15 AIR AND CLIMATE

15.1 INTRODUCTION

This chapter assesses the impacts of the Project on air and climate in section 15.2 and 15.3 respectively. The Project refers to all elements of the Gortloughra Wind Farm, including Grid Connection Route options and Turbine Delivery Route (**Chapter 2: Project Description**). Where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment considers the potential and in combination effects during the following phases of the Project:

- Construction
- Operation
- Decommissioning

This chapter of the EIAR is supported by the following Appendix documents provided in **Volume IV** of this EIAR:

- **Appendix 15.1 Scottish Government – Carbon Calculator Input and Output Data**

Table 15.1: Glossary of Common Acronyms

Glossary of Common Acronyms	
µg	Microgram
AOT_{40}	AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 µg/m3 and is expressed as µg/m3 hours.
AQIH	Air Quality Index for Health
As	Arsenic
BSc	Bachelor of Science
C_6H_6	Benzene
CAFE	Clean Air for Europe
CAP	Climate Action Plan
Cd	Cadmium
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
COP	UN Climate Change Conference
CSO	Central Statistics Office
DOC	Dissolved Organic Carbon
EEA	European Environmental Protection Agency

Glossary of Common Acronyms	
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EU	European Union
g	Gramme(s)
GIS	Geographical Information Systems
GW	Gigawatt(s)
Hg	Mercury
HGV	Heavy Goods Vehicle(s)
HSE	Health Service Executive
km/h	Kilometre(s) per hour
km	Kilometre(s)
kWh	Kilowatt hour(s)
LGV	Light Goods Vehicle(s)
m	Metre(s)
m^3	Cubic metres
MSc	Master of Science
MW	Megawatt(s)
NH_3	Ammonia
Ni	Nickel
NO_2	Nitrogen Dioxide
NO	Nitrogen Oxide
NOx	Nitrous oxides
O_3	Ozone
PAH	Polycyclic aromatic hydrocarbons
Pb	Lead
PM	Particulate matter
PM_{10}	Particulate matter (less than 10 micrometres)
$PM_{2.5}$	Particulate matter (less than 2.5 micrometres)
POC	Particulate Organic Carbon
ppb	Parts per Billion

Glossary of Common Acronyms	
SO_2	Sulphur dioxide
SOx	Sulphur oxides
UN	United Nations
WHO	World Health Organisation

15.1.1 Statement of Authority

This chapter has been prepared by Jennings O'Donovan & Partners Limited. It was prepared by Shirley Holton, with the assistance of John A Clancy and reviewed by Andrew O'Grady.

Andrew O'Grady is a Senior Environmental Consultant and holds a Bachelor (Hons.) Degree in Geography from University of Coventry and a MSc. in Environmental Resources Management from the Free University, Amsterdam. He has worked in environmental consultancy for over seventeen years and has prepared various Environmental Reports and EIARs. Andrew is the Project Manager and lead coordinator in the preparation of this EIAR. Andrew was the technical reviewer of this chapter.

Shirley Holton is an Environmental Scientist with over 3 years' experience in Environmental Consultancy. She graduated with a First-Class Honours Degree (BSc. Hons) in Environmental Science from the Institute of Technology, Sligo. She was also awarded with the Governing Body award for a BSc in Environmental Protection. Shirley's key capabilities include project management; using software such as WindPRO 4.1 and ArcGIS Pro; and the preparation of planning applications, Environmental Impact Assessment Reports, Feasibility Studies, Construction & Environmental Management Plans and management plans relating to surface water, peat, spoil and waste.

John A Clancy is a Junior Environmental Scientist with 1 years' experience in Environmental consulting. John graduated with a BSc. Hons in Environmental Science from the Atlantic Technological University, Sligo. John forms part of the Environmental team responsible for preparing EIAR chapters. He has experience writing EIAR chapters, Forestry Reports, Appropriate Assessments, Geographical Information Systems (GIS) and Feasibility Studies.

15.1.2 Assessment Structure

In line with the revised EIA Directive and current EPA guidelines as listed in **Chapter 1: Introduction, Scoping and Consultation**, Section 1.6, the structure of this Air and Climate chapter is as follows:

- Assessment Methodology and Significance Criteria;
- Relevant legislation, standards and guidance;
- Description of baseline conditions at the Site;
- Identification and assessment of impacts to air and climate associated with the Project, during the construction, operational and decommissioning phases of the Project;
- Mitigation measures to avoid or reduce the impacts identified;
- Identification and assessment of residual impact of the Project considering mitigation measures, and
- Identification and assessment of cumulative impacts if and where applicable.

The desktop study as outlined in section 15.2 and 15.3 together with the other assessments detailed in this chapter are considered adequate to allow the competent authority to carry out an adequate assessment of the Project.

15.1.3 Consultation

Consultation with the relevant organisations was undertaken during the scoping stage of the EIA to identify any potential effects that could be attributable to the Proposed Development. A summary of the responses is detailed in **Table 15.2**.

Table 15.2: Summary of Consultation Response on Air Quality and Human Health

Consultee	Summary of Consultee Response
Health Service Executive	**Response received 5th January 2022:** *…Air Quality* *Due to the nature of the proposed construction works generation of airborne dust has the potential to have significant impacts on sensitive receptors. A Construction Environmental Management Plan (CEMP) should be included in the EIAR which details dust control and mitigation measures. Measures should include:* • *Sweeping of hard road surfaces* • *Provision of a water bowser on site, regular spraying of haul roads* • *Wheel washing facilities at site exit* • *Restrict speed on site* • *Provide covers to all delivery trucks to minimise dust generation* • *Inspect and clean public roads in the vicinity if necessary* • *Material stockpiling provided with adequate protection from the wind* • *Dust monitoring at the site boundary* • *Truck inspection and maintenance plan* • *Details of a road maintenance agreement between the wind farm operator and the Local Roads Authority to clarify responsibility for the upkeep and repair of access roads during the construction phase of the project…* *…Cumulative Impacts* *Table 3.2: 'Wind Farms within 20km of the Development' of the Scoping Report indicates that there are a number of existing and proposed wind farms within the vicinity of the proposed development.*

Consultee	Summary of Consultee Response
	All existing or proposed wind farm developments in the vicinity should be clearly identified in the EIAR. *The impact on sensitive receptors of the proposed development combined with other wind farm developments in the vicinity should be considered. The EIAR should include a detailed assessment of any likely significant cumulative impacts of the proposed renewable energy development.* *The EIAR should state clearly if there is any future proposal to further extend the proposed Gortloughra Wind Farm…*

15.2 AIR QUALITY

15.2.1 Assessment Methodology

This assessment of air quality involved the following:

- A desk study of the air quality baseline in the area of the Project and nationally;
- Identification and assessment of potential effects on receptors to dust and pollutants;
- An evaluation of the significance of effects compared to baseline conditions, and
- The identification of measures to avoid and mitigate potential effects

The EPA's Air Quality Index for Health (AQIH)[1] provides live information about the air quality at each air quality monitoring station. The data, which comes from automated monitoring stations (AMS) is updated at least once daily for each station. The AQIH mapping system shows that Air Quality at Macroom, Co. Cork is rated Index 2, representing good air quality (Index 1-3). The breakdown of the air quality classifications with regards to specific pollutants on human health as used by the AQIH is shown in **Table 15.3**.

Table 15.3: Air Quality Index for Health Classifications[2]

Four Bands of Air Quality	Index (1-10)	Ozone (µg/m³) 8 Hour Mean	Nitrogen Dioxide (µg/m³) 1 Hour Mean	Sulphur Dioxide (µg/m³) 1 Hour Mean	PM2.5 (µg/m³) 24 Hour Mean	PM10 (µg/m³) 24 Hour Mean
Good Air Quality	1	0 - 33	0 - 67	0 - 29	0 - 11	0 - 16
	2	34 - 66	68 - 134	30 - 59	12 - 23	17 - 33
	3	67 - 100	135 - 200	60 - 89	24 - 35	34 - 50
Fair Air Quality	4	101 - 120	201 - 267	90 - 119	36 - 41	51 - 58
	5	121 - 140	268 - 334	120 - 149	42 - 47	59 - 66
	6	141 - 160	335 - 400	150 - 179	48 - 53	67 - 75
Poor Air Quality	7	161 - 187	401 - 467	180 - 236	54 - 58	76 - 83
	8	188 - 213	468 - 534	237 - 295	59 - 64	84 - 91
	9	214 - 240	535 - 600	296 - 354	65 - 70	92 - 100
Very Poor Air Quality	10	241 or more	601 or more	355 or more	71 or more	101 or more

Guidance on the assessment of dust from demolition and construction (IAQM, 2024)[3] was consulted in the preparation of this chapter. The Guidance suggests that:

[1] https://airquality.ie/station/EPA-67
[2] https://airquality.ie/information/air-quality-index-for-health [Accessed 12 June 2024]
[3] Guidance on the assessment of dust from demolition and construction, January 2024 (Version 2.2). The Institute of Air Quality Management (IAQM), United Kingdom.

An assessment will normally be required where there is:

- *a 'human receptor' within:*
  - *250 m of the boundary of the site; and/or*
  - *50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).*

Plate 15.1 describes the methodology of assigning sensitivity to receptors.

Table 2: Sensitivity of the Area to Dust Soiling Effects on People and Property [a b]

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)[c]			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

[a] The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See **STEP 2B**, **Box 6** and **Box 9**.
[b] Estimate the total number of receptors within the stated distance. Only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 m is 102. The sensitivity of the area in this case would be high.
[c] For trackout, the distances should be measured from the side of the roads used by construction traffic. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Plate 15.1: Sensitivity ranking of receptors (Source: IAQM, 2024)

Do Nothing Impact Assessment: This section outlines the impact if the Project were not to go ahead and the likely evolution thereof without the Project as far as natural changes from the baseline scenario.

Significance of effects: The significance of effects resulting from the Project is determined through consideration of a combination of the sensitivity of the receiving environment and the predicted level of change from the baseline state, as outlined in **Chapter 1: Introduction, Scoping and Consultation**, section 1.9.3. Where negative effects are predicted, appropriate mitigation approaches are identified.

Mitigation measures: The mitigation hierarchy approach, as outlined in **Chapter 1: Introduction, Scoping and Consultation** of Avoidance, Reduction/Elimination and

Remedy aims to avoid significant impact through embedded mitigation (avoidance), and where avoidance is not possible, through mitigation measures. Remedy, the lowest rung of the mitigation hierarchy is only considered where mitigation measures are not feasible or possible.

Cumulative Assessment: Other large developments (operational and in the planning process) within a 20 km of the Proposed Development (shown in **Appendix 2.4**), in conjunction with the Project, are assessed to determine the potential cumulative effects on Air Quality and Climate.

15.2.2 Relevant Legislation

The Ambient Air Quality and Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC) incorporates revised provisions for sulphur dioxide (SO_2), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), benzene (C_6H_6) and carbon monoxide (CO). This replaced the Air Quality Framework Directive (96/62/EC) and first three Daughter Directives (1999/30/EC, 2000/69/EC, 2002/3/EC). The Fourth Daughter Directive (2004/107/EC) will be incorporated into the CAFE Directive at a later date and stands alone as a separate EU Directive.

The Fourth Daughter Directive (2004/107/EC) relates to arsenic (As), cadmium (Cd), nickel (Ni), and mercury (Hg) and polycyclic aromatic hydrocarbons (PAH) in ambient air and has been 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)'.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016).

The Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality), (as amended by Directive EU 2015/1480) encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for $PM_{2.5}$ (fine particulate matter) including the limit value and exposure concentration reduction target
- The possibility to discount natural sources of pollution when assessing compliance against limit values

- The possibility for time extensions of three years (for particulate matter PM_{10}) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

The limit values of the CAFE Directive are set out in **Table 15.5**. Limit values are presented in micrograms per cubic metre ($\mu g/m^3$) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

Table 15.4 presents the limit and target values for ozone as per the Ambient Air Quality and Clean Air for Europe (CAFE) Directive (2008/50/EC).

Table 15.4: Limit values of CAFE Directive 2008/50/EC (Source: EPA)[4]

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu g/m^3$)	Limit Value (ppb)	Basis of Application of Limit Value
Sulphur Dioxide (SO_2)	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year
Sulphur Dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year
Sulphur Dioxide (SO_2)	Protection of vegetation	Calendar Year	20	7.5	Annual mean
Sulphur Dioxide (SO_2)	Protection of vegetation	1 Oct to 31 Mar	20	7.5	Winter mean
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean

[4] Air Quality Standards. Available online: https://airquality.ie/information/air-quality-standards Accessed: [11/07/2024]

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m³)	Limit Value (ppb)	Basis of Application of Limit Value
Nitric oxide (NO) + Nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean
PM_{10}	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year
PM_{10}	Protection of human health	Calendar year	40	-	Annual mean
$PM_{2.5}$ - Stage 1	Protection of human health	Calendar year	25	-	Annual mean
$PM_{2.5}$ - Stage 2	Protection of human health	Calendar year	20	-	Annual mean
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8620	Not to be exceeded
Benzene (C_6H_6)	Protection of human health	Calendar year	5	1.5	Annual mean

Table 15.5: Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value from 2010	Target Value from 2020 onwards
Protection of human health	Maximum daily 8- hour mean	120 µg /m^3 not to be exceeded more than 25 days per calendar year averaged over 3 years	120 µg /m^3
Protection of vegetation	*AOT_{40} calculated from 1-hour values from May to July	18,000 µg /m^3 h^{-1} averaged over 5 years	6,000 µg /m^3 h^{-1}
Information Threshold	1-hour average	180 µg /m^3	180 µg /m^3
Alert Threshold	1-hour average	240 µg /m^3	240 µg /m^3

*AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 µg/m^3 and is expressed as µg/m^3 hours.

15.2.3 Baseline Conditions

The Site

The Site is located in a rural area, typically ribbon development with the majority of receptors located to the east of the Proposed Development. A detailed description of the Site can be found in **Chapter 1: Introduction, Scoping and Consultation**.

A desktop study identified 73 no. receptors within 2 km radius of the Proposed Development. The coordinates of each sensitive receptor and its distance to the closest proposed turbine are listed in **Table 15.6** and are shown in **Figure 1.3**.

Table 15.6: Sensitive receptors within 2 km of the Proposed Development

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H1	512574	560249	T1	1459
H2	512548	560240	T1	1483
H3	512576	560296	T1	1467
H4	512607	560021	T1	1401

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H5	513258	560218	T1	787
H6	513280	560045	T1	730
H7	514664	561741	T2	1643
H8	517491	561675	T6	2337
H9	517560	561620	T6	2351
H10	516223	559500	T6	697
H11	516345	559495	T6	780
H12	516426	559436	T6	879
H13	516455	559391	T6	931
H14	516453	559491	T6	860
H15	516742	559597	T6	1045
H17	516913	559519	T6	1232
H18	517205	559763	T6	1432
H19	517186	559907	T6	1390
H20	516995	559974	T6	1194
H21	517058	560064	T6	1254
H22	517237	560043	T6	1433
H23	517355	560026	T6	1551
H24	517505	560096	T6	1701
H25	517525	560068	T6	1721
H26	517602	560034	T6	1799
H27	517766	560044	T6	1962
H28	517833	560174	T6	2032
H29	517746	560332	T6	1961
H30	515967	558698	T9	806
H31	516071	558608	T9	942
H33	516831	558505	T9	1661
H34	516331	558002	T9	1544
H35	516489	557893	T9	1730
H36	516258	557871	T9	1599
H37	515815	557831	T8	1411
H38	512706	558535	T7	1543

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H39	513035	558529	T7	1224
H40	512590	558155	T7	1767
H41	514019	558165	T7	703
H42	514606	558023	T8	868
H44	514826	557698	T8	1159
H45	514556	557258	T7	1616
H46	514715	557154	T8	1708
H47	514833	557430	T8	1427
H48	514870	557636	T8	1222
H49	515012	557597	T8	1272
H50	516168	557781	T9	1622
H60	512339	560424	T1	1727
H61	512089	560001	T1	1918
H62	511856	559964	T1	2152
H63	515138	562209	T2	2181
H64	511651	559779	T1	2364
H67*	514062	558379	T7	486
H68	517177	559907	T6	1381
H69	517375	560081	T6	1571
H70	517485	560120	T6	1682
H71	517582	560131	T6	1779
H72	517565	560150	T6	1764
H73	517665	560186	T6	1866
H74	517712	560152	T6	1910
H75	517770	560146	T6	1968
H76	517793	560211	T6	1995
H77	517724	560209	T6	1926
H78	516185	558817	T9	945
H79	516326	559301	T6	919
H80	517061	559769	T6	1290
H81	516482	559447	T6	912
H82	517190	559916	T6	1393

House ID	Easting ITM	Northing ITM	Closest Turbine	Closest Distance to Turbine (m)
H83	517202	560097	T6	1399
H84	517121	559978	T6	1319
H85	517638	560049	T6	1834
H86	517727	560072	T6	1923
H87	517677	560204	T6	1879

*Landowner has financial involvement in the Project.

Ireland

Ireland is recognised as having some of the best air quality in Europe[5]. However, larger towns and cities have experienced air pollution. The most recent published report on air quality in Ireland is the 'Air Quality in Ireland 2023' report published by the EPA in 2024[6]. This report provides an overview of the ambient air quality in Ireland in 2023. It is based on monitoring data from 115 stations across Ireland. The measured concentrations are compared with both EU legislative standards and WHO air quality guidelines[7] for a range of air pollutants.

Under the Clean Air for Europe Directive (CAFE Directive), EU member states must designate "Zones" for the purpose of managing air quality. For Ireland, four zones were defined in the Air Quality Standards Regulations (2011). The zones were amended on 1 January 2013 to take account of population counts from the 2011 CSO Census and to align with the coal restricted areas in the 2012 Regulations (S.I. No. 326 of 2012).

Results from the monitoring campaign during 2023 show:

- Ireland met all of its EU CAFE Directive legal requirements in 2023.
- Ireland failed to meet the WHO new air quality guidelines in 2022. WHO guideline values were exceeded at a number of monitoring sites for fine Particulate Matter ($PM_{2.5}$) and (PM_{10}), Ozone (O_3), Nitrogen Dioxide (NO_2). WHO guideline values for Sulphur dioxide (SO_2) were exceeded at one monitoring station.

The EU Commission has imposed targets on Ireland's emissions. Ireland's long-term energy policy framework is set out in the Climate Action Plan 2024 (**Chapter 4: Planning Policy Context, Section 4.6.2**).

5 https://www.euronews.com/green/2024/12/14/only-seven-countries-in-the-world-breathe-safe-air-three-of-them-are-in-europe
6 EPA (2024). Air Quality in Ireland Report 2023.
7 https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health [Accessed 12/06/2024]

15.2.3.1 Air Quality Zones

The main areas defined in each zone are:

- **Zone A**: Dublin
- **Zone B**: Cork
- **Zone C**: Other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise.
- **Zone D**: Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

The zones take account of population counts from the CSO Census and to align with the coal restricted areas in the 2012 Regulations (S.I. No. 326 of 2012). The Proposed Development lies within Zone D, which represents rural areas located away from large population centres.

The closest local monitoring site to the Project within the same air quality zone (Zone D) is Macroom, Co. Cork. Macroom indicative monitoring site is located approx. 23.3 km northeast of the Proposed Development. The nearest national meteorological monitoring site is Cork Airport Co. Cork, which is located approx. 49 km east of the Proposed Development.

15.2.3.2 Air Quality & Health

Environmental Protection Agency (EPA, 2020)[8], European Environmental Protection Agency (EEA, 2023[9] and World Health Organisation (WHO, 2014) reports estimate that poor air quality accounted for premature deaths of approximately 327,000 people in Europe in 2021, with 1,300 Irish deaths predominantly due to fine particulate matter ($PM_{2.5}$) in 2020 and 30 Irish deaths attributable to Ozone (O_3) in 2016[10] [11].

Particulate Matter ("PM") less than ten micrometres in size (PM_{10}) can penetrate into the respiratory system increasing the risk of respiratory and cardiovascular disorders. PM_{10} arises from direct emissions of primary particulate such as black smoke and formation of secondary Particulate Matter in the atmosphere by reactions of gases such as sulphur dioxide (SO_2) and ammonia (NH_3).

[8] Ireland's Environment – An Integrated Assessment 2020, EPA, 2020, [Accessed 12/06/2024]
[9] https://www.eea.europa.eu/publications/harm-to-human-health-from-air-pollution/accessed 012th July 2024
[10] https://www.euro.who.int/en/health-topics/environment-and-health/air-quality/news/news/2014/03/almost-600-000-deaths-due-to-air-pollution-in-europe-new-who-global-report, [Accessed 12/06/2024
[11] Irelands Environment 2016 – An Assessment', EPA, 2016, [Accessed 12/06/2024]

Fine particulate matter, ozone, along with others including carbon dioxide (CO_2), nitrogen oxides (NO_x) and sulphur oxides (SO_x) are produced during the burning of fossil fuels for energy generation, transport or home heating. There are no such emissions associated with the operation of wind turbines. Therefore, the construction of wind turbines such as in the Proposed Development will result in lower environmental levels of such parameters, and consequential beneficial effects on human health.

15.2.4 Do Nothing Impact

If the Project was not to proceed, the opportunity to reduce emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2) to the atmosphere would be lost due to the continued dependence on electricity derived from coal, oil and gas-fired power stations, rather than renewable energy sources such as the Project. This would result in an indirect, negative impact on air quality.

15.2.5 Assessment of Potential Effects

15.2.5.1 Construction Phase

15.2.5.1.1 Dust Emissions

The main potential source of impacts on air quality during the construction phase of the Project are dust emissions arising from earthworks, construction of the new access tracks, the temporary storage of excavated materials, the construction of the Onsite Substation and Control Building, the movement of construction vehicles, loading and unloading of aggregates, materials or movement of material around the Site and delivery of turbines. There is potential for the generation of dust from excavations and from construction including construction of access tracks and hardstands and the trench for the cable ducting for the grid connection.

The potential nuisance issues arising from this are dependent on the terrain, weather conditions, (i.e., dry and windy conditions), and the proximity of receptors (**Table 15.6**). Dust from cement can cause ecological damage if allowed to migrate to water courses, though it is proposed that ready-mix concrete will be used with no on-site batching taking place. Therefore, this will not be a potential source of emissions. Potentially dust generating activities are as follows:

- Earth moving and excavation plant and equipment for handling and storage of soils and subsoils.
- Transport and unloading of stone materials for access track construction.

- Rock that is suitable will be extracted from the borrow pit, Turbine Foundation areas and the Onsite Substation and Control Building and this will be used in the construction of Site Access Tracks and Turbine Hardstands.
- Vehicle movements over dry surfaces such as Site Access Tracks and public roads.

Friable dust cannot remain airborne for a very long time. The distance it can travel depends on the particle sizes, disturbance activities and weather conditions. Larger dust particles tend to travel shorter distances than smaller particles. Particle sizes greater than 30 µm will generally deposit within approximately 100 m of its source, while particles between 10-30 µm travel up to approximately 250-500 m and particle sizes of less than 10 µm can travel up to approximately 1 km.[12].

Dust nuisance is most likely to occur at sensitive receptors within approximately 100 m of the source of the dust[13]. It is considered that the principal sites of friable dust generation will be the Turbine Foundations and Turbine Hardstands, and also along new Site Access Tracks. All turbines are situated greater than 486 m away from inhabited dwelling houses and therefore these principal sites of dust generation are greater than a 100 m distance from these sensitive receptors. In addition, existing vegetation such as trees and hedgerows in the vicinity will help to mitigate any airborne dust migrating off the Site. Any effects of dust on vegetation will be confined to the construction and possibly the decommissioning phases and be short-term, slight, negative impact.

If unmitigated, there would also be dust deposition arising from mud on public roads, resulting from traffic leaving the construction site. Impacts from dust deposition at sensitive receptors would give rise to nuisance issues for residents of those properties. The impact would be short-term, temporary and slight negative impact on sensitive receptors.

The potential impact from dust becoming friable and a nuisance to workers and local road users, if unmitigated, is considered, a slight, negative, short-term, direct impact during the construction phase.

15.2.5.1.2 Exhaust Emissions

Emissions from plant and machinery, including trucks, during the construction of the Project are a potential impact. The engines of these machines produce emissions such as carbon

[12] Guidance on the Assessment of Mineral Dust Impacts for Planning, Institute of Air Quality Management. 2016. Accessed online [12/06/2024] https://iaqm.co.uk/text/guidance/mineralsguidance_2016.pdf
[13] Guidance on the assessment of dust from demolition and construction, January 2024 (Version 2.2). The Institute of Air Quality Management (IAQM), United Kingdom.

dioxide (CO_2), carbon monoxide (CO), Nitrogen Oxides (NO_x), and Particulate Matter (PM_{10} and $PM_{2.5}$).

The main sources of primary PM_{10} are incomplete burning of fossil fuels such as coal, oil and peat and emissions from road traffic, in particular diesel engines. Other sources of particulates include re-suspended dust from roads. Natural Particulate Matter includes sea-salt and organic materials such as pollens.

Nitrogen oxides (NO_x), include the two pollutants, nitric oxide (NO) and nitrogen dioxide (NO_2). Anthropogenic (human) activities such as power-generation plants and motor vehicles are the principal sources of nitrogen oxides through high temperature combustion. Nitrogen oxides are an important air pollutant by themselves but can also react in the atmosphere to contribute to the formation of tropospheric ozone (ozone in the air we breathe) and acid rain. Short-term exposure to nitrogen dioxide is associated with reduced lung function and airway responsiveness, and increased reactivity to natural allergens. Long-term exposure is associated with increased risk of respiratory infection in children.

Exhaust emissions associated with vehicles and plant machinery such as CO_2, NO_x, PM_{10} and $PM_{2.5}$ will arise as a result of construction activities. It is estimated that during the wind farm construction, an approximate total of 8,017 loads of material and building supplies will be delivered and removed from the Site (**Chapter 14: Traffic and Transportation**). This potential impact will not cause a significant negative effect and will be restricted to the duration of the construction phase and localised to work areas, thus the impact on air quality from an increase in exhaust emissions will be a short-term, slight negative impact. Mitigation measures to reduce the impact are presented in section 15.2.8**.**

15.2.5.2 Operational Phase

15.2.5.2.1 Dust Emissions

There will be a small number of light vehicles accessing the Site during the operational phase. This could lead to some localised dust being generated, though this will be small and sporadic as only approximately one to two site visits per week will occur at the Proposed Development.

Maintenance vehicles will access the Site periodically during the operational period, however, due to the low traffic movements involved, the impact will be imperceptible. The operational phase will result in positive impacts on air quality due to the displacement of fossil fuels as an energy source.

15.2.5.3 Decommissioning Phase

Impacts during the decommissioning phase of the Project are anticipated to be less than those arising during the construction phase. The decommissioning phase will be as follows:

- Removal of eight wind turbines and concrete plinths.
- Removal of permanent Met Mast.
- Removal of all associated underground Wind Farm Internal Cabling connecting the wind turbines to the Onsite Substation and Control Building. Ducting is to remain *in-situ.*

During the decommissioning phase, the Grid Connection infrastructure including the Onsite Substation and Control Building and ancillary electrical equipment will form part of the national grid and shall be left *in-situ*. The Onsite Substation and Control Building, internal ducts of the Project, and all Site Access Tracks, Turbine Hardstands within the Site will be left *in-situ*, resulting in no additional HGV movements and no impact from emissions from machinery along the cable route.

The Site Access Tracks and associated drainage systems will serve ongoing forestry and agriculture activity in the area. All other hard surfaced areas will be allowed to revegetate naturally. Based on the experience of the project team monitoring operational wind farm sites throughout the country, the approach of allowing these areas to revegetate naturally has proven to be very successful.

The decommissioning phase would be expected to last approximately 2-3 months, and any air quality impacts would be predicted to be imperceptible.

15.2.6 Mitigation Measures and Residual Effects

15.2.6.1 Construction Phase Mitigation

The main potential impact during the construction phase of the Project will be from dust nuisance at sensitive receptors close to the Site. Good practice site procedures will be followed by the appointed contractor to prevent dirt and dust being transported onto the local road network and all mitigation measures outlined in the CEMP (**Appendix 2.1**) will be implemented on site. Good practice site control measures will comprise the following:

- Site Access Tracks will be upgraded and built in the initial construction phases. These roads will be finished with graded aggregate which compacts, preventing dust.

- Approach roads and construction areas will be cleaned on a regular basis to prevent build-up of mud and prevent it from migrating around the Site and onto the public road network.
- Wheel wash facilities will be provided near the Site entrance to prevent mud/dirt being transferred from the site to the public road network.
- Public roads along the Construction Haul Routes will be inspected and cleaned daily. In the unlikely event that dirt/mud is identified on public roads, the roads will be cleaned. The wheel wash facility will be investigated and repaired if necessary.
- During periods of dry and windy weather, there is potential for dust to become friable and cause nuisance to nearby residences and users of the local road network. This requires wetting material and ensuring water is supplied at the correct levels for the duration of the work activity. The weather will be monitored so that the need for damping down activities can be predicted. Water bowsers will be available to spray work areas (Site and Grid Connection Route) and haul roads to suppress dust migration from the Site.
- Vehicles delivering materials to the site will be covered appropriately when transporting materials that could result in dust, e.g., crushed rock or sand.
- Exhaust emissions from vehicles operating within the Site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the Contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.
- All machinery when not in use will be turned off.
- Ready-mix concrete will be delivered to the Site and no batching of concrete will take place on the Site. Only washing out of chutes will take place on Site and this will be undertaken at a designated concrete washout facility at the Temporary Construction Compound. The concrete wash water will be disposed of at a licensed facility as outlined in the Construction Environment Management Plan (CEMP) – Management Plan 5 Waste Management Plan (**Appendix 2.1**)
- Speed restrictions of 15 km/h on access roads will be implemented to reduce the likelihood of dust becoming airborne. Consideration will be given to how on-site speed limits are policed by the Contractor and referred to in the toolbox talks.
- Stockpiling of materials will be carried out in such a way as to minimise their exposure to wind. Stockpiles will be covered with geotextiles layering and damping down will be carried out when weather conditions require it.
- Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable.
- An independent, qualified Geotechnical Engineer will be contracted for the detailed design stage of the project and geotechnical services and will be retained throughout

the construction phase, including monitoring and supervision of construction activities on a regular basis. The methodology statement will be signed off by a suitably qualified Geotechnical Engineer.

- A complaints procedure will be implemented on site where complaints will be reported, logged and appropriate action taken.

15.2.6.2 Operational Phase Mitigation

As the operation of the Project will have positive impacts on air quality, mitigation measures are considered unnecessary. Where turbine components are being replaced, the same mitigation measures as per the construction phase will apply.

15.2.6.3 Decommissioning Phase Mitigation

Mitigation measures during the Decommissioning phase will be similar to those employed during the construction phase as outlined above.

15.2.7 Cumulative Effects

In terms of cumulative impacts, negative cumulative impacts in relation to air quality would only occur if a large development was located in the vicinity of the Proposed Development and in the process of construction at the same time as the Project. The developments considered as part of the cumulative effect assessment are described in **Appendix 1.2**. There are a number of existing, consented and proposed wind energy developments within 20 kilometres of the Site.

In a worst-case scenario, cumulative air impacts may arise if the construction, operational and maintenance period and Decommissioning of any of the projects listed in **Appendix 1.2** occur simultaneously with the construction of the Project. Only those wind energy developments that would be under construction at the same time as the Project are relevant in the context of cumulative effect. The consented (not yet built) and the proposed wind energy developments within 20 km of the Site which may be seen in **Table 2.1** of **Chapter 2: Project Description**.

Cumulative impacts may arise if the construction, operational, maintenance or decommissioning period of these projects occurs simultaneously with the construction of the Project. This will result in slight increased traffic emissions, however, provided the mitigation measures are implemented and the mitigation measures proposed for other developments are implemented, there will be no significant cumulative effects on air quality. Projects for Cumulative Assessment have been included in **Appendix 2.4**.

During the operational phase emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2) or dust emissions from the Project and other projects listed in **Appendix 1.2**, will result from the operation and maintenance vehicles onsite. However, these emissions will be minimal resulting in insignificant long-term cumulative impact on air quality and climate.

Cumulative impacts during the decommissioning phase will be similar to the construction phase although slightly less as a result of the reduced works required during the decommissioning phase as some infrastructure will be left in-situ e.g., Turbine Foundations, and Site Access Tracks.

The nature of the Project and other energy developments within 20 km are such that, once operational, they will have a cumulative long-term, significant, positive effect on air quality.

15.2.8 Residual Impacts of the Project

Construction phase

With mitigation measures in place, any effects of dust emissions during the construction phase will be reduced **short term** and **imperceptible**.

With mitigation measures in place, the effects of exhaust emissions during the construction phase, will remain **short-term, slight negative** effect.

Operational phase

During the operational phase of the Project exhaust emissions will arise from occasional machinery use and Light-Good Vehicles (LGV) that will be required for occasional onsite maintenance works. The impact on dust emission during the operational phase will remain not significant. The impact on exhaust emissions during the operational phase will be not significant.

The wind energy created by the Project once it goes into operation, will avoid the production of electricity from coal, oil or gas-fired power stations resulting in emission savings of carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2). This will lead to a **Slight, Positive** and **Long-term** impact on air quality**.**

Decommissioning phase

With mitigation measures in place, any effects of dust emissions during the Decommissioning phase will be reduced to **imperceptible, negative** and **temporary**.

Mitigated, any effects of exhaust emissions during the Decommissioning phase will remain **not significant,** and **temporary.**

15.2.9 Summary of Significant Effects

This assessment has identified no potentially significant effects, given the mitigation measures embedded in the design which will be implemented in the Project.

15.2.10 Statement of Significance

The Project has been assessed as having no significant direct or indirect effects on air quality during the construction, operation or Decommissioning phases of the Project.

15.3 CLIMATE AND GREENHOUSE GASES

Greenhouse gases, if released in excessive amounts, can lead to increases in global temperatures known as 'global warming' or the 'greenhouse effect' which can influence the climate.

There are a wide range of gases known as greenhouse gases. The most critical greenhouse gases are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). There are also other greenhouse gases known as F-Gases, man-made gases used in refrigeration and air conditioning appliances. Greenhouse gases produced by human activities are changing the composition of the earth's atmosphere. Human activities that produce greenhouse gases include:

- Carbon dioxide emissions through burning fossil fuels such as coal, oil and gas and peat
- Methane and nitrous oxide emissions from agriculture
- Emissions through land use changes such as deforestation, reforestation, urbanization, desertification

Current projections indicate that continued emissions of greenhouse gases, including the burning of fossil fuel to produce electricity, will cause further warming and changes to our climate. Climate is predicted to have indirect and direct impacts on Ireland including:

- Rising sea-levels threatening habitable land and particularly coastal infrastructure;
- Extreme weather, including more intense storms and rainfall affecting our land, coastline and seas;
- Further pressure on our water resources and food production systems with associated impacts on fluvial and coastal ecosystems;
- Increased chance and scale of river and coastal flooding;
- Greater political and security instability;
- Displacement of population and climate refugees;
- Heightened risk of the arrival of new pests and diseases;
- Poorer water quality, and
- Changes in the distribution and time of lifecycle events of plant and animal species on land and in the oceans[14]

Climate change means a significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period – decades or longer. Earth's climate has changed naturally many times during the planet's existence. However, currently

[14] https://www.gov.ie/pdf/?file=https://assets.gov.ie/293730/00ee6688-fc2a-4897-8077-de73280ec7fc.pdf#page=null [Accessed 04/07/2024]

human activities are significantly contributing to climate change through greenhouse gas emissions. The global average temperatures have increased by more than 1°C since pre-industrial times, and there is an 80% chance that the annual global average temperature will temporarily exceed 1.5°C above pre-industrial levels for at least one of the next five years[15].

At the UN Climate Change Conference (COP21) in Paris in 2015, 195 countries adopted the first-ever universal, legally binding global climate treaty called the Paris Agreement. The Paris Agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to below 2°C above pre-industrial levels and to limit the increase to 1.5°C. Under the Paris Agreement, Member States also agreed on the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries and to undertake rapid reductions thereafter in accordance with the best available science.

The Glasgow Climate Pact (COP26) of 2021 aims to limit the rise in global temperature to 1.5°C and finalise the outstanding elements of the Paris Agreement. The Glasgow Climate Pact is manifested across three United Nations climate treaties, including the United Nations Framework Convention on Climate Change (the COP), the Kyoto Protocol (the CMP), and the Paris Agreement (the CMA).

The United Nations Climate Change Conference (COP27) held in November 2022 resulted in countries delivering a package of decisions that reaffirmed their commitment to limit global temperature rise to 1.5°C above pre-industrial levels. The package also strengthened action by countries to cut greenhouse gas emissions and adapt to the inevitable impacts of climate change, as well as boosting the support of finance, technology and capacity building needed by developing countries. Governments took the ground-breaking decision to establish new funding arrangements, as well as a dedicated fund, to assist developing countries in responding to loss and damage.

The most recent United Nations Climate Change Conference was held in Baku, Azerbaijan in November 2024 (COP29). The main headline achievements were a $300 billion annual target for developing countries by 2035 under the New Collective Quantified Goal; progress in establishing a global carbon trading system managed by the UN (this framework has the potential to help reduce emissions while contributing to sustainable development,

[15] World Meteorological Organisation (WMO) Press Release, 05 June 2024, Available at: https://wmo.int/news/media-centre/global-temperature-likely-exceed-15degc-above-pre-industrial-level-temporarily-next-5-years [Accessed 23/09/2024]

particularly in developing countries); recognised role of trade in climate action by launching a multi-year work plan which includes consideration of the impacts of trade policies.

The Climate Action Plan 2024 as set out by the Department of the Environment, Climate and Communications provides a detailed plan for Ireland. It plans for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030 and setting us on a path to reach net-zero emissions by no later than 2050, as committed to in the Programme for Government and set out in the Climate Act 2023. This Plan makes Ireland one of the most ambitious countries in the world on climate.

The CAP 2024 shows how Ireland is putting climate solutions at the very heart of our social and economic development. Among the most important measures in the plan is a target of 9 GW from onshore wind, 8 GW from solar, and at least 5 GW of offshore wind energy by 2030.The provision of the Proposed Development will have a long-term positive impact by providing a sustainable energy source. Should the Proposed Development not proceed, fossil fuel power stations will be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other emissions. It will also hinder Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions as agreed at the Paris climate conference (COP21) in 2015, the Glasgow Climate Pact (COP26) in November 2021 and the Baku UN Climate Change Conference (COP29) in November 2024.

15.3.1 Assessment Methodology

This assessment of climate change and greenhouse gases involved the following:

- A desk-based assessment of the climate in the area of the Project and nationally (baseline description)

- The climate impact of the Project will be assessed using the Carbon Calculator Tool. This carbon calculator was specifically designed for assessing the climate impact of wind farms and was developed under the guidance of the Scottish Government, Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH) and Forestry Research (impact assessment). Commonly used guidance produced by SNH in 2003 (in a technical guidance note) has been used to determine carbon payback in the absence of any more detailed methods to determine the impacts on soil carbon stocks. The use of the Scottish carbon calculator in assessing the climate impact and determining carbon payback for this Proposed Development is acceptable, as the peat habitat of Scotland is similar to Ireland and at similar latitudes, the simulated land-atmosphere interactions are applicable.

The methodology approach taken to evaluate the 'do nothing scenario', 'significance of effects', 'mitigation measures' and 'assessment of cumulative effect' is outlined in section 15.3.5.

The most recent climate projection iteration Regional Climate Model Predictions for Ireland (2021-2060)[16] has identified the following climatic trends as a result of climate change:

- Temperature: Mean monthly increase in temperatures typically between 1.25 °C and 1.5 °C.
- Precipitation: Change in the frequency and distribution (June shows a decrease of c. 10%; December shows an increase between 10 - 25%) and intensity (increase in the frequency of extreme precipitation - events may exceed 20 mm per day) in the Northwest. Rainfall events and cyclones (increase by 15%) compared with the climate of 2005, this is due to the increase in sea surface temperatures.
- River Flooding: Significant increase in more intense discharge episodes and an increase in the frequency of extreme discharges as increased temperatures will lead to greater amounts of water vapour in the atmosphere and an accelerated global water cycle.

15.3.2 Relevant Legislation and Guidance

Greenhouse gases are the subject of international agreements, such as the United Nations Framework Convention on Climate Change, Kyoto Protocol and the Paris Agreement. The Glasgow Climate Pact is manifested across these three United Nations climate treaties. These agreements along with International and National Policy and Legislation are discussed in **Chapter 4: Planning Policy Context**. This section will examine the carbon losses and savings from this Proposed Development and its impact on the Climate.

15.3.3 Existing Climate

The Köppen climate classification divides regions of the globe based on seasonal precipitation and temperature patterns. The five main groups are tropical, dry, temperate, continental, and polar. The Irish climate is defined as a temperate oceanic climate on the Köppen climate classification system[17]. Ireland's climate is mild, moist and changeable with abundant rainfall and a lack of temperature extremes. The country generally receives cool

16 CLIMATE CHANGE: Regional Climate Model Predictions for Ireland (2001-CD-C4-M2), EPA.

17 https://www.britannica.com/science/Koppen-climate-classification/World-distribution-of-major-climatic-types, [Accessed 12/06/2024]

summers and mild winters, and it is considerably warmer than other areas on the same latitude. Ireland's land mass is warmed by the North Atlantic Current all year and as a result does not experience a great annual range of air temperatures.

Nationally, the mean air temperature is generally between 9 and 11 °C. Annual rainfall totals on the west coast generally average between 1,000 mm and 1,400 mm with the wettest months being December and January and April being the driest month. The prevailing wind direction is between south and west. Average wind speed ranges from 3 m/s in south Leinster to 8 m/s in the extreme north of the country.

Cork Airport, Co. Cork, is the closest Met Éireann meteorological station with at least 30 years of historical data to the Proposed Development. For the purpose of the assessment of changes to the climate, meteorological data from Cork Airport over the period of 1994–2023 is shown in **Table 15.7**[18]. **Figure 15.1** shows the monthly mean air temperature and wind speed recorded at Cork Airport over the period of 1994–2023. Cork Airport is located 50 km east of the Proposed Development.

The mean annual air temperature between 1994 and 2023 was 10.1°C. Mean monthly temperatures ranged from 5.8°C in January to 15.2°C in July. Mean annual rainfall over this period was 1254.8 mm, with a maximum monthly mean rainfall of 148.9 mm in October and a minimum monthly mean rainfall of 80.0 mm in April.

[18] https://www.met.ie/climate/available-data/historical-data, [Accessed 01/08/2024]

Table 15.7: Cork Airport Meteorological Station Data Averages (1994–2023)

Month	Mean Air Temperature (°C)	Maximum Air Temperature (°C)	Minimum Air Temperature (°C)	Mean Maximum Temperature (°C)	Mean Minimum Temperature (°C)	Precipitation Amount (mm)	Grass Minimum Temperature (°C)	Mean Wind Speed (knot)	Highest Gust (knot)	Sunshine Duration (hours)
January	5.8	12.2	-1.8	8.3	3.3	129.6	-6.2	10.7	53.6	64.4
February	6.0	12.4	-1.3	8.7	3.2	103.4	-5.7	11.1	51.3	75.1
March	6.8	14.2	-1.0	9.9	3.7	93.1	-5.6	10.4	49.0	112.4
April	8.6	16.5	0.3	12.0	5.1	80.0	-4.5	9.7	44.8	164.2
May	11.0	19.9	3.1	14.6	7.4	80.3	-1.3	9.4	40.3	189.9
June	13.6	22.0	6.1	17.2	10.0	81.7	1.6	8.9	37.8	186.3
July	15.2	23.1	8.0	18.8	11.7	84.2	3.8	8.4	35.8	165.7
August	15.1	22.7	8.2	18.7	11.6	97.3	3.6	8.5	37.9	159.2
September	13.5	20.7	6.1	16.8	10.2	90.8	1.3	8.8	40.3	127.5
October	10.9	17.1	3.2	13.7	8.0	148.9	-1.2	9.8	47.6	97.7
November	7.9	14.2	0.4	10.5	5.3	125.7	-3.6	10.0	48.1	78.2
December	6.3	12.4	-1.0	8.7	3.9	139.7	-4.8	10.9	51.6	57.2
Annual	10.1	24.3	-3.1	13.2	7.0	1254.8	-7.6	9.7	61.5	1477.7

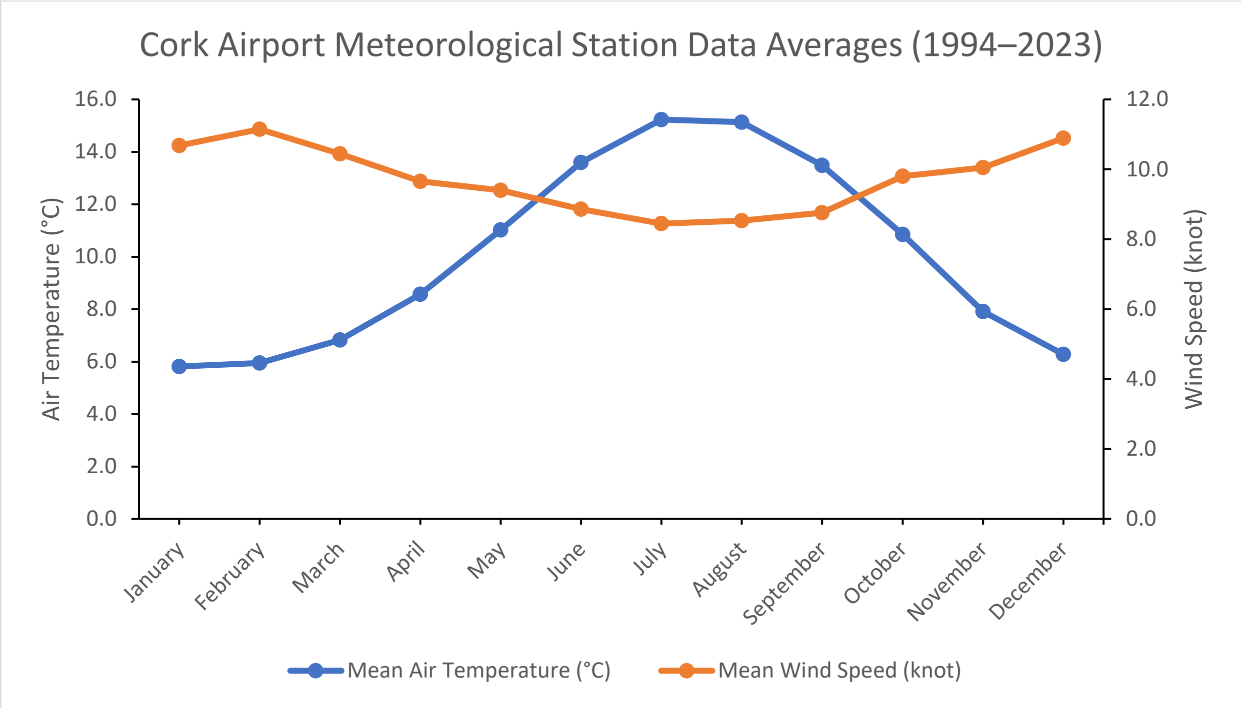

Figure 15.1: Cork Airport Meteorological Station Mean Air Temperature (°C) and Wind Speed (Knot) Data Averages (1994–2023)

15.3.4 Calculating Carbon Losses and Savings

15.3.4.1 Carbon Calculator

To assess the impact of the Project on the climate, the carbon emitted or saved as a result of the Project was determined using a carbon calculator. The Scottish Government have produced an online carbon calculator which aims to assess, in a comprehensive and consistent way, the carbon impact of wind farm developments. This is done by comparing the carbon costs of wind farm developments with the carbon savings attributable to the wind farm. 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 on peat soils, changes in land use and wind turbine manufacture, transportation and construction. Also included in the assessment tool is the assessment of peat disturbance. The Scottish carbon calculator is used as currently, no carbon calculator specific to Ireland has been developed and the peat habitat of Scotland is similar to Ireland.

Assessments are also carried out to estimate the carbon saving over the lifetime of the Wind Farm, compared to electricity produced using fossil fuel. The assessment of carbon savings relates to the capacity of the Wind Farm over the number of years for which it is operational, site improvement works, (i.e., peatland improvement, habitat creation, etc.), and Site restoration works, (i.e., removal of infrastructure and restoration of previous site conditions), when the Wind Farm will be decommissioned.

The completed worksheet, including the assumptions used in the model, is provided in **Appendix 15.1** of this EIAR. The model calculates the total carbon emissions associated with the Project including manufacturing of the turbine technology, transport, construction of the Project and tree felling. The model, which is assessed for 6 MW per turbine, accounts for improvement works (see **Appendix 6.5: Habitat Enhancement Plan**) 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 Project against three comparators:

i. Coal fired Electricity Generation;
ii. Grid mix of Electricity Generation, and
iii. Fossil fuel mix of Electricity Generation (oil, gas and coal)[19].

This is to compare this renewable source of electricity generation to traditional methods of electricity generation to assess the carbon savings and losses.

15.3.4.2 Carbon Losses

The potential carbon losses were assessed for the Project.

The main CO_2 losses due to the Project are summarised in **Table 15.8**. A copy of the input and output data is provided in the completed worksheet in **Appendix 15.1**.

[19] Ireland's energy imports comprise oil (56%), gas (31%) and coal (10%). http://ireland2050.ie/present/oil-and-gas/?q=where-does-ireland-get-its-electricity#:~:text=Ireland%20has%20only%20small%20proven,%25)%20and%20coal%20(10%25, [Accessed 12/06/2024]

Table 15.8: Carbon Losses

Origin of Losses	Total CO_2 Losses (tonnes CO_2 equivalent)
	Vestas V150 6.0 MW
Turbine manufacture, construction and decommissioning	41,108
Losses due to Backup	35,657
Losses due to reduced carbon fixing potential	669
Losses from soil organic matter	460
Losses due to Dissolved Organic Carbon (DOC) and Particulate Organic Carbon (POC) leaching	2,330
Felling of Forestry	0
Total Expected Losses	80,224

* Carbon sequestration describes the process in which carbon dioxide (CO_2) is removed from the atmosphere and subsequently stored through biological, chemical, or physical processes.

The majority of the peat covering the Site lies in the range of 0.0 - 0.5 m depth (**Chapter 8: Soils and Geology)**. The average peat depth across the Site measures 0.34 m (**Appendix 8.1: Peat Slide Risk Assessment**). The carbon calculator was therefore run based on an average peat depth of 0.34 m across the Site.

The worksheet model calculated that the Project is expected to give rise to 80,224 tonnes of CO_2 equivalent (t CO_2 eq.) losses over its 40-year life. Of this total figure, the proposed wind turbines directly account for t CO2 eq.. Losses due to backup[20] account for 35,657 t CO_2 eq.

Losses from soil organic matter, reduced carbon fixing potential, DOC and POC leaching and the felling of forestry account for the remaining 2,790 t CO_2 eq. The tonnes of CO_2 arising from ground activities associated with the Project is calculated based on the entire Project footprint being "Acid Bog", as this is one of only two choices, the other being Fen. The habitat that will be impacted by the Project footprint comprises predominantly agricultural land rather than the acid bog assumed by the model that gives rise to the tonnes

[20] CO_2 loss due to back up is calculated from the extra electricity production baseload capacity required for backup of the windfarm to meet net generation demands when the wind farm is non-generating.

(lower and higher range) and therefore the actual CO_2 losses are expected to be lower than this value.

The figures discussed above are based on the assumption that the hydrology of the Site and habitats within the site are not restored on decommissioning after its expected 40-year useful life.

However, at the end of the 40-year lifespan of the Project, the turbines may be replaced with newer models subject to a consent for the same being obtained. This would mean the carbon losses associated with not restoring the habitats hydrology at the Site would be offset by the carbon-neutral energy that the new turbines would generate.

15.3.4.3 Carbon Savings

The carbon calculator is pre-loaded with information specific to the CO_2 emissions from the United Kingdom's electricity generation plant, which is used to calculate emissions savings from proposed wind farm projects in the UK and similar data was not available for the Irish electricity generation plant. Therefore, these CO_2 emissions savings from the Project were calculated separately from the worksheet.

According to the model described above, the Project will give rise to total losses of 41,108 t CO_2 eq.

A simple formula is used to calculate carbon dioxide emissions reductions resulting from the generation of electricity from wind power rather than from carbon-based fuels such as peat, coal, gas and oil.

The formula is:

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

where:

A = The maximum capacity of the wind energy development in MW

B = The capacity or load factor, which takes into account the availability of wind turbines and array losses etc.[21]

C = The number of hours in a year

D = Carbon load in grams per kWh (kilowatt hour) of electricity generated and distributed via the national grid.

For the purposes of this calculation, the rated capacity of the Project is assumed to be approximately 48 MW. A load factor of 0.35 (or 35%) has been used for the Project.

There has been a strong reduction in the CO_2 emissions intensity of electricity generation, especially after 2016, with intensity falling below 300 g CO_2/kWh for the first time in 2020. It is now less than a third of its 1990 value[22]. The number of hours in a year is 8,760. The most recent data for the carbon load of electricity generated in Ireland is for 2024 and was published in Sustainable Energy Authority Ireland's (SEAI) December 2024 report, 'Energy in Ireland 2024'. The carbon intensity of Ireland's electricity was 254 gCO_2/kWh in 2023[23]. The below calculation for carbon savings is based on the latest emission factor for electricity in Ireland in 2023. This is most recent set of data for a full annual year. The emissions factor for electricity in Ireland in 2023 was 254 gCO_2/kWh.

The calculation for carbon savings as follows:

$$CO_2 \text{ (in tonnes)} = \frac{(48.0 \times 0.35 \times 8{,}760.0 \times 254.0)}{1000}$$

= 37,381 tonnes per annum

[21] EirGrid, 2022, Enduring Connection Policy 2.2 Constraints Report for Area B Solar and Wind

[22] Energy-Related CO_2 Emissions in Ireland 2020 Companion Note to 2020 National Energy Balance October 2021, Sustainable Energy Authority of Ireland Online: https://www.seai.ie/publications/Energy-CO2-emissions-2020-Short-Note-FINAL.pdf [Accessed 12/06/2024]

[23] SEAI (2024) – Energy in Ireland 2024 Report [Accessed 08/01/2024]

Based on this calculation, approximately 37,381 tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Development.

The Scottish Government carbon calculator as presented above calculated 41,108 tonnes of CO_2 will be lost to the atmosphere due to changes in the peat environment and due to the construction and operation of the Project. This represents 2.7% of the total amount of carbon dioxide emissions that will be offset by the Project. The tonnes of CO_2 that will be lost to the atmosphere due to changes in the peat environment and due to the construction and operation of the Project will be offset by the Project in approximately 16 months (1.3 years) of operation compared to traditional fuel mix.

15.3.5 Do Nothing Impact

If the Proposed Development was not to proceed, greenhouse gas emissions, e.g., carbon dioxide, carbon monoxide and nitrogen oxides associated with construction and Decommissioning works would not arise. However, the greenhouse gas savings that would arise from the operation of the Proposed Development would also be lost leading to a long-term, moderate, negative impact.

15.3.6 Assessment of Potential Effects

This section assesses the impact of the Project on climate and Greenhouse Gases.

The effects of climate change on the Project in terms of the dangers with increased turbulant climate/weather events, resilience to lightening, ice build-up, possible flooding, storms etc. are assessed for potential effects and mitigation measures are detailed in **Chapter 17: Major Accidents and Natural Disasters**.

15.3.6.1 Construction Phase

Greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide (CO) and nitrogen oxides (NO_x) are associated with vehicles and plant utilised for construction activities. This potential impact will be slight, given the insignificant quantity of greenhouse gases that will be emitted and will be restricted to the duration of the construction phase. Therefore, this is a short-term, slight, negative impact. Mitigation measures to reduce this impact are outlined in section 15.2.7.

15.3.6.2 Operation Phase

The Project is a renewable energy project in that it will generate electricity from a renewable source. This energy generated will be in direct contrast to traditional energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a positive impact on the climate. The Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 40-year lifespan of the Project. The Project will assist in reducing carbon dioxide (CO_2) emissions (37,381 tonnes per annum) that would otherwise arise if the same energy that the Project will generate were otherwise to be generated by conventional fossil fuel plants. This is a long-term, moderate, positive effect on the climate.

15.3.6.3 Decommissioning Phase

Any impacts that occur during the Decommissioning phase are similar to that which occur during the construction phase. The mitigation measures prescribed for the construction phase of the Project will be implemented during the Decommissioning phase thereby minimising any potential impacts.

15.3.7 Mitigation Measures

It is considered that the Project will have an overall positive impact in terms of carbon reduction and climate.

The Project will assist Ireland in meeting a 51% reduction in overall greenhouse gas emissions by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2024 (CAP2024). The CAP 2024 commits Ireland to installing up to 9 GW of onshore wind capacity by 2030, in order to support the reduction in Ireland's greenhouse gas emissions.

15.3.7.1 Construction Phase

All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.

15.3.7.2 Operation Phase

The operation phase of the Project will have a positive impact on the climate due to the displacement of fossil fuels and therefore no mitigation is necessary for this phase.

15.3.7.3 Decommissioning Phase

Mitigation measures during the Decommissioning phase will be similar to those employed during the construction phase as outlined above.

15.3.8 Cumulative Effects

Potential cumulative effects on the climate between the Proposed Development and other developments in the vicinity were also considered as part of this assessment. The other developments considered as part of the cumulative effects assessment are described in **Appendix 2.4**.

During the construction phase of the Project and other developments within 20 km of the proposed turbines that are yet to be constructed, there will be minor exhaust emissions from construction plant and machinery and dust emissions from construction activities. In a worst-case scenario if any of these developments were constructed at the same time as this Project there will be short-term slight negative cumulative impact on climate due to exhaust and dust emissions.

The nature of the Project is such that, once operational, it will have a long-term, moderate, positive impact on the air climate. It is considered that the cumulative impact will be positive in terms of carbon reduction and the climate also.

During the operational phase emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), and sulphur dioxide (SO_2) or dust emissions from the Project and other projects listed in **Appendix 2.4**, will result from the operation and maintenance vehicles onsite. However, these emissions will be minimal. Therefore, there will be a long-term imperceptible negative cumulative impact on the climate.

Cumulative impacts during the Decommissioning phase will be similar to the construction phase although slightly less as a result of the reduced works required during the Decommissioning phase as some infrastructure will be left in-situ e.g., Turbine Foundations and the Site Access Tracks.

The nature of the Project and other energy developments within 20 km are such that, once operational, they will have a cumulative long-term, significant, positive effect on climate.

15.3.9 Residual Impacts of the Project

15.3.9.1 Construction Phase

There will be a short-term imperceptible negative impact on Climate as a result of greenhouse gas emissions.

15.3.9.2 Operational Phase

There will be a long-term, moderate, positive impact on Climate as a result of reduced greenhouse gas emissions.

15.3.9.3 Decommissioning Phase

Any impacts and consequential effects that occur during the Decommissioning phase are similar to that which occur during the construction phase, albeit of less impact. For example, Turbine Foundations and Site Access Tracks will be left in-situ. No forest felling will take place during the Decommissioning phase.

15.3.10 Summary of Significant Effects

This assessment has identified no potential significant effects, given the mitigation measures embedded in the design and recommended for the implementation of the Project.

15.3.11 Statement of Significance

The Project has been assessed as having the potential to result in a short-term imperceptible, negative impact on Climate during construction. There will be long-term moderate, positive impact on Climate as a result of reduced greenhouse gas emission during the operational phase.

Potential cumulative impact of the Project with other energy developments including wind and solar within 20 km on climate was assessed as having a long-term, significant, positive impact on the Climate.