14.0 AIR QUALITY & CLIMATE

14.1 INTRODUCTION

This chapter assesses the effect on air quality and climate for the region surrounding the proposed project. All meteorological data contained in this report has been received from Met Éireann. This information is adjusted where necessary to take into account the proposed site's location and elevation.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought for the installation of 19 no. wind turbines, which are anticipated to have a nominal capacity of between a minimum of 5 MW and a maximum of 7.2 MW per turbine, which is equivalent to between 95-136.8 MW in total.

The range of installed capacity (between 95-136.8 MW) is being assessed, as this would represent all scenarios from the lowest energy output and longest carbon payback period possible for the proposed wind farm to the highest output and shortest payback period. By taking this approach all scenarios within the range are assessed.

As described in Chapter 2 (Description of the Proposed Project), the proposed wind farm has the potential to produce up to between 274,626 and 395,461 MWh (Megawatt hours) of electricity annually, which would be sufficient to supply the equivalent of between 56,590 and 81,488 Irish households with electricity per year[1].

A full description of the proposed project is provided in Chapter 2 (Description of the Proposed Project) which outlines the overall site and the main components of the proposed project and provides details on the construction, operation and decommissioning of the wind farm and associated infrastructure. This chapter considers the entire project as described in Chapter 2 (Description of the Proposed Project).

14.1.1 Statement of Authority

This chapter was prepared by Serena Byrne, and John Staunton of TOBIN Consulting Engineers. Serena Byrne is a project scientist at TOBIN Consulting Engineers, with over 11 years' multidisciplinary experience in engineering and environmental consulting. She has recently completed a MSc in Environmental Sustainability in University College Dublin on a part time basis, including an EIA Procedures module.

This chapter has been reviewed by Dr John Staunton, Senior Project Manager and Environmental Scientist in TOBIN. John has more than 14 years' postgraduate experience in both research and environmental consultancy. John holds a BSc and PhD in Environmental Science and has considerable experience in project managing wind energy developments and carrying out associated impact assessments including in preparing assessments in relation to air quality and climate.

[1] This is based on the Sustainable Energy Authority of Ireland *"'Energy in Ireland 2021 Report" from December 2021*, which details domestic consumption values for electricity customers in 2020. https://www.seai.ie/publications/Energy-in-Ireland-2021_Final.pdf

14.2 BACKGROUND

14.2.1 Climate

When considering the need for this wind farm development, and wind energy as an energy source in general, it is important to place its development in an international, national and local policy context from the perspectives of environment, energy and planning. In addition to the provisions set out in the Climate Action Plan (CAP23) (DECC, 2023)[2], Chapter 4 (Policy, Planning and Development Context) of this EIAR outlines the legislative mechanisms and requirements from a global to local level (including the National Energy and Climate Plan (NECP) 2021-2030), which have been formulated to support the generation of energy from renewable sources and reduce the dependency on fossil fuels.

The discussion in Chapter 4 (Policy, Planning and Development Context) of the EIAR demonstrates that the proposed wind farm project is consistent with the current energy and planning policy context and drivers, which seek to increase the share of electricity generation from renewable sources and establish wind energy developments in suitable locations, thereby minimising any environmental impacts.

In September 2020, the European Commission updated its Climate and Energy Framework 2030[3] which seeks to drive continued progress towards a low-carbon economy and build a competitive and secure energy system that ensures affordable energy for all consumers and increase the security of the EU's energy supply. It proposes to achieve a 40% reduction in greenhouse gas (GHG) by 2030 relative to 1990, and a binding EU-wide target for renewable energy of at least 32% by 2030. The combination of these measures, as well as an increase in energy efficiency is set to achieve a reduction of 55% in net greenhouse gas emissions.

Under the Renewable Energy Directive (2009/28/EC)[4], Ireland was legally bound to deliver 16% (commonly referred to as *"the overall renewable energy share (RES) target")* of its gross final energy consumption (GFC) requirements from renewable sources by 2020. Ireland has no mandatory target for renewable energy share, however, in order to achieve the 16% target, Ireland set national sub-targets for heat and electricity within the National Renewable Energy Action Plan (NREAP). Under this a national target of 40% for electricity was set.

The Sustainable Energy Authority of Ireland (SEAI)[5] indicates that 42% of electricity demand in Ireland was produced from renewable energy sources in 2020. Electricity has been an area of considerable decarbonising success and a target area for future progress in Ireland. Electricity generated from wind and hydro varies depending on weather (rainfall and wind) conditions. To even this out, the Renewable Energy Directive (2009/28/EC) averages both wind and hydro output over a number of years, a technique known as normalisation. Using this methodology, in 2020 the renewable energy share in electricity (RES-E) in Ireland was 39.1%, falling just short of the 2020 target[6]. Overall, the renewable energy share in 2020 was 13.5%, meaning that Ireland did not meet its overall RES target.

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[2] gov.ie - Climate Action Plan 2023 (www.gov.ie)
[3] https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2030-climate-energy-framework_en
[4] https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules_en
[5] https://www.seai.ie/data-and-insights/seai-statistics/key-publications/renewable-energy-in-ireland/
[6] https://www.seai.ie/data-and-insights/seai-statistics/key-statistics/renewables/

In 2021, the Programme for Government set a target for 70% of electricity to be generated from renewable sources by 2030. The Climate Action Plan published on 4th November 2021 (CAP21) has since increased the target to up to 80% renewable electricity by 2030[7] and this target has remained in the Climate Action Plan 2023.

It is estimated that by 2050, sea levels may rise by 0.25m-0.3m[8]. It is also anticipated that rainfall and wind speed will be generally reduced in summer and increased in winter, with an increase in storm intensity[9]. Any built infrastructure around the country will need to be designed for and withstand these more extreme climatic conditions.

14.2.1.1 Climate Action Plan 2023

The Climate Action Plan 2023 (CAP23) *"is the second annual update to Ireland's Climate Action 2019. This plan is the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, and following the introduction, in 2022, of economy-wide carbon budgets and sectoral emissions ceilings. The plan implements the carbon budgets and sectoral emissions ceilings and sets out a roadmap for taking decisive action to halve our emissions by 2030 and reach net zero no later than 2050, as committed to in the Programme for Government."* Among the most important measures in the plan is to increase the proportion of renewable electricity to up to 80% by 2030, including an increased target of up to 9 Gigawatts from onshore wind energy and at least 7GW of offshore wind energy by 2030. Furthermore, the CAP23 aims to reduce emissions from electricity by ~75% by 2030 from 2018 levels as well as complete the phase-out of coal and peat-fired electricity generation.

The CAP23 also references "Project Ireland 2040" in terms of supporting National Plans and funding, including the Climate Action Fund (CAF). Project Ireland 2040 includes several significant measures aimed at achieving Ireland's targets including the target of *"increasing the share of renewable electricity up to 80% by 2030"*.

Other sector specific targets tied to emissions reduction and electricity/energy consumption within the CAP23 include:

- *Industry: Overall 35% reduction in emissions from this sector by 2030 through measures including; retrofitting, renewable energy, clean mobility, and sustainable agriculture, and encouraging businesses to invest in decarbonisation technologies;*
- *Buildings: Overall 40-45% (40% commercial/public and 45% residential) reduction in emissions from this sector by 2030 through measures including; the new National Retrofit Plan, commitment of retrofitting 500,000 homes by 2030 (including increased funding through the National Development Plan), installation of 680,000 renewable energy heat sources in both new and existing residential buildings, and increased targets for district heating, renewable gas, and the public sector;*
- *Transport: Overall 50% reduction in emissions from this sector by 2030 through measures including; , a reduction of 20% in kilometres driven by the remaining internal combustion*

[7] https://www.gov.ie/en/press-release/d746b-government-sets-policy-for-irelands-commercial-ports-to-develop-infrastructue-to-support-offshore-renewable-energy/#:~:text=The%20Programme%20for%20Government%20set,80%25%20renewable%20electricity%20by%202030.

[8] https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report.html

[9] https://www.climateireland.ie/#!/tools/climateInformation/essentialClimateInformation

engine cars, a reduction in fuel usage, significant increases to sustainable transport trips and modal share, fleet electrification and use of biofuels; ;

- *Agriculture: Overall 25% reduction in emissions from this sector by 2030 through measures including; research and support to promote farm practices that enable farmers to produce with a lower carbon footprint, reduction in use of chemical nitrogen and more targeted use of fertiliser, improving the genetics of herds to reduce emissions while improving productivity, and incentivising increased organic farming and diversification into forestry, biomethane and energy production;*
- *Land Use: Overall sectoral emission ceiling for Land Use sector being revised, ongoing land use review will inform sectoral emission ceiling measures including; reduction in emissions from this sector by 2030 through measures including, reducing emissions and move to being an overall store of carbon, further bog rehabilitation, increased afforestation, improved management of grasslands on mineral soils, increasing the use of cover crops in tillage, rewetting of organic soils;*
- *Circular Economy and Bioeconomy: Overall 50% reduction in emissions from this sector by 2030 through measures including; enactment of the Circular Economy and Miscellaneous Provisions Act 2022[10], ongoing implementation of the Waste Action Plan for a Circular Economy[11] and the Whole-of-Government Circular Economy Strategy (2022-2023)[12] reducing food waste by 50%, ensuring all plastic packaging is reusable or recyclable by 2030, the introduction of a deposit and return scheme for plastic and aluminium beverage containers, reducing food waste by 50% increasing capacity to recycle packaging waste by 70%, and plastic package waste by 55%;*
- *Public Sector: Overall 51% reduction in emissions from this sector by 2030 through measures including; improve energy efficiency in the public sector, increase climate literacy in the public sector, implement green public procurement and retrofit public sector buildings;*

The CAP23 reflects the legally binding carbon budgets and sectoral ceilings which will be adopted by Government. The Plan also reflects Ireland's commitment to achieving the 2030 Agenda for Sustainable Development.

By its nature, the proposed project is fully compatible with all of the relevant provisions set out in the CAP23, relating to the harnessing of renewable energy.

It is also recognised in CAP23 that achieving 80% renewables and the transition to climate-neutrality *"requires that the Government and the people of Ireland come together in a strengthened social contract for climate action and the co-creation of real solutions to these challenges (p.91).*

The proposed project is one such infrastructural development which will contribute to achieving the committed 80% renewable electricity target by 2030.

The CAP23 also describes throughout the plan actions needed to build an Ireland where we *"cut our dependence on imported fossil fuels, and power comes from our own indigenous renewable*

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[10] https://www.irishstatutebook.ie/eli/2022/act/26/enacted/en/html

[11] https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/#:~:text=The%20Waste%20Action%20Plan%20for%20a%20Circular%20Economy,Demolition%2C%20Textiles%2C%20Green%20Public%20Procurement%20and%20Waste%20Enforcement .

[12] https://www.gov.ie/en/publication/b542d-whole-of-government-circular-economy-strategy-2022-2023-living-more-using-less/

resources including wind and solar" which *will also provide* "greater energy security" leading to "stable prices, more jobs and regional development."

The proposed project will be directly compatible with this need and is directly aligned to the required deployment of renewable energy capacity and an increase in renewable energy generation levels. The proposed works for the proposed project include the wind turbine infrastructure itself. However, supporting this infrastructure, the proposed project will also include an onsite substation and grid connection which will ensure that the proposed project will be entirely compatible with and key to the provisions set out in CAP23, by supporting the following measure to support Irelands renewables acceleration programme *"Strengthen the electricity system by upgrading the network and building supporting infrastructure at key strategic locations"*.

With respect to choosing a pathway forward, the CAP23 "will build on the measures and technologies set out in previous Climate Action Plans, as well as the analysis conducted to support preparation of the Sectoral Emissions Ceilings. In addition, it will set out specific actions required to achieve the emissions targets over the coming years". The Sectoral Emissions Ceilings were approved by Government on 28 July 2022. The ceilings were based on analytic input from the Climate Action Modelling Group and other externally procured expertise. The "*measures to implement and deliver the sectional emissions ceilings were assessed and refined based on their emission abatement potential and other factors including cost, feasibility and socioeconomic impact*" (p.51).

Achieving the ambition set out in the sectoral emissions ceilings requires a step change in climate action. CAP23 outlines the five most important decarbonisation measures for Ireland over the coming decade, which include; Renewable Generation, Retrofitting of Residential and Commercial Buildings, Modal Shifts in Transport and Fleet Electrification, Changes to Land Use and Efficiency Improvements in Agriculture. However, while these measures have the largest emissions reduction potential, they alone will be insufficient to achieve the targets. Achieving these measures and all other required measures will require *"a sea change in the functioning of society and the economy including mobilisation of capital, physical construction, reconfiguration and scaling-up of supply chains, and individual behaviour change, to name a few*".

Deploying all measures outlined in the sectoral emissions ceiling analysis would result in emissions reductions of approximately ~43%. Meeting the target of 51% emissions reduction by 2030, relative to 2018 levels, will require the implementation of all measures outlined in the Climate Action Plan as well as additional, not yet specified measures to deliver the unallocated emissions savings of up to 5.25 MtCO2eq. per annum and agreeing a sectoral emissions ceiling for the Land Use, Land Use Change and Forestry.

In terms of electricity, the proposed pathway includes *"a massive and rapid build-out of renewable generation capacity (wind and solar power generation technologies), and will also rely on the continued build-out and strengthening of grid infrastructure, and the deployment of zero emissions gas, and improved electricity demand management. The decarbonisation of the electricity sector will be an immense challenge as we face a growing demand for electricity and a need to ensure security of supply, while providing support for the decarbonisation of other sectors through the electrification of transport and heat" (p.53).*

The CAP23 sets out the potential metrics required to deliver further abatement in this sector, including Onshore Wind Capacity (GW), by 2030. The KPI for Indicative Onshore Wind Capacity (GW) by 2030 is up to 9 GW (and an additional abatement impact of 8.7$MtCO_2$ eq.). The potential metrics outlined in Table 12.5 of CAP 23 are included as Table 14-1 below.

In Ireland (as of May 2022), there is an installed wind capacity of 4,333 MW[13] which leaves a gap of 4,667 MW of wind energy capacity to be installed in order to meet the 2030 targets. In essence, a more than doubling of current wind capacity is needed. In context of the current gap in wind capacity required to meet the 2030 targets, the proposed project would contribute between 2 and 2.9% of additional wind energy in support of meeting that target.

Table 14-1: Key Metrics to Deliver Abatement in Electricity including onshore wind capacity (GW) by 2030, extracted from Table 12.5 from the Climate Action Plan 2023[14]

Theme	2025 KPI	2025 abatement (vs 2018) $MtCO_2eq.$	2030 KPI	2030 abatement (vs 2018) $MtCO^2$ eq.	2031-2035 measures
Accelerate Renewable Energy Generation	50% renewable electricity share of demand 6 GW onshore wind capacity Up to 5 GW solar PV capacity including at least 1 GW of non-new grid solar	1.3	80% renewable electricity share of demand 9 GW onshore wind capacity At least 5 GW offshore wind capacity 8 GW solar PV capacity including 2.5 GW of non-new grid solar Green Hydrogen in production from surplus renewable electricity	8.7	Roadmap for a net-zero power system Green Hydrogen Production via 2 GW Offshore Wind
Accelerate Flexibility	Level of renewables at any one time on grid: 85% Dispatch down (excluding oversupply) of renewables below 7% Minimise oversupply Required long term storage (4 hour plus) in place		Level of renewables at any one time on grid: 95-100% Dispatch down (excluding oversupply) of renewables below 7% Minimise oversupply Required Long term storage (4 hour plus) in place At least 2 GW of new flexible gas fired generation Zero Emission gas fired generation from biomethane and hydrogen commencing by 2030		Long Duration Storage technologies Increased zero emission gas generation to enable a net zero power system
Demand Management	Demand Side Flexibility 15-20% Zero carbon demand growth	0.86	Demand Side Flexibility 20-30% Zero carbon Demand growth	0.86	Roadmap for a net-zero power system Green Hydrogen Production via 2 GW Offshore Wind

[13] https://windenergyireland.com/about-wind/the-basics/facts-stats (Accessed 18th January 2023)

[14] gov.ie - Climate Action Plan 2023 (www.gov.ie)

The indicative construction schedule for the proposed project (as detailed in Chapter 2 (Description of the Proposed Project) of this EIAR) should also be considered with respect to the compatibility of the proposed project with the Climate Action Plan 2023. Construction is proposed to commence (subject to planning permission) in 2026. As such, the wind farm will be contributing renewable energy to the national grid within the timelines required for compliance with the Climate Action Plan objectives for 2030.

In summary, the proposed project is unequivocally compatible with and key to all of the relevant provisions set out in the CAP23, relating to the harnessing of renewable energy. The proposed project will directly contribute to the following:

- A reduction in greenhouse gas (GHG) emissions;
- Additional electricity generation and transmission infrastructure to achieve our renewable energy and emissions targets;
- Deliver the least cost pathway (in the long-term) to meeting the electricity sector targets;
- Input of renewable energy to the national grid to support renewable energy targets;
- Achieving decarbonisation of the electricity sector; The commitment that 80% of our electricity needs will come from renewable sources by 2030;
- Meeting Ireland's Renewable Energy production targets by 2030 and 2040;
- Meeting the specific objectives and indicative targets for onshore wind energy in Ireland by 2030[15] (based on the indicative construction and commissioning schedule for the proposed project); and
- Provision of grid connection infrastructure to support the renewable energy output from the proposed project.

14.2.1.2 Climate Action and Low Carbon Development (Amendment) Act 2021

The Climate Action and Low Carbon Development (Amendment) Act 2021, was signed into law in July 2021 and sets out a plan for Ireland's transition to Net Zero and achieve a climate neutral economy by 2050 by establishing a legally binding framework, with clear targets and commitments set in law, and includes the following key elements:

- *Places on a statutory basis a 'National Climate Objective', which commits to pursue and achieve the transition to a climate resilient, biodiversity-rich, environmentally-sustainable and climate-neutral economy no later than 2050;*
- *Embeds the process of carbon budgeting into law, with Government required to adopt a series of economy-wide 5-year carbon budgets, including sectoral targets for each relevant sector, on a rolling 15-year basis from 2021 onward;*

[15] In terms of large scale renewable generation, the CAP 21 states *"Based on the indicative targets for onshore wind energy and grid-scale solar deployment, the Department of the Environment, Climate and Communications (DECC) will set out a target for the total onshore capacity that should be planned for on a national and regional level"*.

Proposed update - In terms of large scale renewable generation, the CAP 23 sets out to "*increase the proportion of renewable electricity to up to 80% by 2030 and a target of 9 Gigawatts from onshore wind* ."

- *Actions for each sector will be detailed in the Climate Action Plan, which will be updated annually;*
- *A National Long Term Climate Action Strategy will be prepared every 5-years;*
- *Government Minister s will be responsible for achieving the legally-binding targets for their own sectoral area, and be required to account for their performance towards sectoral targets and actions before an Oireachtas Committee annually;*
- *Strengthens the role of the Climate Change Advisory Council, tasking it with proposing carbon budgets to the Minister;*
- *Provides that the first two five-year carbon budgets proposed by the Climate Change Advisory Council should equate to a total reduction of 51% emissions over the period to 2030, in line with the Programme for Government commitment;*
- *Requires each Local Authority to prepare a Climate Action Plan, which will include both mitigation and adaptation measures and be updated every 5-years and be aligned with Local Authority Development Plans; and*
- *Requires Public Bodies to perform their functions in a manner consistent with national climate plans and strategies and furthering the achievement of the national climate objective.*

The proposed project will provide a significant contribution towards supporting the renewable energy targets, not only for County Donegal, but nationally.

14.2.1.3 International Climate Commitments

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in 1997 (Framework Convention on Climate Change, 1999 and Framework Convention on Climate Change, 1997). For the purposes of the EU burden sharing agreement under Article 4 of the Kyoto Protocol, Ireland agreed to limit the net anthropogenic growth of the six Greenhouse Gases (GHGs) under the Kyoto Protocol to 13% above the 1990 level over the period 2008 to 2012 (ERM, 1998). The limit was set at 314.18Mt CO_2eq for the 5-year period, giving a yearly limit of 62.84Mt CO_2eq. Ireland succeeded in meeting the 5-year limit, largely as a result of including forest sinks[16].

However, Ireland is not on track to meet its limits for the next time period (2013-2020) and 2030. In 2021, it was reported based on Ireland's Greenhouse Gas Emissions Projections that Ireland will not meet its 2013-2020 EU greenhouse gas emissions reduction targets, and that immediate action is needed to meet 2030 EU targets (EPA, 2021)[17]. Levels continue to increase and earlier this year the EPA reported that Ireland's 2021 GHG emissions recorded as above 2019 levels[18].

Key findings of Ireland's Greenhouse Gas Emissions Projections 2021-2040 published by the EPA in 2022 indicate that urgent implementation of all climate plans and policies, plus

[16] http://www.epa.ie/pubs/reports/air/airemissions/Ire_GHG_Emissions_1990_2012_handout.pdf

[17] https://www.epa.ie/news-releases/news-releases-2021/ireland-will-not-meet-its-2020-greenhouse-gas-emissions-reduction-targets-action-is-needed-now-to-meet-2030-eu-targets.php#:~:text=Ireland's%202020%20target%20is%20to,on%20greenhouse%20gas%20emission%20reductions.

[18] News Releases 2022 | Environmental Protection Agency (epa.ie)

additional new measures, are needed for Ireland to meet the 51% emissions reduction target and put Ireland on course for climate neutrality by 2050. Furthermore, it states that *"Ireland can meet its non-ETS EU targets of a 30% emission reduction by 2030 (compared to 2005) assuming implementation of planned policies and measures and the use of the flexibilities available. These include a land use flexibility using the Climate Action Plan 2021 afforestation rate of 8,000 hectares per annum"* (EPA, 2022)[19].

In 2015, the Conference of the Parties (COP21) to the agreement was convened in Paris. This conference was an important milestone in terms of international climate change agreements. The "Paris Agreement", agreed by over 200 nations, has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatons per year, whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to greenhouse gas emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made on elevating adaption onto the same level as action to cut and curb emissions.

Since COP21, six additional conferences have been held addressing climate change matters, with the most recent (COP27) held in November 2022 in Sharm El Sheikh, Egypt. The 2018 COP24 reached an agreement on the implementation of what had been previously agreed in Paris. This includes how governments will measure, report on and verify their emission-cutting efforts, which are intended to strengthen delivery of what had been agreed in 2015. The 2019 COP25 aimed to finalise the rules of the Paris Agreement, but details around "Article 6" of the agreement, reporting requirements for transparency and common timeframes for climate pledges were deferred until 2020.

In 2021, the COP26 summit brought parties together in Glasgow in order to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change. The achievements of COP26 were the following pledges and commitments:

- More than 40 countries pledged to phase out fossil fuels and have it completely out of their energy use by the 2030s;
- Commitment to end deforestation by over 140 countries;
- Global Methane Pledge was proposed to cut methane emissions by 30% by 2030;
- Phasing out new gasoline-powered vehicles – six major automakers and 30 national governments have pledged to phase out gasoline- and diesel- powered cars and vans by 2040;
- Increase in net-zero pledges – nearly 90% of countries now have net zero pledges, and while this is progress, there needs to be materialisation on these pledges before there is success;

The aim of COP26 was to keep within reach the limit of the rise in global temperature to 1.5^{oC}, which can only be delivered if every country delivers on what they have pledged. In terms of mitigation this means phasing down reliance on fossil fuels and moving investments towards

[19] https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-greenhouse-gas-emissions-projections-2021-2040.php#:~:text=Under%20the%20Existing%20Measures%20scenario,the%202021%20Climate%20Action%20Plan.

renewable energy sector, switch to electric vehicles, reducing methane and halting/reversing deforestation[20].

Most recently in 2022, the COP27 summit saw a commitment to tackle the effects of climate change on vulnerable countries, by agreeing provision of financial assistance. On the causes of climate change, as governments were requested to revisit and strengthen the 2030 targets in their national climate plans, as well as an acceleration of efforts to reduce fossil fuel power production. Recognition was given to the current global energy crises which highlights the urgency to transform to renewable energy systems within the next decade[21].

Chapter 4 of this EIAR (Policy Planning and Development Context) discusses the above climate agreements and commitments in further detail.

14.2.1.4 Donegal County Development Plan 2018-2024

The Donegal County Development Plan 2018-2024 acknowledges that climate change and greenhouse gas emissions are an important issue that need to be tackled within the county. Section 2A.10 of the document lists as a Core Strategy Objective (CS-O-17) that:

- It is an objective of the Council to promote sustainable development and transportation strategies in urban and rural areas including the promotion of measures to:
- (i) Reduce energy demand in response to the likelihood of increases in energy and other costs due to long-term decline in non-renewable resources;
- (ii) Reduce anthropogenic greenhouse gas emissions; and
- (iii) Address the necessity of adaptation to climate change.

Based on this, the local policy supports developments that reduce the greenhouse gas emissions both within the county and nationally.

14.2.2 Air Quality

The EC has formally adopted the Air Quality Framework Directive (96/62/EC). The First Daughter Directive, 99/30/EC (adopted April 1999), set specific limits for: nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter (PM_{10}) and lead (Pb). In December 2001, the EC adopted the Second Daughter Directive, 2000/69/EC, relating to limit values for benzene and carbon monoxide (CO) in ambient air. The Third Daughter Directive, 2002/3/EC, established target values and long term objectives for the concentration of ozone in air. These directives have been transposed into Irish legislation by the Air Quality Standards Regulations, 2011 (S.I. No. 180 of 2011).

The Fourth Daughter Directive 2004/107/EC relates to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air. This completes the list of pollutants initially described in the Framework Directive (96/62/EC). 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).

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[20] https://ukcop26.org/cop26-goals/

[21] https://unfccc.int/news/cop27-reaches-breakthrough-agreement-on-new-loss-and-damage-fund-for-vulnerable-countries#:~:text=UN%20Climate%20Change%20News%2C%2020,UN%20Climate%20Change%20Executive%20Secretary.

The original Air Quality Directives (except the Fourth Daughter Directive 2004/107/EC) have been replaced by one overriding European Directive, known as the Clean Air for Europe Directive (CAFE Directive) (2008/50/EC) adopted in May 2008 (transposed into Irish Law under S.I. No. 180 of 2011). The EU intends to incorporate the Fourth Daughter Directive into the CAFE Directive in the future. Within the CAFE Directive the specified limits for the protection of human health remain unchanged from those specified in S.I. No. 180 of 2011.

14.2.2.1 Donegal County Development Plan 2018-2024

The Donegal County Development Plan 2018-2024 refers to air quality protection when it lists as an objective in relation to water, environmental services and protection the following (as WES-O-6):

To provide for environmental protection, through:

- The protection of surface water and ground water from pollution in accordance with the relevant River Basin Management Plan, Groundwater Protection Scheme and Source Protection Plans for public water supplies;
- The protection against soil contamination;
- Minimising air and noise pollution;
- Supporting remediation of all existing pollution; and
- Ensuring full compliance with relevant EU Directives, and National and European Policies and Regulations and through monitoring and control of relevant activities

14.3 METHODOLOGY

The significance of effects of the proposed project has been assessed in accordance with the EPA guidance document *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EIAR), May 2022[22]. It also considers the Institute of Environmental Management & Assessment (IEMA) EIA Guide for Climate Change Resilience and Adaption[23].

Table 1-1 of this EIAR (Chapter 1 Introduction), is taken from the EPA document. It outlines guidance for describing the quality and significance of effects. The effects associated with the proposed project are described with respect to the EPA guidance in the relevant sections of this chapter.

14.3.1 Climate

14.3.1.1 Background

As atmospheric levels of CO_2 are widely recognised as being one of the primary causes of climate change, the impact assessment below is based on the potential impacts that the proposed project would have in relation to changes in emissions of CO_2. The Climate Action Plan (See section 14.2.1.1 above) sets out the strategy for Ireland to reduce its production of CO_2 nationally. Carbon dioxide (CO_2) emissions occur naturally in addition to being released with the burning of fossil fuels. All organic material is composed of carbon, which is released as CO_2 when the material decomposes. Organic material acts as a store of carbon. When the

[22] https://www.epa.ie/publications/monitoring-assessment/assessment/EIAR_Guidelines_2022_Web.pdf

[23] https://s3.eu-west-2.amazonaws.com/iema.net/documents/IEMA-EIA-Climate-Change-Resilience-June-2020-1.pdf

vegetation dies, in the acidic waterlogged conditions of bogs and peatlands, the organic material does not decompose fully, and the organic carbon is retained in the accumulating mass of the peatland. The carbon balance of proposed wind farm developments in peatland habitats has attracted significant attention in recent years. When developments such as wind farms are proposed for peatland areas, there will be direct effects and loss of peat in the area of the project footprint. There may also be indirect effects where it is necessary to install drainage in certain areas to facilitate construction. The works can either directly or indirectly allow the peat to dry out, which permits the full decomposition of the stored organic material with the associated release of the stored carbon as CO_2. It is essential, therefore, that any wind farm development in a peatland area saves more CO_2 than is released.

The proposed wind farm site is located within a peatland and forested landscape. It is important to note at this point that peat depths around the site are generally shallow, and although there are small pockets of deeper (<2.5m) peat around the wider wind farm site, it is not anticipated to find notable quantities of peat at any turbine locations. The proposed project has been designed to avoid these areas. Also, most of the wind farm site is used for commercial forestry and is already drained. Given the above, the proposed project will have minimal disturbance to peat. Excavated road designs can be used in all areas of mineral soil or shallow (i.e. <1m) peat. Although peat is found throughout much of the wind farm site, there were no significant depths of peat found beneath the vast majority of the proposed project footprint in surveys undertaken in 2022, as described in Chapter 8 (Land, Soils & Geology). For the proposed site access roads, either an excavated construction type or a floating type can be used, depending on the conditions (i.e. peat depth, slope, etc). Drawing 10798-2040 within Appendix 1-1 illustrates the layout of the internal access roads.

A large portion of the proposed works are located within an area which is currently planted with forestry. Some of this area is located within Coillte lands, while some is located within private lands. As part of the proposed project, there will be a requirement to fell some of this forestry in the areas around the turbine locations as a bat buffer (see Chapter 6 Biodiversity Flora & Fauna) and immediately around the footprint of the other wind farm infrastructure. The total area of forestry to be felled is estimated to be between approximately 69.8ha and 90.9ha, of which approximately 12.6 ha will be replanted on site at the end of the construction phase (at the temporary construction compounds and reinstated borrow pits). As a commercial crop, this forestry is scheduled to be felled in the future regardless of the proposed wind farm being constructed or not.

It is proposed that a large proportion (approximately 96%) will be replanted offsite, with a small amount of onsite replanting to take place where temporary construction compounds are reinstated. This replanting will be carried out at a number of suitable technically approved afforestation sites in the state, and these will be located in a different county, at a significant distance from the proposed wind farm site. However, there will be some extra carbon losses into the atmosphere, associated with the harvesting and transport of the felled trees. A report detailing the forestry felling is provided as Appendix 2-5 of this EIAR.

When assessing the potential for natural disasters on the proposed project in this EIAR, cognisance was taken of climate change (i.e. the predicted future climate[24] for Ireland as described by Met Éireann) in relation to factors such as precipitation and temperature. Met Éireann has considered any uncertainty in the trajectories of greenhouse gases and based their predictions on the most likely outcomes.

[24] https://www.met.ie/epa-climate-projections-2020

14.3.1.2 Calculating Carbon Losses and Savings

The carbon emitted or saved as a result of the proposed project is hugely significant in order to assess its impact on climate. The carbon calculation takes into account the carbon released from a number of sources during the construction, operational and decommissioning stages. These include the effects of drainage works, forestry felling, losses associated with harvesting and transport of felled trees, changes in land use and wind turbine manufacture and construction.

Also included in the assessment tool is the assessment of peat disturbance, though the proposed project was designed to minimise potential for impacts on peat.

Similarly, assessments are carried out to estimate the savings of carbon over the lifetime of the wind farm, compared to the current fossil fuel methods of electricity generation which power the grid.

The Scottish Government have produced an online carbon calculator which aims to estimate the levels of carbon losses and savings from proposed wind farm developments. The calculations are designed to account for the losses of carbon that occur in peatland areas – through removal, drainage and site restoration works. A number of assumptions were made in relation to the site characteristics, where the model uses correction factors based on the Scottish landscape or requires the selection from a specific list.

The completed worksheet, including the assumptions used in the model, is provided in Appendix 14-1 of this EIAR. The model calculates the total carbon emissions associated with the proposed wind farm project including manufacturing of the turbine technology, transport, construction of the project and tree felling. The model accounts for any carbon losses due to peatland disturbance. The model accounts for improvement works and the years taken for the site to return to its original characteristics but does not factor in the potential re-use of turbine components. All metal components can be recycled, while there is limited potential for the recycling/reuse of the fibreglass blades.

The model also calculates the carbon savings associated with the proposed wind farm project against three comparators:

i. Coal fired Electricity Generation
ii. Grid mix of Electricity Generation
iii. Fossil fuel mix of Electricity Generation.

The above comparators are based on UK energy generation figures, which take into account a higher proportion of renewables and nuclear energy, than is provided in Ireland. The most representative case for Ireland, therefore, would be to use a simple formula that is based on the latest available data for electricity generation in Ireland. This is:

$$CO_2 \text{ (in tonnes)} = \frac{A \times B \times C \times D}{1000}$$

For this formula:

- A = the rated capacity of the proposed wind farm (MW)
- B = the capacity/load factor. This accounts for the periods where the proposed wind farm would not be generating power.
- C = number of hours in 1 year

- D = Latest data for the carbon cost per kWh from the national grid.

The formula values that apply to the proposed project are as follows:

- A = 95MW – The anticipated power output of the proposed wind farm is between 95 – 136.8MW. For the purposes of assessing the entire range, the 136.8MW value was also used here.
- B = 31.3% (0.313)
- C = 8,760
- D = 296 g CO2/kWh, based on the 2020 figures, published in 'Energy in Ireland, 2021 Report' by the Sustainable Energy Authority of Ireland (SEAI)[25]

The expected CO_2 losses due to the proposed wind farm project and the total savings anticipated as a result of the wind farm are summarised in Section 14.5 below.

14.3.2 Air Quality

14.3.2.1 Air Quality Standards and Guidelines

The Environmental Protection Agency (EPA) is the competent authority responsible for the implementation of all Irish and EU ambient air quality legislation. The main air pollutants monitored by the EPA are ozone, carbon monoxide, nitrogen dioxide and oxides, sulphur dioxide, particulate matter (PM_{10} and $PM_{2.5}$), benzene, lead, Poly Aromatic Hydrocarbons (PAH), Arsenic, Nickel, Cadmium and Mercury[26]. Apart from ozone, all of these pollutants result from the burning of fossil fuels, either from transport, domestic heating, electricity generating stations or industry. High ozone levels are formed from the reaction of two key pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs), in the presence of sunlight.

The EPA uses the limits[27] as described in the CAFÉ Directive to assess and regulate air quality standards. These limit values are presented in Table 14-2.

In particular, dust particles may pose a risk to human respiratory and cardiovascular health should their size fall below 10 microns, PM_{10}. No specific statutory guidelines exist in Ireland in relation to dust particles exceeding the 10-micron limit, nor have any project specific standards been issued regarding the production of nuisance dust during development. However, for reference the German TA Luft standards[28] provide a numerical benchmark for comparison purposes. This document sets out an upper limit average of no more than $350mg.m^{-2}.day^{-1}$ for non-hazardous dust over a one-year timescale at any receptors outside of the site boundaries.

This limit of $350mg.m^{-2}.day^{-1}$, based on the Bergerhoff method[29] is confirmed by the Department of the Environment, Health and Local Government recommendations for use at

[25] https://www.seai.ie/publications/Energy-in-Ireland-2021_Final.pdf

[26] http://www.epa.ie/air/quality/monitor/

[27] http://www.epa.ie/air/quality/standards/

[28] https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Luft/taluft_engl.pdf

[29] https://www.epa.ie/publications/licensing--permitting/industrial/ied/environmental-management-in-the-extractive-industry.php

quarries. Where no definitive protocol exists, this can be applied as the best approach with respect to construction related dust. Cognisance was also held of the Institute of Air Quality Management (IAQM) produced document, 'Guidance on the Assessment of Dust from Demolition and Construction' through the assessment.

Table 14-1: Air Quality Standards Regulations 2011 (based on EU Council Directive 2008/50/EC)

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	None	200 µg/m^3 NO_2
		Annual limit for protection of human health	None	40 µg/m^3 NO_2
		Critical level for protection of vegetation	None	30 µg/m^3 NO + NO_2
Lead	2008/50/EC	Annual limit for protection of human health	100% Note 2	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	-	125 µg/m^3
		Critical level for protection of vegetation	-	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)	-	Annual limit for protection of human health	-	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)
Ozone (O_3)	2008/50/EC	Maximum daily 8-hour mean	-	120 µg/m^3
Cadmium (Cd)	2004/107/EC	Concentration in the PM_{10} fraction averaged over a calendar year	-	5 ng/m^3**

Pollutant	Regulation Note 1	Limit Type	Margin of Tolerance	Value
Nickel (N)	2004/107/EC	Concentration in the PM_{10} fraction averaged over a calendar year	-	20 ng/m^{3**}
Arsenic (As)	2004/107/EC	Concentration in the PM_{10} fraction averaged over a calendar year	-	6 ng/m^{3**}

* 5 µg/m^3 from the date of entry into force of these Regulations, reducing on 1 January 2006 and every 12 months thereafter by 1 µg/m^3 to reach 0 µg/m^3 by 1 January 2010

** Target value effective from 31 December 2012

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'

Due to the non-industrial emission nature of the proposed project, the short-term nature of the construction period and the general character of the surrounding area (i.e. rural parts of County Donegal), air quality sampling was deemed to be unnecessary for this EIAR. As there are no obvious sources of air pollution in the area around the proposed wind farm, it is considered that the long-term air quality monitoring carried out nationally by the EPA would be an accurate reflection of the air quality of the site as it allows for any short-term outlier data. See Section 14.4.2 below for further information. The nearest EPA licenced waste or industrial sites identified are situated >10km from the proposed windfarm site.

The most representative available air quality data for the proposed project site was assessed to see if the proposed project could have the potential to deteriorate the values to unacceptable levels in the area. The nature of the proposed works was reviewed alongside this to determine to what extent the likely air quality-related emissions would occur. The air quality data was sourced from the EPA monitoring data as described in Section 14.4.

14.4 EXISTING ENVIRONMENT

14.4.1 Climate

14.4.1.1 Greenhouse Gases

The sources of Ireland's carbon emissions is quite different to how it was in 1990 as seen in Figure 14-1. While emissions from energy industry have been reducing in recent years, they still accounted for approximately 16.7% of total carbon emissions in 2021.

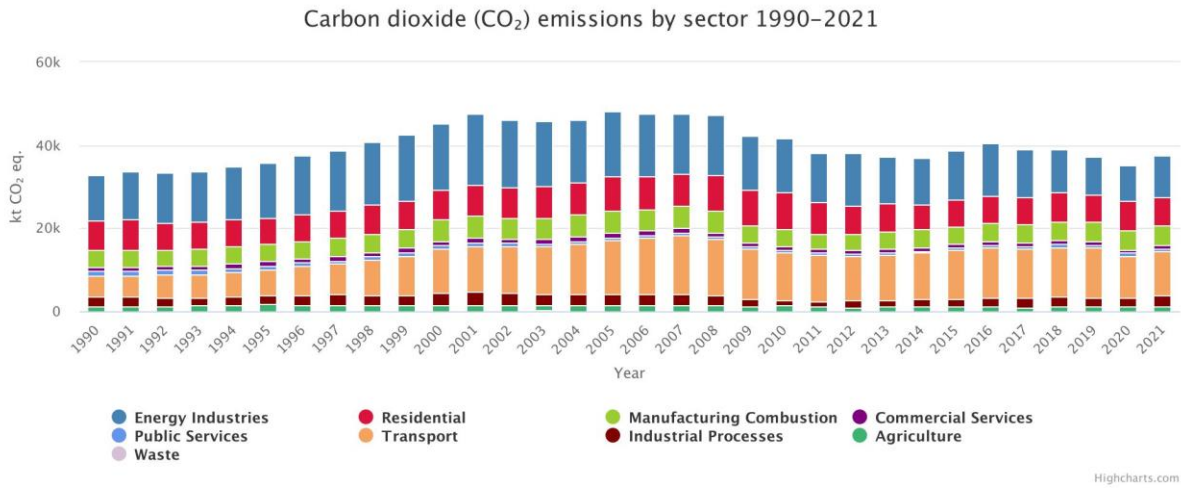

Figure 14-1: Sources of carbon emissions in Ireland since 1990 (Source EPA, Ireland's Provisional Greenhouse Gas Emissions 1990-2021 (July 2022))

The CAP23 recognises the significant changes in energy security since the publication of CAP21 with "*significant increases in prices in the international oil and gas markets, due to increased demand as the post-COVID 19 recovery continues and the disruption to traditional energy supplies following the Russian invasion of Ukraine. The resultant sharp increase in energy prices underlines the importance for Ireland to eliminate our dependency on fossil fuels and that an increase in renewable energy generation, along with supporting flexibility and demand management measures, is necessary for our future energy security." Combined with this "in the short- and medium-term, new demand growth from large energy users, such as data centres, will have to be moderated to protect security of supply and ensure consistency with the carbon budget programme (p.131, 139). [75% reduction in emissions by 2030*]".

The projected increases in demand highlight the necessity to increase the generation capacity for renewable energies nationally in the coming decade. Further information on CAP23 is provided in Section 14.2.1.1 above.

14.4.1.2 Climatic Conditions

A desk-top assessment of available climatic information was undertaken to characterise the existing climate. Although there is no site specific climate data available for the site of the proposed wind farm, long term meteorological data is available online for a number of locations around Ireland which are broadly representative of this location. The meteorological data contained in this EIAR chapter has been received from Met Éireann.

According to Met Éireann[30], in general terms, Ireland's climate can be described as follows:

"The dominant influence on Ireland's climate is the Atlantic Ocean. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitude. The warm North Atlantic Drift has a marked influence on sea temperatures. This maritime influence is strongest near the Atlantic coasts and decreases with distance inland. The hills and mountains, many of which are near the coasts, provide shelter from strong winds and from the direct oceanic influence. Winters tend to be cool and windy, while summers, when the depression track is further north and depressions less deep, are mostly mild and less windy.".

[30] https://www.met.ie/climate / https://www.met.ie/climate/climate-change

Status of Ireland's Climate

In August 2021, the 2nd Status of Ireland´s Climate report, which presents the current state of Ireland's climate was published; the first report was published in 2013. The report was co-funded by Met Éireann, The Marine Institute, the EPA and produced by MaREI (Science Foundation Ireland (SFI) Research Centre) University College Cork[31]. The 2021 report provides an update and incorporates new datasets, analyses and reporting on ongoing climate observations over the previous 7-years.

Due to its geographical position on the western boundary of Europe and the Atlantic Ocean, Ireland is in an ideal setting to measure and assess ongoing climate change. The report was based on the collation and analysis of data from almost 50 internationally defined "Essential Climate Variables (ECV)" observed in atmospheric, oceanic and terrestrial environments around the world. The most recent report found clear evidence that global warming is causing the climate to change in Ireland, including:

- *The annual average surface air temperature in Ireland has increased by over 0.9°C over the last 120 years, with a rise in temperature being observed in all seasons;*
- *Annual precipitation was 6 per cent higher in the period 1989 to 2018, compared to the 30 year period 1961 to 1990; and*
- *Sea level rise and higher ocean temperatures are also observed in our oceans and coastal areas.*

Climate Projections for Ireland

In 2020, updated mid-21st-century (2041-2060) high-resolution climate projections for Ireland were published[32]. These took a multi-model ensemble approach in order to better quantify the inherent uncertainty associated with such projections. The research was carried out by the Irish Centre for High-End Computing (ICHEC) on behalf of the Environmental Protection Agency EPA and supported by Met Éireann and the Marine Institute[33]. The results of the climate modelling reported are in broad agreement with numerous earlier studies. In summary, for Ireland it was found that by mid-century (2041-2060):

- *"Temperatures are projected to increase by 1–1.6°C compared with the reference period (1981–2000), with an east-west gradient and with the largest increases in the east;*
- *Warming will be enhanced at the extremes, with summer daytime and winter night-time temperatures projected to increase by 1–2.4°C;*
- *The number of frost and ice days will decrease by approximately 50%;*
- *Summer heatwave events are expected to occur more frequently;*
- *Precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events;*

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[31]EPA Research Report 386 Prepared by MaREI, University College Cork. Editors and Lead Authors: Walther C.A. Cámaro García, Ned Dwyer and Jeremy Gault - https://www.epa.ie/publications/research/climate-change/research-386-the-status-of-irelands-climate-2020.php

[32] https://www.met.ie/epa-climate-projections-2020

[33] Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach (Nolan and Flanagan, 2020) - https://www.epa.ie/publications/research/climate-change/research-339-high-resolution-climate-projections-for-ireland-.php

- *Snowfall is projected to decrease substantially across the country;*
- *Specific humidity is projected to increase substantially, while relative humidity is projected to increase slightly for all seasons except summer;*
- *Mean 10-m wind speeds are projected to decrease for all seasons;*
- *An overall reduction of ~10% in the numbers of storms affecting Ireland, with an eastward extension of the more severe wind storms over Ireland and the UK;*
- *An increase in the length of the growing season of between 12% and 16%;*
- *The energy content of the 120-m wind is projected to decrease, while a small decrease in solar photovoltaic (PV) power is projected".*

Rainfall Stations

There are approximately 500 rainfall stations across the country[34], strategically located as part of the National Observing Network (Met Éireann). These stations measure the daily rainfall in millimetres (mm). A number of these stations also measure additional parameters such as soil moisture, temperature, humidity, etc.

Synoptic Stations

There are currently 25 synoptic stations[35] located across Ireland that continuously observe and record surface meteorological data. Parameters observed include rainfall, temperature, wind speed and direction, relative humidity, solar radiation, clouds, atmospheric pressure, sunshine hours, evaporation and visibility. They report a mixture of snapshot hourly observations of the weather known as synoptic observations and daily summaries of the weather known as climate observations[36].

The climate of the proposed wind farm location is best described by measurements collected by the National Meteorological Service from meteorological stations in Donegal; Finner Camp, a military barracks situated close to Ballyshannon in the southwest of the county (c. 35km south), and Malin Head (c. 75km northeast) situated at the northern tip of the county and north Atlantic Ocean.

The Finner Camp Met Éireann Weather Station has hourly, daily and monthly data is available for this station. The Malin Head observation station is the only one in Donegal for which 30-year average (1981-2010)[37] weather data is available, as well as hourly, daily and monthly data.

The 30-year Average Monthly rainfall data for Malin Head are presented in Table 14-3 below. The average monthly rainfall for Malin Head over the 30-year period (1981-2010) is 1076 mm, the greatest daily total of rainfall was recorded in the month of October (60 mm). The months of January and October experienced the highest number of days with rainfall levels 5.0 mm or more at 8 days. Overall, a mean of 70 days annually experienced 5.0 mm or more over the 30-year period.

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[34] https://www.met.ie/climate/the-national-observing-network/

[35] https://www.met.ie/latest-reports

[36] https://www.met.ie/latest-reports/observations

[37] The 30-year Averages for 1991-2020 is in the process of being quality assured and collated. Met Eireann note this data is expected to be made available on their website in 2022. At the time of writing (September 2022), this data has yet to be published - https://www.met.ie/climate/30-year-averages

Table 14-2: 30-year Average Monthly Precipitation Data at Donegal (Malin Head)(1981-2010)

30-year Average Monthly Rainfall – Malin Head, Donegal													
Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean Monthly Total	117.4	84.8	85.9	63.1	56.9	69.1	76.8	93.2	91.8	118.4	104.5	114.2	1076.0
Greatest Daily Total	32.6	34.3	31.4	26.3	35.0	26.7	38.7	49.9	48.6	60.0	31.6	39.6	60.0
Mean num. of days with >= 5.0mm	8.0	6.0	6.0	4.0	3.0	4.0	5.0	6.0	6.0	8.0	7.0	7.0	70

The average monthly values for precipitation at Finner Camp and Malin Head for the period 2019-2022 (Q3 2022) is summarised in Table 14-4 below, to provide a snapshot of current rainfall data and an indication of the long term averages (LTA) for recent years in Donegal.

Currently for both Finner Camp and Malin Head, 2021 has seen the lowest annual mean for rainfall in the past four years at 1093.6 mm and 1049.8 mm respectively[38]. The LTA for rainfall for the past four years for Finner Camp was 1249.9 mm, with Malin Head experiencing slightly less rainfall over the period with an LTA of 1107 mm. Given the distance between the two stations (c. 115km), relative distance from the proposed wind farm site (c. 35km and c. 75km respectively) and the experiencing the similar averages for 2022 and LTA, it may be interpreted that this rainfall levels would be similar across County Donegal, and by extension, the site of the proposed project, i.e. range of c. 1100-1250mm annually.

Table 14-3: Average Monthly Values (2019 – Q3 2022) for Precipitation in Donegal (Finner Camp and Malin Head)

Average Monthly Values – Precipitation													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Finner Camp													
2022	70.2	180.2	53.7	77.0	77.4	94.8	73.6	-	-	-	-	-	647.2
2021	132.5	96.1	111.9	33.8	83.2	58.9	91.7	123.6	69.2	112.1	74.8	105.8	1093.6
2020	91.0	263.2	101.3	16.3	30.7	170.3	153.4	100.1	94.8	159.2	164.9	146.2	1491.4
2019	91.6	72.2	194.2	43.6	73.9	94.6	95.7	188.1	106.8	136.4	81.9	143.6	1322.6
LTA	130.4	95.4	103.8	75.9	77.2	72.3	91.0	105.7	102.4	136.8	128.6	130.6	1249.9
Malin Head													
2022	93.1	177.3	23.3	84.2	74.8	66.4	66.3	-	-	-	-	-	607.3
2021	26.9	96.1	90.7	31.6	99.3	49.0	52.0	69.1	68.3	156.2	95.4	115.2	1049.8
2020	79.3	210.4	79.4	20.1	37.3	106.3	133.8	123.1	115.7	148.4	130.0	144.3	1328.1
2019	81.5	59.7	138.8	49.9	79.9	67.3	85.9	162.9	124.5	83.4	91.7	124.2	1149.7
LTA	119.7	87.4	88.4	64.7	58.4	70.2	80.8	95.4	96.4	120.6	108.6	116.4	1107.0

Both Finner Camp and Malin Head weather stations are located close to the sea, and are therefore located at low elevations, while the site elevation ranges from sea level to over 360mOD. Although there may be a slight difference in precipitation locally as a result of this elevation difference (as well as the spatial difference), this is not anticipated to be significant.

Based on the 30-year averages for Malin Head, the number of days per year in which a mean rainfall of 5mm is exceeded was 70 days.

[38] Currently 2021 is the lowest level of rainfall due to 2022 data not complete, once 2022 full data becomes available at the end of Q4 2022 this may change.

Based on the 30-year average precipitation at Malin Head (Table 14-3), total annual rainfall is highest during the winter period (October – January). These levels of precipitation (including snow) are typically associated with more prolonged Atlantic frontal weather depressions passing over the region compared to the summer.

Wind

The Malin Head Met Éireann Station wind rose diagram shows that the prevailing winds are from between the west-southwest (c. 12%) and south (c. 14%)[39] (See Figure 14-2) North-westerly (c. 7%) and south-easterly (c. 10%) winds are less frequent. Northerly and easterly winds tend to be infrequent (c. 5-6%), and north-easterly winds are very infrequent (c. 3%)

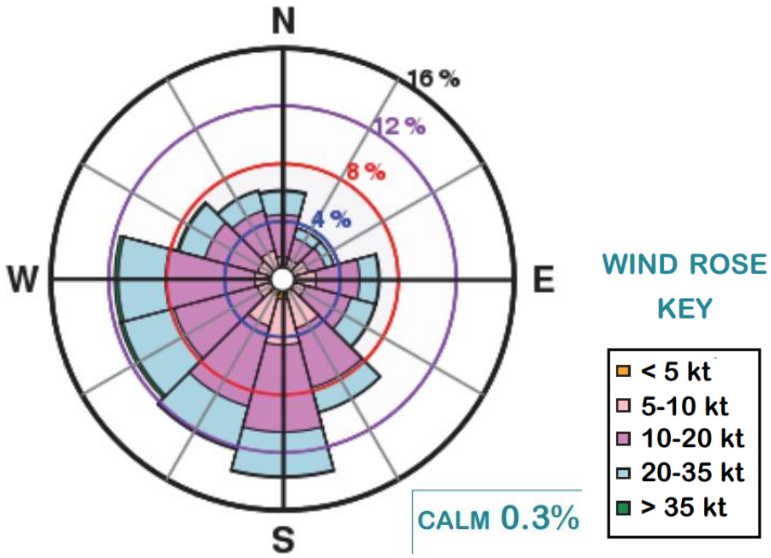

Figure 14-2: Wind Rose for Malin Head Weather Station. Extracted from "A Summary of Climate Averages for Ireland 1981-2010" [40]

Based on the averages between 1981 and 2010[41] (Table 14-5), the mean annual wind speed at Malin Head is 15.6 knots (30.3 m/s), while the maximum average monthly gust reached 96 knots (186.6 m/s) over the period. The mean number of days with gales during these years was 65.3 days.

This wind data provides some context for regional wind direction and speed but are not likely to be reflective of those at the proposed project site, due to differences in location and elevation. The SEAI Wind Atlas shows wind speed at the site of the proposed wind farm is generally between approximately 7-9 m/s at a height of 100m[42]. This speed is likely to be more representative of the site conditions as it accounts for elevation.

[39] https://www.met.ie/climate-ireland/SummaryClimAvgs.pdf

[40] https://www.met.ie/climate-ireland/SummaryClimAvgs.pdf

[41] https://www.met.ie/climate-ireland/1981-2010/malin.html

[42] https://gis.seai.ie/wind/

Table 14-4:30-year Average Monthly Wind Data at Donegal (Malin Head)(1981-2010)

30-year Average Monthly Wind – Malin Head, Donegal													
Wind (knots)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean Monthly Speed	19.0	18.6	17.3	14.6	13.3	12.8	12.3	12.8	14.6	16.8	17.6	17.5	15.6
Max Gust	91	86	90	71	68	62	74	62	85	78	92	96	96
Mean num. of days with Gales	11.8	10.3	8.7	3.6	2.1	1.0	0.7	1.1	3.0	6.5	8.0	8.5	65.3

Temperature

The 30-year averages for temperature at Malin Head, Donegal (summarised in Table 14-6 below), show that across the year the average daily temperature is 9.8°C. There is an average annual mean daily maximum temperature of 12.2 °C and a minimum of 7.5 °C. Across the year, the data shows that on average the number of days with air frost is 8 days, and ground frost is 33.6 days.

Table 14-5: 30-year Average Monthly Temperature Data at Donegal (Malin Head)(1981-2010)

30-year Average Monthly Temperature – Malin Head, Donegal													
Temp (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
mean daily max	8.1	8.1	9.3	10.8	13.1	15.1	16.8	17.0	15.6	13.0	10.4	8.6	12.2
mean daily min	3.6	3.5	4.4	5.8	7.8	10.3	12.1	12.3	10.9	8.5	6.1	4.2	7.5
mean temp.	5.9	5.8	6.9	8.3	10.5	12.7	14.5	14.7	13.3	10.8	8.2	6.4	9.8
mean num. of days with air frost	2.4	2.1	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.0	8.0
mean num. of days with ground frost	8.0	7.1	5.2	2.9	0.6	0.0	0.0	0.0	0.0	0.4	2.6	6.9	33.6

The average monthly values for Temperature at Finner Camp and Malin Head for the period 2019-2022 (Q3 2022) is summarised in Table 14-7 below, to provide a snapshot of current temperature data and an indication of the LTAs for recent years in Donegal. Currently for both Finner Camp and Malin Head, 2022 has seen the highest annual mean temperature in the past four years at 10.6°C and 10.4 °C respectively. The LTA temperature for the past four years for both sites was 9.7 °C. Given the distance between the two stations and experiencing of the same LTA, it may be interpreted that this LTA would be similar across County Donegal, and by extension, the site of the proposed project.

Table 14-6: Average Monthly Values (2019 – Q3 2022) for Temperature in Donegal (Finner Camp and Malin Head)

Average Monthly Values – Temperature (°C)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Finner Camp													
2022	7.0	7.0	7.4	8.9	12.3	13.4	15.3	16.0	-	-	-	-	10.6
2021	4.2	5.9	7.6	7.3	9.7	13.1	16.8	15.3	14.8	11.6	9.2	7.5	10.3

2020	7.0	5.7	6.2	9.8	12.0	13.2	13.6	15.4	13.1	10.1	8.8	5.7	10.1
2019	6.1	8.3	7.4	9.4	10.6	12.6	15.7	15.4	13.5	9.5	6.2	6.5	10.1
LTA	5.1	5.3	6.8	8.3	10.9	13.3	15.1	14.8	13.1	10.3	7.6	5.5	9.7
Malin Head													
2022	7.3	6.9	7.6	8.6	11.9	13.3	14.6	15.0	-	-	-	-	10.4
2021	5.1	6.1	7.5	7.3	9.4	13.2	14.9	14.4	14.3	11.8	9.6	7.2	10.1
2020	7.1	5.6	6.6	8.8	11.2	12.5	13.5	14.5	13.2	10.4	9.1	6.4	9.9
2019	6.4	8.1	7.6	9.3	10.0	12.4	15.4	15.1	13.5	10.2	7.3	7.0	10.2
LTA	5.9	5.8	6.8	8.2	10.3	12.5	14.3	14.5	13.1	10.7	8.2	6.4	9.7

Weather Events

Weather events have the potential to disrupt construction, operational and decommissioning activities. The proposed wind farm must consider weather events such as cold weather, rain, wind, and more extreme events such as snow and storms. The 30-year average monthly values for weather events recorded at Malin Head is available from Met Éireann and has been summarised in Table 14-8 below, this shows the mean number of days per annum on average across the 30-year period for various weather events.

Hail was the most frequent weather event experienced at 47.7 days, snow and sleet was less frequent at 20.4 days.

Table 14-7: 30-year Average Monthly values for Weather Events in Donegal (Malin Head) (1981-2010)

30-year Averages for Weather Events – Malin Head, Donegal													
Mean No. Days	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Hail	9.2	7.4	7.6	4.4	1.7	0.3	0.1	0.2	0.6	3.1	5.8	7.3	47.7
Thunder	0.7	0.6	0.3	0.2	0.4	0.7	0.8	0.6	0.3	0.5	0.5	0.6	6.1
Fog	0.4	0.4	0.8	1.3	1.7	1.6	1.6	1.2	0.6	0.1	0.4	0.3	10.5
Snow or Sleet	5.1	5.2	3.4	1.6	0.1	0.0	0.0	0.0	0.0	0.0	1.1	3.8	20.4
Snow Lying at 0900UTC	0.4	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.3

14.4.2 Air Quality

The EU Clean Air for Europe Directive requires Member States to categorise geographic areas in terms of Zones and Agglomerations for the purpose of managing Air Quality. The vicinity of the proposed project falls into the area classified as Zone D – Rural Ireland (i.e. the remainder of the State excluding Zones A, B and C). The main areas defined in each zone are shown in Table 14-9. A detailed description of the Air Quality Zones is given on the EPA website[43].

The proposed project site is situated within the EPA's 'Rural West' Air Quality Index for Health (AQIH) Region. The most recent reporting by the EPA indicates that the current air quality in this region is classified as "3 (Good)" (according to EPA records accessed on 17/08/2022)[44].

[43] https://airquality.ie/information/air-quality-zones

[44] https://airquality.ie/

Table 14-9 gives a summary description of the AQIH regions and the Air Quality Management Zones.

Table 14-8: Air Quality Index for Health Regions and corresponding Air Quality Zone

AQIH Region[45]	Definition	Air Quality Zone[46]
Dublin City	Dublin agglomeration from Shankill in south Dublin to Lucan in west Dublin to Swords in north Dublin.	Zone A Dublin conurbation
Cork City	Cork agglomeration incorporating Cork City Council jurisdiction with additional built-up areas.	Zone B Cork conurbation
Large Towns Population > 15,000	Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Letterkenny, Celbridge, Newbridge, Mullingar, Balbriggan, Greystones, Leixlip and Portlaoise.	Corresponds to Zone C Large Towns
Small Towns	Towns and cities with a population between 5,000 and 15,000.	Corresponds to Zone D Rural Ireland
Rural West	Towns with population less than 5,000, villages and rural areas in Counties Clare, Cork, Donegal, Galway, Kerry, Leitrim, Limerick, Mayo, Roscommon and Sligo.	
Rural East	Towns with population less than 5,000, villages and rural areas in Counties Carlow, Cavan, Dublin, Kildare, Kilkenny, Laois, Longford, Louth, Meath, Monaghan, Offaly, Tipperary, Waterford, Westmeath,	

The AQIH is described in detail on the EPA website[47]. The EPA undertakes air monitoring at various sites nationwide as representations for a variety of settings. The most proximal air quality monitoring stations to the proposed wind farm are listed in Table 14-10. Although no data is available relating to air quality in the immediate vicinity of the proposed project location, it is considered that air quality at the site of the proposed project can be represented by the most recent data available for zone D.

The most recent monitoring carried out by the EPA is summarised in their annual report "Air Quality Monitoring Report 2020"[48] published in 2021. Taking account of the urban/rural designations as listed above, the EPA undertakes nitrogen dioxide (NO_2) testing at a number of designated air quality sites, in rural (Zone D) and urban areas, in order to fulfil the requirements of the Air Quality Standards Regulations, 2011 (S.I. No. 180 of 2011).

[45] The AQIH is comprised of 6 regions, and data 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. The purpose of the AQIH is to inform both the general population and sensitive individuals as to the current state of air quality in their regions.

[46] The Air Zones were defined initially in the Air Quality Regulations (SI 180 of 2011). The EPA reviews the zones regularly and amends when necessary. The purpose of the Air Zone data is the Management of the national ambient air quality network.

[47] http://www.epa.ie/air/quality/index

[48] https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2020.php

In terms of Zone D sites, over the past 5-year period of available EPA Air Quality annual reporting from 2016 to 2020, NO_2 measurements have been undertaken at the sites of Emo Court (County Laois), and Kilkitt (County Monaghan), and at the suburban sites of Birr (County Offaly), Carrick-on-Shannon (County Roscommon), Castlebar (County Mayo) and Enniscorthy, (County Wexford).

With the annual mean limit value of 40µg/m^3, both the Zone D rural and suburban sites were in compliance. The results as presented below highlight a mean annual range of 2 – 4.1 µg/m^3 in the Zone D rural test sites and 6 -17µg/m^3 in the Zone D suburban test sites for the years 2016-2020. The data from the rural stations below are likely to be representative of the typical background concentrations at the proposed wind farm project site.

Table 14-9: NO_2 trends for air quality monitoring stations in Zone D over the 5-year period 2016-2020.

Zone D Station	Proximity to site (km)	NO_2 - Averaging Period Notes 1, 2	Year				
			2016	2017	2018	2019	2020
Birr (Suburban)	c. 190km	Annual Mean (µg/m^3)	-	-	-	-	9
		Hourly Max (µg/m^3)	-	-	-	-	64
Carrick-on-Shannon (Suburban)	c. 100km	Annual Mean (µg/m^3)	-	-	-	-	17
		Hourly Max (µg/m^3)	-	-	-	-	73.7
Castlebar (Suburban)	c. 125km	Annual Mean (µg/m^3)	8.5	7.4	8	8	6
		Hourly Max (µg/m^3)	90.9	111.5	92	86	75.6
Emo Court (Rural)	c. 200km	Annual Mean (µg/m^3)	4.1	3.4	3	4	4
		Hourly Max (µg/m^3)	48.7	33	91	56	38
Enniscorthy (Suburban)	c. 300km	Annual Mean (µg/m^3)	9.6	-	-	-	-
		Hourly Max (µg/m^3)	136	-	-	-	-
Kilkitt (Rural)	c. 120km	Annual Mean (µg/m^3)	3.0	2.3	3	5	2
		Hourly Max (µg/m^3)	80.2	25.4	37	59	18.3

Note 1 NO_2 annual mean limit value for the protection of human health: 40 µg/m3 applicable from 2010.

Note 2 NO_2 hourly limit value for the protection of human health: No more than 18 hrs > 200 µg/m3 applicable from 2010

Similar testing was carried out for Particulate Matter of 10 microns diameter or less (PM_{10}), with the sites chosen for monitoring shown below in Table 14-11 and 14-12. Over the past 5-year period of available EPA Air Quality annual reporting, in terms of PM10 monitoring in Zone D, sampling has been undertaken at Birr, Carrick-on-Shannon, Castlebar, Cavan, Cobh (County Cork), Enniscorthy, Macroom (County Cork), Roscommon Town, and Tipperary Town to represent suburban environments, and Askeaton (County Limerick), Claremorris (County Mayo), and Kilkitt to represent rural environments over the time period between 2016 and 2020. Over this period the results show the annual mean concentrations falling well below the annual average maximum value of 40 µg/m^3 (at 9-28 µg/m^3 and 7-12 µg/m^3 for suburban and rural sites respectively). The no. of days >50 µg/m^3 has been less than 35 days annually as per the limit value for PM_{10} for all rural and urban monitoring sites over the 5-year period 2016-2020; the highest recorded in a year was 7 and 14 days for the urban site Enniscorthy in 2016 and 2019 respectively, with the remaining sites ranged from 0 to 5 days over the period.

The data from the rural stations are likely to be broadly representative of the typical background concentrations at the proposed project site.

Table 14-10: PM_{10} trends for air quality monitoring stations in Zone D over the 5-year period 2016-2020.

Station	PM_{10} – Averaging Period Notes 1, 2, 3,	Year				
		2016	2017	2018	2019	2020
Askeaton (Rural)	Annual Mean (µg/m³)	-	-	-	-	7
	Daily Max (µg/m³)	-	-	-	-	18
	Days >50 µg/m³	-	-	-	-	0
Birr (Suburban)	Annual Mean (µg/m³)	-	-	-	-	10
	Daily Max (µg/m³)	-	-	-	-	28
	Days >50 µg/m³	-	-	-	-	0
Carrick-on-Shannon (Suburban)	Annual Mean (µg/m³)	-	-	-	-	10
	Daily Max (µg/m³)	-	-	-	-	18
	Days >50 µg/m³	-	-	-	-	0
Castlebar (Suburban)	Annual Mean (µg/m³)	11.9	11.2	11	16	14
	Daily Max (µg/m³)	57	97.1	38	53	70
	Days >50 µg/m³	1	1	0	1	2
Cavan (Suburban)	Annual Mean (µg/m³)	-	-	-	-	9
	Daily Max (µg/m³)	-	-	-	-	34
	Days >50 µg/m³	-	-	-	-	0
Claremorris (Rural)	Annual Mean (µg/m³)	10.1	10.8	12	11	10
	Daily Max (µg/m³)	35.4	51.7	43	44	30
	Days >50 µg/m³	0	1	0	0	0
Cobh (Suburban)	Annual Mean (µg/m³)	-	-	15	13	13
	Daily Max (µg/m³)	-	-	26	47	44
	Days >50 µg/m³	-	-	0	0	0
Enniscorthy (Suburban)	Annual Mean (µg/m³)	17.3	-	-	18	15
	Daily Max (µg/m³)	87.9	-	-	63	102
	Days >50 µg/m³	7	-	-	14	4
Kilkitt (Rural)	Annual Mean (µg/m³)	8.1	7.8	9	7	8
	Daily Max (µg/m³)	30.9	41.5	35	63	34
	Days >50 µg/m³	0	0	0	1	0
Macroom (Suburban)	Annual Mean (µg/m³)	-	-	-	28	15
	Daily Max (µg/m³)	-	-	-	69	67
	Days >50 µg/m³				2	5
Roscommon Town (Suburban)	Annual Mean (µg/m³)	-	-	12	12	11
	Daily Max (µg/m³)	-	-	34	54	42
	Days >50 µg/m³	-	-	0	2	0
Tipperary Town (Suburban)	Annual Mean (µg/m³)	-	-	-	9	12
	Daily Max (µg/m³)	-	-	-	54	71
	Days >50 µg/m³	-	-	-	1	1

Note 1 PM_{10} annual mean limit value for the protection of human health: 40 µg/m³ applicable from 2005.

Note 2 PM_{10} daily limit for the protection of human health: No more than 35 days >50 µg/m³ applicable from 2005.

Table 14-11: Air Monitoring Stations in Proximity to the Proposed Wind Farm Site

Monitoring Station	Proximity to Proposed Wind Farm	Air Quality Zone	Pollutants Measured	Monitoring Period
Kilkitt (Co. Monaghan)	c. 120km southeast	Zone D (Rural)	PM_{10}, $PM_{2.5}$	Continuous
Carrick-on-Shannon (Co. Roscommon)	c. 100km south	Zone D (Suburban)	PM_{10}, $PM_{2.5}$, Oxides of Nitrogen (NOx)	Continuous
Cavan (Co. Cavan)	c. 110km southeast	Zone D (Suburban)	PM_{10}, $PM_{2.5}$	Continuous
Castlebar (Co. Mayo)	c. 125km southwest	Zone D (Suburban)	PM_{10}, Ozone (O_3), NOx, Metals	Continuous
Claremorris (Co. Mayo)	c. 130km southwest	Zone D (Rural)	PM_{10}, $PM_{2.5}$	Continuous
Malin Head (Co. Donegal)	c. 75km northeast	Zone D (Rural)	O_3	Continuous (currently not available)[49]
Letterkenny (Co. Donegal)	c. 35km northeast	Zone C (Large Towns)	PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2)	Continuous

Current data is available for a Zone D (Rural Ireland) monitoring location in Donegal at Malin Head on a continuous basis; however, the measurements are limited to the monitoring of Ozone (O_3) only.

The other active EPA Air Quality monitoring site in County Donegal is situated in Letterkenny, however this site is within Zone C (Large Towns) and is not representative of the site of the proposed wind farm which is in a rural area (Zone D).

Current data is available for a Zone D (Rural Ireland) monitoring location at Kilkitt, on a continuous basis; however, the available live measurements on the EPA Air Quality website[50] are limited to the monitoring of Nitrogen Dioxide, Sulphur Dioxide and Ozone. However, PM_{10} has been reported for Kilkitt in EPA Air Quality annual reporting. This location is the most reflective of the rural nature of the proposed project site.

Data is also available for a Zone D (Rural Ireland) monitoring location at Claremorris, County Mayo, on a continuous basis; however, the available live measurements on the EPA Air Quality website, and EPA annual reporting are limited to the monitoring of PM_{10} and $PM_{2.5}$. This location is also considered reflective of the rural nature of the proposed project site.

Other Zone D sites situated in the northwest of Ireland include Carrick-on-Shannon, Cavan, and Castlebar, however, each of these sites is situated within a suburban area and is not considered representative of the site of the proposed project.

The monitoring location that is currently used to collate data on background air quality for Zone D (Rural Ireland) across the broader suite of air quality parameters is the Kilkitt air quality monitoring site in County Monaghan (>185km from the proposed site) in conjunction with the

[49] https://airquality.ie/stations - EPA website states status for Malin Head states site is "online" & current AQIH "Not available" at time of writing (18/08/2022).

[50] https://airquality.ie/stations

Claremorris monitoring site in County Mayo and the Malin Head monitoring site in County Donegal. Reference to each monitoring location is made below.

Air Quality Monitoring at Kilkitt, County Monaghan (Zone D – Rural Ireland)

The information on the EPA website relating to air quality monitoring notes *"The Kilkitt site is located in the drinking water treatment works at Kilkitt in County Monaghan. This is a rural setting with little traffic or other influences on air quality. Monitoring is done using continuous monitors for nitrogen oxides, sulphur dioxide and ozone."*[51]

As mentioned, this location is the most reflective of the rural nature of the proposed project site. Data from the continuous monitoring and EPA annual "Air Quality in Ireland" reporting for Kilkitt, County Monaghan shows that nitrogen dioxide concentration is consistently below the annual (40 µg/m^3) and hourly (200µg/m^3) EPA limit values, with annual mean concentrations generally in the range below 10 µg/m^3 (e.g. 2 µg/m^3 in 2020) and hourly max concentrations in the range below 100 µg/m^3 (e.g. 18.3 µg/m^3 in 2020).

O_3 concentration is consistently below the 120 µg/m^3 Air Quality Standards Regulations (2011) and 180µg/m^3 EPA limit value[52] and is generally in the range of 30-65 µg/m[53] with periodic spikes in concentrations between 65-125µg/m^3 [54]. Furthermore, past EPA annual reporting data for the site over the past 5-year period (2016-2020) show that the annual mean for O_3 at the site is consistently below 120 µg/m^3, with annual mean concentrations generally in the range below 59 µg/m^3 (e.g. 56 µg/m^3 in 2020) and the no. of days >120 µg/m^3 has been 5 days over the 3-year period 2016-2018, and the no. of days >180 µg/m^3 has been 0 days over the 2-year period 2019-2020.

Sulphur dioxide (SO_2) concentrations are consistently below the daily 125µg/m^3 EPA limit value, with no. daily values >125 equalling 0 days over the 5-year period (2016-2020) and daily concentrations generally <6µg/m^3 (e.g. annual mean for 2020 was 1.4µg/m^3).

PM_{10} is also measured at this site. The conditions for a perceived exceedance in PM_{10}, require the daily limit of 50 µg/m^3 to be exceeded >35 times per year or have an annual mean of 40 µg/m^3. The EPA Air Quality annual reporting data over the past 5-year period (2016-2020) shows that the annual mean for PM_{10} at the site is consistently below 40 µg/m^3, with annual mean concentrations generally in the range between 7 and 9 µg/m^3 (e.g. 8 µg/m^3 in 2020) and the no. of days >50 µg/m^3 has been 1 day (2019) over the 5-year period.

Air Quality Monitoring at Malin Head (Zone D – Rural Ireland)

The information on the EPA website relating to air quality monitoring notes *"The continuous ozone monitor is located at the EMEP (European Monitoring and Evaluation Programme) site at Malin Head. The Irish programme is funded by EPA and carried out in partnership with NUI Galway and Met Éireann".*[55]

[51] http://www.epa.ie/air/quality/data/kt/

[52] EPA Limit Value "Max ozone limit 8-hr mean limit - no more than 25 days > 120 µg/m^3" and > 180 µg/m^3 in 2019-2020 annual reporting (180 µg/m^3 triggers a public information alert).
[53] http://www.epa.ie/air/quality/data/kt/gas/
[54]Data reviewed for past 6-month period (max. month range permitted) (Accessed 18 August 2022) - https://airquality.ie/readings?station=EPA-58&dateFrom=18+Feb+2022&dateTo=18+Aug+2022
[55] https://airquality.ie/station/EPA-27

Data from the continuous monitoring presented from Malin Head shows that O_3 concentration is consistently below the 120 and 180µg/m^3 limits (based on seven-day data available online).

Furthermore, past annual reporting data for the site over the past 3-year period (2018-2020) show that the annual mean for O_3 at the site is consistently below 180 µg/m^3, with annual mean concentrations generally in the range below 67 µg/m^3 (e.g. 65 µg/m^3 in 2020) and the no. of days >180 µg/m^3 has been 0 days over the 3-year period.

Air Quality Monitoring at Claremorris (Zone D – Rural Ireland)

The information on the EPA website relating to air quality monitoring notes *"The Claremorris site is located in the waste water treatment plant approximately 4km outside the town of Claremorris, Co. Mayo. This is a rural setting with little traffic or other influences on air quality. Monitoring began at this site in 2011. Monitoring is done using a continuous monitor for particulate matter PM10 and PM2.5"*.[56]

This location is also reflective of the rural nature of the proposed project site. Data from the continuous monitoring at Claremorris, County Mayo, as well as and EPA annual reporting, shows that PM_{10} concentration is consistently below the annual (40 µg/m^3) and daily (50µg/m^3) EPA limit values, with annual mean concentrations generally in the range below 12 µg/m^3 (e.g. 10 µg/m^3 in 2020) and the no. of days >50 µg/m^3 has been 1 day (2017) over the 5-year period.

Data from the continuous monitoring and EPA annual reporting for Claremorris shows that $PM_{2.5}$ concentration is consistently below the annual mean 25µg/m^3 limit value.

14.5 POTENTIAL EFFECTS

14.5.1 Do nothing Effect

It is most likely that the site of the proposed project would continue in its current land uses, which are primarily of forestry and agriculture.

In relation to the air quality and climate at the site, it is unlikely that there would be any significant local positive or negative impacts in the 'Do Nothing' scenario. However, there would be a negative impact on the wider air quality targets in Ireland, should fossil fuel generators continue to be used for energy supply. Similarly, the 'Do Nothing' scenario does not provide any benefits in terms of meeting nationwide targets for renewable energy and carbon emission targets. It is likely that fines will be imposed on Ireland due to non-compliance with these targets. The Do-Nothing scenario supports the continued use of fossil fuels to meet the increased national energy demand, leading to increased carbon emissions. This would have a potential moderate permanent negative effect.

14.5.2 Climate

14.5.2.1 Construction Phase

During the construction phase of the proposed project, the potential negative effects on climate will include those associated with exhaust emissions from construction traffic (site based vehicles and those going to/from the site). These works include those on the site of the

[56] https://airquality.ie/station/EPA-103

wind farm itself, as well as along the grid connection cable route. There will also be vehicular emissions associated with the transport of materials and infrastructure components to the site (see Chapter 16 for predicted traffic volumes). These effects will be of short-term duration, being limited to the time of the construction works. There is a slight short-term negative effect on climate anticipated from this.

The felling of forestry will be required in the areas immediately around the footprint of the wind farm infrastructure (approximately between approximately 69.8ha and 90.9ha of the site area). Some of this area is located within Coillte lands, while some is located within private lands. However, these areas of forestry are a commercial crop that would be felled at some point as part of the ongoing forestry cycle, regardless of the construction of the proposed wind farm. A report detailing the forestry felling is provided as Appendix 2-5.

A detailed assessment of the existing biomass associated with the proposed felling was carried out (See Appendix 2-5 for details). Between approximately 57.1ha and 78.3ha of this area will be replanted off site while the remaining 12.6ha will be replanted onsite at the end of the construction phase. The result is that there is no net loss of afforested area, and therefore the loss of carbon associated with tree felling is negated. The felling is anticipated to have a short-term imperceptible neutral effect on climate.

The potential impact on climate, in terms of CO_2 loss, during the component lifecycle (which covers manufacture, transport to site, erection (incl. construction of concrete foundations) and decommissioning phases) is assessed as part of the carbon modelling for the operational phase of the project and is detailed in Table 14-13 below.

14.5.2.2 Operational Phase

Carbon Losses

The expected and maximum, worst-case scenario CO_2 losses due to the proposed wind farm project are summarised in Table 14-12, which is based on the results obtained from the Scottish Carbon Calculator described in Section 14.3 above. The input and results data for all scenarios assessed in the range for the carbon calculator are provided in Appendix 14-1. The model assumes that projects are constructed on peatlands (acid bog), and it accounts for the proposed range of turbine dimensions (and associated power outputs).

Table 14-12: CO2 losses from the proposed project

Origin of Losses	Expected CO_2 Losses (tonnes CO_2 equivalent)	Minimum CO_2 Losses (tonnes CO_2 equivalent)	Maximum CO_2 Losses (tonnes CO_2 equivalent)
Losses due to turbine lifecycle (e.g. manufacture, construction, decommissioning)	97,948	80,117	119,252
Losses due to backup (to the grid)	75,497	62,914	90,597
Losses due to decreased carbon fixing potential	1,656	1,069	2,458

Losses from soil organic matter	139,257	30,279	260,561
Losses due to Dissolved & Particulate Organic Carbon leaching	0	0	1
Losses due to felling forestry[1]	41,996	31,307	43,210
Total	356,354	205,686	516,079

The data as calculated from SNH may overestimate the carbon lost as a result of tree felling. An estimate based on site specific survey data in the Forestry Report (Appendix 2-5 of this EIAR), yielded a carbon displacement of 18,831tCO^2e. The difference between the two methodologies may reflect the varied age of the onsite forestry crop (the SNH model may assume a more mature crop), as well as the fact that the calculations in Appendix 14-1 of this EIAR do not account for the carbon loss associated with roots. In order to ensure the assessment is robust and deals with the worst-case scenario, the SNH figure will be used.

The tree felling losses mentioned in the table above account for the variations in the felling buffers around turbines and do not account for the replanting of forestry, which is proposed, thereby negating these carbon losses completely over time. However, it must be taken into account that the trees which will be felled as part of the wind farm construction will be replanted within 3 years.

Furthermore, felling of the forestry will be carried out at some point regardless of the proposed project, as they are part of a commercial forest rotation. It also should be noted that a significant portion of the carbon present in the forestry, which has been felled and is used for timber, is embedded for the lifetime of the product and therefore is not lost into the environment. Further information on the forestry felling is provided in Appendix 2-5 of this EIAR.

Based on the calculations as presented above, the worst-case scenario is that 516,079 tonnes of CO_2 are expected to be lost to the atmosphere due to the construction, operation and decommissioning of the proposed project. It is likely that actual carbon loss will be lower than this.

Carbon Savings

The SNH model is pre-set with data for a UK-based fossil fuel mix which incorporates a different level of renewables than Ireland as well as nuclear power. A more suitable approximation of the Irish case involves calculating carbon savings based on the most recent data provided by the SEAI and is discussed in Section 14.3.1 above. The formula was used to calculate carbon dioxide emissions saving based on the generation of electricity from the proposed wind farm rather than from carbon-based fuels such as peat, coal, gas and oil.

The worst case (i.e. assuming an output of just 95MW) calculation for carbon savings is therefore as follows:

$$CO_2 \text{ (in tonnes)} = \frac{(95 \times 0.313 \times 8{,}760 \times 375.2)}{1000} = 97{,}731 \text{ tonnes per annum}$$

The optimistic scenario (i.e. assuming an output of 136.8MW) for the wind farm would result in a carbon saving of 140,733 tonnes per annum.

Based on a lifetime 35-years, the wind farm is anticipated to save between 3,420,585 and 4,925,655 tonnes of carbon equivalent. The estimate of whole life carbon losses to the environment associated with the proposed project as calculated from the SNH calculator above is a worst case of 516,079 tonnes, representing between 10.5% and 15.1% of the volume of carbon offset during the lifetime of the windfarm. This would take between approximately 44 - 63-months (approximately 3.7 - 5.3 years) to be paid back assuming maximum carbon losses. As mentioned above, this payback period includes for a worst-case scenario.

While in operation, the wind farm will have indirect, positive effects on the climate. Wind energy is a renewable, clean and a sustainable means of electricity generation. The proposed project will have a positive effect on the atmospheric environment and climate by avoiding emissions of pollutants and greenhouse gases that would otherwise be emitted from a conventional, fossil fuel fired generation plant. This will have a long-term moderate positive effect on climate. It will provide a significant contribution to the renewable energy production targets for County Donegal and on a national scale for Ireland.

During the operational phase, there will be a requirement for regular maintenance works to be carried out to ensure the smooth operation of the turbines over their lifetime. This will require the presence of vehicles onsite which will give rise to greenhouse gas emissions. There will also be a presence of vehicles associated with the proposed amenity facility onsite. This vehicular activity has the potential for a long term imperceptible negative effect on climate.

The proposed amenity facility will also have a presence of vehicles at the proposed public car park. However, as the vehicles will be confined to the public car park, the potential impact from this car park will be negligible. In addition, the amenity will encourage walking and cycling activities within the site. Therefore, no specific mitigation measures are proposed.

The proposed project has been designed to account for the projected changes in the Irish climate. The Flood Risk Assessment (Appendix 2-8) has accounted for the effects of climate change when looking at the potential for flooding on site (which shows the project has no significant risk of flooding), while the turbines themselves can withstand very high wind speeds (i.e. storms) due to safety measures such as being able to turn out of the wind in times of exceptionally high wind speed storms if required. Therefore, it is anticipated that climate change will have no significant impact on the proposed project during the operational phase.

14.5.2.3 Decommissioning Phase

The largest likely climatic effect during the decommissioning phase is a result of the presence of vehicular traffic at the site (similar to the construction phase albeit at a much smaller scale as the access tracks and turbine foundations will be left in place), which will emit carbon into the atmosphere. The effect will be a short term, imperceptible negative effect on climate. There is likely to be a negative effect on the climate post the decommissioning phase due to the loss of energy from a renewable source.

14.5.3 Air Quality

14.5.3.1 Construction Phase

Dust or pollutants generated from the proposed project construction phase will typically arise from:

- Movement of construction vehicles;
- Transportation of turbines and construction materials to and within the site;
- Blasting, breaking and crushing of rock;
- Movement and placement of stockpiles (excavated soils/fill materials); and
- Wind generated dust from stockpiles, any required excavations and exposed unconsolidated soils.

There will be some exhaust emissions from construction activities onsite during the construction phase giving rise to a localised short-term imperceptible negative effect on air quality on site. There will also be a predicted increase in traffic volumes on nearby roads (including the L6483, L6363 R250 and R252) resulting from the construction phase, as discussed in Chapter 16 (Traffic & Transportation), which is anticipated to have a potential short-term imperceptible negative effect on air quality along these routes due to dust and emissions.

Using the NRA Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, the impact of the proposed project in terms of dust is likely to be minimal. With reference to Box A8.1 in Appendix 8 of the document, the development would be fall into the "major" development category. For major developments, the distance for significant effects to occur is cited as 25m for PM_{10}, while the distance for dust soiling effects is 100m. There are no residential sensitive receptors within 100m of the proposed main wind farm project footprint and as such dust generated onsite will not have a significant effect on the surrounding areas. Some smaller areas of works associated with the turbine delivery route will involve transient temporary works in closer proximity to sensitive receptors which may have the potential to cause a temporary moderate negative impact.

In addition, data provided in the Met Éireann 30-year Averages for Donegal (Malin Head) shows the number of days per year in which a mean rainfall of 0.2mm is exceeded as 226 (See section 14.4.1 above). This further limits the impact of dust on the air quality as dust is carried from a particulate solid dispersed in the air into suspension in the water. With rainfall anticipated for well over half the year, it is unlikely that significant nuisance will be caused by dust on these days, and that dust generated on dry days will be minimised in line with the measures outlined in the mitigation section below and also detailed in the CEMP.

Considering the above, the proposed project will have a potential short-term moderate impact with regard to dust within the site of the proposed wind farm, while this would be a potential short-term slight negative impact in the area around the wind farm site.

The grid connection works will not have the same level of impact because the excavation works are relatively shallow and almost entirely located off road apart from a single crossing, with no sensitive receptors located at this area. Works on the turbine delivery route are also of a small scale and shallow nature. Therefore, there will be a potential brief imperceptible negative effect on the areas around the grid connection and delivery route works prior to mitigation measures being applied.

14.5.3.2 Operation Phase

As discussed in Section 14.4.2, the existing environment at the site of the proposed project currently has a high standard in relation to Air Quality. On a national level, the wind farm while in operation will have an indirect, slight positive effect on air quality due to the corresponding reduction in fossil fuel power generation which can produce a number of harmful pollutants. Wind energy is a renewable, clean and sustainable means of electricity generation.

The positive impact on air quality associated with the reduced reliance on fossil fuel based electricity generation mentioned above will have a slight positive effect on human health, as it is known that chemicals such as NO_x and SO^2 which are produced by burning fossil fuels can have harmful effects on human health.

The proposed amenity facility will also have a presence of vehicles during the operational phase to carry out onsite maintenance works and accessing the proposed public amenity car park. This vehicular activity will have the potential to create nuisance dust and exhaust emissions locally. The effect on the onsite air quality will be a long term negligible negative as a result.

14.5.3.3 Decommissioning Phase

The decommissioning works are likely to produce a limited amount of dust and pollutants as a result of site works and exhaust emissions from construction vehicles, but there will be less traffic than the construction phase of the development primarily due to the fact that the access tracks and turbine foundations will remain in-situ. The impact on air quality during the decommissioning phase will have a potential short-term slight negative effect in terms of air quality (dust and emissions).

14.6 MITIGATION MEASURES

14.6.1 Climate

14.6.1.1 Construction Phase

During the construction phase of the proposed project, all contractors will ensure that machinery used on site is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from construction traffic.

14.6.1.2 Operational Phase

During the operational phase of the proposed project, the works onsite will be limited to maintenance associated with the wind farm components and use of the amenity facilities. Although the intensity of activity will be only a small fraction of the construction phase, all employees and contractors that are on site will ensure that machinery used is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic.

As the proposed project will produce a significant amount of renewable energy, the operational phase will not require further climate-related mitigation measures.

14.6.1.3 Decommissioning Phase

Similar to the construction phase, all contractors will ensure that machinery used on site is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from construction traffic.

14.6.2 Air Quality

14.6.2.1 Construction Phase

Potential effects arising from dust and exhaust emissions will be minimised through the provision of mitigation measures that are detailed below and also incorporated into the Construction Environmental Management Plan (CEMP). These are as follows:

- Minimisation of extent of working areas;
- Stockpiling of excavated materials will be limited to the volumes required to practically meet the construction schedule;
- Drop heights of excavated materials into haulage vehicles will be minimised to a practicable level;
- Daily inspections by site personnel to identify potential sources of dust generation along with implementation measures to remove causes where found;
- Provision of dust suppression measures (e.g. sweeps/covers/water bowsers) will be used on stockpiles and the road surface during periods of extended dry weather.
- Traffic coming to site will only use the specified haul routes.;
- Onsite borrow pits will be used to minimise quantities of stone material being brought to site;
- Best practice (including industry recognised dust suppression techniques/equipment, as described in the CEMP) will be used to minimise the potential for dust production during the extraction of rock from the borrow pits and excavations elsewhere;
- Vehicles and plant will be routinely serviced to minimise the exhaust emissions during construction;
- Vehicles will not be left running unnecessarily and low emission fuels will be used where possible; and
- a wheelwash will be provided near the main site entrance and used to prevent the transfer of dust from vehicles used during construction works on to public roads.

14.6.2.2 Operational Phase

During the operation phase of the proposed project routine maintenance works will be required, during which all contractors/staff will ensure that machinery used on site is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic. Traffic associated with the public amenity facility will be confined to the proposed public car park.

14.6.2.3 Decommissioning Phase

All relevant mitigation measures as described in Section 14.6.2.1 will be implemented during decommissioning works, the majority of which are related to machinery and vehicles at the site. Vehicles and plant will be routinely serviced to minimise the exhaust emissions during construction and will not be left running unnecessarily. Similarly, emphasis will be put on dust reduction measures and inspections as described in Section 14.6.2.1.

14.7 RESIDUAL EFFECTS

14.7.1 Climate

14.7.1.1 Construction Phase

The proposed construction works will have a short-term imperceptible negative effect on climate due to greenhouse gas emissions.

14.7.1.2 Operational Phase

Electricity generated by the operational wind farm will result in an avoidance of greenhouse gas emissions that would otherwise occur through generation from fossil fuel sources. The carbon costs to construct the proposed project would take approximately between 44 and 63 months to pay back (assuming the expected, maximum and worst case of all scenarios assessed within the range - See Section 14.5.2), with the proposed project preventing the emission of a total of between 2,904,506 - 4,409,576 tonnes of carbon over its 35-year lifespan, dependent on whether the minimum or maximum MWs are installed within the range (these figures also assume the worst case carbon loss). When the forestry replanting (and the associated balance of carbon) is accounted for, over the 35-year life of the wind farm it is anticipated that between 2,947,716 and 4,452,786 tonnes of carbon will be offset in the production of electricity. The avoided emissions, therefore, result in a moderate, long-term, positive effect on climate. The proposed project would also significantly contribute towards the achievement of renewable energy production targets for County Donegal and Ireland.

The GHG emissions associated with the expected maintenance vehicles and use of the public amenity car park will have a potential negligible long term negative effect on climate.

14.7.1.3 Decommissioning Phase

The decommissioning phase of the proposed project will likely be similar to the construction phase, albeit at a smaller scale. There is anticipated to be a short-term imperceptible negative effect on climate due to GHG emissions.

14.7.2 Air Quality

14.7.2.1 Construction Phase

There is anticipated to be a very localised potential slight, short-term, negative effect on air quality through dust generation and exhaust emissions during the construction stage, following the application of mitigation measures outlined above and in the CEMP.

14.7.2.2 Operational Phase

In the context of an operational lifetime of 35-years, emissions of a number of pollutants associated with burning fossil fuels including nitrous oxides (NO_x), sulphurous oxides (SO_x), particulate matter (PM) and secondary pollutants, such as ozone, will be avoided at energy production facilities elsewhere in the country through the generation of renewable energy. The avoided emissions, therefore, result in a potential slight long-term, positive effect on air quality at those locations.

It is anticipated that the site activity (i.e. vehicles for maintenance and amenity use) might have a very localised long term imperceptible negative effect on air quality through dust generation and exhaust emissions during the operational stage.

14.7.2.3 Decommissioning Phase

The decommissioning phase of the proposed project will likely be similar to the construction phase, albeit at a smaller scale. There is anticipated to be a short-term imperceptible negative effect on air quality due to dust and exhaust emissions.

14.8 CUMULATIVE EFFECTS

A list of all other existing and approved plans/projects and projects pending a decision from the planning authority or An Bord Pleanála is provided in Section 4.3 of Chapter 4 (Policy, Planning and Development Context) of this EIAR (including other wind farms and infrastructure developments in the vicinity) and these were all considered as part of this cumulative assessment.

Currently the closest operational wind farm to the proposed site is Loughderryduff Wind Farm which is c. 4.5km to the southwest of the site and c.5.6km to the west/northwest of Glenties. The site was commissioned in 2008 and has a capacity of 7.65 MW. There are no other permitted wind farms or large-scale developments within 5km of the proposed project, which would result in cumulative air quality effects during construction (e.g. dust) or operation.

For climate a county-wide study area was reviewed for potential cumulative effects. As Figure 4-1 (Chapter 4 – Policy, Planning and Development Context) illustrates there are a number of permitted wind farms across the county. The proposed project has the potential for imperceptible negative cumulative impacts during construction on climate (from carbon emissions) with other wind farms or other large construction projects being constructed in County Donegal or nationally at the same time. The proposed project will have a broadly positive impact on climate once operational, so it is anticipated that there will therefore be a positive cumulative impact on climate between the proposed project and other wind farms across the county.

In addition, there have been several applications submitted over the last number of years in Donegal and the surrounding counties for wind farm development. These have been outlined in Table 4-1 and Figure 4-1 of Chapter 4.

Should any other works or construction projects occur (e.g. construction of residential/agricultural/commercial developments, agricultural and forestry activity, maintenance of the existing nearby renewable energy developments and nearby quarry activity) in the wider area (i.e. within 10km, a suitably wide study area to capture potential effects from the proposed project and any construction traffic using the local road network) at the same time as the construction of the proposed project, there will also be emissions associated with those other projects. These emissions would be associated with dust and exhaust emissions from plant and machinery on the construction sites, as well as from the vehicles travelling to/from the sites which may use the same roads as the proposed haul routes for the proposed wind farm. Once the mitigation measures described in Section 14.6 above are implemented, there will be no measurable negative cumulative impacts on air quality. The proposed project will have a moderate positive long-term impact on climate, and there would also be no significant negative cumulative impact on climate.

The proposed offsite replanting of forestry will involve a small level of emission generation for the planting works, with the forestry itself sequestering carbon as it grows. However, this will occur at locations which are remote from the proposed wind farm site (>50km), so it is therefore not anticipated that there will be any significant cumulative impacts in relation to either air quality or climate from the offsite forestry replanting lands.

During the operational phase of the proposed project, there will be a long term, moderate positive effect on climate and a long-term, slight positive effect on air quality. Other operating wind farms and permitted Solar PV energy developments in the local area will replicate the same positive effects and generate an even greater cumulative long term, moderate positive effect on air quality and climate.

14.9 CONCLUSION

The climate emergency requires immediate action to be taken to mitigate against the warming of the earth by in excess of 1.5˚C. The Irish government have set out their commitment to carbon neutrality by the year 2050, in line with similar EU efforts. As part of this plan, a significant increase in the production of renewable energy is required before the year 2030. The proposed project will provide a significant contribution to achieving this target. Ireland has committed to having 80% of our electricity needs coming from renewable energy sources by the year 2030, with onshore wind planned to be a major source for this. The estimated power output of between 95-136.8 MW of Renewable Energy to the electrical grid, is directly compatible with the provisions set out in the Climate Action Plan 2023.

There will be expected carbon costs of between 205,686- 516,079 tonnes which reflects the entire range of potential turbines being considered, but these costs are anticipated to be offset within between approximately 44 and 63 months once the wind farm becomes operational. When the forestry replanting (and the associated balance of carbon) is accounted for, over the 35-year life of the wind farm it is anticipated that that between 2,947,716 and 4,452,786 tonnes of carbon will be offset in the production of electricity. The project will have a positive long-term impact on climate and air quality, with a reduction in greenhouse gas emissions by utilisation of the least cost renewable energy technology.

The proposed project is located in a rural area, which would be considered to have generally good background air quality. The construction phase of the proposed project will result in a potential for localised dust and greenhouse gas emissions, but the mitigation measures proposed above will ensure that any such effects are minimised as much as possible and will not be significant.

Overall, there are no significant negative effects on air quality or climate associated with the proposed project. There will be a moderate positive long-term impact on climate, and the proposed wind farm will make a significant contribution towards achieving the carbon reduction targets set out for Ireland.