# 9 Climate

## 9.1 Introduction

This chapter presents an assessment of the impact of the proposed Ringaskiddy Resource Recovery Centre on climate. Climate represents long term weather patterns and considers environmental aspects such as climate change resulting from greenhouse gas emissions. Potential emissions of greenhouse gases that can contribute to climate change include carbon dioxide ($CO_2$) and nitrous oxide ($N_2O$). This chapter considers the balance between the avoidance of emissions that would otherwise be produced in the generation of electricity from fossil fuel-based power stations that is displaced by electricity produced by the proposed facility and emissions of greenhouse gases from the facility.

The Resource Recovery Centre will have a furnace and flue gas cleaning line. The ash hall, ash handling areas and ash silos will be located in the building at the south side. The boiler feed water treatment equipment, boiler feed water tank, transformers and high voltage switch room will also be located in the building. The line will have a moving grate furnace with a state-of-the-art flue gas cleaning system.

In the facility, heat will be recovered and converted to electricity, thereby contributing to a reduction in the consumption of fossil fuels and hence a reduction of $CO_2$ emissions. A quantity of waste residual materials will be produced during operation of the facility, which will require disposal. This waste includes flue gas cleaning residues, boiler ash and bottom ash, refer to **Section 4.13.2** of **Chapter 4** ***Description of the Proposed Project*** *and* **Section 15.5.8** in **Chapter 15** ***Material Assets*** for further detail.

## 9.2 Methodology

Predictions of greenhouse gas emissions from the proposed resource recovery centre were prepared using the emission factors derived from the European Commission [(1),] UK DEFRA [(2,3)], IPCC [(4)], using the latest national waste statistics from the EPA[(5,6)] and from information supplied by Indaver.

The waste-to-energy process would be expected to be the dominant source of $CO_2$ and $N_2O$ emissions from the proposed development. Detailed waste throughput information was obtained from Indaver and this information was used to estimate Greenhouse Gas (GHG) emissions.

In order to calculate the proposed facility's net contribution to greenhouse gas emissions and the effect of the proposed development on Ireland's obligations under the EU 2020 strategy on climate change [(7)], the total forecasted anthropogenic ('man-made') emissions due to the proposed development have been calculated. During the incineration of waste at the facility the thermal energy generated will be recovered and converted into electrical output. The electrical energy generated (21 $MW_e$), minus the plants electrical demand (2.5 $MW_e$), will be available to the National Grid.

The renewable energy when exported to the National Grid will be used to displace energy currently generated via fossil fuels.

In 2017, the primary energy mix within the national generation system was gas (51%), coal (18%), renewables and waste (20%), peat (10%), fuel oil (1%) and others [8]. The energy mix represents the relative contribution of different types of fuels or means of electricity generation supplying the national electricity distribution system.

Ireland has a binding renewable energy EU target of 16% by 2020. According to SEAI's *Renewable Energy in Ireland (2019 report),* in 2017 renewable energy supply was 10.6% of gross final consumption[9]. In looking to 2030, Member States of the EU agreed renewable energy targets of at least 32% by 2030[10]. Emission reduction targets for 2030 have been set at the Member State level. Ireland has a target reduction of 30% compared to 2005 levels[11].

Ireland has made good progress towards meeting renewable electricity targets. In 2016, the use of renewables in electricity generation avoided just over €192 million in fossil fuel imports to Ireland. The profile of fuel type by 2030 will be significantly different from the current one due to greater penetration of renewable fuels. In order to calculate the emissions displacement, an average grid intensity of 0.40 tonnes $CO_2$ /MWh has been used which is more conservative than the 2015 value of 0.467 tonnes $CO_2$ /MWh [8].

The renewable target set in Council Directive 2009/28/EC (Renewable Directive) for 2020 is set at 16% of the total final energy consumption. This target will be made up of contributions from renewable energy in electricity (RES-E), renewable energy in transport (RES-T) and renewable energy for heat and cooling (RES-H). The target for RES-E is 40% of renewables to contribute to gross electricity consumption by 2020. The target for RES-T is that biofuels and the renewable portion of electricity will account for 10% of transport energy by 2020. The RES-H target is that the renewable contribution to heat will reach 12% by 2020. As of 2017, the 10.6% of the total final energy consumption comes from renewable energy (SEAI) [9].

## 9.3 Receiving Environment

### 9.3.1 Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002 [12,13]. For the purposes of the EU burden sharing agreement under Article 4 of the Doha Amendment to the Kyoto Protocol, in December 2012, Ireland agreed to limit the net growth of the six Greenhouse Gases (GHGs) under the Kyoto Protocol to 20% below the 2005 level over the period 2013 to 2020 [14]. In order to meet the ultimate objective of the Convention to prevent dangerous anthropogenic interference in the climate system, cuts of up to 70% in this century are expected to be required [15]. The UNFCCC is continuing detailed negotiations in relation to GHG reductions and in relation to technical issues such as Emission Trading and burden sharing. The most recent Conference of the Parties to the Convention (COP24) to the agreement was in Katowice, Poland in December 2018. COP21, held in December 2015, was an important milestone in terms of international climate change agreements.

The "Paris Agreement", agreed by over 200 nations, has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries.

Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) that will form the foundation for climate action post 2020. Significant progress was also made on elevating adaption onto the same level as action to cut and curb emissions. The EU Effort Sharing Decision 406/2009/EC on greenhouse gas (GHG) emissions [(15)], requires Ireland to achieve a 20% reduction, relative to 2005 levels, by 2020 in GHG emissions for sectors of the economy not covered by the EU Emissions Trading Directive [(16)] (i.e. non-ETS GHG emissions).

In 2014, the EU agreed the "*2030 Climate and Energy Policy Framework*" [(17)]. The European Council endorsed a binding EU target of at least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. The EU will collectively deliver the target in the most cost-effective manner possible, with the reductions in the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005, respectively. Following on from political agreement, EU Member States legislated for emissions reduction targets at the national level while the renewable target is set at the EU level. As mentioned in **Section 9.2**, Ireland has a target reduction of 30% compared to 2005 levels. An EU level binding target of at least 32% for the share of renewable energy consumed in the EU was agreed for 2030.

The "*Draft National Energy and Climate Plan (NECP) 2021-2030*" [(18)] was published in December 2018 and will be submitted by the government, as a final version, to the EU by the end of 2019. The plan, when finalised, will outline the roadmap for meeting the legal energy and climate obligations including a 30% reduction target in greenhouse gas emissions from the non-ETS sectors including transport, buildings, agriculture and waste management.

### 9.3.2 Baseline Conditions

An important part of the approach to reducing GHG emissions, engrained in the Doha Amendment to the Kyoto Agreement (dated 2012), is that emission reductions should reflect the most economically efficient cost of achieving the set target. As part of this approach, three "flexible mechanisms" facilitate the cost-effective implementation of the Protocol. These mechanisms are Emission Trading (ET), Joint Implementation (JT) and the Clean Development Mechanism (CDM). Emission trading is a development whereby polluting entities are allocated allowances for their emissions which can subsequently be traded with each other. Emitters for whom it is very expensive to effect emission reductions are likely to buy permits from emitters for whom emissions reduction is more cost-effective thus ensuring that a pre-determined environmental outcome will take place where the cost of reduction is lowest. Due to significant economic growth in Ireland since 1990, emissions trading is of benefit to Ireland in meeting its commitments to limit the growth of GHG emissions [(18)]. Both Joint Implementation and the Clean Development Mechanisms allow states to share reduction credits by investing in another territory with the aim of reducing emissions. However, the Clean Development Mechanism differs in that the projects are specific to assisting developing countries that are particularly vulnerable to the adverse effects of climate change to meet the cost of adaptation.

GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere.

In order to compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWPs) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The GWP100 for $CO_2$ is the basic unit (GWP = 1) whereas $CH_4$ has a global warming potential equivalent to 28 units of $CO_2$ and $N_2O$ has a GWP100 of 265. Greenhouse gases other than $CO_2$ (i.e. methane, nitrous oxide and so-called F-gases) may be converted to $CO_2$ equivalent using their global warming potentials, providing a $CO_2$ equivalent or $CO_{2eq}$ value [(20)].

Anthropogenic emissions of GHGs in Ireland included in the EU 2020 strategy are given in **Table 9.1** and **Table 9.2** based on data from the EPA. Agriculture is the greatest source of emissions at 33.6% of $CO_{2eq}$ (2020 projection) [(19)]. The next largest share of energy emissions projected for 2020 is from fuel combustion for power generation (19.7% of total emissions) and road transport (21.0%). Waste represents 1.0% of total emissions in 2020 [(19)]. Emissions from waste consist mainly of $CH_4$ with small amounts of other GHGs. 2013 was the first year where the European Union's Effort Sharing Decision "*EU 2020 Strategy*" (Decision 406/2009/EC) was assessed for effectiveness in meeting the objectives outlined in the strategy. Ireland had non-ETS sectors emissions of 43.8 Mtonne $CO_{2eq}$ in 2017, when emissions covered by the EU's Emissions Trading Scheme for stationary and aviation operators were removed. Recent data from the EU [(20)] indicates that Ireland is unlikely to meet the 2020 targets, based on current projections, in terms of GHG emissions and in terms of the renewable energy targets. The most recent data [(19)] suggest that based on "*With Additional Measures*" scenario, Ireland's non-Emission Trading Scheme emissions will be 6% below 2005 levels in 2020 compared to a target of 20% below 2005 levels in 2020.

### 9.3.3 IPCC Guidelines For National GHG Inventories

The Intergovernmental Panel on Climate Change (IPCC) has outlined detailed guidelines on compiling national GHG inventories. The guidelines are designed to estimate and report on national inventories of anthropogenic GHG emissions and removals in order to ensure compliance with the Kyoto Protocol. Anthropogenic refers to GHG emissions and removals that are a direct result of human activities or are a result of natural processes that have been affected by human activities [(4)]. The quantity of carbon from natural cycles through the earth's atmosphere, waters, soils and biota is much greater than the quantity added by anthropogenic GHG sources. However, the focus of the UNFCCC and the IPCC is on anthropogenic emissions because these emissions have the potential to alter the climate by disrupting the natural balances in carbon's biogeochemical cycle, and by altering the atmosphere's heat-trapping ability. The carbon from biogenic sources such as paper waste and food waste were originally removed from the atmosphere by photosynthesis, and under natural conditions, it would eventually cycle back to the atmosphere as $CO_2$ due to degradation processes.

Thus, these sources of carbon are not considered anthropogenic sources and do not contribute to emission totals considered in the EU 2020 Strategy (4).

In relation to solid waste disposal sites (SWDSs) including municipal waste landfills, detailed guidelines have been published for the calculation of GHG emissions (4,22). The main GHG emission from SWDSs is methane ($CH_4$).

Even though the source of carbon is primarily biogenic, $CH_4$ would not be emitted were it not for the human activity of landfilling waste, which creates anaerobic conditions conducive to $CH_4$ formation. Although $CO_2$ is also produced in substantial amounts from landfills, the primary source of $CO_2$ is from the decomposition of organic material derived from biomass sources (crops, forests) and which are re-grown on an annual basis. Hence, these $CO_2$ emissions are not treated as net emissions from waste in the IPCC Methodology (4).

Similarly, in relation to the proposed facility, a large fraction of the carbon in waste combusted (paper, food waste) is derived from biomass raw materials which are replaced by re-growth on an annual basis. Thus, these emissions should not be considered as net anthropogenic $CO_2$ emissions in the IPCC Methodology (4). On the other hand, some carbon in waste is in the form of plastics or other products based on fossil fuel. Combustion of these products, like fossil fuel combustion, releases net $CO_2$ emissions. Thus, in estimating emissions from waste for the current facility, the desired approach is to separate carbon in the waste to be incinerated into biomass and fossil fuel-based fractions and thereafter to use only the fossil fuel fraction in calculating net carbon emissions (4,22). This approach follows the methodology outlined in the IPCC Guidelines For National GHG Inventories (4). Other relevant gases released from combustion are net GHG emissions including $CH_4$ and $N_2O$.

**Table 9.1 GHG Emissions in Ireland (ktonnes $CO_2$ equivalent) (2018) (18)**

| Sector | Emissions (ktonnes $CO_2$ equivalent) |
|---|---|
| Energy | 12,764 |
| Industrial Processes / Commercial / Manufacturing | 7,810 |
| Agriculture | 20,296 |
| Transport | 12,471 |
| Residential | 6,639 |
| Waste | 712 |
| **Total** | **61,850.6** |

**Table 9.2 GHG Emissions (ktonnes $CO_2$ equivalent) (18)**

| Year | Emissions by National Climate Change Strategy Sectors (ktonnes $CO_{2eq}$) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Energy | Residential | Industry & Commercial | Agriculture | Transport | Waste | Total |
| 2013 | 11,487 | 6,395 | 7,631 | 19.129 | 11,068 | 671 | 57,410 |
| 2014 | 11,272 | 5,746 | 7,894 | 18,901 | 11,347 | 853 | 57,098 |
| 2015 | 11,891 | 6,041 | 8,288 | 19,128 | 11,813 | 949 | 59,212 |
| 2016 | 12,608 | 6,047 | 8,528 | 19,945 | 12,294 | 957 | 61,270 |

| Year | Emissions by National Climate Change Strategy Sectors (ktonnes $CO_{2eq}$) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Energy** | **Residential** | **Industry & Commercial** | **Agriculture** | **Transport** | **Waste** | **Total** |
| 2017 | 11,744 | 5,742 | 8,879 | 20,213 | 12,003 | 933 | 60,744 |
| 2018 | 12,764 | 6,639 | 7,810 | 20,296 | 12,471 | 712 | 61,851 |

# 9.4 Characteristics of Proposed Development

## 9.4.1 Construction Phase

There is the potential for a number of emissions to atmosphere during the construction of the facility. Construction vehicles, generators etc., may give rise to $CO_2$ and $N_2O$ emissions. However, given the modest number of vehicles during the construction phase of the development (peaking at 145 HGVs/day and 597 cars/day one way), greenhouse gas emissions during the construction phase will not be significant in the context of Ireland's total GHG emissions.

## 9.4.2 Operational Phase

The proposed waste-to-energy facility would be expected to be the dominant source of $CO_2$ and $N_2O$ emissions. Waste throughput information was obtained from Indaver and this information has been used to estimate GHG emissions from the facility. The annual waste throughput for the proposed grate incinerator will vary but will not be greater than 240,000 tonnes consisting of residual household, commercial and industrial waste. The net GHG contribution from the waste was derived using the procedure recommended by the European Commission [(1)], UK DEFRA [(2,3)] and IPCC [(4)].

## 9.4.3 Climate Change Adaptation Measures

Annex IV, point 5(f) of the EIAR Directive (2014/52/EU) asks for

*"A description of the likely significant effects of the project on the environment resulting from, inter alia:*

*(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; […]."*

The EU EIAR guidance[1] defines climate change adaptation in **Section 1.3.2** as

"*Climate change adaptation: this considers the vulnerability of the Project to future changes in the climate, and its capacity to adapt to the impacts of climate change, which may be uncertain."*

The proposed development has incorporated climate adaptation measures to address the effects associated with climate change, for example, the rise sea levels or more extreme weather events.

During the preparation of the site-specific Flood Risk Assessment (**Appendix 13.4**) completed by Arup, a conservative site flood defence level was proposed for the site (4.55mOD) which factored in a 200-year tidal level, climate change and the nature of the proposed development whereby flooding of the site may lead to negative impacts on the environment.

[1] European Commission (2018) Environmental Impact Assessment of Projects – Guidance on the preparation of environmental impact assessment report. (http://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf)

This study informed part of the design for the L2545 road upgrade and the proposed raising of the site ground levels.

Climate adaptation was incorporated into the three infrastructure areas of the proposed development which are discussed in more detail in the relevant sections:

- The effects of tidal flooding are addressed by raising of the site ground levels, described in **Section 4.3.3** and considered in **Section 7.1** of **Appendix 13.4 Flood Risk Assessment** of **Chapter 13**;
- Flooding of the L2545 road is addressed by raising of the road level of the L2545 along the northern boundary, as described in **Section 4.3.2** and considered in **Section 7.5** of **Appendix 13.4 Flood Risk Assessment** of **Chapter 13**; and
- The potential effects of sea level rise due to climate change is considered in **Appendix 13.3 Coastal Study** in terms of coastal management measures for the coastal boundary.

During the preparation of the site-specific Flood Risk Assessment (**Appendix 13.4**) completed by Arup, a conservative site flood defence level was proposed for the site (4.55mOD) which factored in a 200-year tidal level, climate change and the nature of the proposed development whereby flooding of the site may lead to negative impacts on the environment. This study informed part of the design for the L2545 road upgrade and the proposed raising of the site ground levels.

### 9.4.4 Road Traffic

Road traffic would be expected to be a source of GHG emissions as a result of the operation of the proposed facility. Waste will be transported from the source of the waste to the site for disposal whilst the bottom ash and residues may subsequently be removed from the facility to be landfilled. If an ash recovery plant is constructed in Ireland it would be the intention of Indaver to proactively identify potential uses for the bottom ash. If no market can be found for the bottom ash, it will be sent to a suitably licensed landfill site. Recyclable materials recovered by the facility will also be transported from the site. In the absence of the facility, this waste will also be collected and disposed of to landfill or exported for incineration in Europe.

In the absence of a detailed breakdown of the sources of waste and specific final management option, a detailed comparison of GHG emissions is not possible between the various options. However, it is likely that these emissions will be minor compared to emissions from the thermal treatment process [(22)]. Moreover, analysis by the USEPA has estimated that the traffic-derived GHG emissions from waste-to-energy facilities are approximately equivalent at 0.01 MTCE (metric tonnes of carbon equivalent) of anthropogenic $CO_2$ emission per ton (US) of material combusted with the resulting ash landfilled [(22)]. In this context, the impact from the transport of waste accounts for less than 3% of the impact from the facility (excluding energy recovery) and thus is a minor contributor to the overall GHG emission total.

# 9.5 Evaluation of Impacts

## 9.5.1 'Do Nothing' Effects

In the absence of the facility, the impact on climate will not be significant.

## 9.5.2 Construction Phase

The effect of construction on climate, when annualised over the lifetime of the facility, will not be significant relative to process emissions generated by the thermal process and emissions of fossil fuel-based electricity generation displaced by the proposed development.

## 9.5.3 Operational Phase

**Tables 9.3** - **9.6** gives the annual anthropogenic GHG emission from the proposed development. **Table 9.3** is based on UK DEFRA defaults (2,3) for total carbon and fossil carbon content whilst **Table 9.4** is based on EU (1) defaults for total carbon and fossil carbon content with the average of the two methods used in the calculation of greenhouse gas emissions. The emissions have been compared with the estimated total GHG emissions in Ireland in 2020 based on the latest information from the EPA (18). The contribution to the total GHG emissions, in the absence of power generation, is 0.19% of the total in Ireland in that year and thus is a minor source of GHGs as shown in **Table 9.5**, particularly in the context of strategic infrastructure.

During the treatment of waste the thermal energy generated by the burning of waste will be recovered and will give an electrical output of about 21$MW_e$. As approximately 2.5$MW_e$ is required for electrical demand within the plant, the net electrical output for export to the national grid will be 18.5$MW_e$. Thus, the export of 18.5$MW_e$ will give a direct benefit in terms of GHG emissions which would have been released in the production of 18.5$MW_e$ from power stations as outlined in **Table 9.6**.

Resource recovery facility systems such as the proposed development are continuous and thus will compete with base-load generation which have historically been open-cycle oil or natural gas fuelled steam turbines, although new stations are now mainly combined-cycle gas turbines (CCGTs) (23,24). By 2020 Ireland is committed to meeting the target set down in Council Directive 2009/28/EC of ensuring that 16% of gross energy consumed in Ireland is from renewable energy sources. It is envisaged that this target will be met mainly through wind power generation (9).

The proposed facility will export 18.5$MW_e$ of power to the national grid when in operation. This will undoubtedly result in displacement of an existing fuel/generation system, and the quantification or credit to be ascribed to the proposed development in this regard is considered below. In order to calculate the emissions displacement, a displacement intensity of 0.40 tonnes $CO_2$ /MWh for all renewable generation is used (8).

The production of power for export to the National Grid reduces the impact of the site significantly such that the facility will emit approximately 0.097% of the estimated total GHG emissions in Ireland in 2020 based on the latest information from the EPA[(18)], when energy recovery is taken into account.

**Table 9.3 Anthropogenic $CO_2$ emissions from the grate incinerator of 240,000 tonnes of MSW (tonnes $CO_2$ eq) based on EU and UK Guidance using the UK DEFRA [(2,3)] Total Carbon and Fossil Carbon Defaults**

| Type | Waste Totals[Note 1] | Waste Fraction | Total Carbon Content (wet) | Fossil Carbon Fraction | $CO_2$ Emissions (Tonnes/Annum) |
|---|---|---|---|---|---|
| Paper | 48,053 | 20.0% | 31.9% | 0.0% | 0 |
| Glass | 5,653 | 2.4% | 0.3% | 0.0% | 0 |
| Plastic | 43,120 | 18.0% | 51.3% | 100.0% | 81,109 |
| Metals | 9,963 | 4.2% | 0.0% | 0.0% | 0 |
| Nappies | 14,005 | 5.8% | 24.0% | 10.0% | 1,232 |
| Textiles | 19,856 | 8.3% | 39.9% | 50.0% | 14,525 |
| Organics | 57,387 | 23.9% | 13.5% | 0.2% | 57 |
| WEEE | 1,248 | 0.5% | 0.0% | 100.0% | 0 |
| Wood | 2,336 | 1.0% | 42.5% | 0.0% | 0 |
| Others | 38,379 | 16.0% | 21.8% | 50.0% | 15,339 |
| Total | **240,000** | 100.0% | | | **112,261** |

Note 1 Waste breakdown based on latest EPA statistics[(5,6)]

**Table 9.4 Anthropogenic $CO_2$ emissions from the grate incinerator of 240,000 tonnes of MSW (tonnes $CO_2$ eq) based on EU and UK Guidance using the EU [(1)] Total Carbon and Fossil Carbon Defaults**

| Type | Waste Totals[Note 1] | Waste Fraction | Total Carbon Content (wet) | Fossil Carbon Fraction | $CO_2$ Emissions (Tonnes/Annum) |
|---|---|---|---|---|---|
| Paper | 48,053 | 20.0% | 33.0% | 0.0% | 0 |
| Glass | 5,653 | 2.4% | 0.0% | 0.0% | 0 |
| Plastic | 43,120 | 18.0% | 61.0% | 100.0% | 96,445 |
| Metals | 9,963 | 4.2% | 0.0% | 0.0% | 0 |
| Nappies | 14,005 | 5.8% | 24.0% | 10.0% | 1,232 |
| Textiles | 19,856 | 8.3% | 39.0% | 50.0% | 14,197 |
| Organics | 57,387 | 23.9% | 19.0% | 0.2% | 80 |
| WEEE | 1,248 | 0.5% | 0.0% | 100.0% | 0 |
| Wood | 2,336 | 1.0% | 42.5% | 0.0% | 0 |
| Others | 38,379 | 16.0% | 24.0% | 29.0% | 9,794 |
| Total | 240,000 | 100.0% | | | **121,749** |

Note 1 Waste breakdown based on latest EPA statistics[(5,6)]

**Table 9.5 GHG Emissions at the facility based on a 240,000 Tonnes/Annum Grate Incinerator**

| Total / Annum | $CO_2$ | $N_2O$ | $CH_4$ | % Of Ireland's Total Emissions[1] |
|---|---|---|---|---|
| Total / Annum (tonnes) | 117,005 | 4.6 | 34.5 | - |
| Total / Annum (tonnes $CO_2$ Equivalent) | 117,005 | 1217 | 965 | 0.19 |

[1] Based on GHG emissions estimated by the EPA for 2020[19]

**Table 9.6 GHG Emissions displaced due to the operation of the facility based on a 240,000 Tonnes/Annum Grate Incinerator**

| Total / Annum | Year 2023 |
|---|---|
| Total / Annum (tonnes $CO_2$ Equivalent) | 119,187 |
| Displaced Power (18.5MW) | 59,200 |
| Total / Annum (tonnes $CO_2$ Equivalent) | 59,987 |
| Total / % of Ireland's Total Emissions[1] | 0.097% |

[1] Based on GHG emissions estimated by the EPA for 2020[19]

## 9.5.4 IPCC Position on Waste Management

In order to ensure compliance with the Kyoto Protocol, the Intergovernmental Panel on Climate Change (IPCC) published Climate Change 2007: Mitigation, Contribution of Working Group III the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [25]. In **Chapter 10 *Waste Management***, the report assesses the various waste management practices from the viewpoint of greenhouse gas emissions. The report concludes that:

> *"because landfills produce CH4 for decades, incineration, composting and other strategies that reduce landfilled waste are complementary mitigation measures to landfill gas recovery in the short- to medium-term"* [25].

Specifically, in relation to waste incineration, the report remarks that "compared to landfilling, waste incineration and other thermal processes avoid most of the GHG generation, resulting only in minor emissions of $CO_2$ from fossil sources, including plastics and synthetic textiles" [25]. In relation to resource recovery, the report states that "thermal processes can efficiently exploit the energy value of post-consumer waste" [25].

As part of Working Group III for the Fifth Assessment Report (AR5), the IPCC has published Climate Change 2014: Mitigation of Climate Change [26]. **Chapter 10**: Industry highlights the role energy recovery plays in the hierarchy of waste management to avoid GHG emissions.

The facility will also emit a quantity of waste heat as part of the operation of the facility. The stack will emit 11.3MW of thermal energy whilst the condensers will release 47MW of thermal energy.

The impact of this thermal energy in the local microclimate is not expected to be significant as the heat will rapidly dissipate in the ambient environment and will have no adverse significant impact on the local environment.

### 9.5.5 Potential Cumulative Impacts

There are a number of planned or permitted developments in the vicinity of the proposed WtE facility which have the potential to cumulatively create higher GHG emissions in the vicinity, while others (Novartis, DePuy, GSK and Janssen wind turbines, local heat network from Indaver and grid connection for Indaver) have the potential of beneficial impacts with respect to GHG emissions. It is not predicted that a net adverse impact will be significant with respect to climate.

**Proposed projects**

- N28 Upgrade

  Due to the termination of the route at the port and industrial nature of Ringaskiddy, it is unlikely that any additional traffic which does not require to use the route will utilise it. The N28 upgrade will improve access to the site and reduce exposure of pollutants emitted from vehicles by the sensitive receptors in villages, such as Shanbally, which the current route passes through. The realignment may reduce congestion at pinch points along the current route, reducing emissions.

- Haulbowline Development and Spike Island Masterplan

  The EIS associated with the Haulbowline east tip remediation waste licence states that the total estimated greenhouse gas emissions associated with the proposed construction is calculated at 17,899 tonnes of $CO_{2eq}$. This equates to 0.0307% of the total national greenhouse gas emission for Ireland in 2013. Mitigation measures have been put in place in order to reduce the impact. The EIS states "*There are no predicted impacts to atmosphere through the end-use, aftercare and maintenance stages of the proposed development.*"

- Ringaskiddy Port Redevelopment

  The Ringaskiddy Port Redevelopment EIS states that there will not be any significant climate impacts on a national or regional level due to planned activities. The development will lead to minor increases in greenhouse gases, due to increased shipping traffic although these increases, as outlined in the Environmental Impact Statement (RPS, 2014) are minor (approximately 28 tonnes per year increase between "do nothing" and "do something" in 2033). The predicted percentage change in regional climate emissions are significantly below 5%. Mitigation measures will be put in place in order to ensure emissions due to port and shipping are kept to a minimum. The Ringaskiddy Port Redevelopment EIS states when assessing cumulative impacts for the area that:

  > *The proposed redevelopment may be constructed at the same time to the other large developments in the area. … A range of projects including the IMRC Masterplan, Proposed N28 Road Scheme, East Tip Remediation Project, and Haulbowline Island has been taken into consideration as part of the cumulative assessment. When these projects have been considered as part of this assessment, no significant cumulative effects are predicted.*

- Heat Network From Indaver to Local Users

  A heat network utilising waste heat from the resource recovery facility is currently under consideration but does not form part of this application for permission or the current iteration of the project. A local heat network is highly likely to have a net positive benefit to GHG emissions if the scheme progresses. The recast Renewable Energy Directive, published in the Official Journal of the European Union in December 2018, requires governments to increase the share of energy from renewable sources and from waste heat and cold in district heating and cooling by at least one percentage point as an annual average calculated for the period 2021 to 2025 and for the period 2026 to 2030(22).

- Cork Lower Harbour Main Drainage Scheme Sewage Treatment Plant, Shanbally

  The EIS was accepted by An Bord Pleanàla in 2009 as part of the Cork Lower Harbour Project for the sewage treatment plant. The EIS does not anticipate any significant climate impacts regionally or locally. The plant commenced operations in December 2016.

- Novartis Wind Turbine

  Novartis has collaborated with other companies (including DePuy, GSK and Janssen Biologics) in Ringaskiddy in a group known as the Cork Lower Harbour Energy Group (CLHEG) and obtained planning for a 3MW turbine however construction has not commenced. The permitted wind turbine will provide approximately 30% of the company’s electricity consumption (at the time the planning application was submitted). This is of positive benefit with respect to climate emissions in the area as it reduces GHG emissions from on-site boilers. The EIS cumulative impact assessment states with respect to these turbines:

  > *Similar impacts on air quality and climate are predicted for the other Cork Lower Harbour Energy Group wind energy projects. No cumulative adverse impacts are predicted arising from the construction activities, due to the separation between the sites, and a long term cumulative beneficial impact is predicted both for air quality and climate at a global scale, arising from the consequent reduction in carbon dioxide, oxides of nitrogen, and sulphur dioxide. The cumulative reduction in carbon dioxide emissions will be approximately 22,000 tonnes per year.*

Existing projects

- Wind Turbines at DePuy Synthes, DePuy (J&J Loughbeg 2), GSK and Janssen

  The EIS for each of these wind turbines states that the net impact on climate is positive due to the reduced reliance of fossil fuels at these facilities. These three facilities are part of the CLHEG alongside Novartis and were considered in the recent EIS for the Novartis wind turbine.

- Hammond Lane Metal Company Extension

  The EIS, completed by Ray Keane & Associates in June 2012, for the Hammond Lane Metal Company extension states that the proposed development will not result in any impacts on climate or microclimate.

- Beaufort Laboratory

The Beaufort Laboratory is associated with UCC. One of the aims of this facility is to “achieve a competitive, high quality and sustainable maritime and energy sector.” Therefore, it is predicted that climate impacts due to this facility will be minimised.

# 9.6 Mitigation Measures - Climate

## 9.6.1 Construction Phase

There will be no significant impact on climate during the construction phase of the project. Therefore, no mitigation measures are proposed with respect to climate.

## 9.6.2 Operational Phase

During the treatment of waste at the facility, the thermal energy generated by the burning of waste will be recovered and will give an electrical output of about 21 MW with a net electrical output from the plant for export to the national grid of 18.5$MW_e$ (see **Table 9.6**). Thus, the export of 18.5$MW_e$ will give a direct benefit in terms of GHG emissions which would have been released in the production of 18.5$MW_e$ from fossil-fuel burning power stations.

The Ringaskiddy Resource Recovery Centre will also recover and recycle ferrous and non-ferrous materials during the thermal treatment process. The recycling of these metals will require less energy than processes using virgin inputs and thus lead to a direct saving in energy and thus GHG emissions.

The operation of the facility will also allow the export of 172,000 tonnes of residual waste currently exported in the Southern Waste Region to continental Europe to cease leading to a saving of over 3,500 tonnes of $CO2_{eq}$ / annum.

The risk of rising sea levels due to climate change and the risk of increased flooding has been mitigated by a range of site-specific measures including the raising of the levels on the site and the adjoining road as outlined in **Section 13.3.7.2** and **Appendix 13.4** (Flood Risk Assessment). **Section 13.4.3** summarises the design for the surface water drainage and the raising of the road levels and levels on the site.

As outlined in **Section 16.3.1.2** of the ***Major Accidents and Disasters*** chapter states that there are no major accident scenarios envisaged from either flooding or coastal erosion.

# 9.7 Residual Impacts

## 9.7.1 Construction Phase

There will be no significant residual impacts on climate.

### 9.7.2 Operational Phase

The assessment has shown that the operational phase will not cause a significant impact on climate. Residual emissions from the operational phase will be 0.097% of Ireland's likely national emissions total in 2020 and thus is not considered to be significant in the context of aggregated national emission sources and the benefits associated with energy recovery and displacement of electricity derived from fossil fuel sources.

## 9.8 References

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