Climate Action
LAOIS COUNTY COUNCIL

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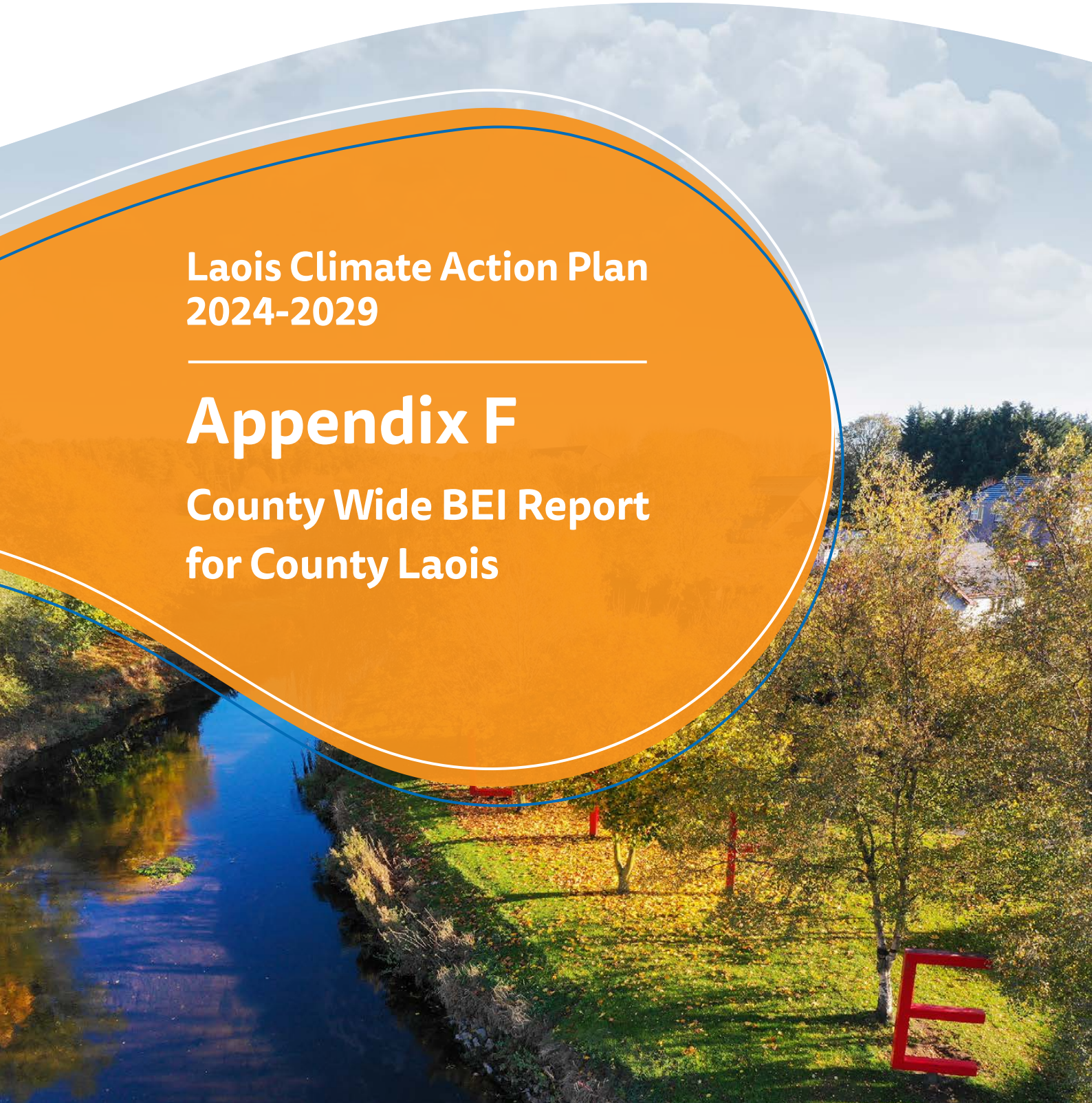
Laois Climate Action Plan 2024-2029

Appendix F

County Wide BEI Report for County Laois



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BASELINE EMISSIONS INVENTORY REPORT

Baseline Emissions Inventory Report for County Laois

Prepared for:

Laois County Council

Laois County Council
Áras an Chontae, Portlaoise, Co. Laois

Date: **April 2023**

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Baseline Emissions Inventory Report for County Laois

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Abstract: This report presents the findings of a baseline emissions inventory study carried by Fehily Timoney and Company (FT) on behalf of Laois County Council. The report presents a 'helicopter overview' of baseline greenhouse gas emissions from various sectors in a year. This baseline report aims to raise awareness of climate change and the impact that different sectors in the midlands region have on Ireland's overall carbon emissions. It provides Laois County Council with the necessary information to make informed decisions on climate change actions to lower the county's carbon emissions. The sectors that have been included in this analysis are residential, commercial and industrial, industrial processes, agriculture, transport, waste and wastewater, and land use, and land use change and forestry (LULUCF). Emissions associated with the local authority's own operations have also been accounted for.

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EXECUTIVE SUMMARY

This report presents the findings of a 'Tier 1' Baseline Emission Inventory (BEI) study carried out by Fehily Timoney and Company (FT) for the county of Laois. The report evaluates and determines the baseline greenhouse gas (GHG) emissions from various societal sectors in the county and for the local authority organization in 2018 and allows LCC to measure the emission reductions required to achieve the emission reduction target of reducing GHG emissions by 51% by 2030.

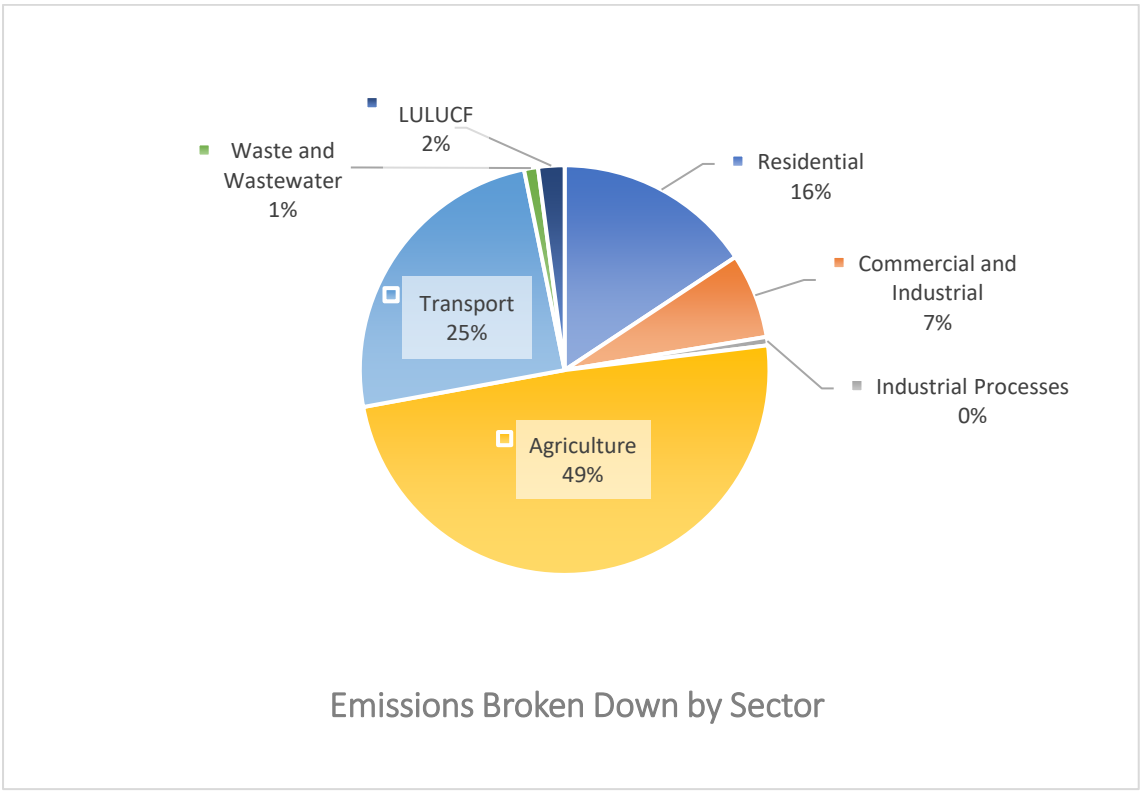
The sectors that have been included in the county wide analysis are residential, commercial and industrial, industrial processes, agriculture, transport, waste and wastewater, and land use, and land use change and forestry (LULUCF). GHG emissions associated with the local authority's own operations have been accounted for separately.

The methodology is based on the Tier 1 'Top-down' Approach defined in Annex C to the Draft Local Authority Climate Action Plan Guidelines.

Overall, the emissions generated from all analysed sectors in the county equate to 1,396,468 tCO_2-eq in the baseline year. An overall emission reduction of 712,199 tCO_2-eq to 684,269 tCO_2-eq is required for the county across all sectors to achieve the target to reduce GHG emissions by 51% by 2030.

The top three sectors in the county in terms of GHG emission levels were Agriculture, Transport and Residential producing 49%, 25% and 16% of tCO_2-eq respectively, of the total emissions in the county. The analysis shows that these sectors should be the main targets of climate action initiatives.

A percentage breakdown of sectoral GHG emissions in County Laois in the baseline year is provided in the figure below.



Emissions Broken Down by Sector

1. INTRODUCTION

1.1 Background and Purpose

This report presents the findings of a 'Tier 1' Baseline Emission Inventory (BEI) study carried out by Fehily Timoney and Company (FT) for the county of Laois on behalf of Laois County Council (LCC).

The methodology is based on the Tier 1 'Top-down' Approach defined in Annex C to the Draft Local Authority Climate Action Plan Guidelines. This is the most basic and straightforward BEI calculation 'top-down' approach. This approach does not require any sectoral expertise and is made straightforward by the use of the Map EIre dataset. The tier one approach outlines the simplest, easiest, and quickest analysis of emissions at a county level. It will help the local authority to get a 'helicopter' overview and breakdown of where emissions are coming from in their county and what sectors are contributing most.

The report evaluates and determines the baseline greenhouse gas (GHG) emissions from various societal sectors in the county and for the local authority organization in 2018 and allows LCC to measure the emission reductions required to achieve the emission reduction target of reducing GHG emissions by 51% by 2030. This baseline report aims to raise awareness of climate change and the impact that different sectors in the county have on Ireland's overall carbon emissions. It provides LCC with the necessary information to make informed decisions on climate change actions to lower the county's carbon emissions.

1.2 Overview

The sectors that have been included in the county wide analysis are residential, commercial and industrial, industrial processes, agriculture, transport, waste and wastewater, and land use, and land use change and forestry (LULUCF). GHG emissions associated with the local authority's own operations have been accounted for separately.

The methodology is based on the Tier 1 'Top-down' Approach defined in Annex C to the Draft Local Authority Climate Action Plan Guidelines.

The national emission reduction target of 51% by the end of 2030 is based on the GHG emissions reported for the end of 2018, in the national GHG emissions inventory. Accordingly, the data collated and analysed to inform this BEI is relative to the baseline year of 2018, or the nearest year possible to 2018.

GHG emissions are reported as Carbon dioxide (CO_2) or Carbon dioxide equivalent (CO_2-eq) in this report. The Global Warming Potential (GWP) of other GHGs (e.g., Methane, CH_4) has been factored to allow for reporting in CO_2-eq. Where the term 'emissions' in and of itself is used in this report, this refers solely to GHG emissions, and not non-GHG emissions (such as Sulphur oxides, SO_x, or Nitrogen oxides, NO_x).

1.3 Structure of the Report

This report is structured as follows from this point forward:

- **Section 2 - Context**: This section provides background detail on the climate change challenge; policy and statute underpinning climate action in Ireland; Ireland's GHG emission targets and the background to and purpose of BEIs in a local context.

- **Section 3 - Baseline Emission Inventory**: This section reports on GHG emissions associated with each societal sector in the county. Detail on methodologies for calculating sectoral emissions, results and analysis, and data assumptions and limitations is provided in this section. GHG emissions associated with the local authority's own operations have been accounted for separately.
- **Section 4 - Overview and Main Conclusions**: This section quantifies the total amount of GHG emissions in the county (broken down by sector in percentage terms) and identifies the amount of GHG emission reductions required overall for the county. It also reports on the local authority's GHG emissions and emission reductions required for the local authority as an organization.

1.4 Baseline Year Recalculation Policy

Making meaningful comparisons of emissions data over time is an integral part of any GHG accounting assessment that aims to be credible, transparent and useful. A prerequisite for such meaningful comparisons is a consistent data set over time, or in other words, comparisons of 'like' with 'like' over time. A baseline year (2018 in this case) is a reference point in the past with which current emissions can be compared. In order to maintain the consistency between data sets, baseline year emissions need to be recalculated when new data or methodological approaches become available. As such, baseline year emissions, as calculated in this report, shall be retroactively recalculated when updating the BEI to reflect any future changes in either data set availability or emission accounting methodologies that would otherwise compromise the consistency of emission measurement over time and the integrity of the BEI.

1.5 The Sectors Examined

A list of the sectors examined and a description of the scope of each sector is provided in Table 1-1.

Table 1-1 The Sectors Examined

Sector	Scope of the Sector
Residential	This sector covers all GHG emissions associated with dwellings. It covers GHG emissions from electricity use and combustion sources. It covers both private owned dwelling and social house units.
Commercial and Industrial	This sector covers Manufacturing Combustion as well as space heating, water heating, cooking and laundry involved in Commercial Services. Generally, it covers GHG emissions from electricity use and combustion sources. It does not include GHG emissions from specified Industrial Processes, which are dealt with under a separate category. The Commercial Services sub-category covers the provision of services for the purpose of generating profit or revenue generally. These can include: 1) selling goods and services, 2) advertising and marketing, and 3) banking and finance. This sector also covers GHG emissions from the Institutional sector (i.e., emissions associated with local and central government, schools, hospitals etc.), which is defined as a sub-sector of the commercial sector in the EPA National Emission inventory 2021.
Industrial Processes	This sector covers a range of industrial processes which generate GHG emissions, such as cement production, ceramics, lime production, uses of carbonates, and solvent use. It does not include GHG emissions from manufacturing combustion or electricity use.

Sector	Scope of the Sector
Agriculture	This sector covers agricultural related GHG emissions from enteric fermentation, manure management, agricultural soils, liming, and use of fertilisers and urea application. Livestock farming results in the generation of GHG emissions from enteric fermentation and manure management. The management and use of soils in agriculture (e.g., through the application of fertilizer or lime) also results in the generation of GHG emissions (e.g., through N_2O volatization from fertilizer, urine, dung; CO_2 volatization from liming or urea application).
Transport	The primary source of this sector's emissions come from the burning of diesel and petrol in combustion engines. This sector covers GHG emission from private vehicle use as well as public transport.
Waste and Wastewater	This sector is responsible for the emissions from the handling of waste, incineration of waste (without energy utilization), composting, and wastewater handling.
Land Use, Land Use Change and Forestry (LULUCF)	This sector is responsible for emissions as well as removals, related to land use land use change and forestry. Forest land (and harvested wood production), grassland, cropland, wetlands, and settlement areas all result in GHG emissions and removals. The CO_2 mass balance for each type of land use is dependent on the above-ground biomass, below-ground biomass, dead organic matter (litter and dead wood) and soils associated with each land use type. Land use change results in a change in CO_2 emission / removal mass balances associated with a geographic area based on these factors.

Further detail on particularly complex sectors and sub-sectors is provided in Appendix 1.

1.6 Main Sources of Data

The GHG emission calculations that inform this report are based on data from Map EIre and Ireland's National Emissions Inventory 2021.

Map EIre is a project on national mapping of GHG and non-GHG emissions sources funded by the Irish EPA and is part of the Environmental Protection Agency Research Call 2015 on Climate - Air Science under the EPA Research Programme 2014-2020. The project was carried out by the Department of Environmental Science (ENVS) at Aarhus University (AU), Denmark, in cooperation with the Irish EPA.

The EPA must report on emissions of a wide range of pollutants that come under the scope of the CAFÉ Directive, the Convention on Long Range Transboundary Air Pollution (CLRTAP) and the UN Framework Convention on Climate Change (UNFCCC). The scope of the Map EIre project is to develop two models of a temporal and a spatial resolution to provide emissions for all activities and of all pollutants that are included in the aforementioned legal agreements.

Data on the Map EIre website can be found here: https://projects.au.dk/mapeire/spatial-results/download

The UNFCCC guidelines also require that Parties prepare a National Inventory Report (NIR) as one of the key components of their annual submissions to the UNFCCC secretariat. The purpose of the NIR is to describe the input data, methodologies, emission factors, quality assurance and quality control procedures and other information underlying the inventory compilation for greenhouse gases and to give details of any recalculations of inventories previously submitted.

The EPA 2021 National Emission Inventory serves as Ireland's NIR. This document, which is referenced in this report, is ultimately intended to inform Irish Government departments and institutions involved in the national system, as well as other relevant stakeholders in Ireland, of the level of emissions associated with sectors and sub-sectors in the nation. The inventories developed are state-of-the-art of Irish greenhouse gas inventories.

2. CONTEXT

2.1 Climate Change Challenges

Climate change refers to the long-term changes in the earth's weather patterns or average temperatures. In Ireland this is demonstrated by rising sea levels, extreme weather events and changes in the eco-system. Extensive research and a significant body of evidence has shown a correlation between the increasing global average temperature and the increasing quantity of GHG released into the atmosphere, particularly from anthropogenic sources.

Changes in weather patterns and climate can have significant adverse impacts on the environment and human beings. The Intergovernmental Panel on Climate Change (IPCC) published the Climate Change 2022: *Impacts, Adaptation and Vulnerability in 2022*. Included in this report is an outline of observed impacts of climate change on the environment and human beings. These include impacts from inland flooding, damages to infrastructure, impacts from infectious disease, displacement, animal and livestock health and productivity, mental health and water scarcity derived from climate change.

The seriousness of the potential impacts and risks associated with climate change is reflected in the vast quantity of legislation that has been introduced to mitigate those impacts and risks, beginning with the establishment of the United Nations Framework Convention on Climate Change (UNFCCC) treaty in 1992. Subsequent significant, international treaties, agreements have been made and international gathering taken place since, including, the Kyoto Protocol, the Paris Agreement, 2030 Climate and Energy Policy Framework and the twenty-seven UNFCC, Convention of the Parties (COP) conferences that have taken places since its formation.

The Paris Agreement was the first-ever universal, legally binding global climate change agreement, adopted at the Paris climate conference (COP21) in December 2015.

There are many significant additional benefits to reducing GHG emission levels and increasing the share of renewable energies. These include a decrease in dependency on fossil fuels, which in turn results in a higher security of energy supply, better health, lower energy costs, an increase in the county's competitiveness, and a more sustainable economy.

2.2 Greenhouse Gas Emission Targets

The Climate Action and Low Carbon Development Act (as amended) provides a statutory underpinning to climate action in Ireland. It specifies the requirement to develop a national Climate Action Plan (CAP) (and update it every year), a National Adaptation Framework (NAF), a National Long Term Climate Action Strategy and Sectoral Adaptation Plans (SAPs). It also specifies a series of carbon budgets and the associated sectoral emission ceilings.

It sets out actions that must be taken to ensure delivery of commitments and a target to reduce GHG by 51% by 2030 and to achieve net zero GHG emissions by 2050. The successful delivery of climate action and the achievement of these targets will require significant, unanimous effort across all sectors of society.

There are currently three carbon budgets, indicating the limit of GHG emissions over three consecutive five-year periods beginning with the period 2021-2025. The 51% target applies to GHGs that come from all sectors of society including industrial, agricultural, energy, land use and other anthropogenic (i.e., human-based) activities in the State. The 51% target for 2030 is the primary constraint on carbon budgets for the periods 2021-2025 and 2026-2030. Ireland's total GHG emissions in 2018 were 68.3 Mt CO_2-eq. Therefore, the first two carbon budgets must lead to our total emissions being reduced to 33.5 Mt CO_2-eq by 2030.

In the latest National Climate Action Plan developed (CAP23), which was published in late December 2022, Sectoral Emission Ceilings (SECs) have been defined. Sectoral Emissions Ceilings (SECs) refer to the total amount of permitted greenhouse gas emissions that each sector of the economy can produce during a specific time period. Specific GHG emission reduction targets have been prescribed for each sector of society to reflect the SECs. More detail on Sectoral Emission Ceilings for Ireland can be found via the following Government of Ireland web link - gov.ie - Sectoral Emissions Ceilings (www.gov.ie)

The Environmental Protection Agency (EPA) has confirmed that Ireland has exceeded its 2020 target for GHG emissions by 6.73 Mt CO_2-eq. Projections indicate that Ireland can meet its climate action targets over the 2023 – 2030 period but only with the full implementation of CAP23. CAP23 is an update of the Climate Action Plan 2021 and is the first Action Plan delivered under the amended Act of 2021. It reflects the Government-approved carbon budgets and sectoral emissions ceilings, which seeks to provide a pathway and framework to achieving a 51% reduction in greenhouse gas emissions by the end of this decade. CAP23 was published on December the 21st 2022.

2.3 Baseline Emissions Inventories - *Setting Local Targets*

A key element of the Climate Action and Low Carbon Development Act (as amended) relevant to local authorities is the requirement for local authorities to prepare individual Local Authority Climate Action Plans (LACAPs) for their functional area. The purpose of LACAPs will be to deliver effective climate action and mitigation at local authority and community levels. Local Authority Development Plans must also be aligned with their LACAP.

The primary goal of the national CAP is to ensure a just transition to a climate neutral Ireland using *'an integrated, structured and evidence-based approach.'* The CAP also states, *'our capacity to anticipate and plan for a just transition requires the development of a robust evidence base to support policy development and effective ongoing monitoring'*. Furthermore *'data will play a critical role in assisting local authorities in forecasting where changes will occur (or are already underway), and who will be most impacted'*.

In line with this overarching policy, the primary objective of this report is the generation of a BEI for the local authority functional area of County Laois. This BEI will be a contemporary snapshot in time of GHG emissions in County Laois and will act as a reference point on which specific county wide and/or sectoral targets can be established to manage and reduce GHG emissions.

Specifically, the BEI will serve to inform the development of the LACAP for the county. LACAPs should have an inward and outward focus. Climate action in the plan should be defined by local authorities for their own organization which they have full control over (i.e., the inward focus), and for communities in their functional area, which they exert a strong influence over in partnership with relevant stakeholders (i.e., the outward focus). As such, a BEI will be prepared for all societal sectors broadly (which would facilitate outward climate action), whilst a separate BEI will be prepared for the local authority organization itself (which would facilitate inward climate action).

The BEIs will allow the monitoring and tracking of progress towards meeting targets and the efficacy of any climate action mitigation measures adopted and implemented by a local authority.

Assessing sectoral contributions will define where reductions in GHG emissions are most needed to achieve GHG emissions targets. By assessing sectoral contributions to climate change and the risks they pose with respect to climate change, local authorities can rank sectors and sub-sectors with respect to their counties contribution to climate change and make informed, practical decisions on how they can contribute to and influence mitigating these risks within each sector in partnership with relevant stakeholders.

Assessing local authority organizational GHG emissions will facilitate a local authority in understanding aspects of its organization that contribute the most in terms of GHG emissions and the optimum areas to target to successfully reduce their organizational GHG emissions in line climate action planning requirements.

LACAPs will be established for a duration of five years. It is expected that, at a minimum, and to maintain an up-to-date and accurate evidence base to inform decision making, local authority BEIs would be revised at least every five years in line with each revision of the local authority CAPs. However, it is also advised that BEIs should be updated when new, significant evidence, data etc. is available.

3. BASELINE EMISSIONS INVENTORY

3.1 Residential

3.1.1 Methodology

The following methodology was used to determine emissions from the Residential sector.

- Map EIre on combustion related GHG emissions for the residential sector in the county was sourced.
- Central Statistics Office (CSO) data on metered electricity consumption for the residential sector in the county was sourced. GHG emissions associated with electricity consumption were calculated using the Sustainable Energy Authority Ireland (SEAI) emission factor for electricity in 2018.
- Residential sector GHG emissions for the county and per capita were calculated having regard to the above data.
- An estimate for main source of heating fuel for dwellings in the county was made using data from the CSO, which in turn is sourced from the Building Energy Rating (BER) database. This data was used to determine the number of dwellings in the county that rely on the following fuel types as their main source of space heating: Mains Gas, LPG, Heating Oil, Electricity, Solid Fuel. This aids the characterization of Residential sector emissions, providing an additional layer of insight.

3.1.2 Results

A breakdown of residential sector emission for the county for the baseline year is presented in Table 3-1 and Figure 3-1.

Table 3-1: Overview of Residential Emissions

Combustion Emissions in the County (from space heating and hot water) tCO_2-eq	152,038	65.60%
Electricity Emissions in the County (from electrical appliances and lighting) tCO_2-eq	67,109	34.40%
Total tCO_2-eq	219,147	

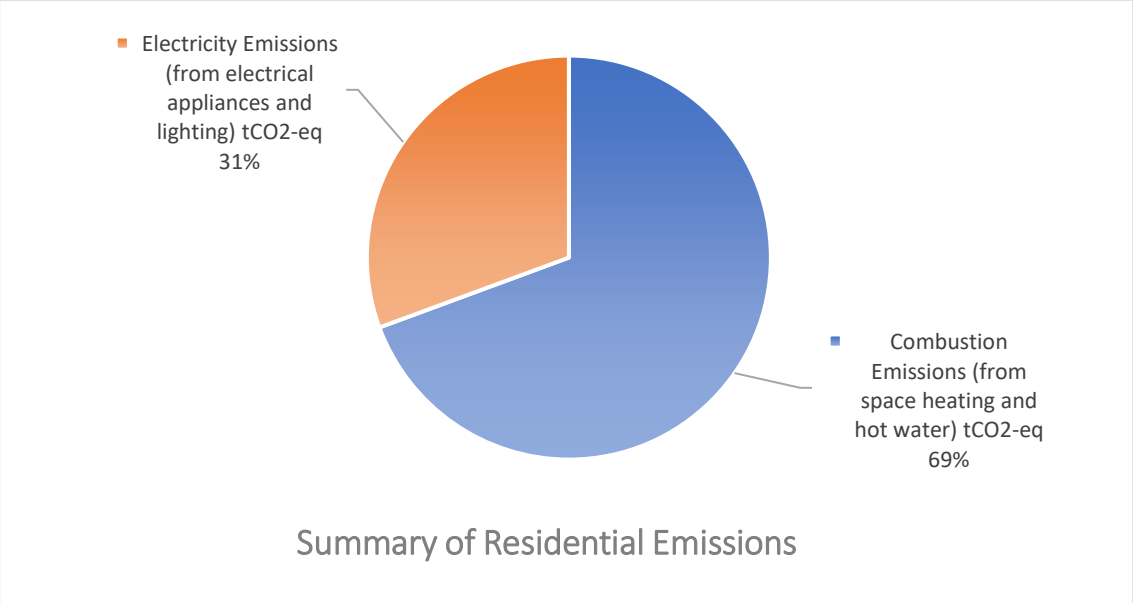


Figure 3-1: Overview of Residential Emissions

The majority of residential sector emissions are from the combustion of fuels for space heating and hot water (69%). Electricity related emissions account for 31% of residential emissions in the county.

The calculated emissions per capita in the baseline year for the county was 2.59 tCO_2-eq.

For an additional level of insight, a breakdown of main space heating fuels used at dwellings in the county is provided in Figure 3-2.

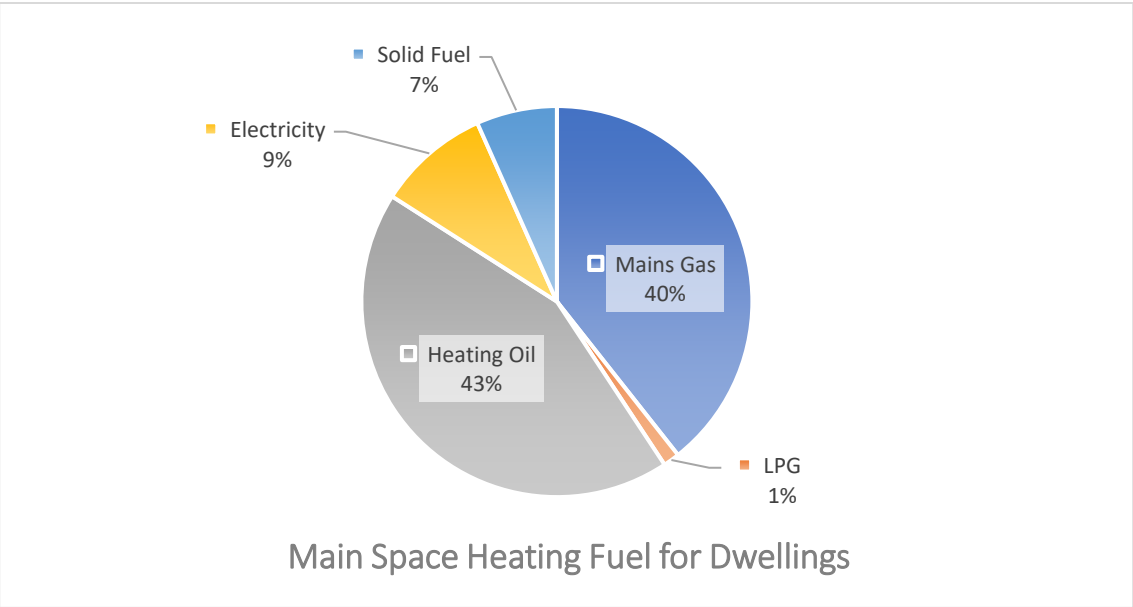


Figure 3-2: Breakdown of Main Space Heating Fuel for Dwellings

Heating oil is the primary source of main space heating fuel in the county (43%). It is commonly used in detached and semi-detached dwellings in rural areas. The combustion of heating oil generates a higher level of emissions per unit of energy compared to the combustion of many other heating fuels such as gas or LPG. The use of heating oil has significant contribution to residential sector emissions in the county. Heating oil levels in the county are however relatively less than other counties in the region. This is due to the level of mains gas use for space heating in the county.

Mains gas accounts for 39% of main space heating fuel use in the county. This figure in relatively high in comparison to surrounding counties in the midlands and is due to presence of a sizeable gas network in the county. A substantial number of residential dwellings in the county would access to this gas network.

A noteworthy number of dwellings use electricity as a main space heating fuel (9%). This practice is generally more common in apartments.

A noteworthy number of dwellings use solid fuel as a main space heating fuel (7%). This is likely due to the presence of a significant level of bogland in the county and the relatively high number of dwellings that use peat sourced from these lands as their main space heating fuel. Solid fuel burning will generate a relatively higher level of emissions compared to other commonly used space heating fuels due to its carbon intensity.

3.1.3 Assumptions and Limitations

The following assumptions and limitations exist in relation to the Residential sector data:

- The 'Top Down' methodology employed in this instance results in a broad, high-level estimation of GHG emissions from this sector in the county. A degree of 'uncertainty of measurement' therefore exists in relation to the emissions data.
- All assumptions and limitations relating to Map EIre national inventory emission data apply to the emissions data presented, as this data is informed by Map EIre data.
- The CSO database for heating fuel type only considers dwellings in the county that have had BER Ratings completed from them. The use of BER data is limited in that it only provides data for dwellings that have had BERs carried out on them, which only represents a proportion of the general housing stock. BER data does however provide a good representation of the housing stock generally given the level of BERs carried out on housing in the county.

3.1.4 Data Sources

1. Map EIre / Environmental Protection Agency National Emission Inventory, Local Authority Emissions, 2021.
2. Central Statistics Office, Metered Electricity Consumption, 2018.
3. Central Statistics Office, Main Space Heating Fuel Per County, 2018.
4. SEAI, Energy in Ireland, 2018.
5. CSO, Census of Population, 2016.

3.2 Commercial and Industrial

3.2.1 Methodology

The following methodology was used to determine emissions from the Commercial and Industrial sector.

- Raw data on commercial and industrial sector combustion related GHG emissions for 2018 was sourced from the Map EIre / the EPA's National Emission Inventory (2021) for the county. This emissions data is broken down by emissions from the combustion of fossil fuels in the commercial services sub-sector and the manufacturing sub-sector.
- Total non-residential electricity use levels for 2018 for the county was sourced from Electricity Supply Board (ESB) / CSO databases on metered electricity consumption. This total is then multiplied by the SEAI's electricity emission factor for 2018 to determine electricity related GHG emissions in the commercial and industrial sector for the year.
- The total GHG emissions in tCO_2-eq for the county is then calculated by adding the combustion and electricity GHG emissions.

3.2.2 Results

The commercial and industrial sector in the county generates 93,720 tCO_2-eq. 67% of these emissions are due to electricity consumption in the sector, whilst 33% are due to combustion related emissions (See Figure 3-3).

70% of combustion related emissions originate from the commercial services sub-sector. 30% of combustion related emissions originate from the manufacturing sub-sector (See Figure 3-4).

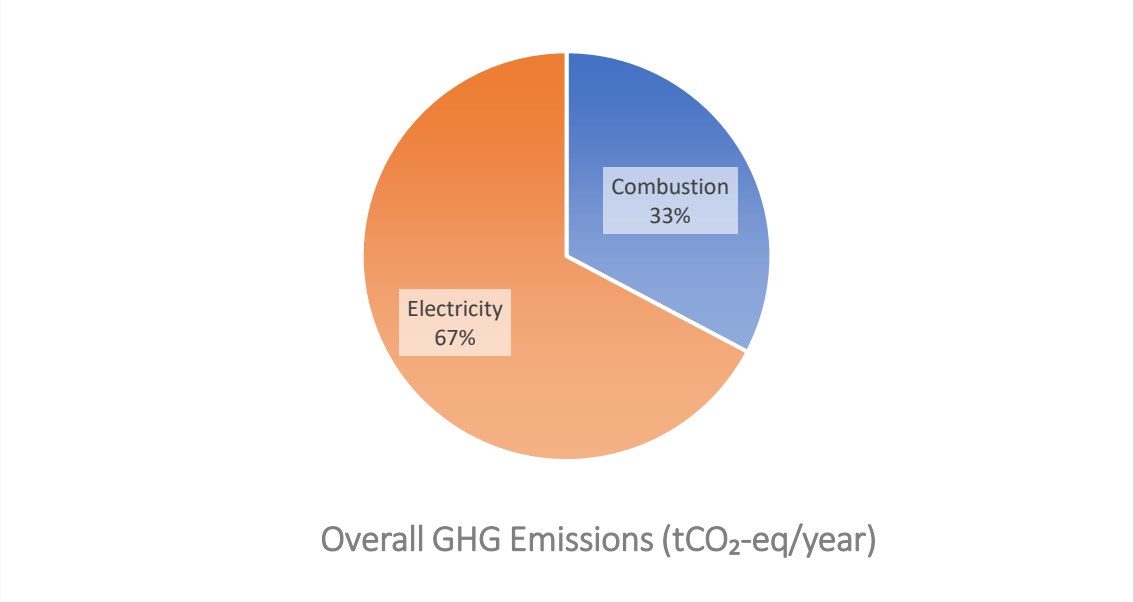


Figure 3-3 Percentage Breakdown of GHG emissions in the Commercial and Industrial Sector (combustion versus electricity)

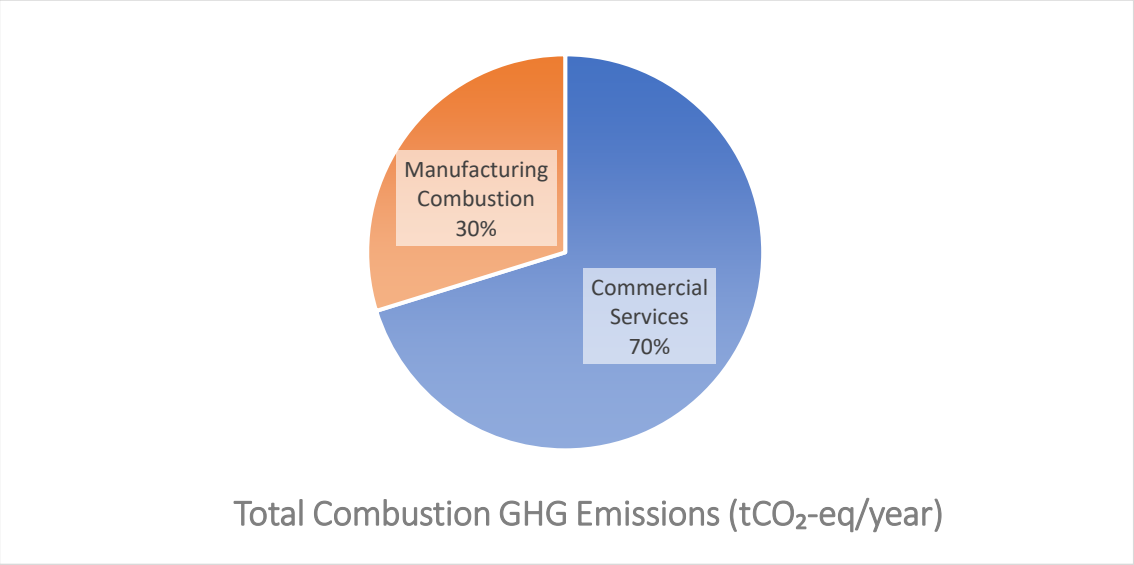


Figure 3-4 Percentage Breakdown of combustion GHG emissions (commercial services versus manufacturing combustion)

3.2.3 Assumptions and Limitations

The following assumptions and limitations exist in relation to the Commercial and Industrial sector data:

- The 'Top Down' methodology employed in this instance results in a broad, high-level estimation of GHG emissions from this sector in the county. A degree of 'uncertainty of measurement' therefore exists in relation to the emissions data.
- All assumptions and limitations relating to Map EIre national inventory emission data apply to the emissions data presented, as this data is informed by Map EIre data.

No other assumptions and limitations exist in relation to the Commercial and Industrial sector data. It is noted that 'Industrial Processes' is considered as a separate category within this report.

3.2.4 Data Sources

- Map EIre / Environmental Protection Agency, National Emission Inventory, Local Authority Emissions, 2021.
- MEC03 - Metered Electricity Consumption. Central Statistics Office. <https://data.cso.ie/>. Accessed on the 23rd November 2022.
- Energy in Ireland – 2019 Report. Sustainable Energy Authority of Ireland, 2019. <https://www.seai.ie/publications/Energy-in-Ireland-2019-.pdf>

3.3 Industrial Processes

3.3.1 Methodology

The following methodology was used to determine emissions from the Industrial Processes sector.

- A breakdown of emissions for the sector was obtained from the Map EIre database. The Access database file contains emissions from all sectors for all Irish counties separated into different sub-categories. The emissions data for Industrial Processes specific to the county was extracted.
- The GHG Emissions from the database are categorised into various pollutants (i.e. CO_2, CH_4, N_2O and SF_6). The emissions figures for these pollutants were converted to CO_2-eq with reference to the GWP value for each substance.

3.3.2 Results

A breakdown of industrial process related emissions is provided in Table 3-2 and illustrated in Figure 3-5.

Table 3-2 Breakdown of Industrial Processes Emissions

Industry Category	GHG Emissions (tCO_2-eq)
Mineral	6.52
Chemical	0.00
Metal	0.00
Non-energy Products from Fuels and Solvent Use	2,215.78
Electronics	0.00
Product Uses as Substitutes for ODS	0.00
Other Product Manufacture and Use	6,982.72
Other - Food and Beverage	59.70

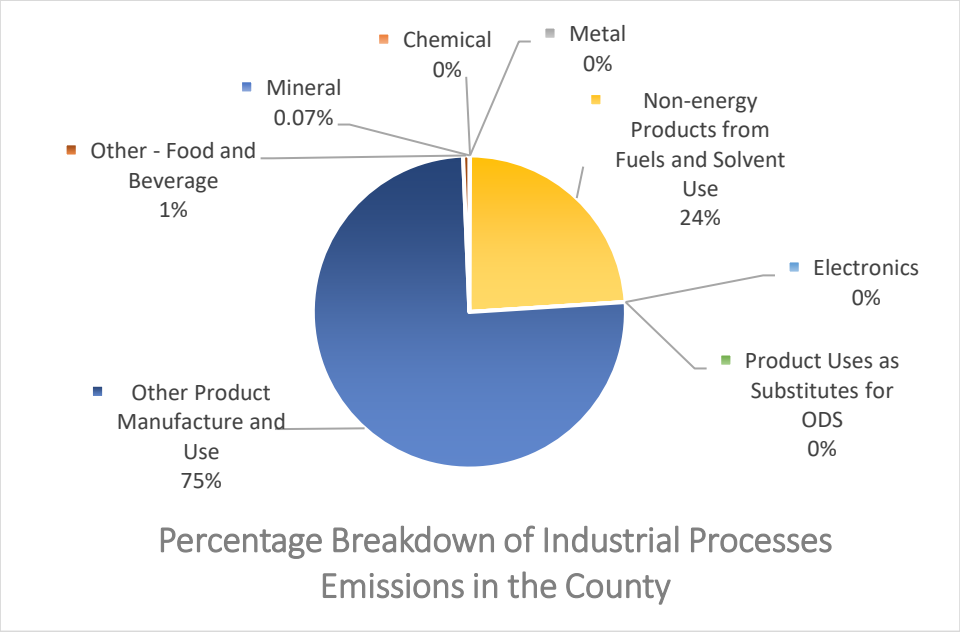


Figure 3-5 Breakdown of Industrial Processes Emissions

The total amount of GHG emissions from the Industrial Processes sector in the county were estimated to be 9,265 tCO_2eq in the baseline year.

GHG emissions from industrial processes in the county arise from 4 main subcategories. Emissions from 'Other Product Manufacture and Use' are the highest (75%) at 6,983 tonne CO_2eq, followed by 'Non-energy products from fuels and solvent use' (24%) at 2,216 tonne CO_2eq, A relatively minor level of emissions arise from 'Other - Food and Beverage' (1%) and 'Minerals' (0.07%).

3.3.3 Assumptions and Limitations

The following assumptions and limitations exist in relation to the Industrial Processes sector data:

- The 'Top Down' methodology employed in this instance results in a broad, high level estimation of GHG emissions from this sector in the county. A degree of 'uncertainty of measurement' therefore exists in relation to the emissions data.
- All assumptions and limitations relating to Map EIre national inventory emission data apply to the emissions data presented, as this data is informed by Map EIre data.

3.3.4 Data Sources

- Map EIre / Environmental Protection Agency National Emission Inventory 2021.

3.4 Agriculture

3.4.1 Methodology

County level agricultural data was obtained from the CSO's Census of Agriculture. This data was broken down into different agricultural activities relevant to the county.

Once all data was obtained, a breakdown of agricultural sector related emissions was developed. These emissions were broken into two categories, as follows:

- Livestock (sum of cattle (suckler and dairy), pigs, sheep and poultry).
- Managed Soils (sum of direct and indirect N_2O emissions, limestone emissions and urea application emissions).

Livestock emissions at county level was determined with reference to national emissions statistics, the national herd, and the herd in the county. This was considered to be the most representative and accurate method for determining emissions for livestock.

Managed soils emissions at county level were estimated with reference to national emission statistics for direct and indirect N_2O emissions, limestone emissions and urea application emissions; and the area of managed agricultural soils nationally compared to the area of managed soils in the county.

3.4.2 Results

A breakdown of livestock numbers in the county is presented in Table 3-3

Table 3-3: Breakdown of Livestock Numbers in the County

Breakdown of Livestock Numbers in the County	
Livestock Type	**Livestock Numbers**
Dairy Cows	50,262
Other Cattle and Cows	213,281
Sheep	65,345
Pigs	65,499
Poultry	92,073

Cattle farming is the primary type of livestock farming in the county. Other cattle and cows (for beef production) constitute 44% of total livestock numbers within the county. In terms of numbers, this is followed by poultry, then pigs, sheep and dairy cows.

A breakdown of agricultural related emissions in the baseline year is presented in Table 3-4.

Table 3-4: Breakdown of Agricultural Emissions

Type	CO_2-eq Emissions (tCO_2-eq)
Livestock	
Cattle	475,581.62
Sheep	9,439.16
Pigs	13,674.70
Poultry	872.62
Managed Soils	
Managed Soils	185,358
Totals	
Total Livestock	499,568.09
Total Managed Soils	185,358.33
Overall Total	684,926.42

A breakdown of livestock related emissions is presented in Figure 3-6.

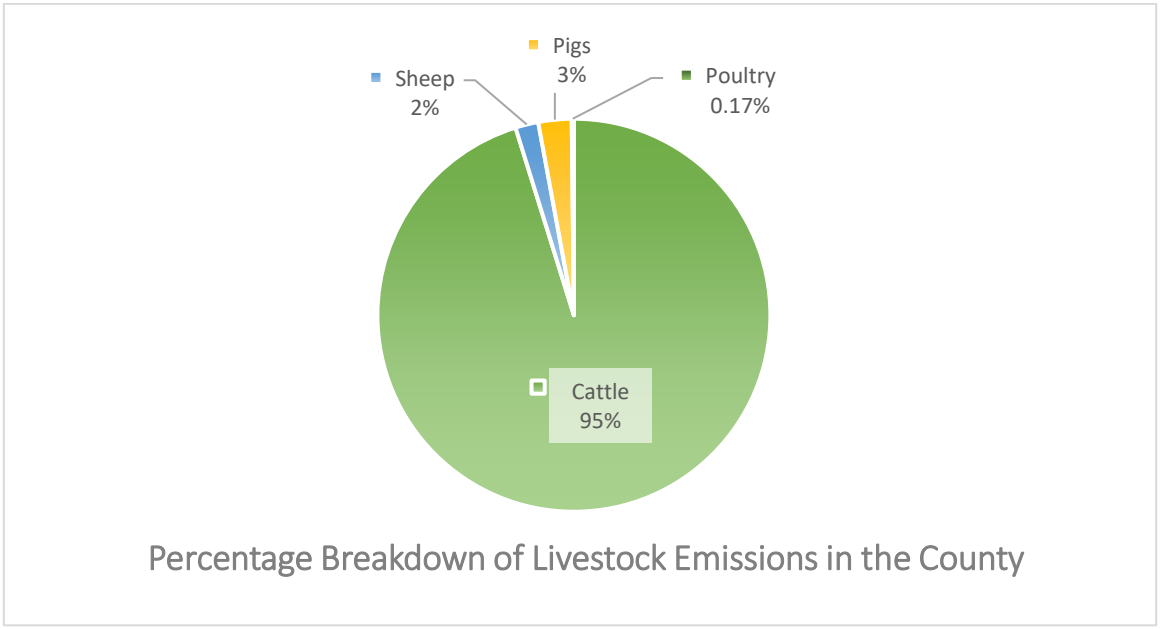


Figure 3-6: Percentage Breakdown of Livestock Emissions

Emissions from cattle (beef and dairy cows) combined contribute the most in terms of livestock related emissions by far, accounting for 95% of CO_2-eq emissions from agriculture in the county. Cattle produce much more methane emissions than other livestock, and due to the higher global warming potential of methane, their impact is much larger on the environment. Emissions associated with sheep, pig and poultry farming are relatively low by comparison.

Managed soils in the county generated 185,358 tCO_2-eq emissions in the baseline year.

Agricultural emissions for the county broken down by the two overarching categories, total livestock, and managed soils combined are presented in Figure 3-7.

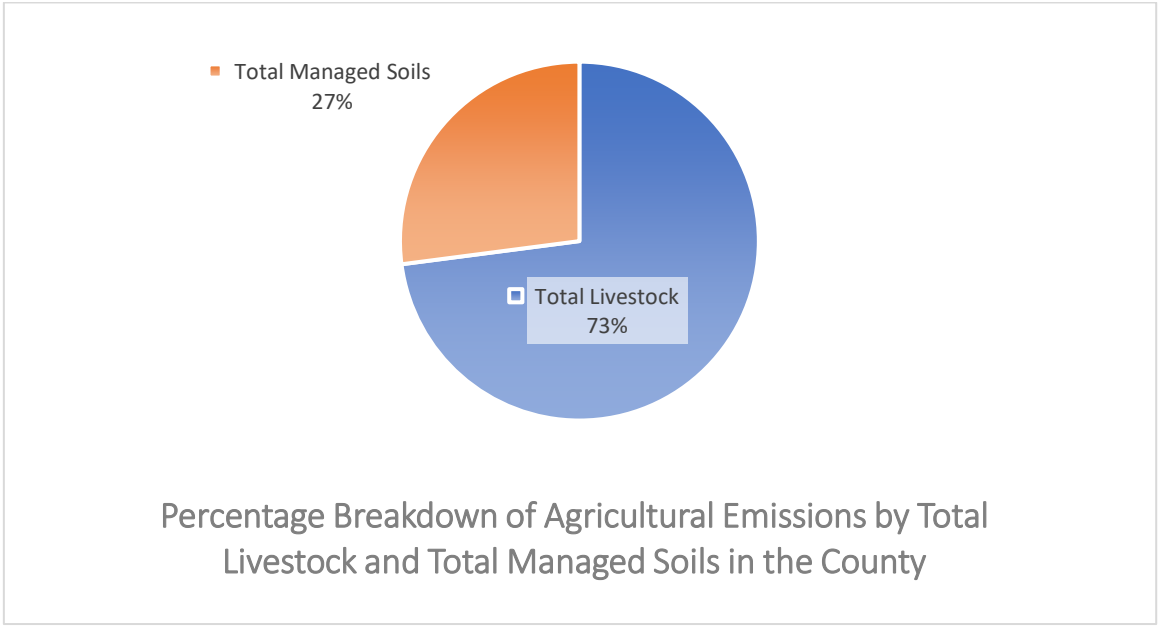


Figure 3-7: Percentage Breakdown of Agricultural Emissions Overall

Livestock emissions account for the majority of emissions from the sector overall (73%). Managed soils emissions are lower by comparison, yet still significant (27%).

3.4.3 Assumptions and Limitations

The following assumptions and limitations exist in relation to the Agricultural sector data:

- The 'Top Down' methodology employed in this instance results in a broad, high-level estimation of GHG emissions from this sector in the county. A degree of 'uncertainty of measurement' therefore exists in relation to the emissions data.
- All assumptions and limitations relating to Map EIre national inventory emission data apply to the emissions data presented, as this data is informed by Map EIre data.
- National emissions data for 'Other Livestock' defined in the EPA's national emission inventory has been assumed to relate to Poultry. This 'Other Livestock' category includes poultry, goats, horses and mink, however, in terms of population, poultry accounts for the vast majority of livestock under this category.
- It is assumed that all managed agricultural soils in the county release the same level of emissions. In reality, emissions levels will vary depending on the type and level of fertilizer, lime or urea application on those soils based on their specific use (i.e., pasture, wheat, barley, potatoes).

3.4.4 Data Sources

- Map EIre / Environmental Protection Agency, National Emission Inventory 2021.
- Central Statistics Office, Census of Agriculture, 2020.

3.5 Transport

3.5.1 Methodology

The following methodology was applied to determine transport related emissions in the county:

- GHG emissions data for the transport sector was sourced from the Map EIre database / the EPA's National Emission Inventory 2021. This database provides a breakdown of emission for a number of transport sub-categories. Various emission types (CH_4, N_2O) reported were converted to tCO_2-eq using the GWP for each type of emission.
- For an additional layer of insight, an estimation of GHG emissions per single unit of each vehicle type is made by dividing emissions associated with each vehicle type by vehicle population. The CSO's Transport Omnibus from 2018 was reviewed to ascertain the vehicle population in the county for 2018 for each vehicle type.

3.5.2 Results

Detail on GHG emissions associated with each transport category in the county is provided in Table 3-5 and illustrated in Figure 3-8.

Table 3-5: Breakdown of Transport Emissions in the County

Transport Category	GHG Emissions (tCO_2-eq)
Passenger cars	191,315.31
Light-duty trucks	51,303.56
Heavy-duty vehicles	93,938.44
Motorcycles	443.45
Railways	7,941.25

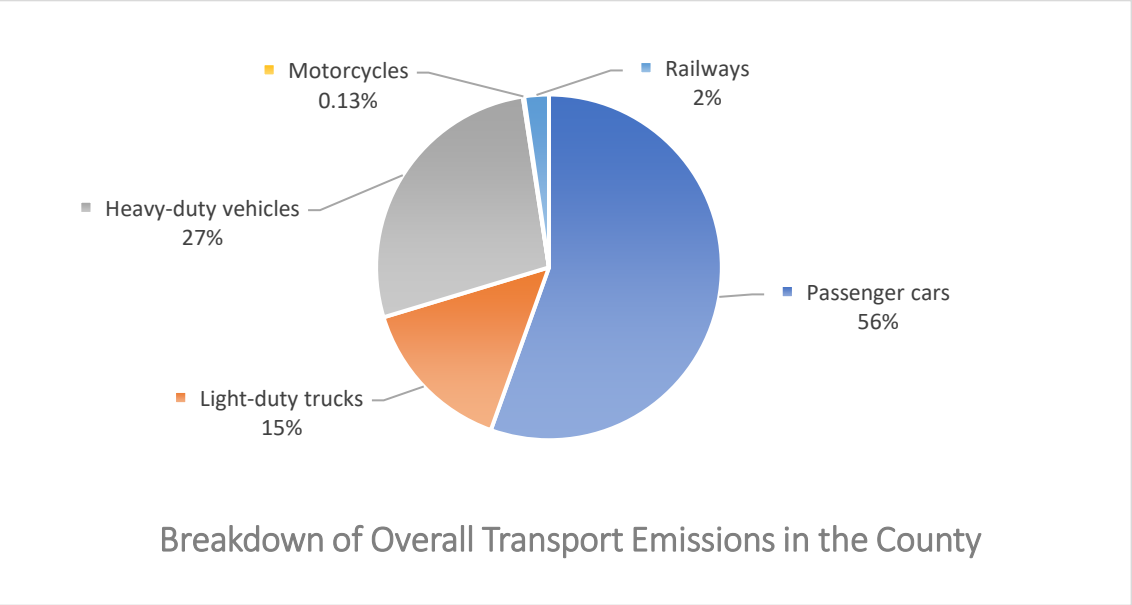


Figure 3-8: Breakdown of Transport Emissions in the County

The total amount of transport sector GHG emissions was estimated to be 344,942 tCO_2-eq in the baseline year.

Passenger cars are the primary source of transport related GHG emission in the county (56%), followed by heavy duty vehicles (27%), then light duty trucks (15%). Emissions from railways are relatively minor, which reflects the low level of railway services in the county. Emissions from motorcycles are relatively minor, which reflects the low number of this type of vehicle in the county. Transport related emission in the county were closely similar to other counties in the Midlands region.

An estimation of emissions per single unit of each vehicle type is presented in Figure 3-9.

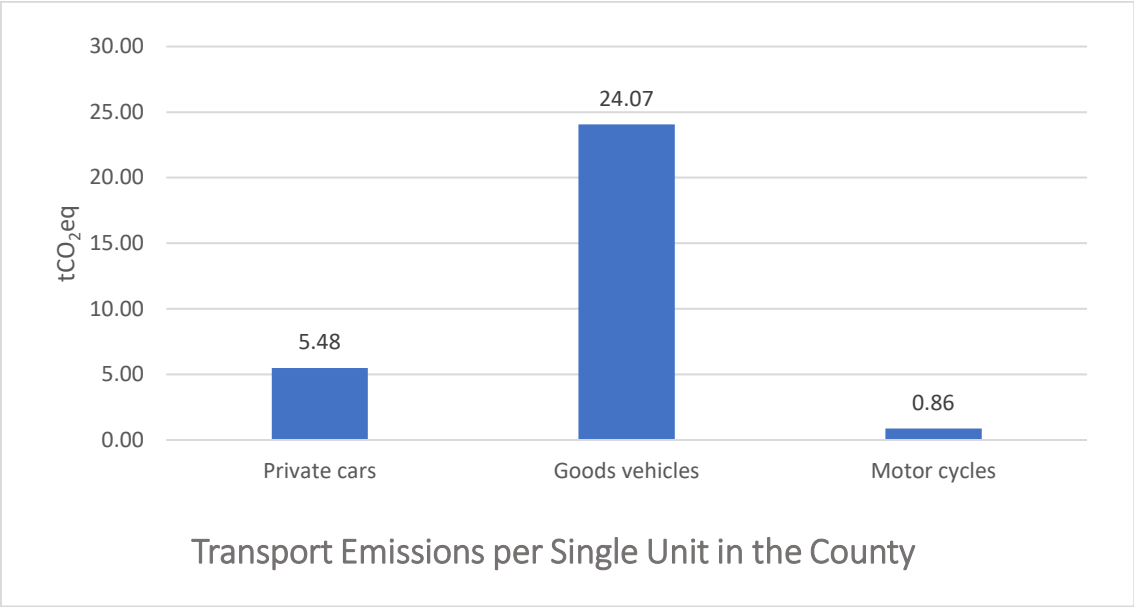


Figure 3-9: Emissions per Single Unit of Vehilce Type

Goods vehicles are the most carbon intensive vehicle type in the county. This reflects the relatively high level of carbon emissions associated with these weight laden vehicles. Private cars are next most carbon intensive vehicle type in the county, followed by motorcycles.

3.5.3 Assumptions and Limitations

The following assumptions and limitations exist in relation to the Transport sector data:

- The 'Top Down' methodology employed in this instance results in a broad, high-level estimation of GHG emissions from this sector in the county. A degree of 'uncertainty of measurement' therefore exists in relation to the emissions data.
- All assumptions and limitations relating to Map EIre national inventory emission data apply to the emissions data presented, as this data is informed by Map EIre data.
- When determining emissions per single unit of vehicle type goods vehicles (as defined by the CSO) were assumed to be inclusive of both light duty trucks and heavy-duty vehicles. Heavy duty vehicles were also inclusive of buses.

3.5.4 Data Sources

- Map EIre / Environmental Protection Agency, National Emission Inventory 2021.
- Transport Omnibus 2018, Central Statistics Office, 2018.

3.6 Waste and Wastewater

3.6.1 Methodology

3.6.1.1 Waste

Qualitative analysis of the waste sector in the county was carried out to determine the level of GHG emissions associated with the sector. The following waste categories defined in the EPA's National Emission Inventory 2021 were examined.

- Managed Waste Disposal,
- Composting,
- Anaerobic Digestion (AD),
- Incineration, and
- Open Burning of Waste.

Using national emissions data for the managed waste disposal, incineration and open burning of waste categories defined in the EPA's National Emission Inventory 2021, emissions associated with this sector for the county were estimated for the county on a pro-rata basis considering national and county population levels. The accumulated emissions data for these waste activities in the county were combined to determine emissions in tCO_2-eq for the baseline year.

There are no composting or anaerobic digestion facilities in the county. Thus, there are no emission in the county from these categories of waste facility.

For open burning of waste, there is no local data on GHG emissions from this unregularized and uncontrolled activity.

3.6.1.2 Wastewater

Using national emissions data for the wastewater sector defined in the EPA's National Emission Inventory 2021, emissions associated with this sector for the county were estimated for the county on a population pro-rata basis.

3.6.2 Results

3.6.2.1 Waste

A breakdown of the emissions from the waste sector in the county is presented in Table 3-6 and illustrated in Figure 3-10.

Table 3-6 Emissions from the Waste Sector in the County

Waste Category	National GHG Emissions 2018 (tCO_2eq)	County GHG Emissions (tCO_2eq)
Managed Waste Disposal Sites	692,700	12,321
Waste incineration	20,300	361
Open burning of waste	3,630	65
Composting	42,000	0
Anaerobic Digestion at biogas facilities	2,400	0

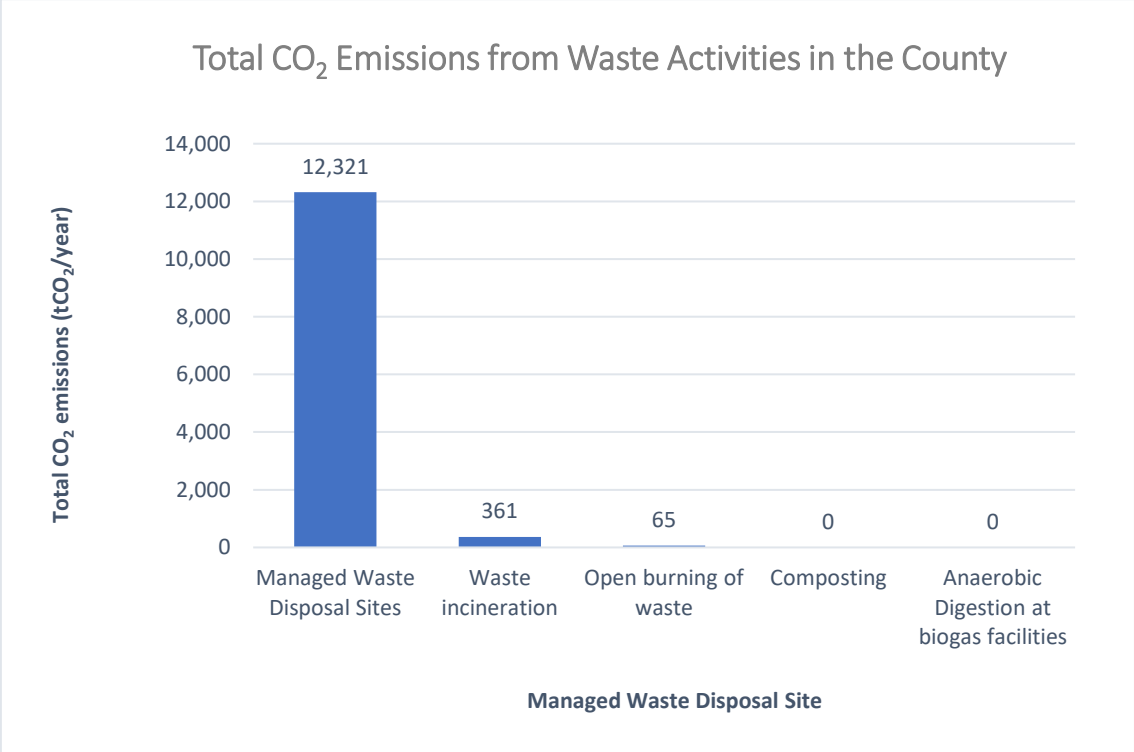


Figure 3-10: Emission from the Waste Sector in the County

The waste sector in the county generated 12,746 tCO_2 in the baseline year. 97% of waste sector emissions originate from managed waste disposal sites, namely managed landfills including closed or historic landfills still generating Methane and Carbon dioxide emissions due to the decomposition of waste inside the waste bodies of the landfills.

3.6.2.2 Wastewater

Estimates for GHG emissions from the wastewater sector in the county for the baseline year are presented in Table 3-7.

Table 3-7: Wastewater Emissions

Sector Category	National GHG Emissions 2018 (tCO_2eq)	County GHG Emissions 2018 (tCO_2eq)
Domestic Wastewater	147,900.00	2,630.6

3.6.2.3 Summary

A summary of the key findings for the waste and wastewater sectors is presented below:

- Total emissions from the waste sector in the county were estimated to be 12,746 tCO_2-eq.
- The majority of waste sector emissions in the county are generated by managed landfills.
- Total emissions from the wastewater sector in the County were estimated to be 2,630.6 tCO_2-eq, which represents a small fraction of domestic wastewater emissions nationally.
- Total emission from the combined waste and wastewater sector were estimated to be 15,377 tCO_2-eq.

3.6.3 Assumptions and Limitations

The following assumptions and limitations exist in relation to the Waste and Wastewater sector data:

- The 'Top Down' methodology employed in this instance results in a broad, high-level estimation of GHG emissions from this sector in the county. A degree of 'uncertainty of measurement' therefore exists in relation to the emissions data.
- All assumptions and limitations relating to Map EIre national inventory emission data apply to the emissions data presented, as this data is informed by Map EIre data.
- Managed waste disposal related to all regularized landfills including operational landfills and closed or historic landfills.

3.6.4 Data Sources

- Map EIre / Environmental Protection Agency, National Emission Inventory, EPA, 2021.
- EPA IE licence, IPC licence, waste licence and WFP search databases and licence files for landfills contained within them - accessed 28/11/2022.

3.7 Land Use, Land Use Change and Forestry (LULUCF)

3.7.1 Methodology

The following methodology was used to determine emissions from the LULUCF sector.

- A breakdown of emissions for the sector was obtained from the Map EIre database. The Access database file contains emissions from all sectors for all Irish counties separated into different sub-categories. The emissions data for LULUCF specific to the county was extracted.

- The GHG Emissions from the database are categorised into various pollutants (i.e. CO_2, CH_4, N_2O and SF_6). The emissions figures for these pollutants were converted to CO_2-eq with reference to the GWP value for each substance.

3.7.2 Results

A breakdown of GHG emissions relating to land use, land use change and forestry for the various land uses in the county for the baseline year is presented in Table 3-8 and Figure 3-11.

Table 3-8: Breakdown of LULUCF Emissions in the County

Sector Category	GHG Emissions (tCO_2eq)
Forestland	-182,422.69
Cropland	-3,995.45
Grassland	206,163.44
Wetlands	16,852.43
Settlements	4,715.07
Other land	155.87
Harvested wood products	-12,378.18

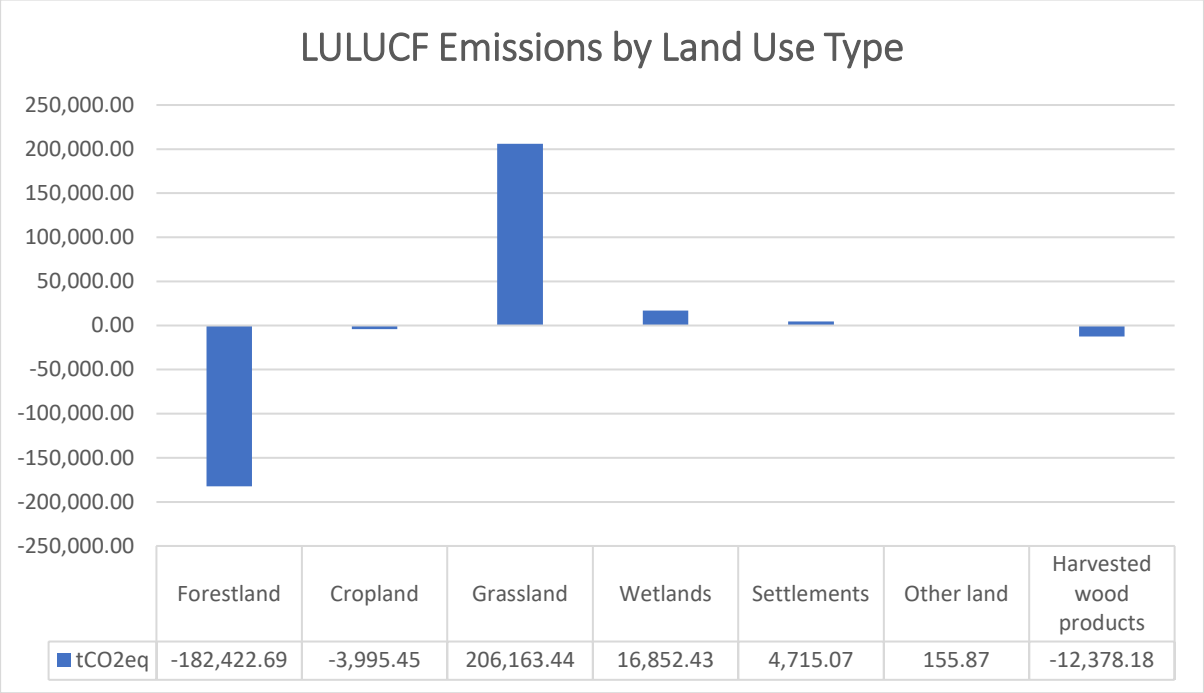


Figure 3-11 Breakdown of LULUCF Emissions in the County

The total amount of GHG emission from the LULUCF sector was estimated to be 29,090 tCO_2-eq in the baseline year.

Grassland in the county is the land use type that contributes most in terms of emissions, followed by the Wetlands, Settlements and Other Land categories. Forestland and Cropland serve to absorb CO_2 considering both CO_2 gains and losses overall. Forestland and Cropland generally absorb more carbon (e.g., through vegetative photosynthesis) than they release (e.g., through deforestation or harvesting). In terms of harvested wood products (HWP), after harvest, atmospheric carbon (C) is immediately sequestered by vegetation re-growth. This temporal mismatch between oxidation of HWPs and C uptake by vegetation generates a net sink.

3.7.3 Assumptions and Limitations

The following assumptions and limitations exist in relation to the LULUCF sector data:

- The 'Top Down' methodology employed in this instance results in a broad, high-level estimation of GHG emissions from this sector in the county. A degree of 'uncertainty of measurement' therefore exists in relation to the emissions data.
- All assumptions and limitations relating to Map EIre national inventory emission data apply to the emissions data presented, as this data is informed by Map EIre data.

3.7.4 Data Sources

- Map EIre / Environmental Protection Agency, National Emission Inventory 2021.

3.8 Local Authority

As detailed in Annex C to the Draft Local Authority Climate Action Guidelines, public sector including local authority GHG emissions are captured under the sectors dealt with so far in this report (e.g., Institutional emissions are captured under the Commercial sector, Public Transport emissions are captured under the Transport Sector). The guidance advises that a separate BEI for local authority GHG emissions is prepared, however, having regard to the local authority's responsibility establish a GHG emission baseline and deliver on its own targets for GHG emission reductions.

GHG emissions data for the local authority was sourced from the county council's SEAI monitoring and reporting database. This data is presented in Table 3-9 and Figure 3-12.

Table 3-9: GHG Emissions Data for the Local Authority

Category	GHG Emission tCO_2-eq
Electricity	2,400
Thermal	552
Transport	711
Total	3,663

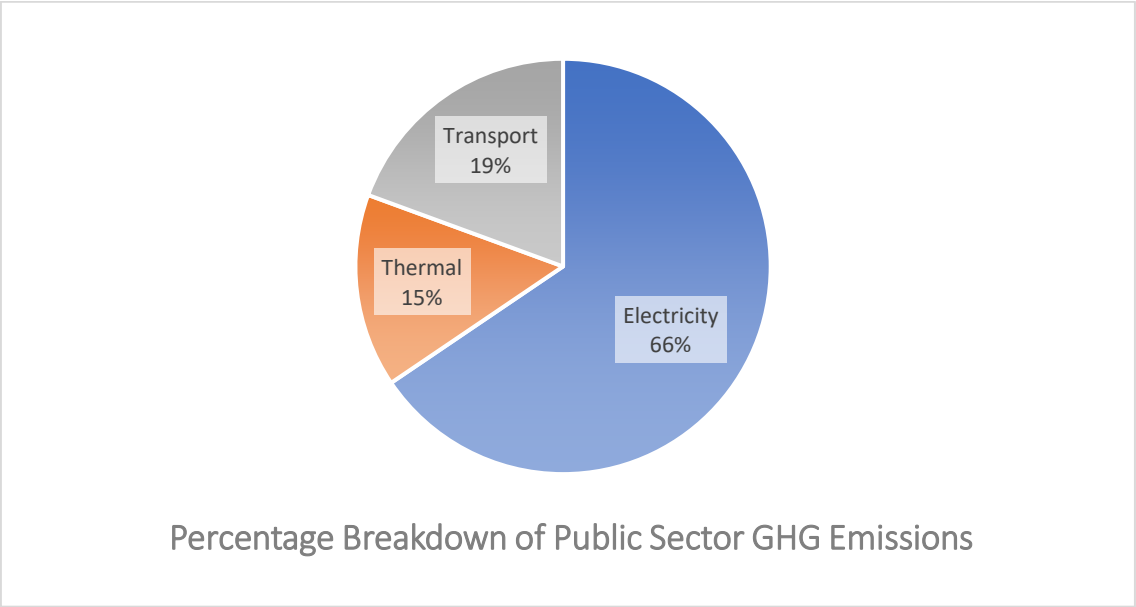


Figure 3-12: Percentage Breakdown of GHG Emissions for the Local Authority

4. OVERVIEW AND MAIN CONCLUSIONS

The analysed sectors in the county generated 1,396,467.7 tCO_2-eq in the baseline year, overall. A breakdown of these emissions and targeted emission levels for 2030 by sector is presented in Table 4-1.

Table 4-1: Breakdown of Emissions Per Sector in the County

Sector	2018 Emissions tCO_2-eq	Percentage Breakdown	Sectoral Emission Ceiling Reduction Percentage 2030	Target Emissions 2030 tCO_2-eq
Residential	219,147	16%	40%	131,488
Commercial and Industrial	93,720	7%	45%	51,546
Industrial Processes	9,265	1%	35%	6,022
Agriculture	684,926	49%	25%	513,695
Transport	344,942	25%	50%	172,471
Waste and Wastewater	15,377	1%	50%	7,688
LULUCF	29,090	2%	-	-
Total	1,396,468	100%	-	-

**Commercial and Industrial GHG emissions are unable to be disaggregated considering the methodology applied to calculate GHG emission for these sectors and the available data that underpins the calculations (e.g., electricity use data sourced from the CSO is only available for the 'non-residential sector' and does not differentiate between the commercial and industrial sector). As such, the more conservative 'Commercial' sectoral emission ceiling reduction has been applied.*

*** Finalization of the sectoral emission ceiling for the LULUCF sector has been deferred for up to 18 months from July 2022 to allow for the completion of a national land use review.*

A percentage breakdown of emissions in the baseline year is provided in Figure 4-1.

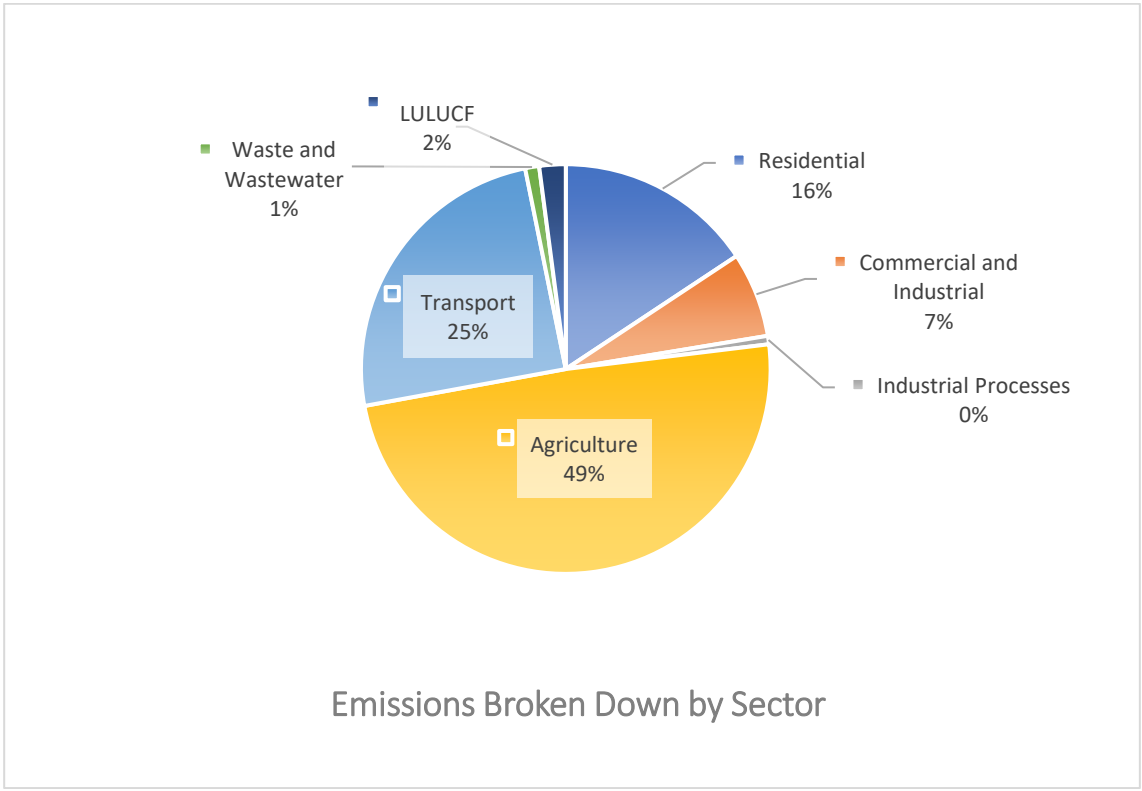


Figure 4-1: Breakdown of Emissions Per Sector in the County

The top three sectors in the county in terms of GHG emission levels were Agriculture, Transport and Residential producing 49%, 25% and 16% of tCO_2-eq respectively, of the total emissions in the county. From this analysis, these sectors should be the main targets of energy and emission initiatives.

An illustration of the target emissions for 2030 broken down by each sector is provided in Figure 4-2.

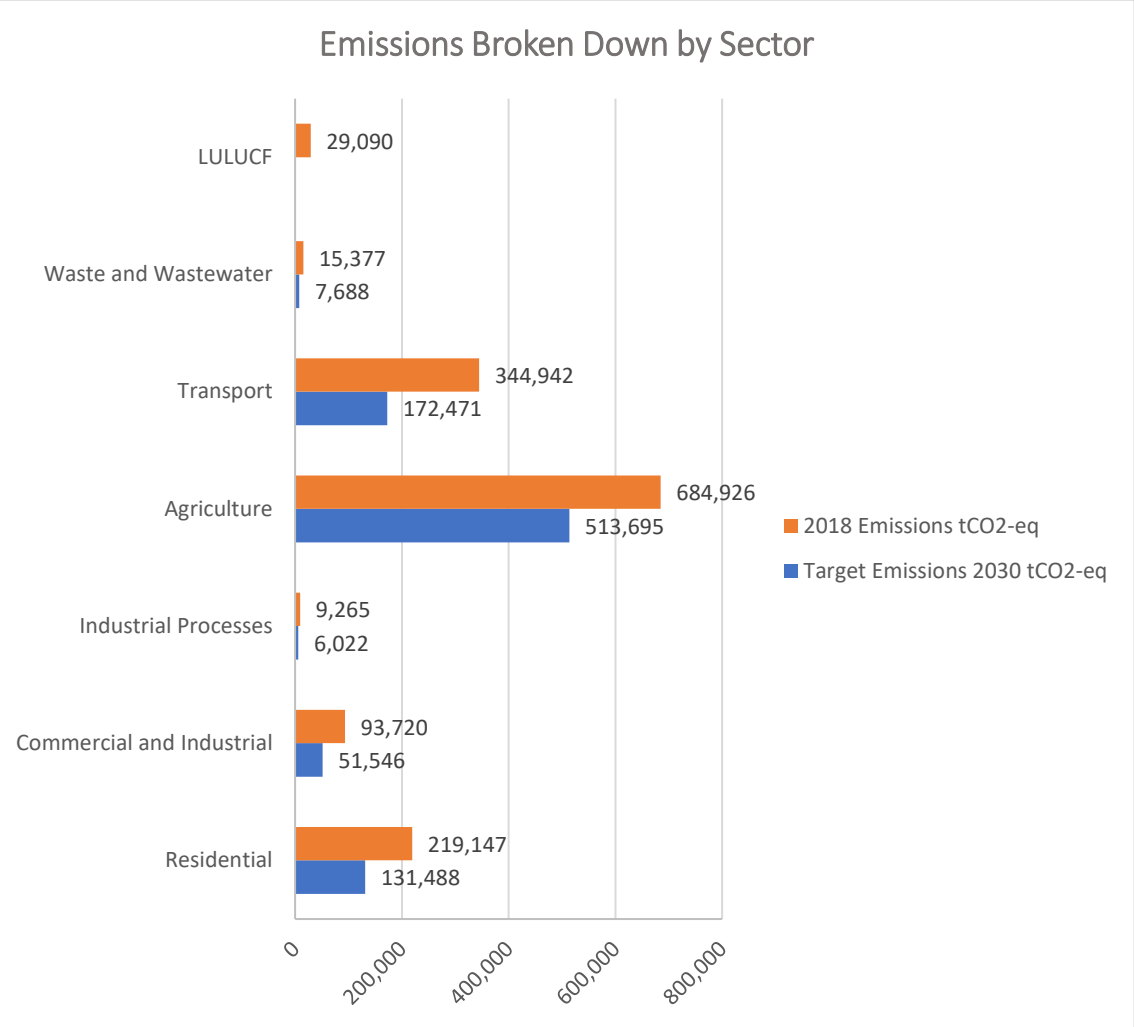


Figure 4-2: Emission Reduction Requirements Per Sector

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APPENDIX 1

Further Explanation of the Sectors

Detailed Explanation on Subsectors/Subcategories for Each Sector

The sections below provide further detail on particularly complex to understand subsectors/subcategories, including:

- Commercial and Industrial - Manufacturing Combustion
- Industrial Processes
- Agriculture - Managed soils
- LULUCF
- LULUCF - Grassland
- LULUCF - Harvested Wood Products
- LULUCF - Peatlands (Wetlands)

The EPA's National Emissions Inventory Report (NIR) provides more information on these sectors.

Commercial and Industrial - Manufacturing Combustion

Manufacturing Combustion emissions derive from emissions from combustion in the manufacturing industry (i.e., for space heating, process heating, energy etc). A prime example is the use of an on-site boiler or generator at a manufacturing installation. It also includes combustion for combined heat and power for own use in these industries.

Industrial Processes

This Industrial Processes sector is distinct from the 'Commercial and Industrial' category. The Industrial Processes sector estimates greenhouse gas emissions occurring from non-combustion related industrial processes, from the use of greenhouse gases in products, and from non-energy uses of fossil fuel carbon. Examples of 'Industrial Process' related GHG emissions include cement production, chemical manufacturing, mineral processing, metal processing, and fertilizer production).

Agriculture - Managed Soils

The 2006 IPCC Guidelines on National Greenhouse Gas Inventories defines managed soils as all soils on land, including Forest Land, which is managed. Nitrous oxide is produced naturally in soils through the processes of nitrification and denitrification. Nitrification is the aerobic microbial oxidation of ammonium to nitrate, and denitrification is the anaerobic microbial reduction of nitrate to nitrogen gas (N2). Nitrous oxide is a gaseous intermediate in the reaction sequence of denitrification and a by-product of nitrification that leaks from microbial cells into the soil and ultimately into the atmosphere. One of the main controlling factors in this reaction is the availability of inorganic N in the soil.

Under the agriculture sector, GHG emissions from managed soils are therefore estimated based on N_2O emissions.

The emissions of N_2O that result from anthropogenic N inputs or N mineralisation occur through both a direct pathway (i.e., directly from the soils to which the N is added/released), and through two indirect pathways: (i) following volatilisation of NH_3 and NO_x from managed soils and from fossil fuel combustion and biomass burning, and the subsequent redeposition of these gases and their products NH_4^+ and NO_3^- to soils and waters; and (ii) after leaching and runoff of N, mainly as NO_3^-, from managed soils.

There are two key emission source categories in Ireland (see the EPA's National Emissions Inventory Report) for agricultural soils, namely 'Direct N_2O Emissions from Managed Soils' and 'Indirect N_2O Emissions from Managed Soils'. These are further explained in the table below.

Emission Source Category	Description
Direct N_2O Emissions from Managed Soils	This category includes emissions from **inorganic N fertilisers, organic N fertilisers, urine and dung deposited by grazing, crop residues, mineralisation / immobilization associated with loss / gain of soil organic matter and cultivation of organic soils**.
Indirect N_2O Emissions from Managed Soils	This category includes emissions from **atmospheric deposition and nitrogen leaching and run-off** from two indirect pathways: (i) following volatilisation of NH_3 and NO_x from managed soils and the subsequent redeposition of these gases and their products NH_4^+ and NO_3^- to soils and waters; and (ii) after leaching and runoff of N, mainly as NO_3^-, from managed soils.

This sub-category is distinct from the LULUCF sector in that it solely relates to GHG emissions which are as a result of land spreading and deposition related to agricultural activity (i.e., fertilizer application emissions, loss of N contained in fertilizer through volatization or leaching and run-off).

LULUCF

The rate of build-up of carbon dioxide (CO_2) in the atmosphere can be reduced by taking advantage of the fact that atmospheric CO_2 can accumulate as carbon in vegetation and soils in terrestrial ecosystems. Under the United Nations Framework Convention on Climate Change any process, activity or mechanism which removes a greenhouse gas (GHG) from the atmosphere is referred to as a "sink". Human activities impact terrestrial sinks, through land use, land-use change and forestry (LULUCF), consequently, the exchange of CO_2 (carbon cycle) between the terrestrial biosphere and the atmosphere is altered.

LULUCF stands for Land Use, Land Use Change and Forestry. It is defined by the United Nations Climate Change Secretariat as ‘a greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities.’ The LULUCF sector includes the land use categories: Forest land, Cropland, Grassland, Wetlands, Settlements, Other land and Harvested Wood products.

Breaking down LULUCF into its individual terms:

- **‘Land Use’** refers to the human use of the material on land which represents the economic and cultural activities practiced at a given place.
- **‘Land Use Change’** is then the process by which human activities transform the natural landscape, referring to how land has been used.
- **'Forestry'** refers to the practice of creating, managing, planting, using, conserving and repairing forests and woodlands for associated resources for human and environmental benefits. Note that land cover does not equate to land use (land cover refers to only the physical material on the land).

A description of each land use category is provided in the table below.

Land Use Category	Description[1]
Forest Land	Includes all public and private plantation forests. Forest land is an area of land where tree crown cover is greater than 20% of the total area occupied. It refers to emissions and removals from forest management activities such as **timber harvesting, thinning and replanting, and ecological processes** such as tree growth and decomposition.
Grassland	Includes improved grasslands, unimproved grasslands and grasslands not currently in use. Improved grasslands include areas identified as lands managed for **livestock grazing and grass-based feed and winter fodder production** (pasture, silage and hay). Unimproved grasslands are identified as **rough grazing** for livestock, predominantly sheep or low intensity beef farming. Grasslands not in use are those lands identified as dominated by grass habitats, but not currently managed (in any one year) for livestock.
Cropland	Refers to emissions and removals from annual and perennial cropland, as well as from forest lands and grassland converted to cropland. Cropland includes lands in annual crops, summer fallow and perennial crops.
Wetlands	Includes unmanaged wetlands and managed wetlands. Managed wetland are areas commercially exploited for **public and private extraction of peat** and areas used for **domestic harvesting of peat**. Unmanaged wetlands are natural unexploited wetlands.
Settlements	Refers to emissions and removals occurring on developed lands (such as urban environments, transport infrastructure and mining), from land conversion of forests and agricultural land to settlements and the footprint of industrial, commercial/institutional, and residential buildings.
Other Land	Refers to the residual emissions and removals when all other land use areas have been determined.
Harvested Wood Products	Refers to wood materials removed from the harvested site and turned into consumer products, such as **timber for construction, furniture, or paper products**. Harvested wood products are not limited to wood harvested from forests and include those harvested from agricultural land and land conversion.

LULUCF - Grassland

Grasslands have a significant amount of carbon content and can act as either as a carbon emitting land use or a land use that sequesters carbon. This depends on a complex array of processes in combination with land use activities occurring on a grassland. GHG emissions associated with grasslands are a function of these processes of affecting biomass and soils containing carbon.

In Ireland, grassland grazing, for example, contributes to grassland related GHG emissions, depending on interactions between soils, plant species, and climate. Rainfall significantly effects carbon releases on grasslands that are subject to grazing. On sites with higher rainfall, grazing generally increases soil carbon releases on sandy, coarse-textured soils, while clay soils respond with weak increases to strong decreases in soil carbon releases. Naturally, the Irish climate is characterized by cool and damp, cloudy and rainy weather conditions throughout the year. This significantly contributes to the release of carbon emissions from grasslands (the same can be said for wetlands).

[1] *Table 6.3 Description of Land Use Categories*, Ireland's National Inventory Report 2022.

Emissions from grassland can also be due to their intensive use for food and forage production because of their high natural soil fertility. Carbon stores within grasslands are sensitive to management and are thus vulnerable to losses in soil carbon. Land degradation—which is a long-term decline in plant productivity and the associated soil and water functions that support it—is widespread in grasslands in part due to soil carbon losses.

When grassland becomes degraded, these soils can lose carbon, converting to carbon dioxide in the process. Conversely, when grassland is restored (for example, from cropland), carbon can be sequestered. Emissions here therefore refer to the net balance of these carbon losses and gains from grassland biomass and soils.

Studies have suggested that grassland soils can potentially act as significant carbon sinks. Land management practices can enable sequestration. An article published by Teagasc (Grassland and carbon sequestration, Teagasc) provides some examples of possible management techniques to increase carbon sequestration. These include:

- Grazed pastures may sequester more carbon than grasslands used for silage or hay production, due to the recycling of organic matter and nutrients from faeces and plant residues.
- Improve fertiliser management. Combine liming treatments with nutrient fertilisation.
- Ensure good grazing infrastructure — this will lead to less grassland damage and less frequent reseeding.

LULUCF - Harvested Wood Products (HWPs)

Harvested wood products also store carbon. Three types of wood products are distinguished in the greenhouse gas inventories: sawn wood, panels, and paper. Carbon is stored in the wood product over a certain lifetime related to its use. At the end of the product lifetime, and when released to the atmosphere, the carbon formerly stored in the wood product is considered an emission in a GHG inventory.

When more carbon flows into the wood products pool than what has reached the end of the lifetime, then a build-up of carbon in products occurs and this is accounted for as a net sink in the GHG inventory. The HWPs can be counted as additional carbon sink in the GHG inventory because the biomass loss due to harvest is already considered in the biomass of Forest Land. Note that CO_2 is released during combustion where there is a supply of woody biomass for energy.

LULUCF - Peatlands (Wetlands)

Peatlands are known to be the largest natural terrestrial carbon store. They are able to store more carbon than all other vegetation types in the world combined. In peatlands, year-round water-logged conditions slow plant decomposition to such an extent that dead plants accumulate to form peat. This stores the carbon the plants absorbed from the atmosphere within peat soils, providing a net-cooling effect and helping to mitigate the climate crisis.

Forested peatlands are productive carbon sinks considering trees are good CO_2 sequesters. Combined with the properties of unexploited peatlands, the sequestered carbon from trees remains stored in peat soils.

However, the harvesting and overexploitation and associated degradation of peatlands release large quantities of GHG emissions and are responsible for almost 5% of global anthropogenic CO_2 emissions. Such harvesting has been common place across Ireland for decades, which means that Peatlands are net emitters in an Irish context. Peatland rehabilitation and restoration can reduce emissions significantly and change peatlands from net emitters to net sequesters.

For more information on the LULUCF sector, please refer to the following links:

Land Use, Land-Use Change and Forestry (LULUCF) | UNFCCC

Climate change reporting (europa.eu)

LULUCF | Environmental Protection Agency (epa.ie)

Ireland's forests a source or sink of carbon dioxide? | Gov.ie

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