Planning and Environmental Consultants

Environmental Impact Assessment Report (EIAR)

Lackareagh Wind Farm, Co. Clare

Chapter 11 – Climate

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11. CLIMATE

11.1 Introduction

This chapter identifies, describes, and assesses the potential significant direct and indirect effects on climate arising from the construction, operation and decommissioning of the Proposed Lackareagh Wind Farm, henceforth to be referred to using the following terms 'the Proposed Project, 'Proposed Wind Farm', 'Proposed Grid Connection Route', 'the site', as outlined in Section 1.1.1 of Chapter 1) and has been completed in accordance with the EIA guidance and legislation set out in Chapter 1: Introduction of this EIAR. The full description of the Proposed Project is detailed in Chapter 4 of this EIAR.

The objective of this assessment is to assess the potential effects that the Proposed Project may have on Climate and sets out proposed mitigation measures to avoid, reduce or offset any potential significant effects that are identified. This EIAR comprehensively assesses the susceptibility of the Proposed Project to climate change across EIAR Chapters 5 through 16, outlining specific measures in each chapter to enhance the Proposed Project's ability to withstand potential impacts, including those resulting from climate change. Chapter 16 of this EIAR consolidates the risks and vulnerabilities identified throughout all EIAR chapters to assess the overall risk to the Proposed Project concerning major accidents and natural disasters; please refer to Chapter 16 for detailed information regarding the project's risks associated with climate change.

The aim of the Proposed Project when in operation is to reduce the input of carbon intensive energy into the national grid and reduce the amount of greenhouse gas emissions being released to the atmosphere that are associated with electricity generation and use. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment.

11.1.1 Background

The Proposed Wind Farm is located immediately east of the village of Kilbane, Co. Clare and 6km west of Killaloe, Co. Clare. It is proposed to access the Proposed Wind Farm via upgrades to the L7080 Local Road (the Gap Road) which bisects the Proposed Wind Farm site, with proposed infrastructure located both north and south of the Local Road. The Proposed Wind Farm is served by a number of existing public, forestry and agricultural roads and tracks.

The Proposed Grid Connection Route includes for underground 38kV cabling from the proposed onsite 38kV substation, in the townland of Killeagy (Goonan), to the existing Ardnacrusha 110kV substation in the townlands of Ballykeelaun and Castlebank. The Proposed Grid Connection Route to Ardnacrusha, measuring approximately 14.7km in length, is almost entirely located within the public road corridor.

Current land-use on the Proposed Wind Farm site comprises commercial coniferous forestry plantations and small-scale agriculture. Current land-use along the Proposed Grid Connection Route comprises of public road corridor, public open space, pastures, mixed forestry and land principally used by agriculture with significant areas of natural vegetation, as well as discontinuous urban fabric. Land-use in the wider landscape of the site comprises a mix of agriculture, quarrying, low density residential and commercial forestry.

11.1.2 Relevant Guidance

The climate chapter of this EIAR is carried out in accordance with the 'EIA Directive' as amended by Directive 2014/52/EU and has been prepared in accordance with guidance listed in Section 1.7.2 of

Chapter 1: Introduction. Due to the nature of the Proposed Project, a wind farm project, the following methodology and guidance was utilised for the climate section of this EIAR:

- '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment'* (2013) European Commission
- *'Calculating Carbon Savings from Wind Farms on Scottish Peat Lands*' (University of Aberdeen and the Macauley Institute 2008); and
- '*Wind Farms and Carbon Savings*' (Scottish Natural Heritage, 2003).
- Macauley Institute Carbon Calculator for Wind Farms on Scottish Peatlands (Version 1.8.1) (2023)
- Transport Infrastructure Ireland (TII) Carbon Assessment Tool (Version 0.7.6) (TII, 2020)

Consideration has also been given to the 'Air Quality Assessment of Proposed National Roads – Standard PE-ENV-01107' (Transport Infrastructure Ireland, December 2022 (2022a)), Climate Assessment of Proposed National Roads – Standard and Overarching Technical Documentation (Transport Infrastructure Ireland December 2022b/c) and Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document, GE-ENV-01106 (TII 2022d).

11.1.3 Scoping and Consultation

The scope for this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process and the List of Consultees is outlined in Section 2.7 of this EIAR. Matters raised by Consultees in their responses with respect to climate are summarised in Table 11-1 below.

Table 11-1 Summary of Climate Related Scoping Response

Consultee	Description	Addressed in Section
Health Service Executive (HSE)	The HSE recommends that the following matters are included and assessed in the EIAR: › Public Consultation › Decommissioning phase of the Proposed Wind Farm › Siting and Location of turbines › Noise and Vibration › Shadow Flicker › Air Quality › Surface and Groundwater Quality › Geological Impacts › Ancillary Facilities › Cumulative Impacts	Section 11.1.2. Due to the interrelationship between air quality and climate, consideration has also been given to Chapter 10 of this EIAR: Air Quality.
Transport Infrastructure Ireland	The developer, in preparing an EIAR, should have regard to TII's Environmental Assessment and Construction Guidelines, including the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (National Roads Authority, 2006),	Section 11.1.2. Due to the interrelationship between air quality and climate, consideration has also been given to Chapter 10 of this EIAR: Air Quality.

11.2 Statement of Authority

This section of the EIAR has been prepared by Catherine Johnson and reviewed by Niamh McHugh and Sean Creedon, all of MKO. Catherine is an Environmental Scientist and Climate Practitioner at MKO with over two years of consultancy experience in climate and sustainability. Prior to joining MKO in 2022, Catherine worked as an Environmental Social Governance (ESG) analyst for Acasta in Edinburgh. Catherine has expertise in international climate law and policy, earth science, and sustainability/ESG processes. Catherine has a BSc in Earth and Ocean Science and an LLM in Global Environment and Climate Change Law. Niamh is a Project Environmental Scientist who has been working with MKO since June 2021. Niamh possesses a BSc (Hons) in Environmental Science from the National University of Ireland, Galway. Niamh has been involved in the compilation and production of a number of EIARs, mainly in the field of Renewables. This report has been reviewed by Sean Creedon (B.Sc., M.Sc.). Sean has over 22 years' experience in planning and environmental impact elements within all stages of wind farm project delivery.

11.3 Climate Change and Greenhouse Gases

Although variation in climate is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing the world today and is primarily the result of increased levels of greenhouse gases in the atmosphere. Increasing human emissions of carbon dioxide and other greenhouse gases cause a positive radiative imbalance at the top of the atmosphere, meaning energy is being trapped within the climate system. The imbalance leads to an accumulation of energy in the Earth system in the form of heat that is driving global warming.[1,2] Greenhouse gases come primarily from the combustion of fossil fuels in energy use.

In March 2024 the European Environment Agency (EEA) published the European Climate Risk Assessment.[3] This assessment states that Europe is the fastest warming continent on the planet and is warming at about the twice the global rate. The average global temperature in the 12-month period between February 2023 and January 2024 exceeding pre-industrial levels by 1.5°C. 2023 was the warmest year on record over more than 100,000 years globally, at 1.48°C above pre-industrial levels, with the world's ocean temperature also reaching new heights.

The Intergovernmental Panel on Climate Change (IPCC), in their AR6 Synthesis Report: Climate Change 2023[4], state that widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. This has led to widespread adverse impacts and related losses and damages to people and nature due to the pressures of climate change and the inability to adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

11.3.1 International Greenhouse Gas Emission and Climate Targets

Globally, governance relating to climate change has changed significantly since 1994 when the United Nations Framework Convention on Climate Change (UNFCCC) entered into force. Greenhouse Gas

[1] *Hansen, J.; Sato, M.; Kharecha, P. et al. Earth's Energy Imbalance and Implications. Atmospheric Chemistry and Physics 2011, 11 (24), 13421–13449. https://doi.org/10.5194/acp-11-13421-2011*
[2] *von Schuckmann, K.; Palmer, M. D.; Trenberth, K. E. et al. An Imperative to Monitor Earth's Energy Imbalance. Nature Clim Change 2016, 6 (2), 138–144. https://doi.org/10.1038/nclimate2876.*
[3] *European Environment Agency (2024) European Climate Risk Assessment <https://www.eea.europa.eu/publications/european-climate-risk-assessment>*
[4] *IPCC AR6 Synthesis Report: Climate Change 2023. https://www.ipcc.ch/report/sixth-assessment-report-cycle/*

emissions have been a primary focus of climate related international agreements for almost two decades.

International greenhouse gas emission and climate targets play an important role in stimulating and enabling action for developed and developing nations. The following sections provide an overview of the international agreements that have played key roles in establishing climate governance.

11.3.1.1 Kyoto Protocol

The Kyoto Protocol was adopted on 11 December 1997; this Protocol operationalised the UNFCCC and was the first international agreement that committed countries to reduce their greenhouse gas emissions. It set limitations and reduction targets for greenhouse gases for developed countries (Annex I countries) and set a special obligation for certain countries to provide financial resources and facilitate technology transfer to developing countries (Annex II countries). The EU, and therefore Ireland, was both an Annex I and Annex II country.

The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, became binding for the first time.

Under the Kyoto Protocol, the EU agreed to achieve a significant reduction in total greenhouse gas emissions in the period 2008 to 2012. These EU emission targets are legally binding in Ireland. Ireland's contribution to the EU commitment for the period 2008 – 2012 (the first commitment period) was to limit its greenhouse gas emissions to no more than 13% above 1990 levels. Ireland achieved its Kyoto Protocol targets under the EU burden-sharing agreement.

11.3.1.1.1 *Doha Amendment to the Kyoto Protocol*

In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from starting in 2013 and lasting until 2020.
    - The amendment entered into force on 31 December 2020
- A revised list of greenhouse gases to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialised countries and the European Community committed to reduce greenhouse gas emissions to an average of 5% below 1990 levels. During the second commitment period, Parties committed to reduce greenhouse gas emissions by at least 18% below 1990 levels in the eight-year period from 2013 to 2020. The composition of Parties in the second commitment period is different from the first; however, Ireland and the EU signed up to both the first and second commitment periods. Under the protocol, countries must meet their targets primarily through national measures, although market-based mechanisms (such as international emissions trading) can also be utilised.

Although the 1997 Kyoto Protocol and 2012 Doha Amendment were in force in 2020, the 2015 Paris Agreement superseded the Kyoto Protocol as the principle regulatory instrument governing the global response to climate change.

11.3.1.2 Conference of the Parties

Every year since 1995, the Conference of the Parties (COP) has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments, and is the supreme decision-making body of the UNFCCC.

The following details the most significant COPs in terms of impact on climate action as well as a summary of the most recent COP, COP28, which took place in Dubai.

11.3.1.2.1 *COP21 Paris Agreement*

COP21 was the 21st session of the COP to the UNFCCC. COP21 was organised by the United Nations in Paris and held from 30th November to 12th December 2015.

COP21 closed on 12th December 2015 with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C. It is flexible and takes into account the needs and capacities of each country. It is balanced as regards adaptation and mitigation, and durable, with a periodical ratcheting-up of ambitions.

11.3.1.2.2 *COP25 Climate Change Conference- Madrid*

The 25th United Nations Climate Change conference, COP25, was held in Madrid and ran from December 2nd to December 13th, 2019. While largely regarded as an unsuccessful conference, the European Union launched its most ambitious plan, 'The European Green Deal' which aims to lower CO_2 emissions to zero by 2050. The deal includes proposals to reduce emissions from the transport, agriculture and energy sectors and will affect the technology chemicals, textiles, cement, and steel industries. Measures such as fines and pay-outs by member states who rely on coal power will be in place to encourage the switch to renewable clean energies such as wind. On the 4th of March 2020, the European Commission put forward the proposal for a European climate law. This aims to establish the framework for achieving EU climate neutrality. It aims to provide a direction by setting a pathway to climate neutrality and to this end, aims to set in legislation the EU's 2050 climate-neutrality objective.

11.3.1.2.3 *COP28 Climate Change Conference – Dubai*

The 28th COP for the UNFCCC (COP28) took place in Dubai from the 30th of November 2023 to the 13th of December 2023.

COP28 resulted in a landmark deal to 'transition away' from fossil fuels, the United Arab Emirates (UAE) Consensus. The agreement calls for 'transitioning away from fossil fuels in energy systems, in a just, orderly, and equitable manner.' This is the first time in 28 years that fossil fuels have been mentioned in a COP outcome. However, it is noted that the text of 'phase out as soon as possible inefficient fossil fuel subsidies' does not address energy poverty or the just transition. The UAE Consensus also calls for more explicit near-term goals in the lead up to 2050, calling for the world to cut greenhouse gas emissions by 43% by 2030 as compared to 2019 levels. However, many island states have criticised that despite the text being an improvement over previous agreements, there is a litany of loopholes that will enable destructive environmental practices to continue and do not assuage their concerns over rising sea levels and other climate change impacts.

COP28 concluded the first ever Global Stocktake under the Paris Agreement. The Global Stocktake recognises that the world is not on track to meet 1.5°C and will require Parties to align their national targets and measures with the Paris Agreement. Parties have two years to submit their Nationally

Determined Contributions for 2035, these need to be aligned with the best available science and the outcomes of the Global Stocktake.

An unusual aspect that came out of COP28 in the final hours of discussion was the quantity of decisions and documents which remained unfinished and not signed off. Notably, discussions on carbon markets collapsed in the final days of COP28 as no consensus could be reached on the country-to-country trading regimes or rules for the market in relation to Article 6 of the Paris Agreement. Negotiations will be continued at COP29 in Azerbaijan.

11.3.1.3 United Nations Sustainable Development Goals Report 2023

Transforming our World: the 2030 Agenda for Sustainable Development which includes 17 Sustainable Development Goals (SDGs), and 169 targets was adopted by all UN Member States at a UN summit held in New York in 2015. The agenda is universally applicable with all countries having a shared responsibility to achieve the goals and targets which came into effect on January 1st, 2016. The goals and targets are to be actions over the 15-year period, are integrated and indivisible i.e., all must be implemented together by each Member State.

On the 28th of June 2024, the United Nations published '*The Sustainable Development Goals Report 2024*'[5] (hereafter referred to as the UN SDG 2024 Report) highlighting how the lasting impacts of the COVID-19 pandemic, the war in Ukraine, ongoing and escalating geopolitical conflicts, and the increasing consequences of the climate crisis have hindered the achievement of the SDGs. The UN SDG 2024 Report finds that, following an assessment of all 169 targets, for which trend data is available, only 17% of the SDG targets are on track, 48% of SDG targets are showing minimum or moderate progress, 18% having stalled in progress and 17% having regressed from 2023. The UN SDG 2024 Report highlights the urgent need for stronger and more effective international cooperation to maximize progress, with immediate effect.

The UN SDG 2024 Report further details the progress, setbacks and recommendations in relation to SDG 7: affordable and clean energy; stating that "*the world's capacity to generate renewable power is expanding at an unprecedented rate, presenting a tangible opportunity to triple global capacity by 2030".* However, the UN SDG 2024 Report also confirms that 685 million people still lacked electricity in 2022, up 10 million than in 2021; further emphasising the need for robust policies to help "*accelerate electrification, enhance energy efficiency and increase investments in renewable energy".*

On the 17th of June 2024 the Dublin University Press published the *'Sustainable Development Report 2024'*.[6] The report highlights five key findings:

- On average, only 16% of the SDG targets are on track to be met globally by 2030, with the remaining 84% showing limited progress or a reversal of progress.
  - At the global level, SDG progress has been stagnant since 2020.
- The pace of SDG progress varies significantly across country groups.
  - As in previous years, European countries – notably the Nordic countries – top the 2024 SDG Index.
- Sustainable development remains a long-term investment challenge. Reforming global financial architecture is more urgent than ever. The world requires many essential public goods that far transcend the nation-state.
- Global challenges require global cooperation.
  - The report's new Index of support to UN-based multilateralism ranks countries based on their engagement with the UN system – including treaty

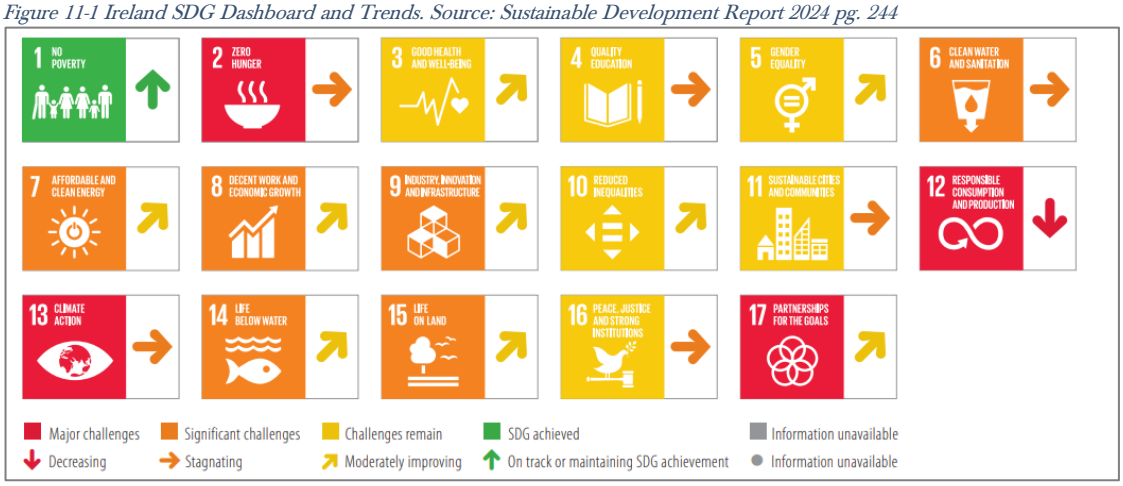
[5] *The Sustainable Development Goals Report (2024). Available at: https://unstats.un.org/sdgs/report/2024/*
[6] *Dublin University Press (2024) Sustainable Development Report 2024 The SDGs and the UN Summit of the Future Includes the SDG Index and Dashboards. <https://s3.amazonaws.com/sustainabledevelopment.report/2024/sustainable-development-report-2024.pdf>*

ratification, votes at the UN General Assembly, membership in UN organisations, participation in conflicts and militarisation, use of unilateral sanctions, and financial contributions to the United Nations.

- Ireland is ranked 28/167 with an overall country score of 78.7/100 (this is higher than the regional average 77.2); please see Figure 11-1 below for a detailed breakdown of Irelands SDG trends for each goal.

- The SDG targets related to food and land systems are particularly off-track.
  - Greenhouse gas emissions from agriculture, forestry, and other land use account for almost a quarter of total annual global GHG emissions.
  - The Food, Agriculture, Biodiversity, Land-Use, and Energy (FABLE) Consortium determined a "global sustainability" pathway which would avoid up to 100 million hectares of deforestation by 2030 and 100 gigatons of CO_2 emissions by 2050. Additional measures would be needed to avoid trade-offs with on-

Figure 11-1 Ireland SDG Dashboard and Trends. Source: Sustainable Development Report 2024 pg. 244



In October 2022 the Department of Communications, Climate Action & Environment in partnerships with all Government Departments, key stakeholders, and based on input from two public consultation processes published the Sustainable Development Goals National Implementation Plan 2022-2024 ('the SDG Plan').[7] The SDG Plan identifies that, overall, the world is not on track to achieve the global Goals by 2030. The SDG Plan sets out how Ireland will work to achieve the goals and targets of the Agenda for Sustainable Development both domestically and internationally. Irelands first National Implementation Plan provided a framework for Ireland to work towards the implementation of the SDGs; the SDG Plan aims to build on the structures and mechanisms from the first National Implementation Plan and to develop and integrate additional approaches in areas identified as requiring further action.

In September 2023, the UN Summit on the SDGs took place in New York and was co-facilitated by Ireland and Qatar. Representing the halfway mark to achieving the SDGs by 2030, it marked the beginning of a new phase of accelerated progress towards the SDGs with high-level political guidance on transformative and accelerated actions. The Global Sustainable Development Report 2023[8] was published in September 2023. The previous Global Sustainable Development Report (2019[9]) found that for some targets the global community was on track, but for many others the world would need to quicken the pace. In 2023, the situation is much more worrisome owing to slow implementation and a

[7] *National Implementation Plan for the Sustainable Development Goals 2022-2024. Available at:* <https://www.gov.ie/en/publication/e950f-national-implementation-plan-for-the-sustainable-development-goals-2022-2024/>
[8] *Global Sustainable Development Report 2023* <https://sdgs.un.org/sites/default/files/2023-09/FINAL%20GSDR%202023-Digital%20-110923_1.pdf>
[9] *Global Sustainable Development Report 2019* <https://sdgs.un.org/sites/default/files/2020-07/24797GSDR_report_2019.pdf>

confluence of crises. The 2023 Report goes on to highlight the current standing of each SDG and its relevant indicators. A 2023 UN Special Report[10] found that over 30% of the SDGs have seen either no improvement or reverse trends in progress. The push for transformation to achieve the SDGs will come through shifts in six key entry points:

1. *Human Well Being and Capabilities*
2. *Sustainable and Just Economies*
3. *Food Systems and Healthy Nutrition*
4. *Energy Decarbonisation with Universal Access*
5. *Urban and Peri-Urban Development*
6. *Global Environmental Commons*

The Proposed Project will contribute to Entry Point 4 due to the clean and renewable energy it will provide over its operational life. The phase out of fossil fuels in a manner that is globally and domestically just, while strengthening the transition to renewables by increasing energy efficiency and encouraging behavioural change will be key to achieving the relevant SDGs to the Proposed Project.

Relevant SDGs to the Proposed Project and how they are implemented into Irish National plans and policies can be found in Table 11-2.

[10] *The Sustainable Development Goals Report 2023: Special Edition* <https://unstats.un.org/sdgs/report/2023/The-Sustainable-Development-Goals-Report-2023.pdf>

Table 11-2 Sustainable Development Goals Report 2024, Relevant SDGs to the Proposed Project, and Implementation into Irish National Plans

SDG	Targets	International Progress/Downfalls to Date (2024)[11]	National Relevant Policy
SDG 7 Affordable and Clean Energy: *Ensure access to affordable, reliable, sustainable and modern energy for all*	› By 2030, ensure universal access to affordable, reliable and modern energy services › By 2030, increase substantially the share of renewable energy in the global energy mix › By 2030, double the global rate of improvement in energy efficiency › By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology › By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	In 2022, global electricity access declined for the first time in a decade, primarily due to disruptions from COVID-19 and the Ukraine conflict. Despite improvements in energy intensity and renewable energy growth, international financial flows for clean energy in developing countries remain insufficient. At the current rate, 660 million people will still lack electricity and 1.8 billion will not have access to clean cooking by 2030. To achieve universal access to energy by 2030, we need to expedite electrification efforts, boost investments in renewable energy, enhance energy efficiency, and establish supportive policies and regulatory frameworks. In 2021 the global share of renewable sources in total final energy consumption stood at 18.7%. Excluding traditional use of biomass, the share of modern renewable sources rose gradually from 10% in 2015 to 12.5% in 2021. The electricity sector led the charge with renewables, contributing 28.2% to total final electricity consumption. However, insufficient progress in the heat and transport sectors underscores the need for stronger conservation measures and policy actions. Tripling world's installed renewable energy generation agreed at the COP28 is an important step aligning with the SDG7. Installed renewable energy capacity is on the rise worldwide, reaching 424 watts per person globally in 2022. Developed nations averaged 1,073 watts per person, while developing countries averaged 293 watts per person. This represents an 8.5% increase from 2021,	*Ireland's Transition to a Low Carbon Energy Future 2015-2030;* *Energy Poverty Action Plan;* *Ireland's Transition to a Low Carbon Energy Future 2015-2030;* *National Mitigation Plan;* *National Energy Efficiency Action Plan;* *One World, One Future;* *The Global Island* *Economic Recovery Plan* *Project Ireland 2040: National Planning Framework;* *Project 2040;* *National Development Plan 2021-2030;* *Climate Action Plan 2024*

[11] *United Nations, the 17 Goals – Sustainable Development* <https://sdgs.un.org/goals>

SDG	Targets	International Progress/Downfalls to Date (2024)[11]	National Relevant Policy
		maintaining a steady compound annual growth rate of 8.1% over five-year periods.	
SDG 9: Industry, Innovation, and Infrastructure *Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation*	› Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. › Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries › Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities	Since 2022, the manufacturing sector has faced stagnation, attributed to geopolitical instability, inflation, logistical challenges, rising energy costs, and a broader global economic slowdown. Globally, manufacturing's share in employment has regressed. While there has been progress in reducing CO2 intensity in manufacturing, it falls short of 2030 target values. To expedite progress towards SDG 9, efforts should prioritize accelerating the green transition, strategically prioritizing sectors, and addressing inequalities in digital and innovation sectors. The manufacturing sector rebounded strongly in 2021 post-COVID, but growth has plateaued at around 2.7% since 2022, expected to continue in 2024. Despite this, global manufacturing value added per capita rose by 16% from 2015 to 2023, reaching $1,922 per capita. Regional gaps are stark, with Europe and Northern America hitting a record $4,986 per capita, contrasting with stagnant levels of $163 in sub-Saharan Africa. Since 2015, global manufacturing employment has fluctuated. Starting at 14.3% in 2015, it dipped to 14.2% in 2020 but saw a marginal recovery in 2021. However, by 2022, it declined to 14.1%, with notable regional disparities.	*National Development Plan 2021-2030;* *National Economic Recovery Plan;* *Climate Action Plan 2024;* *National Implementation Plan on Persistent Organic Pollutants;* *Waste Action Plan for a Circular Economy;* *National Waste Prevention Programme;* *A Better World*
SDG 11: Sustainable Cities and Communities *Make cities and human settlements*	› By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums › By 2030, provide access to safe, affordable, accessible and sustainable transport systems	More than half the world's population currently reside in cities. However, cities are grappling with a multitude of complex issues, made more difficult by rising global urban poverty levels in the wake of COVID-19. From rising slum populations, insufficient public transport, city expansion outpacing population growth to threats to	*Rebuilding Ireland Action Plan for Housing and Homelessness;* *Housing for All;*

SDG	Targets	International Progress/Downfalls to Date (2024)[11]	National Relevant Policy
inclusive, safe, resilient and sustainable	for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons › Strengthen efforts to protect and safeguard the world's cultural and natural heritage › By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	critical infrastructure and disruption of basic services by disasters, it is essential that cities are equipped to adequately handle these challenges. As the world turns more urban, with nearly 70% of the global population projected to reside in cities by 2050, critical infrastructure, affordable housing, efficient transport and essential social services are crucial for creating resilient, sustainable cities for all. On average, 104,049 critical infrastructure units and facilities were destroyed or damaged by disasters annually from 2015 to 2022. Furthermore, disasters disrupted over 1.6 million basic services, including educational and health services, each year. A comparison of air pollution five-year average before and after the development of the SDGs showed a significant decrease of 9% in fine particulate matter global levels and current alignment with the WHO Air Quality Guideline (AQG) Interim Target 1 value of 35 ug/m3.	*EU Regulation 1370/2007 on Public Passenger Transport Services by Rail and by Road;* *Project Ireland 2040 National Planning Framework;* *National Clean Air Strategy;* *Rural Development Programme 2014-2022;* *National Implementation Plan on Persistent Organic Pollutants;* *Waste Action Plan for a Circular Economy;* *National Waste Prevention Programme;* *A Better World*
SDG 12 Responsible Consumption and production: *Ensure sustainable consumption and production patterns.*	› By 2030, achieve the sustainable management and efficient use of natural resources. › By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment › Encourage companies, especially large and transnational companies, to adopt	Unsustainable patterns of consumption and production are the root cause of the triple planetary crisis: 1. *Climate Change* 2. *Biodiversity Loss* 3. *Pollution* The world is seriously off track in its effort to halve per-capita food waste and losses by 2030. While countries are fulfilling their environmental agreement obligations and embracing comprehensive approaches to address environmental degradation, public funding supporting the production and consumption of fossil fuels has more than tripled since 2015, impeding the transition to net-zero emissions.	*National Implementation Plan on Persistent Organic Pollutants;* *Waste Action Plan for a Circular Economy;* *National Waste Prevention Programme;* *Climate Action Plan 2024* *Tourism Action Plan;* *National Clean Air Strategy;* *Towards Responsible Business: Ireland's Second National Plan on Corporate*

SDG	Targets	International Progress/Downfalls to Date (2024)[11]	National Relevant Policy
	sustainable practices and to integrate sustainability information into their reporting cycle › Promote public procurement practices that are sustainable, in accordance with national policies and priorities. › Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products	Each stage of production or manufacturing presents an opportunity to reduce resource and fossil fuel use, foster innovation, conserve energy, cut emissions, and advocate for a circular economy approach. From 2019 to 2023, one-third of member states (63 countries) have reported 516 policy instruments related to sustainable consumption and production. In 2021-2022, 73% of companies included in the sample published sustainability reports, with the number of companies tripling since 2016. This growth was observed in all regions in 2022. Fossil fuel subsidies hit a record high of $1.53 trillion in 2022, reversing the declining trend observed from 2012 to 2020. The post-COVID energy price surge inflated these subsidies, prompting some governments to introduce new support measures. Consequently, public funding for oil, coal, and gas production and consumption more than doubled from 2021 to 2022 and tripled since 2015, impeding progress towards net-zero transition.	*Social Responsibility (CSR) 2017-2020;* *Sustainable, Inclusive and Empowered Communities 2019-2024;*
SDG 13 Climate Action: *Take urgent action to combat climate change and its impacts** **Acknowledging that the United Nations Framework Convention on*	› Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries › Integrate climate change measures into national policies, strategies and planning › Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	Climate records were shattered in 2023, with the world watching the climate crisis unfold in real time. Communities around the world are suffering the effects of extreme weather, which is destroying lives and livelihoods on a daily basis. The roadmap to limit the rise in global temperature to 1.5°C and avoid the worst of climate chaos cannot afford any delays, indecision or half measures by the global community. It demands immediate action for drastic reductions in global greenhouse gas emissions in this decade and the achievement of net zero by 2050.	*National Adaptation Framework;* *Building on Recovery: Infrastructure and Capital Investment 2016-2021;* *National Mitigation Plan;* *National Biodiversity Action Plan 2017-2021;* *National Policy Position on Climate Action and Low Carbon Development;*

SDG	Targets	International Progress/Downfalls to Date (2024)[11]	National Relevant Policy
Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.		The number of disaster-related deaths and missing persons per 100,000 population (excluding COVID-19 deaths) has nearly halved from 1.62 in the decade 2005-2014 to 0.82 in 2013-2022. However, the absolute number remains high. Between 2013 and 2022, disasters worldwide claimed 42,553 mortalities each year. Further, the number of persons affected by disasters per 100,000 population has increased by over two-third, from 1,169 in 2005-2014 to 1,980 in 2013-2022. The year 2023 broke every single climate indicator and was the warmest year on record according to the World Meteorological Organization. Global temperatures rose to 1.45°C, dangerously close for the first time to the 1.5°C lower limit of the Paris Agreement on climate change. Despite some reduction in greenhouse gas emissions in developed countries, concentrations of greenhouse gases reached record high observed levels in 2022 and real-time data in 2023 show greenhouse gases continuing to increase. Carbon dioxide levels are 150% above pre-industrial levels. Climate finance, reported by Annex I Parties as support provided to developing countries, has increased at a compound rate of 5% from 2015 to 2020, amounting to $41 billion. Although there are a range of estimates and a lack of an agreed accounting methodology on the $100 billion per year goal, the goal was not yet met as of 2021. However, recent progress made in the provision and mobilization of climate finance amounted to $89.6 billion in 2021.	*Project 2040: National Development Plan 2021-2030; Climate Action Plan 2024; National Dialogue on Climate Action; Agriculture, Forest, and Seafood Climate Change Sectoral Adaptation Plan; The National Strategy on Education for Sustainable Development in Ireland*

11.3.1.4 Climate Change Performance Index 2024

Established in 2005, the Climate Change Performance Index (CCPI)[12] is an independent monitoring tool which tracks countries climate protection performance. It assesses individual countries based on climate policies, energy usage per capita, renewable energy implementation and greenhouse gas emissions and ranks their performance in each category and overall. The 2024 CCPI was published on December 2023. While the CCPI 2024 indicates signs of potential reductions in global emissions, no country achieved its Paris Climate targets and therefore the first three places of the ranking system remain unoccupied.

Ireland, ranked 37th in 2023, has fallen 6 places to 43rd for 2024, and remains as a "low" performer in international performance. The CCPI states that Ireland's policies are missing a long-term strategy for phasing out fossil fuel infrastructure and shifting investments from natural gas towards an emissions-neutral energy supply. Rebound effects from economic growth in emissions-intensive sectors (such as agriculture and land use) cause absolute emissions to remain high. The chance to integrate clear sanctions into the framework has so far been missed.

However, the CCPI experts welcome Ireland's medium-term offshore wind and solar plans. The country's offshore wind offers considerable opportunities for capitalising on renewable energy and (over the long term) potential for electricity export.

Ireland has moved to the 'low' category in 2024 from the 'very low' category in 2023 on the Greenhouse Gas Emissions ratings despite falling to 54th in 2024 in the world from 47th in 2023. Ireland remains in the 'Medium' category in the Renewable Energy rating table; however, Ireland has fallen from 23rd in 2023 to 31st in 2024.

11.3.1.5 State of the Global Climate 2023

In March 2023, the World Meteorological Organisation (WMO) published a report entitled the '*State of the Global Climate 2023*'.[13] This report provided a summary on the state of the climate indicators in 2023 with sections on key climate indicators, extreme events and impacts. The key messages in the report include:

- 2023 was the warmest year on record at 1.45 ± 0.12 °C above the pre-industrial average.
- Concentrations of the three main greenhouse gases – carbon dioxide, methane, and nitrous oxide – reached record high observed levels.

The State of the Global Climate report goes on to state that renewable energy generation, primarily driven by the dynamic forces of solar radiation, wind and the water cycle, has surged to the forefront of climate action for its potential to achieve decarbonisation targets. There has been a substantial worldwide energy transition, with renewable capacity additions increasing by nearly 50% from 2022, totalling 510 gigawatts (GW).[14] This growth represents the highest rate observed in the past two decades, signalling a significant momentum toward achieving the clean energy goal set at COP28 meeting in 2023 to triple renewable energy capacity globally to 11,000 GW by 2030.

Alterations in the physical climate can trigger a series of repercussions on national advancement and the pursuit of SDGs (Section 11.3.1.3 above). The interconnections between the climate emergency and development pathways can foster synergistic endeavours, resulting in positive benefits for communities and human well-being (refer to Chapter 5 of this EIAR for more details). This synergy serves as a

[12] *Climate Change Performance Index 2024* <https://ccpi.org/>
[13] *WMO (2024) State of the Global Climate 2023* <https://library.wmo.int/records/item/68835-state-of-the-global-climate-2023>
[14] *IEA (2024), Renewables 2023, IEA, Paris* <https://www.iea.org/reports/renewables-2023>

potent driver for adaption to climate change and lays the groundwork for the global energy transition. Emphasizing wind energy and other renewable sources enables the global energy transition towards sustainability.

11.3.2 National Greenhouse Gas Emission and Climate Targets

11.3.2.1 Programme for Government

The Programme for Government – Our Shared Future ("Programme for Government")[15] was published in October 2020 and last updated July 2021. In relation to climate change the programme recognises that the next ten years are a critical period in addressing the climate crisis. It is an ambition of the programme to more than halve carbon emissions over the course of the decade (2020-2030). The programme notes that the government are committed to reducing greenhouse gas emissions by an average 7% per annum over the next decade in a push to achieve a net zero emissions by the year 2050. The programme also recognises the severity of the climate challenge as it clarifies that:

"Climate change is the single greatest threat facing humanity".

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

The Climate Action and Low Carbon (Amendment) Act 2021 is a piece of legislation which commits the country to move to a climate resilient and climate neutral economy by 2050. This was passed into law in July 2021.

The Programme for Government has committed to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieve net zero emissions by 2050. This Act will manage the implementation of a suite of policies to assist in achieving these annual targets.

The Act includes the following key elements, among others:

- Places on a statutory basis a 'national climate objective', which commits to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy.
- Embeds the process of carbon budgeting into law, the Government are required to adopt a series of economy-wide five-year carbon budgets, including sectoral targets for each relevant sector, on a rolling 15-year basis, starting in 2021.
- Actions for each sector will be detailed in the Climate Action Plan, updated annually.
- A National Long Term Climate Action Strategy will be prepared every five years.
- Government Ministers will be responsible for achieving the legally binding targets for their own sectoral area with each Minister accounting for their performance towards sectoral targets and actions before an Oireachtas Committee each year.
- 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 (CCAC) should equate to a total reduction of 51% emissions over the period to 2030, in line with the Programme for Government commitment.

[15] *Programme for Government – Our Shared Future.* <https://assets.gov.ie/130911/fe93e24e-dfe0-40ff-9934-def2b44b7b52.pdf>

11.3.2.3 Climate Change Advisory Council 2023

The CCAC was established on 18th January 2016 under the Climate Action and Low Carbon Development Act 2015. The CCAC aims to provide independent evidence-based advice and recommendations on policy to support Ireland's Just Transition to a biodiversity-rich, environmentally sustainable, climate-neutral, and resilient society.

In July 2023, the CCAC published the 2023 Annual Review[16], this is the seventh annual review carried out by CCAC and details the CCAC concerns that the necessary national actions are not taking place or being enabled at the required speed, going on to state that 'at the current rate of policy implementation, Ireland will not meet the targets set in the first and second carbon budget periods unless urgent action is taken immediately, and emissions begin to fall much more rapidly.'

In 2024 the CCAC has changed it approach to produce sector specific annual reviews in order to emphasise the requirement for greater effort across all sectors to remain within their sectoral emission ceiling. In a statement released on 9th July 2024 the CCAC state that while '*the provisional greenhouse gas emissions data published today by the EPA shows some positive results across the sectors but overall, it is increasingly unlikely that the first carbon budget will be achieved. Much more urgent action is required from Government if Ireland is to achieve its climate change objectives.*'[17]

The Annual Review 2024: Electricity[18] report has been released by the CCAC and focuses specifically on key findings and recommendations for the Electricity sector. In 2023, emissions from the sector reduced by approximately 21% from 2022 to the lowest level since records began in 1990. This was driven by a considerable decline in the use of coal for electricity generation, coupled with a notable rise in imported electricity.

Renewables accounted for 41% of electricity demand in 2023, up from 39% in 2022 and approaching the 2025 target of a 50% renewable energy share in electricity generation. By the end of 2023, the total renewable grid capacity in Ireland was 5.7 GW, with the majority (4.7 GW) from onshore wind turbine installations. However, there is still a significant lack of progress towards onshore wind targets in 2023, with just 0.2GW of new onshore wind being connected to the grid in 2023.

11.3.2.4 Carbon Budgets

The first national carbon budget programme proposed by the CCAC, approved by Government and adopted by both Houses of the Oireachtas in April 2022 comprises three successive 5-year carbon budgets. The total emissions allowed under each budget are shown in Table 11-3.

Table 11-3 Proposed Carbon Budgets of the Climate Change Advisory Council

	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2	2031 – 2035 Provisional Carbon Budget 3
	All Gases		
Carbon Budget (Mt CO_2eq)	295	200	151

[16] *Climate Change Advisory Council 2023 Review* <https://www.climatecouncil.ie/councilpublications/annualreviewandreport/CCAC-AR-2023-postfinal.pdf>
[17] https://www.climatecouncil.ie/news/chairs-statement-irelands-provisional-greenhouse-gas-emissions-1990-2023.html
[18] *Climate Change Advisory Council (2024) Annual Report 2024: Electricity* <https://www.climatecouncil.ie/councilpublications/annualreviewandreport/AR2024-Electricity-final.pdf>

	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2	2031 – 2035 Provisional Carbon Budget 3
Annual Average Percentage Change in Emissions	-4.8%	-8.3%	-3.5%
The figures are consistent with emissions in 2018 of 68.3 Mt CO_2eq reducing to 33.5 Mt CO_2eq in 2030 thus allowing compliance with the 51% emissions reduction target by 2030			

Ireland has expended 47% of its emissions for the first carbon budget period in the first two years. Thus, only 53% is leftover, requiring a 12.4% reduction in emissions each year to stay in budget.

11.3.2.5 Sectoral Emissions Ceilings

The Sectoral Emissions Ceilings were launched in September 2022. The objective of the initiative is to inform on the total amount of permitted greenhouse gas emissions that each sector of the Irish economy can produce during a specific time period. The Sectoral Emissions Ceilings alongside the annual published Climate Action Plan provide a detailed plan for taking decisive action to achieve a 51% reduction in overall greenhouse gas emissions by 2030.

Section C of the Climate Action and Low Carbon Development (Amendment) Act 2021 provides the minister with a method of preparing the Sectoral Emissions Ceiling within the bounds of the carbon budget. The Sectoral Emission Ceilings for each 5-year carbon budget period was approved by the government on the 28th of July 2022 and are shown in Table 11-4 below.

Table 11-4 Sectoral Emission Ceilings 2022

	Sectoral Emission Ceilings for each 5-year carbon budget period (MtCO2eq.)	
Sector	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2
Electricity	**40**	**20**
Transport	54	37
Built Environment-Residential	29	23
Built Environment-Commercial	7	5
Industry	30	24
Agriculture	106	96
LULUCF[1]	Yet to be determined	Yet to be determined
Other (F-Gases, Waste & Petroleum refining)	9	8
Unallocated Savings		*-26*
Total[2]	Yet to be determined	Yet to be determined

	Sectoral Emission Ceilings for each 5-year carbon budget period (MtCO2eq.)	
Sector	2021 – 2025 Carbon Budget 1	2026 – 2030 Carbon Budget 2
Legally binding Carbon budgets and 2030 Emission Reduction Targets	295	200

[1] Finalising the Sectoral Emissions Ceiling for the land-use, Land-use Change and Forestry (LULUCF) sector has been deferred for up to 18 months to allow for the completion of the Land-use Strategy
[2] Once LULUCF sector figures are finalised, total figures will be available.

The electricity sector is the third largest emitting sector in Ireland and the successful decarbonisation of this sector could lead to decarbonisation in other sectors, such as the electrification of transport and heating. The CCAC 2023 Annual Review, detailed above, states that the electricity sector has been set one of the smallest sectoral emission ceilings and the steepest decline in emissions of all sectors with emission ceilings of 40MtCO$_2$eq for the first carbon budget period (2021–2025) and 20MtCO$_2$eq for the second carbon budget period (2026–2030). This equates to a headline target of a 75% reduction in emissions in the sector from 2018 levels by 2030, which will be achieved by increasing the share of renewable electricity to 80%, encompassing 9GW of onshore wind capacity, at least 5GW of offshore wind capacity, with 2 GW earmarked for green hydrogen production, and 8GW of solar photovoltaic capacity, supported by a range of actions set out in the Climate Action Plan 2024.

The Annual Review 2024: Electricity report, detailed above in Section 11.3.2.3, states that to stay within the agreed carbon budget, the Electricity sector needs to achieve the largest reduction in sectoral emissions of all sectors, i.e., a 75% decrease by 2030 compared with 2018. The CCAC has found that approximately 49% of the Electricity sectoral emissions ceiling has now been used in the first 2 years of the first carbon budget period; with the SEAI estimating that 68% of the Electricity sectoral emissions ceiling has now been used in the first 3 years of the first carbon budget period. Accelerated deployment of onshore wind and solar electricity generation is crucial if the Electricity sector is to meet its sectoral emissions ceiling for the first carbon budget period.

11.3.2.6 Climate Action Plan 2024

The National Climate Action Plan 2024 (CAP 2024)[19] was launched in December 2023. Following on from Climate Action Plans 2019, 2021, and 2023, CAP 2024 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral emission ceilings that were agreed by Government in July 2022 following the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a *legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030*. CAP 2024 seeks to build on the progress made under Climate Action Plan 2023 by delivering policies, measurements and actions that will support the achievement of Irelands carbon budgets, sectoral emission ceilings, and 2030 and 2050 climate targets; while further enabling the closure of identified emissions gaps and the allocation of unallocated emission savings associated with each carbon budget period.

Six Vital High Impact Sectors were identified within Climate Action Plan 2023[20] relating to the sectoral emission ceilings (Section 11.3.2.5 above). These sectors and their associated targets are as follows:

[19] Department of the Environment, Climate and Communications (2023) Climate Action Plan 2024. Available at: https://www.gov.ie/en/publication/79659-climate-action-plan-2024/#new-approach-to-the-2024-annex-of-actions
[20] Department of the Environment, Climate and Communications (2022) Climate Action Plan 2023 – Summary Document

Powering Renewables – 75% Reduction in emissions by 2030

'We will facilitate a large-scale deployment of renewables that will be critical to decarbonising the power sector as well as enabling the electrification of other technologies.

- *Accelerate the delivery of onshore wind, offshore wind, and solar.*
- *Dial up to 9 GW onshore wind, 8 GW solar, and at least 7 GW of offshore wind by 2030 (with 2 GW earmarked for green hydrogen production).*
- *Support at least 500 MW of local community-based renewable energy projects and increased levels of new micro-generation and small-scale generation.*
- *Phase out and end the use of coal and peat in electricity generation.*
- *New, dynamic Green Electricity Tariff will be developed by 2025 to incentivise people to use lower cost renewable electricity at times of high wind and solar generation.'*

Achievement of the 75% reduction in emissions by 2030 and the decarbonisation of the grid in Ireland would assist in the achievement of the Electricity sectoral emission ceiling.

Building Better – 45% (Commercial/Public) and 40% (Residential) Reduction in Emissions by 2030

'We will increase the energy efficiency of existing buildings, put in place policies to deliver zero-emissions new builds, and continue to ramp up our retrofitting programme.

- *Ramp up retrofitting to 120,000 dwellings to BER B2 by 2025, jumping to 500,000 by 2030.*
- *Put heat pumps into 45,000 existing and 170,000 new dwellings by 2025, up to 400,000 existing and 280,000 new dwellings by 2030.*
- *Generation up to 0.8 TWh of district heating by 2025 and up to 2.5 TWh by 2030.'*

Achievement of the 45% (Commercial/Public) and 40% (Residential) reduction in emissions by 2030 would assist in the achievement of the Built Environment (Commercial/Residential) sectoral emission ceiling.

Turning Transport Around – 50% Reduction in Emissions by 2030

'We will drive policies to reduce transport emissions by improving our town, cities, and rural planning, and by adopting the Avoid-Shift-Improve approach: reducing or avoiding the need for travel, shifting to public transport, walking, and cycling and improving the energy efficiency of vehicles.

- *Change the way we use our road space.*
- *Reduce the total distance driven across all car journeys by 20%.*
- *Walking, cycling and public transport to account for 50% of our journeys.*
- *Nearly 1 in 3 private cars will be an Electric Vehicle.*
- *Increase walking and cycling networks.*
- *70% of people in rural Ireland will have buses that provide at least 3 trips to the nearby town daily by 2030.'*

Achievement of the 50% reduction in emissions relating to transport by 2030 would assist in the achievement of the Transport sectoral emission ceiling.

Making Family Farms More Sustainable – 25% Reduction in Emissions by 2030

'We will support farmers to continue to produce world class, safe and nutritious food while also seeking to diversify income through tillage, energy generation and forestry.

- *Significantly reduce our use of chemical nitrogen as a fertilizer.*
- *Increase uptake of protected urea on grassland farms to 90-100%.*
- *Increase organic farming to up to 450,000 hectares, the area of tillage to up to 400,000 ha.*
- *Expand the indigenous biomethane sector through anaerobic digestion, reaching up to 5.7TWh of biomethane.*
- *Contribute to delivery of the land use targets for afforestation and reduced management intensity of organic soils.'*

Achievement of a 25% reduction in emissions by 2030 in agriculture and farming practices would assist in the achievement of the Agriculture sectoral emission ceiling.

Greening Business and Enterprise – 35% Reduction in Emissions by 2030

'We're changing how we produce, consume, and design our goods and services by breaking the link between fossil fuels and economic progress. Decarbonising industry and enterprise are key to Ireland's economy and future competitiveness.

- *Reduce clinker content in cement and substitute products with lower carbon content for construction materials, ensuring 35% reduction in emissions by 2030 (against 2018).*
- *Reduce fossil fuel use from 64% of final consumption (2021) to 45% by 2025 and further by 2030.*
- *Increase total share of heating to carbon neutral to 50-55% by 2025, up to 70-75% by 2030.*
- *Significantly grow the circular economy and bioeconomy.'*

Achievement of a 35% reduction in emissions by 2030 in relation to Irish production and consumption would enable a more circular economy and assist in the achievement of the Industry and Other sectoral emission ceilings.

Changing our land use

'The first phase of the land use review will tell us how we are using our land now. Then, we can map, with evidence, how it can be used most effectively to capture and store carbon and to produce better, greener food and energy.

- *Increase our annual afforestation rates to 8,000 hectares per annum from 2023 onwards.*
- *Rethink our Forestry Programme and Vision.*
- *Promote forest management initiatives in both public and private forests to increase carbon sinks and stores.*
- *Improve carbon sequestration of 450,000 ha of grasslands on mineral soils and reduce the management intensity of grasslands on 80,000 ha of drained organic soils.*
- *Rehabilitate 77,600 hectares of peatlands.'*

By improving the manner in which Ireland utilises its land use, Ireland can achieve emission reductions and mitigate the ongoing climate and biodiversity crisis's. The LULUCF sectoral emission ceiling will be set after completion of the Land-use Strategy. Exact reduction target for this sector is yet to be determined.

Adaptation

CAP 2024 highlights the need for adaptation to climate change. Adaptation is the process of adjustment to actual or expected climate change and its effects. Observations show that Irelands climate is

changing in terms of coastline, sea level rise, seasonal temperatures, and changes in typical weather patterns. Climate change is expected to have diverse and wide-ranging impacts on Ireland's environment, society, and economic development, including managed and natural ecosystems, water resources, agriculture and food security, the built environment, human health, and coastal zones.

Climate Sectoral Adaptation Planning[21] includes for 12 sectoral adaptation plans that describe and assess the extent of the risks presented by climate change to a sector, and present contingency plans to address these risks and ensure climate resilience. They include actions to mainstream adaptation into policy and administration at sectoral level to improve the resilience of existing and planned critical infrastructure, systems, and procedures, to the effects and variability of climate change, as well as to improve cooperation and coherence within and across sectors, as well as on a local and national level.

11.3.2.7 Irelands Climate Change Assessment

In 2024 the EPA published Irelands Climate Change Assessment (ICCA).[22] This assessment provides a comprehensive overview and breakdown of the state of knowledge around key aspects of climate change with a focus on Ireland. The ICCA report is presented in four volumes.

- Volume 1: Climate Science – Ireland in a Changing World
- Volume 2: Achieving Climate Neutrality in 2050
- Volume 3: Being Prepared for Irelands Future
- Volume 4: Realising the Benefits of Transition and Transformation

The ICCA Synthesis Report states that, having peaked in 2001, Irelands greenhouse gas emissions have reduced in all sectors except agriculture. However, Ireland currently emits more greenhouse gases per person than the EU average. The report goes on to state that there has been an identified gap in policy that indicates that Ireland will not meet its statutory greenhouse gas emission targets. Already Ireland has seen significant and ongoing deterioration in environmental quality, including declines in water quality, biodiversity and ecosystem quality. Developing a climate-resilient Ireland will require sufficient public and private investment and financial support in ways that adequately recognise the value of ecosystem services and the importance of societal wellbeing.

There are well-established 'no-regret options' that need to happen now, which can get Ireland most of the way to net zero carbon dioxide emissions. Beyond that, there are 'future energy choices' relating to the scale and magnitude of technologies that will assist in achieving Ireland statutory climate targets. Ireland's no-regret options are demand reduction (e.g. through energy efficiency and reduced consumption), electrification (e.g. electric vehicles and heat pumps), deployment of market-ready renewables (e.g. wind energy and solar photovoltaics) and low-carbon heating options (e.g. district heating). Irelands future choices include hydrogen, carbon capture and storage, nuclear energy and electro-fuels.

Achieving net zero carbon dioxide emissions by 2050 requires significant and unprecedented changes to Ireland's energy system. Policies tailored to suit different stages of technology development are critical for achieving a net zero energy system. Established technologies, such as wind energy, solar photovoltaics and bioenergy, will be key in meeting short-term emission reduction targets (i.e. 2030), whereas offshore wind infrastructure is expected to be the backbone of future energy systems (i.e., 2050).

The ICCA serves as a stark warning: Ireland stands to face a myriad of challenges in efforts to mitigate and adapt to climate change at the almost halfway mark to 2030. Further decisive action is imperative to

[21] *Department of the Environment, Climate and Communications (2020) Sectoral Adaptation Planning.* https://www.gov.ie/en/collection/51df3-sectoral-adaptation-planning/
[22] *Environmental Protection Agency (2023) Irelands Climate Change Assessment.* https://www.epa.ie/our-services/monitoring--assessment/climate-change/irelands-climate-change-assessment-icca/

mitigate the escalating impacts of climate change on Irelands environment, economy, and society that are highlighted throughout the four volumes of the ICCA.

11.3.2.8 Greenhouse Gas Emissions Projections

In its approach to decarbonisation, the EU has split greenhouse gas emissions into two categories, the Emissions Trading System (ETS) and the non-ETS. Emissions from electricity generation and large industry in the ETS are subject to EU-wide targets which require that emissions from these sectors be reduced by 43% by 2030, relative to 2005 levels. Within the ETS, participants are required to purchase allowances for every tonne of emissions, with the amount of these allowances declining over time to ensure the required reduction of 43% in greenhouse gas emissions is achieved at EU-level[23].

Emissions from all other sectors, including agriculture, transport, buildings, and light industry are covered by the EU Effort Sharing Regulation (ESR[24]). This established binding annual greenhouse gas emission targets for Member States for the period 2021–2030. Ireland is required to reduce its emissions from these sectors by 30% by 2030, relative to 2005 levels. Under the EU Green Deal, the targets for the ETS and non-ETS sectors will be revised upwards in order to achieve the commitment, at EU level, to reach an economy-wide 2030 reduction in emissions of at least 55%, compared to 1990 levels.

The Environmental Protection Agency (EPA) publish Ireland's greenhouse gas emission projections and at the time of writing, the most recent report, *'Ireland's Greenhouse Gas Emissions Projections 2023-2050* was published in May 2023. The report includes an assessment of Ireland's progress towards achieving its emission reduction targets out to 2030 set under the ESR.

The EPA has produced two scenarios in preparing these greenhouse gas emissions projections: a "With Existing Measures" (WEM) scenario and a "With Additional Measures" (WAM) scenario. These scenarios forecast Irelands greenhouse gas emissions in different ways. The WEM scenario assumes that no additional policies and measures, beyond those already in place by the end of 2020. This is the cut off point for which the latest national greenhouse gas emission inventory data is available, known as the 'base year' for projections. The WAM scenario has a higher level of ambition and includes government policies and measures to reduce emissions such as those in Ireland's Climate Action Plan 2024 that are not yet implemented. As implementation of policies and measures occurs, they will be migrated into the WEM Scenario.

The EPA Emission Projections Update notes the following key trends:

- Ireland is not on track to meet the 51% emissions reduction target by 2030 (as compared to 2018 levels) based on most up to date EPA projections which include the majority of CAP 2024 measures
- The first two carbon budgets (2021-2030), which aim to support achievement of the 51% emissions reduction goal, are projected to be exceeded by a significant margin of between 17 and 27%.
- Sectoral emissions ceilings for 2025 and 2030 are projected to be exceeded in almost all cases, including Agriculture, Electricity, Industry and Transport.
    - Total emissions from the agriculture sector are projected to decrease by between 1 and 18% over the period 2022 to 2030
    - Transport emissions are projected to decrease by 5 to 26% over the period 2022-2030

[23] *Department of the Environment, Climate and Communications (2023) - Climate Action Plan 2024* https://www.gov.ie/en/publication/79659-climate-action-plan-2024/

[24] *Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance)*

- Emissions from the LULUCF sector have been revised significantly to reflect new science. Total emissions from the LULUCF sector are projected to increase over the period 2022 to 2030

- Emissions from the Energy Industries sector are projected to decrease by between 57 and 62% over the period 2022 to 2030
  - Renewable energy generation at the end of the decade is projected to range from 69 to 80% of electricity generation as a result of a projected rapid expansion in wind energy and other renewables
- Ireland will not meet its non-ETS EU targets of a 42% emissions reduction by 2030 in WAM even with both the ETS and LULUCF flexibilities.
- Emissions in the WEM Scenario are projected to be 29% lower in 2030 (compared with 2018) whereas in the WAM Scenario the emissions reduction is projected to be 11%
  - There has been no improvement in these figures since EPA projections published in 2023.

11.3.3 Local Greenhouse Gas Emission and Climate Targets

11.3.3.1 Clare County Council Local Authority Climate Action Plan 2024-2029

The *'Clare Local Authority Climate Action Plan 2024-2029*[25] (Clare LACAP) was adopted in February 2024 and published in March of the same year.

The Clare LACAP highlights the current state of climate action in Ireland, and how Clare County Council intends to deliver and enable climate action for a just transition to a low carbon and climate resilient future within County Clare. The Clare LACAP forms part of longer-term effort that requires a sustained and planned response to support the delivery of the climate neutrality objective at local and community levels. It will provide a mechanism for bringing together both adaptation and mitigation actions to help drive positive climate action and outcomes across the local authority and its administrative area.

Overall, the greenhouse gas emissions generated from County Clare equated to 1,905,730 tCO2eq in the baseline year, 2018. The top three emitting sectors within County Clare in terms of total greenhouse gas emissions in the baseline year were agriculture, transport and residential, producing 45%, 20%, and 16% of total emissions respectively. The commercial and industrial sector was the fourth largest emitter in 2018, representing 15% of emissions for County Clare. Clare County Council, along with all public sector entities must reduce greenhouse gas emissions by 51% by 2030 as compared to 2018 in line with the National Climate Action Plan 2024 (Section 11.3.2.6).

The Clare LACAP assesses climate risk relevant to Ireland and to County Clare, this, plus the evidence baseline, inform the climate objectives and actions that will be undertaken by Clare County Council to assist in the achievement of national and international climate targets.

The Clare County Development Plan 2023-2029[26] (CCDP) sets out the overall strategy for the proper planning and sustainable development of the County over a 6-year period. The CCDP includes numerous actions and objectives on sustainability and climate for Clare to achieve over the 6-year period. The CCDP further includes a Renewable Energy Strategy[27] and a Wind Energy Strategy[28] for the County.

[25] *Clare Local Authority Climate Action Plan 2024-2029.* <https://clarecococlimateactionplan.ie>
[26] *Clare County Council (2023) Clare County Development Plan 2023-2029* <https://clarecdp2023-2029.clarecoco.ie/stage3-amendments/adoption/>
[27] *Clare County Council (2023) Volume 5 Clare Renewable Energy Strategy* <https://clarecdp2023-2029.clarecoco.ie/stage3-amendments/adoption/volume-5-clare-renewable-strategy-clare-county-development-plan-2023-2029-51389.pdf>
[28] *Clare County Council (2023) Volume 6 Wind Energy Strategy* <https://clarecdp2023-2029.clarecoco.ie/stage3-amendments/adoption/volume-6-clare-wind-energy-strategy-clare-county-development-plan-2023-2029-51390.pdf>

11.4 Climate and Weather in the Existing Environment

Climate change projections show that the Earth is getting warmer and extreme weather events are increasing in frequency on an annual basis. The Proposed Wind Farm will assist in mitigating these effects through the deployment of clean renewable energy to the national grid and subsequent decarbonisation of energy systems. Changes to climate and weather in Ireland will occur as a result of climate change, details of the Proposed Projects susceptibility to climate change are provided in EIAR Chapters 5 through 16. For detailed analysis on the risks associated with the Proposed Project please refer to Chapter 16 Major Accidents and Natural Disasters.

Ireland has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Shannon Airport is the nearest weather and climate monitoring station to the Proposed Wind Farm that has meteorological data recorded for the 30-year period from 1991-2020. The monitoring station was located approximately 27km southwest of the Proposed Wind Farm. Meteorological data recorded at Shannon Airport over the 30-year period from 1991-2020 is shown in Table 11-5. The wettest months are November and December, with April and May being the driest. July is the warmest month with an average temperature of 16° Celsius.

Recent monthly meteorological data recorded at Shannon Airport, Co Clare, located approximately 27km southwest of the Proposed Wind Farm, from January 2021 to January 2024 is available at: https://www.met.ie/climate/available-data/monthly-data. July 2023 was the wettest month in this time period, with 155mm of rainfall recorded, while April 2021 was the driest month with 15.4mm of rainfall. July 2021 was the warmest month in this time period, with a mean monthly temperature of 17.8° Celsius. January 2021 and December 2022 were the coldest months in this time period with a mean monthly temperature of 4.5° Celsius.

Table 11-5 Data from Met Éireann Weather Station at Shannon Airport from 1991-2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
Mean daily max	8.9	9.4	10.9	13.4	16	18.3	19.5	19.1	17.5	14.2	11.1	9.2	14
Mean daily min	3.3	3.3	4	5.8	8.1	10.8	12.6	12.4	10.7	8.1	5.5	3.7	7.4
Mean temperature	6.1	6.3	7.5	9.6	12	14.5	16	15.8	14.1	11.2	8.3	6.4	10.7
Absolute max.	14.7	15.5	19.6	23	27.8	32	30.2	29.2	25.6	21.9	17.2	15.4	32
Absolute min.	-11.2	-5.1	-5.8	-2.9	0.1	3.1	6.2	4.4	1.7	-2.3	-6.6	-11.4	-11.4
Mean num. of days with air frost	5.2	4.6	3.2	0.6	0	0	0	0	0	0.4	1.9	4.4	20.3
Mean num. of days with ground frost	13	11.8	11.9	7.7	2.9	0.2	0	0	0.8	3.3	8	11.3	70.9
RELATIVE HUMIDITY (%)													
Mean at 0900UTC	87.8	87.9	85	79.3	76.2	76.6	80	82.3	85.1	87.4	89.9	88.9	83.9
Mean at 1500UTC	81.2	75.4	69.8	64.1	63.5	64.6	69.3	69.1	70	75	81	83.5	72.2
SUNSHINE (Hours)													
Mean daily duration	1.7	2.4	3.6	5.4	5.9	5.5	4.4	4.6	3.9	3	2.1	1.5	3.7
Greatest daily duration	8.1	10.2	11.5	13.6	15.6	15.8	15.7	14.4	12.2	10.1	8.3	7.1	15.8
Mean num. of days with no sun	9.1	5.9	5.3	2.3	1.9	1.8	2.1	2.1	2.6	5.1	7.7	10.1	56
RAINFALL (mm)													
Mean monthly total	103.8	86.7	75.8	62.3	63.1	69.6	75.8	87.6	77.4	95.5	106.6	115.4	1019.7
Greatest daily total	38.2	33.8	34.8	40.2	25	45.3	39.5	51	52.3	36.9	29.4	33.5	52.3
Mean num. of days with >= 0.2mm	21.3	18.3	18	16.2	16.2	15.5	18.3	19	17.7	19.9	21.6	21	223
Mean num. of days with >= 1.0mm	16.9	13.9	13.4	11.4	12.1	11.3	13.5	13.7	12.9	15.4	16.8	17.2	168.5
Mean num. of days with >= 5.0mm	7.8	5.8	5.5	4.7	4.6	4.8	4.9	5.8	4.8	7	8	8.5	72.2
WIND (knots)													
Mean monthly speed	10	10.1	9.6	9.2	9	8.5	8.4	8.3	8.4	8.9	9.1	9.7	9.1
Max. gust	75	86	63	66	52	51	52	61	58	66	69	83	86
Max. mean 10-minute speed	47	61	44	45	37	37	38	44	44	47	50	57	61
Mean num. of days with gales	2.1	1.2	1.4	0.5	0.5	0.1	0	0.1	0.6	0.9	1	1.5	9.8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
WEATHER (Mean No. of Days With:)													
Snow or sleet	1.5	1.8	1.2	0.3	0	0	0	0	0	0	0.1	1	5.9
Snow lying at 0900UTC	0.2	0	0.1	0	0	0	0	0	0	0	0	0.1	0.5
Hail	3.1	3.4	2.8	2	0.7	0	0	0.1	0.1	0.5	1	2.3	16
Thunder	0.9	0.4	0.3	0.3	0.5	0.4	0.7	0.5	0.2	0.3	0.3	0.4	5.2
Fog	3.4	2.2	2.4	1.8	1.3	1	0.9	1.6	2.8	3.1	4	3.8	28.3

11.5 Calculating Carbon Losses and Savings from the Proposed Project

11.5.1 Background

In addition to the combustion of fossil fuels, greenhouse gases are also released through natural processes such as the decomposition of organic material (which is composed of carbon). Bogs and peatlands are known to store large amounts of carbon. Due to the waterlogged nature of these habitats, stored carbon is not broken down and released into the atmosphere. The construction of wind farms on bog and peat habitats may affect the natural hydrological regime, thus exposing and drying out the peat and allowing the decomposition of carbon. It is therefore necessary to demonstrate that any wind farm constructed on such sites saves more carbon than is released. The Proposed Wind Farm is situated on agricultural land and peatland, covered by coniferous forestry and smaller areas of transitional woodland scrub. For this reason, the carbon balance between the use of renewable energy and the loss of carbon stored in the peat will be assessed in this section of the EIAR. Note, in line with the Forest Service's published policy[29] on granting felling licences for wind farm developments, areas cleared of forestry for access roads, and any other wind farm-related uses will be replaced by replanting at an alternative site or sites. The Forest Service policy requires replacement or replanting on a hectare for hectare basis for the footprint of the infrastructure developments.

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. Peatland habitats have a significant capacity to store organic carbon. The vegetation on a peat bog slowly absorbs CO_2 from the atmosphere when it is alive and converts it to organic carbon. When the 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 ground.

The carbon balance of 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 impacts and loss of peat in the area of the development footprint. There may also be indirect impacts where it is necessary to install drainage in certain areas to facilitate construction, or from the reinstatement of extracted peat. The works can either directly or indirectly allow the peat to dry out, locally, 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.

11.5.2 Methodology for Calculating Losses

A methodology was published in June 2008 by scientists at the University of Aberdeen and the Macauley Institute with support from the Rural and Environment Research and Analysis Directorate of the Scottish Government, Science Policy and Co-ordination Division. The document, '*Calculating Carbon Savings from Wind Farms on Scottish Peat Lands*', was developed to calculate the impact of wind farm developments on the soil carbon stocks held in peat. This methodology was refined and updated in 2011 based on feedback from users of the initial methodology and further research in the area. The web-based version of the carbon calculator, which supersedes the excel based versions of the tool, was released in 2016 and is currently available as Version 1.8.1 which was last updated in December 2023. The tool provides a transparent and easy to follow method for estimating the impacts of wind farms on the carbon dynamics of peatlands. Previously guidance produced by Scottish Natural

[29] *Department of Agriculture, Food, and the Marine, Tree Felling and Reforestation Policy* <https://www.gov.ie/en/publication/19b8d-tree-felling-licences/>

Heritage in 2003 had been widely employed to determine carbon payback in the absence of any more detailed methods.

Although the loss of carbon fixing potential from plants on peat land is not substantial, it is nonetheless calculated for areas from which peat is removed and the areas affected by drainage. This calculation can take account of the annual gains due to the carbon fixing potential of the peat land and the time required for any habitat restoration. The carbon sequestered in the peat itself represents a much more substantial potential source of carbon loss. During wind farm construction, carbon is lost as a result of peat excavation and peat drainage. The amount of carbon lost is estimated using default values from the IPCC (IPCC, 1997) as well as by more site-specific equations derived from the scientific literature and updated emission factors. Carbon gains due to habitat improvement and site restoration are calculated in a similar fashion.

Peatlands are essentially unbalanced systems. When flooded, peat soils emit less carbon dioxide but more methane than when drained. In waterlogged soils, carbon dioxide emissions are usually exceeded by plant fixation, so the net exchange of carbon with the atmosphere is negative and soil carbon stocks increase. When soils are aerated, carbon emissions usually exceed plant fixation, so the net exchange of carbon with the atmosphere is positive. In order to calculate the carbon emissions resulting from the removal or drainage of the peat, the Macauley Institute method accounts for emissions occurring if the peat had been left in-situ and subtracts these from the emissions occurring after removal and drainage.

The Macauley Institute methodology states that the total volume of peat impacted by the construction of a wind farm is strongly correlated to the extent of the peatland affected by drainage at the site.

The drainage of peat soils leads to continual loss of soil carbon until a new steady state is reached, when inputs are approximately equal to losses. For peats, this steady state approximates 0% carbon, so 100% carbon loss from drained peats is assumed if the site is not restored after decommissioning of the wind farm. The amount of carbon lost is calculated on the basis of the annual emissions of methane and carbon dioxide, the area of drained peat, and the time until the site is restored. In the case of the Proposed Project, the model has been prepared on the basis that restoration will not occur upon decommissioning of the Proposed Wind Farm (i.e., site roads and hardstands will be left in situ). Please refer to Section 4.10 of Chapter 4 of this EIAR or the Decommissioning Plan which is available at Appendix 4-7 to this EIAR.

The effects of drainage may also reduce dissolved and particulate organic carbon retention within the peat. Losses of carbon dioxide due to leaching of dissolved and particulate organic carbon are calculated as a proportion of the gaseous losses of carbon from the peat. The Macauley Institute method assumes that published good practice is employed in relation to avoiding the risk of peat landslides. As detailed in Section 8.3.8 in Chapter 8 of this EIAR: Land Soils and Geology, the Proposed Project has been the subject of a peat stability risk assessment; further details are contained within Appendix 8-1 of this EIAR.

Clear-felling of existing forestry surrounding turbine locations is necessary to allow for the construction of the Proposed Wind Farm, and to protect local bat populations. Forestry may be felled earlier than originally planned due to the construction schedule of the Proposed Wind Farm, so limiting the nature and longevity of the resulting timber produced. If a forestry plantation was due to be felled with no plan to replant, the effect of the land use change is not attributable to the wind farm development and is omitted from the calculation. If, however, the forestry is felled for the development, as is the case for the Proposed Project, the effects are judged to be attributable to the wind farm development. Carbon losses as a result of felling are calculated from the area to be felled the average carbon sequestered annually, and the lifetime of the wind farm. Alterations in soil carbon levels following felling are calculated using the equations for drainage and site restoration already described.

The outputs of the Macauley Institute web-based carbon calculator are included in Appendix 11-1 of this EIAR, '*Carbon Calculations'.*

In addition to the Macauley Institute methodology described above, where possible, carbon emissions or losses associated with embodied carbon of materials used in the construction, operational and decommissioning phase of the Proposed Project have been identified. Embodied carbon refers to the emissions associated with procuring, mining, and harvesting raw materials, the transformation of those materials into construction products, transporting them to the site, installation of these materials during a construction phase, and the subsequent replacement, removal, and disposal of these materials upon decommissioning.[30]

The full life cycle and embodied carbon of the Proposed Wind Farm turbines have been taken account of in the Macauley Institute model. The emissions associated with the embodied carbon, along with the construction phase transport movements, of the remaining features of the site are considered using the Transport Infrastructure Ireland (TII) Carbon Tool (TII 2022)[31]. The TII Carbon Tool is customised for road and light rail projects in Ireland, using emission factors from recognised sources during the construction, maintenance and operation of TII projects in Ireland.

Section 15.1 in Chapter 15 of this EIAR outlines traffic generation numbers relative to quantum of materials required for the construction of the Proposed Project, the details of which have been utilised to determine the emissions associated with these activities and are included in Appendix 11-1.

11.5.3 Carbon Losses and Savings Calculations

11.5.3.1 Carbon Losses

The Scottish Government online carbon calculator was used to assess the impacts of the Proposed Project in terms of potential carbon losses taking into account peat removal and reinstatement, drainage, habitat improvement, forestry felling and site restoration. The online 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. However, due to the availability of Irish specific carbon intensity emission factors for the Irish electricity generation plant, the CO_2 emissions savings from the Proposed Project have been calculated separately from the online carbon calculator as set out in Section 11.5.3.2 below.

In relation to embodied carbon and associated transport movements of all other ancillary elements of the Proposed Project, the TII Carbon Tool has been utilised to assess the impacts of the Proposed Project in terms of potential carbon losses relating to construction phase transport emissions and embodied carbon.

A copy of the outputs is provided as Appendix 11-1 of this EIAR, *'Carbon Calculations'*. Where available and relevant, site-specific information was inserted into the online carbon calculators. Otherwise, default values were used.

The main CO_2 losses due to the Proposed Project are summarised in Table 11-6.

[30] *Irish green Building Council – What is embodied carbon?* <https://www.igbc.ie/what-is-embodied-carbon/>
[31] *Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document* https://www.tiipublications.ie/library/GE-ENV-01106-01.pdf

Table 11-6 CO_2 Losses from the Proposed Project

Origin of Losses	CO_2 Losses (tonnes CO_2 equivalent)	
	Expected	Maximum
Losses due to turbine life (e.g., manufacture, construction, decommissioning)	30,894	40,548
Losses due to backup	30,030	30,485
Losses from reduced carbon fixing potential	909	1,540
Losses from soil organic matter and due to leaching of dissolved and particulate organic carbon (CO_2 loss from removed and drained peat)	1,446	10,136
Losses associated to forestry felling	6,376	6,600
Losses associated with embodied carbon in construction materials	3,450	3,450
Losses associated with traffic and transport movements	40	40
Total	82,145	92,799

The worksheet models and online tools calculate that the Proposed Project will give rise to 82,145 tonnes of CO_2 equivalent losses over its 35-year life. Of this total figure, the Proposed Wind Farm turbines directly account for 30,894 tonnes, or 49%. Losses due to backup account for 30,030 tonnes, or 37%. Losses from reduced carbon fixing potential accounts for 1% or 909 tonnes. Losses from soil organic matter, i.e., CO_2 loss from removed and drained peat, will equate to 1,446 tonnes, or 2%. Losses due to forestry felling account for 6,376 tonnes or 8%. Losses due to embodied carbon accounts for 3,450 tonnes or 4%, and losses due to construction phase transport emissions accounts for 0.05% or 40 tonnes.

The figure of 909 tonnes of CO_2 arising from ground activities associated with the Proposed Project is calculated based on the entire Proposed Project development footprint being "Acid Bog", as this is one of only two choices the model allows (the other being Fen). The habitat that will be impacted by the development footprint comprises agricultural land, coniferous forestry and smaller areas of peat bogs and heathland rather than the acid bog assumed by the model that gives rise to the 909 tonnes and therefore the actual CO_2 losses are expected to be lower than this value.

The values discussed above are based on the assumption that no habitat enhancement or afforestation activities will take place as part of the Proposed Project. As detailed in Section 4.4.4.1 of this EIAR, the estimated 13.8ha of forestry that will be permanently felled for the footprint of the Proposed Project infrastructure will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that will be issued in respect of the Proposed Project. Similarly, as detailed in Appendix 6-4, a Biodiversity Enhancement and Management Plan (BEMP) for the Proposed Wind Farm has identified enhancement activities such as planting of hedgerow and woodland, and protected fauna habitat enhancement. Taking into account the afforestation and habitat enhancement that will take place, the actual CO_2 losses for forestry felling and reduced carbon fixing potential are expected to be lower than the values detailed in Table 11-6, over the lifetime of the project.

The figure of 3,450 tonnes of CO_2 arising from the embodied carbon of construction materials associated with the Proposed Project is calculated based the types of materials available in the TII Carbon tool such as, concrete, steel, cement and granular fill, and assumes that each HGV or LGV will be carrying material at its full capacity. The figure of 40 tonnes of CO_2 arising from transport movements associated with construction activities of the Proposed Project is calculated based on the assumption that material will be imported locally or from a port/city location where applicable. Details on the assumptions made for the modelling of embodied carbon and construction phase transport emissions are included in Appendix 11-1.

The values discussed above are based on the assumption that the hydrology of the Proposed Project and habitats within the site are not restored on decommissioning of the Proposed Wind Farm site after its expected 35-year proposed operational life. As detailed in the Decommissioning Plan, Appendix 4-7, the wind turbines and met mast will be dismantled and removed offsite. It is not intended to remove the concrete foundations from the ground as it is considered that its removal will be the least preferred option in terms of having potential effects on the environment. The associated foundations will be reinstated and revegetated with an appropriate seed mix and the resumption of natural drainage processes. The electrical and fibre optic cabling that connects each turbine to the proposed onsite 38kV substation will be removed from the cable ducting. it is proposed that the cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance for an underground element that is not visible with no environmental impact associated with leaving the ducting in-situ. Taking into account the proposals incorporated in the Decommissioning Plan, the actual CO_2 losses are expected to be lower than the values detailed in Table 11-6.

11.5.3.2 Carbon Savings

According to the model described above, the Proposed Project will give rise to total losses of 82,145 tonnes of carbon dioxide.

A simple formula can be 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 rated capacity of the wind energy development in MW

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

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 Proposed Wind Farm is assumed to be 46.2MW (based on 7 No. 6.6MW turbines).

A load factor of 0.35 (or 35%) has been used for the Proposed Project.[32]

[32] *EirGrid, 2022 Enduring Connection Policy 2.3 Constraints Report for Solar and Wind* <https://cms.eirgrid.ie/sites/default/files/publications/ECP-2.3-Solar-and-Wind-Constraints-Report-Results-for-Area-D-v1.0.pdf>
The Proposed Project is located within the D wind region for Ireland with an associated capacity factor of 35%.

The number of hours in a year is 8,760.

A conservative figure for the carbon load of electricity generated by natural gas in Ireland was sourced from Sustainable Energy Authority Ireland's (SEAI) Conversion and Emissions Factors for Publication worksheet.[33] The emission factor for electricity generated in Ireland in 2023 was 229.9 gCO_2/kWh.[34]

The calculation for carbon savings is therefore as follows:

$$CO_2 \text{ (in tonnes)} = \frac{(46.2 \times 0.35 \times 8{,}760 \times 229.9)}{1000}$$

$$= 32{,}565 \text{ tonnes per annum}$$

Based on this calculation, **32,565** tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Proposed Wind Farm. Over the proposed 35-year lifetime of the development, therefore **1,139,775** tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.

Based on the Scottish Government carbon calculator as presented above in Section 11.5.3.1, 82,145 tonnes of CO_2 will be lost to the atmosphere due to changes in the soil and ground conditions and due to the construction and operation of the Proposed Project. This represents **7%** of the total amount of carbon dioxide emissions that will be offset by the Proposed Wind Farm. The 82,145 tonnes of CO_2 that will be lost to the atmosphere due to changes in soil and ground conditions and due to the construction and operation of the Proposed Project will be offset by the Proposed Wind Farm in approximately **30** months of operation.

As detailed in Section 11.5.3.1 above, habitat enhancement and afforestation activities will take place as part of the Proposed Project. As detailed in Section 4.4.4.1 of this EIAR, the estimated 13.8ha of forestry that will be permanently felled for the footprint of the Proposed Project infrastructure will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that will be issued in respect of the Proposed Project. Similarly, as detailed in Appendix 6-4, a BEMP for the Proposed Project has identified enhancement activities such as planting of hedgerow and woodland, and protected fauna habitat enhancement. These activities, over the lifetime of the Proposed Project have the potential to give rise to carbon savings.

11.6 Likely Significant Effects and Associated Mitigation Measures

11.6.1 'Do-Nothing' Effect

If the Proposed Project were not to proceed, the opportunity to further significantly reduce emissions of greenhouse gas emissions, including carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide (SO_2) from fossil fuels to the atmosphere would be lost. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol, the Paris Agreement, and EU law would also be lost. This would be a long-term slight negative effect.

[33] *Conversion and Emission Factors for Publication (2023)* https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/SEAI-conversion-and-emission-factors.xlsx

[34] *SEAI have published the provisional 2023 emission factor for electricity generation in Ireland as 229.9 gCO2/kWh. Please note that this is a provisional value that may change.*

11.6.2 Construction Phase

11.6.2.1 Greenhouse Gas Emissions

Proposed Project

The construction of Proposed Wind Farm infrastructure including turbines, and site roads, and the Proposed Grid Connection Route infrastructure (as outlined in Chapter 4 of this EIAR) will require the removal and reinstatement of peat habitat, tree felling, construction materials (such as cement), and the operation of vehicles and plant at the Proposed Project. Greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with the removal and reinstatement of peat habitat, tree felling and planting, production of construction materials, and operation of vehicles and plant will arise as a result of the construction activities. This impact will be short-term and slight only, given the quantity of greenhouse gases that will be emitted to the atmosphere, and will be restricted to the duration of the construction phase. Mitigation measures to reduce this effect are presented below.

Some potential long-term slight negative effects will occur due to the removal of carbon fixing vegetation and habitat, however, as detailed in Section 3.2.6 of Chapter 3 of this EIAR, this has been avoided where possible by the design and layout of the Proposed Project, which has ensured the utilisation of as much of the existing roads within the site as possible to gain access to the proposed turbine locations and minimise the construction of additional roads. This impact will be long-term and slight only, given the quantity of greenhouse gases that will be emitted to the atmosphere.

Transport to and from the Proposed Project

The transport of turbines and construction materials to the site, which will occur on specified routes only (see Section 4.5 in Chapter 4 of this EIAR), will also give rise to greenhouse gas emissions associated with the transport vehicles and exhaust emissions. This impact will be short-term and slight only, given the quantity of greenhouse gases that will be emitted, and will be restricted to the duration of the construction phase. Mitigation measures to reduce this effect are presented below.

Waste

Construction waste will arise from the Proposed Project, mainly from excavation and unavoidable construction waste including material surpluses, damaged materials and packaging waste. This potential impact will be short-term and slight only, given the quantity of greenhouse gases associated with the generation and management of these waste streams that will be emitted to the atmosphere, and will be restricted to the duration of the construction phase. Waste management will be carried out in accordance with *Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects* (2021) produced by the EPA.

Please refer to Section 4.4.5.6 of Chapter 4 of this EIAR and Section 3.9 of the Construction and Environmental Management Plan (CEMP, Appendix 4-3) for detailed processes on waste management during the construction phase of the Proposed Project.

Mitigation

- Construction staff will be trained how to inspect and maintain construction vehicles and plant to ensure good operational order while onsite, thereby minimising any emissions that arise. The Site Supervisor/Construction Manager produce and follow a site inspection and machinery checklist which will be followed and updated if/when required.

- All plant and materials vehicles shall be stored in dedicated areas (onsite). Machinery will be switched off when not in use.
- Turbines and construction materials will be transported to the site on specified routes only, unless otherwise agreed with the Planning Authority. Please see Chapter 15 Material Assets for details.
- Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction.
- The expected waste volumes generated onsite are unlikely to be large enough to warrant source segregation at the site. Therefore, all wastes streams generated onsite will be deposited into a single waste skip which will be covered.
    - This waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.
    - The MRF will be local to the Proposed Project to reduce the emissions associated with vehicle movements; the closest MRF is the Scariff recycling centre and transfer station in Fossa Beg, County Clare, located approximately 22.1km north of the Proposed Wind Farm site
- A CEMP will be in place throughout the construction phase (see Appendix 4-3).
- Aggregate materials for the construction of the Proposed Project will be obtained from the onsite borrow pit. This will reduce journey distances of the delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements.
- Where applicable, low carbon intensive construction materials will be sourced and utilised onsite.

Residual Effects

Following implementation of the mitigation measures above, residual effects of greenhouse gas emissions arising from the construction phase of the Proposed Project will have a short-term imperceptible negative effect. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate.

When considering these greenhouse gas emissions within the context of the national Electricity Sector Emissions Ceilings detailed in Section 11.3.2.5, Carbon Budget 1 (2021-2025) has an Electricity Sector budget of 40 MtCO2eq. and Carbon Budget 2 (2026-2030) has an Electricity Sector budget of 20 MtCO2eq for large-scale deployment of renewables. As detailed in Section 11.5.3.2, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Wind Farm. Therefore, while there will be greenhouse gas emissions associated with the construction of the Proposed Project, this will take place under the Electricity sector emissions ceiling and will be offset by the operation of the Proposed Wind Farm within its operational life.

Significance of Effects

Based on the assessment above there will be no significant effects.

11.6.3 Operational Phase

11.6.3.1 Greenhouse Gas Emissions

Proposed Project

The Proposed Project will generate energy from a renewable source. As detailed in Section 11.5.3.2 above, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Project. For the purposes of this EIAR, a rated output of 6.6MW per turbine has been chosen to calculate the anticipated power output of the Proposed Project, which would result in an estimated output of 46.2MW, displacing approximately 32,565 tonnes of carbon dioxide per annum from traditional carbon-based electricity generation. This will have a long-term significant positive impact on climate.

Some potential long-term slight negative impacts that may occur during the operational phase of the Proposed Project are the release of carbon dioxide to the atmosphere due to maintenance and monitoring activities and the removal of carbon fixing vegetation and habitat, as well as peat reinstatement and associated drainage.

Transport to and from the Proposed Project

In the unlikely event that a turbine blade is damaged and must be replaced during the operational phase, the impacts described in Section 11.6.2.1 will be the same. Emissions resulting from routine maintenance at Proposed Wind Farm site are included in the section above.

Waste

Waste is not proposed to be generated on the site during the operational phase, any waste that does arise will be minimal and any impact will be short-term and imperceptible. Waste management will be carried out in accordance with '*Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects'* (2021) produced by the EPA.

Mitigation

- Ensure that all maintenance and monitoring vehicles will be maintained in good operational order while onsite, and, when stationary, be required to turn off engines thereby minimising any emissions that arise.
- As detailed in Appendix 6-4, a Biodiversity Enhancement and Management Plan (BEMP) for the Proposed Wind Farm has identified enhancement activities such as planting of hedgerow and woodland (approx. 890m of new native broadleaved treelines, approx. 1,240m of new native hedgerow and enhancement of approx. 550m of treelines and 530m of hedgerows via supplementary planting), peatland enhancement and restoration, and protected fauna habitat enhancement including badger, common frog, and otter.
- Afforestation of the 13.8ha of forestry being felled for the Proposed Project will be completed as per the Forest Service's policy on granting felling licenses for wind farm development (Section 4.4.4.1 of Chapter 4 of this EIAR)

Residual Effect

Following implementation of the BEMP outlined above, the loss of carbon fixing vegetation and in particular peat habitat over the lifetime of the Proposed Project will be partially offset by the BEMP and afforestation of 13.8ha of forestry and using the precautionary principle, will have a potential long-term

imperceptible negative effect on Climate. However, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Project. Therefore, while there will be greenhouse gas emissions associated with the operation of the Proposed Project, this will be offset by the operation of the Proposed Project within the 35-year operational life.

Long-term Moderate Positive Effect on Climate as a result of reduced greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant effects.

11.6.4 Decommissioning Phase

The wind turbines proposed as part of the Proposed Project are expected to have a lifespan of approximately 35 years. Following the end of the operational life of the Proposed Wind Farm, the wind turbines may be retained and the operational life extended or replaced with a new set of turbines, subject to planning permission being obtained. In the event that neither of the above options are implemented, the Proposed Project will be decommissioned fully as agreed with the Planning Authority. The proposed onsite 38kV substation and Proposed Grid Connection Route will remain in place as it will be under the ownership of the ESB and EirGrid and will form a permanent part of the national electricity grid. The battery energy storage system will remain in place.

The works required during the decommissioning phase are described in Section 4.10 in Chapter 4: Description of the Proposed Project. Any impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential impacts.

A Decommissioning Plan is included as Appendix 4-7 of this EIAR, the detail of which will be agreed with the local authority prior to any decommissioning. The potential for effects during the decommissioning phase of the Proposed Project has been fully assessed in the EIAR.

11.7 Cumulative Assessment

Potential cumulative effects on climate between the Proposed Project and other permitted or proposed projects and plans in the area, (wind energy or otherwise), as set out in Section 2.9 in Chapter 2 of this EIAR, were also considered as part of this assessment. The developments considered as part of the cumulative effect assessment are described in Section 2.9 of this EIAR, with relevant developments within 1km of the red line planning application boundary presented below in Table 11-7 below. Forestry operations in the townlands of Kilbane, Killeagy (Ryan), Shannaknock, Killeagy (Stritch), Killeagy (Goonan), Magherareagh, Lackareagh Beg and Ballymoloney in Co. Clare have also been considered as part of this cumulative assessment.

Table 11-7 Developments with the potential to cause cumulative effects on Climate alongside the Proposed Project.

Planning Ref.	Description	Decision
317227	Development of a wind farm together with the development of an underground grid connection cable to the national grid. The development will consist of 8 wind turbines, a permanent meteorological mast, an onsite 38kV electrical substation, and all associated site works. An Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) have been submitted with the application	Grant Permissions with Conditions

Planning Ref.	Description	Decision
318505	Proposed construction of a 110kV underground grid connection cable connecting the permitted Carrownagowan windfarm to the existing 110kV substation at Ardnacrusha.	Case is due to be decided by 23/05/2024
318846	The erection of a temporary 100m high lattice type meteorological mast for a period of 5 years which also includes a hardstanding area and all ancillary works.	Case is due to be decided by 20/05/2024

In addition to the Proposed Project, the following permitted and proposed developments are acknowledged to have permitted or proposed grid connection underground cabling routes connecting to the Ardnacrusha 110kV substation:

- Proposed Knockshanvo Wind Farm
- Permitted Carrownagowan Wind Farm
  - Proposed construction of a 110kV underground grid connection cable connecting the permitted Carrownagowan Wind Farm to the existing 110kV substation at Ardnacrusha (Pl Ref. VA03.318505)
- Permitted Fahy Beg Wind Farm

11.7.1 Construction Phase

During the construction phase of the Proposed Project and other permitted or proposed projects and plans in the area as set out in Section 2.9 in Chapter 2 of this EIAR, that are yet to be constructed, there will be greenhouse gas emissions arising from production of construction materials (such as cement), and the operation of construction vehicles and plant. These will be restricted to the duration of the construction phase, and as such will give rise to emission over a short-term duration. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate.

11.7.2 Operational Phase

The nature of the Proposed Project is such that, once operational, it will have a long-term, moderate, positive impact on climate. However, as noted above, the Proposed Wind Farm will offset the **82,145** tonnes of CO_2 associated with the construction and operational phase that will be lost to the atmosphere (Section 11.5.3.1) in approximately **30** months of operation.

When considering these construction and operational phase greenhouse gas emissions within the context of the Electricity Sector Emissions Ceilings detailed in Section 11.3.2.5, Carbon Budget 1 (2021-2025) has an Electricity Sector budget of 40 MtCO2eq. and Carbon Budget 2 (2026-2030) has an Electricity Sector budget of 20 MtCO2eq for large-scale deployment of renewables. As detailed in Section 11.5.3.2, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Project. Therefore, while there will be greenhouse gas emissions associated with the construction of the Proposed Project, this will take place under the Electricity sector emissions ceiling and will be offset by the operation of the Proposed Project within its operational life. Thus, there will be no cumulative effects arising on climate from the Proposed Project and other permitted or proposed projects and plans in the area as set out in Section 2.9 in Chapter 2 of this EIAR.

11.7.3 Decommissioning Phase

The works required during the decommissioning phase are described in Section 4.10 in Chapter 4: Description of the Proposed Project. Any cumulative impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential cumulative effects.