Farm will displace CO_2 emissions and air pollutants that would otherwise have been produced by fossil fuel generated electricity.

This project, in combination with other renewable energy projects deemed necessary in the National Climate Action Plan, will result in a long term significant positive impact on air quality and climate.

14.7 CONCLUSION

The proposed wind farm project will facilitate decarbonisation objectives at local and national levels as set out in the 2019 National Climate Action Plan and the 2017 - 2023 Clare County Development Plan which states that Clare County Council *will facilitate the development of energy sources which will achieve low carbon outputs*. The proposed development as described herein, is by definition such an energy source.

Decarbonisation is critical to reducing rising global temperatures and the resultant adverse impacts to the Planet and its occupants.

14.8 REFERENCES

Baringa Partners LLP (2018) *A 70% Renewable Electricity Vision for Ireland in 2030*. Baringa Partners LLP.

Construction Industry Research and Information Association (CIRA) (2015) Environmental Good Practice on Site. CIRA.

Department of Climate, Communications, and the Environment (DCCAE) (2019). Climate Action Plan. DCCAE.

Eirgrid (2018) Generation Capacity Statement. Eirgrid.

Institute of Environmental Management and Assessment (IEMA) (2008) Environmental Management Plans. IEMA.

National Roads Authority (NRA) (2011) Guidelines for the Treatment of Air Quality During the Planning of and Construction of National Road Schemes. NRA.

Scottish Government (2019) Calculating carbon savings from Wind Farms on Scottish peatlands. Scottish Government.

Sustainable Energy Authority of Ireland (SEAI) (2018), Energy in Ireland. SEAI.

Sustainable Energy Authority of Ireland (SEAI 2018), *Energy Related CO_2 emissions in Ireland 2005 to 2018*

UK British Research Establishment (BRE) (2003) *Control of Dust from Construction and Demolition Activitie*s. BRE.

Lithium-Ion Vehicle Battery Production: Status 2019 on Energy Use, CO2 Emissions, Use of Metals, Products Environmental Footprint, and Recycling by Erik Emilsson and Lisbeth Dahllöf. Published November 2019.

PEFCR – Product Environmental Footprint Category Rules for High Specific Energy Rechargeable Batteries for Mobile Applications. Published February 2018.

CO2 Earth, 2020, Viewed 26/05/2020, <www.co2.earth/daily-co2>

European Parliament 2020, Viewed, 28/05/2020 <www.europarl.europa.eu/news/en/press-room/20191121IPR67110/the-european-parliament-declares-climate-emergency>

Environmental Protection Agency, 2020, Viewed 27/05/2020 <www.epa.ie/irelandsenvironment/air/>

Forbes 2020, Viewed 6/06/2020, Estimating the Carbon Footprint of Utility-Scale Batter Storage< https://www.forbes.com/sites/rrapier/2020/02/16/estimating-the-carbon-footprint-of-utility-scale-battery-storage/#1bd230cb7adb

Office of Public Works (OPW), 2020, Viewed 28/05/2020, <http://www.floodmaps.ie/View/Default.aspx>

World Meteorological Organisation (WMO), 2020, Viewed 28/05/2020 <https://library.wmo.int/doc_num.php?explnum_id=10108, 2020>