



Tier 2 Baseline Emission Inventory April 2023



**Comhairle Cathrach
& Contae Phort Láirge**
Waterford
City & County Council

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Revision:	Prepared by:	Reviewed and prepared by:
Rev 1:	Initials: KT Date: 30/01/23	Initials: Date:
Rev 2:	Initials: AH & MD Date: 20/03/23	Initials: AH Date: 22/03/23
Rev 3:	Initials: JM & MD Date: 19/04/23	Initials: AH Date: 21/04/23
Rev 4:	Initials: Date:	Initials: AH Date: 03/05/23 - HOUSING
Rev 5:	Initials: AH & MD Date: 12/09/23	Initials: AH Date: 13/09/23

GLOSSARY OF TERMS

BER - Building Energy Rating

CIBSE - Chartered Institution of Building Energy Services Engineers

CNG - Compressed Natural Gas

CO₂ - Carbon Dioxide

CSO - Central Statistics Office

eq - equivalent

F-gases – Fluorinated gases

GHG – Greenhouse Gas Emissions

kt - Kilotons

ktoe - kiloton of oil equivalent

kWh - Kilowatt Hour

LPG - Liquid Petroleum Gas

LULUCF – Land Use, land use change, and forestry

M&R – monitoring and Reporting

MWh - Megawatt-hour

National Baseline Period – National Baseline for Ireland is 2018, as set out in the Climate Action Plan 2021

NFR - Nomenclature for Reporting

PSVs – Public Service Vehicles

Public Sector Baseline Period – Public Sector baseline, including for Waterford City & County Council is 2016-2018, as set out in the Climate Action Plan 2021

SEAI - Sustainable Energy Authority of Ireland

TFC - Total Final Consumption

WCCC – Waterford City & County Council

WWTP - Wastewater Treatment Plant

EXECUTIVE SUMMARY

The national carbon reduction targets set out in the Climate Action and Low Carbon Development (Amendment) Act 2021 are 51% reduction by 2030, compared to 2018 levels.

Waterford City & County Council (WCCC) is required, under Section 16 of the Climate Action and Low Carbon Development (Amendment) Act 2021, to prepare a Local Authority Climate Action Plan (LACAP). The LACAP will outline the pathway for Waterford City & County Council to reduce its Greenhouse Gas Emissions (GHG) by the required 51% by 2023. This is compared to GHG emission levels from 2018, which has been set as the baseline, see Figure 1.

For the purpose of this report and the data analysis, all GHG are converted and reported as CO₂equivalent emissions, or CO₂eq. Some emissions are actual carbon dioxide (CO₂), some are methane (CH₄) and some are Nitrous Oxide (N₂O). All emissions are converted into CO₂eq.

The quantitative Baseline Emission Inventory was prepared in accordance with the methodology provided in “Technical Annex C: Climate Mitigation Assessment” of the Local Authority Climate Action Plan Guidelines” (DECC, 2023). These guidelines outlined the Tier 2 approach to be taken by the Local Authorities in the development of the Baseline Emissions Inventory at County Level. Tier 2 is the bottom-up approach for data analysis, which takes national datasets and local-scale datasets together to look at county wide GHG emissions across various sectors which include:

- Residential
- Manufacturing & Commercial
- Industrial Processes
- Agriculture
- Transport
- Land Use Change and Forestry (LULUCF)
- Waste
- F-gases

The LACAP will outline the specific target Waterford City & County Council and, therefore, included in this BEI is the extraction of Waterford City & County Council direct GHG emissions from the above sectors. Waterford City & County Councils data is reported as a separate sector in this report. Waterford City & County Council has full accountability and obligations to reduce its own GHG emissions by 51% by 2030, and can influence, co-ordinate, facilitate and advocate for all other sectors to reduce their own GHG emissions by the same 51% by 2030.

Although the National targets are set against a 2018 baseline, Local Authorities are required, in accordance with Department Guidelines on the preparation of a Climate Action Plan, to use the data average of 2016-2018 as their baseline period. This County Wide Baseline Emissions Inventory (BEI) therefore outlines the 2018 baseline data for County Waterford as a whole, which includes Waterford City & County Councils 2018 data. However, for Waterford City & County Councils own targets, the 2016-2018 baseline period must be used, as outlined in the Climate Action Plan 2021. Both sets of data are included in this report.

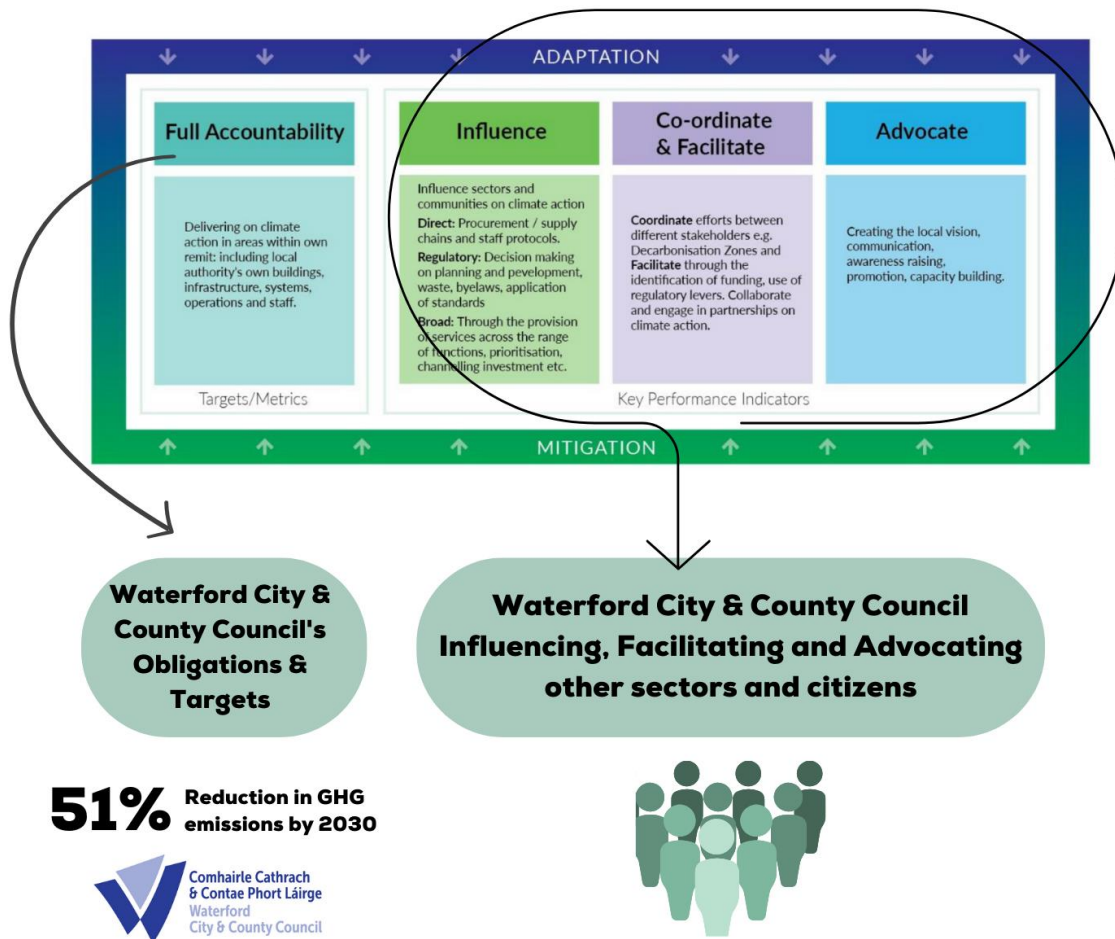
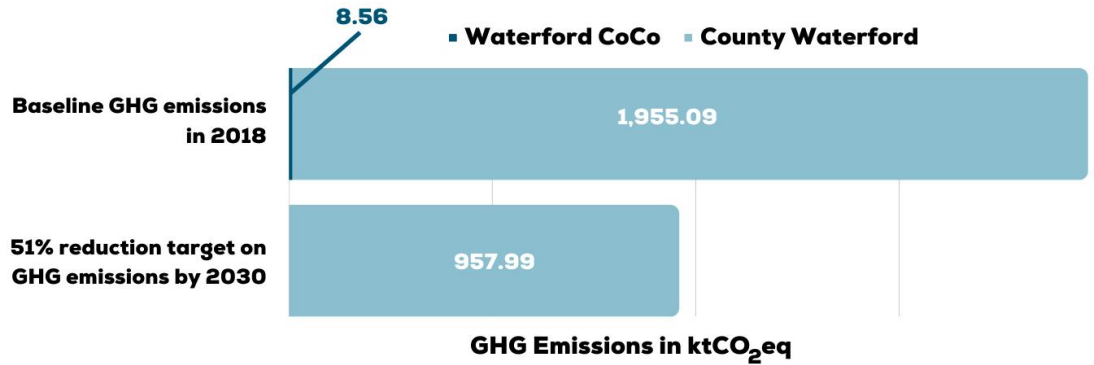


Figure 1. Local Authority Scope on Climate Action (source CCMA/CARO)

This Tier 2 Baseline Emissions Inventory (BEI) outlines the GHG figures for 2018, in order to establish the absolute GHG emissions target for 2030 for County Waterford.

Documents outlining the data collection process, the sources of data, assumptions or projections made, and the calculation methodology are available in the “Technical Annex C: Climate Mitigation Assessment” of the Local Authority Climate Action Plan Guidelines”.

In order to ascertain the GHG emissions per sector, the energy consumption has also been analysed and is reported alongside the GHG data in this report. Although not the focus of the report, which is GHG emissions, the energy data has been included for reference purposes, as it is the energy data that is converted to CO₂eq. GHG emissions in some sectors (where applicable).

Energy consumption in 2018 for County Waterford is 4,107.0 Gigawatt hours (GWh). It should be noted that energy from on-site renewables only contributed to 6.4% of the total fuel mix. Renewables associated with grid electricity is 33.2%¹, see **Error! Reference source not found.**

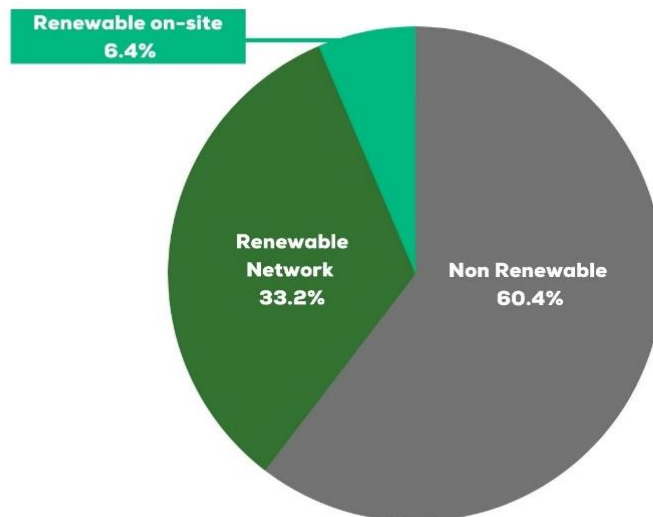


Figure 2. County Waterford Energy from Renewable Sources

The non-energy related GHG emissions include Methane (CH₄), Nitrous Oxide (N₂O), sulfur Hexafluoride (SF₆) and are mainly associated with agriculture, industrial processes, waste & F-gases sectors.

¹ <https://www.seai.ie/publications/Energy-in-Ireland-2019-.pdf>

The breakdown of GHG emissions and energy consumption per sector for 2018 is as follows, see **Error! Reference source not found.:**

Waterford City & County Council

- Total final emissions produced by Waterford City & County Council in 2018 was 8.56 ktCO₂eq.
- Total final energy used in 2018 was 28.44 GWh

Residential

- Total residential emissions were 309.92 kt of CO₂eq in 2018
- Total delivered energy for the residential sector for 2018 was 1,065.29 GWh

Manufacturing and Commercial

- Total emissions in 2018 were 467.18 kt of CO₂eq;
- Total final energy used in 2018 was 1,839.79 GWh

Industrial Processes

- Total emissions from industrial processes were 13.91 ktCO₂eq.

Agriculture

- Total emissions in 2018 were 768.14 ktCO₂eq.
- Total final energy used in 2018 was 130.50 GWh

Transport

- Total final emissions from transport were 276.19 ktCO₂eq.
- Total final Energy for Transport sector was 1,043.01GWh

Land Use, Land Use Change and Forestry (LULUCF)

- Total emissions from LULUCF sector were 60.86 ktCO₂ eq in 2018

Waste

- Total emissions from waste sector were 55.53 ktCO₂ eq in 2018

F-Gases

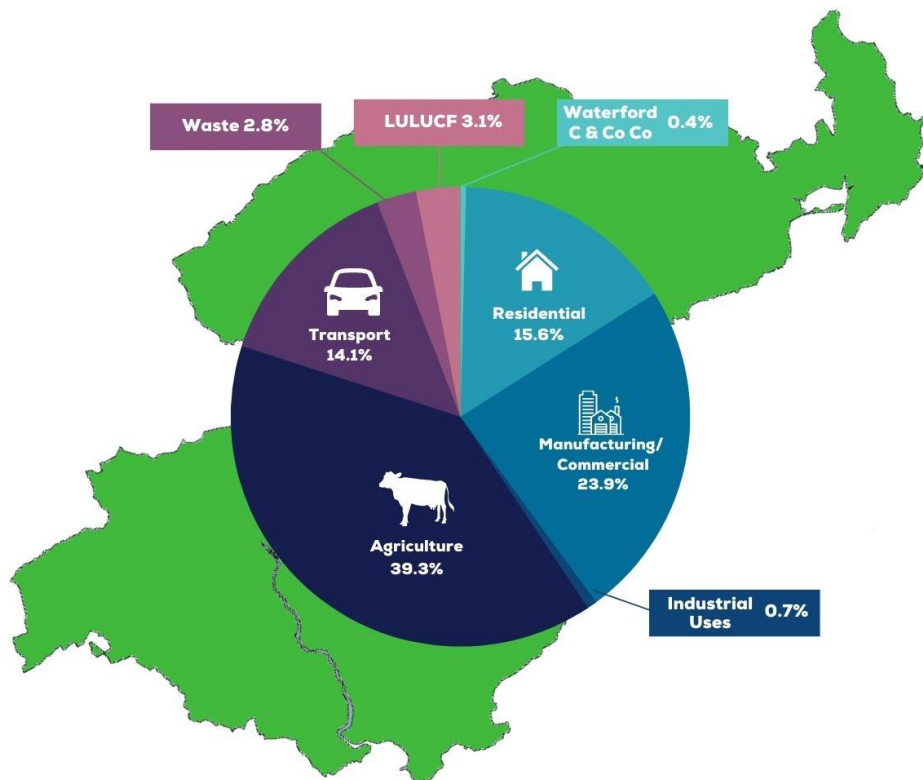
- In County Waterford there were no emission accounted for by F-gases

GHG emissions in 2018 for County Waterford was **1,955.09 of CO₂eq.**

Agriculture was the highest GHG emitter, with 39.3% of the County GHG emissions.

Manufacturing & Commercial is second with 23.9% and Residential follows with 15.6% GHG emissions.

GHG emissions for Waterford City & County Council in 2018 were **8.56kt of CO₂eq.** or 0.4% of the County wide GHG emissions.



County Waterford Total Emissions 2018

Figure 3. Share of Total Emissions in County Waterford 2018

1.0 INTRODUCTION

The 2030 Emission Reduction Target as set out in the Climate Action and Low Carbon Development (Amendment) Act 2021 is a 51% absolute reduction in overall greenhouse gas emissions by 2030 and setting us on a path to reach net-zero emissions by no later than 2050, as committed to in the Program for Government (Government of Ireland, 2021).

An absolute reduction means that regardless of activity in the county, the total GHG emissions across the County by 2030 must be 51% less than the total GHG emissions in the baseline year, which in this case is 2018. For example, if the GHG emissions in 2018 were 100 ktCO₂ equivalent, then the total allowable GHG emissions by 2030 is 49kt CO₂ equivalent. The absolute target must be met regardless of growth or changes within each sector.

Although the National targets are set against a 2018 baseline, Local Authorities are required, in accordance with Department Guidelines on the preparation of a Climate Action Plan, to use the data average of 2016-2018 as their baseline period. This County Wide Baseline Emissions Inventory (BEI) therefore outlines the 2018 baseline data for County Waterford as a whole, which includes Waterford City & County Councils 2018 data. However, for Waterford City & County Councils own targets, the 2016-2018 baseline period must be used, as outlined in the Climate Action Plan 2021. Both sets of data are included in this report.

Waterford City & County Council (WCCC) requested the South East Energy Agency (SEEA) to prepare this Tier 2 Baseline Emissions Inventory (BEI) for County Waterford to serve as an evidence-base for mitigation planning in County Waterford, and to inform the development of the 5-year Waterford Local Authority Climate Action Plan.

The following report outlines the results and the methodology used to calculate County Waterford's energy consumption and GHG emissions per sector for 2018. The methodology and Tier 2 approach for the County Wide GHG emissions inventory was outlined in the "Technical Annex C: Climate Mitigation Assessment" of the Local Authority Climate Action Plan Guidelines" published in March 2023 (pages 24-30) (DECC, 2023).

Tier 2 is the bottom-up approach for data analysis, which takes national datasets and local-scale datasets together to look at county wide GHG emissions across various sectors which include:

- Residential
- Manufacturing & Commercial
- Industrial Processes
- Agriculture
- Transport
- Land Use Change and Forestry (LULUCF)
- Waste
- F-gases

This baseline report aims to raise awareness of climate change and the impact that different sectors in County Waterford have on Ireland's overall carbon emissions and energy use. It provides Waterford City & County Council with the necessary information to make decisions on climate

change actions to lower the carbon emissions in their own direct emissions, which is the emissions they have responsibility and accountability for.

It is important to note that the BEI is a ‘snapshot in time’ of an area’s GHG emissions sources, and it is not an inventory of emission reduction opportunities ((page 17 (DECC, 2023)).

The methodology used for the analysis was developed using MapElre² and EPA data, and other publicly available local sources including:

- Electricity metered consumption data¹
- Central Statistics Office’s household census, agricultural census and transport Omnibus²
- SEAI’s latest Energy in Ireland report³, emission factors for fuels and grid electricity⁴
- M&R system and National Building Energy Rating Database⁵
- Valuation Office data on commercial buildings⁶
- CIBSE energy benchmarks (Guide F and TM46)
- Agricultural energy and emissions benchmarks from sources such as Teagasc, Dept. Agriculture, Food and Marine, and the Carbon Trust

MapElre is the state-of-the-art integrated model system to map emissions for Ireland’s emission inventories of air pollutants and greenhouse gases. Based on a variety of spatial and statistical data, the MapElre model produced detailed spatial emissions at a resolution of 1 km × 1 km (Plejdrup, 2018).

¹[Metered Electricity Consumption 2020 - CSO - Central Statistics Office](#)

²[Introduction and Overview of Results - CSO - Central Statistics Office](#)

³[Energy in Ireland 2019 Report \(seai.ie\)](#)

⁴<https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/>

⁵<https://ndber.seai.ie/BERResearchTool/ber/search.aspx>

⁶<https://opendata.valoff.ie/api/>

2.0 SCOPE OF REQUIREMENTS

The following elements for the Baseline Emissions Inventory (BEI) were required by Waterford City & County Council, as outlined in Annex C³ of the Local Authority Climate Action Plan Guidelines (DECC, 2023).

- A calculation of the Greenhouse Gas (GHG) emissions resulting from activity within the geographical boundary of the Waterford City & County Council area.
- Visual representation of the resulting GHG emissions baseline, broken down as far as possible into sub-sectors.
- A ranking of sectors and sub-sectors contributing the largest GHG emissions.
- A detailed report outlining the methodology, assumptions and all data sets used to formulate the BEI, and an executive summary customised for a non-technical audience.
- A calculation of the emissions reduction required, based on the baseline, to meet the national climate action plan 2030 targets.
- Any other outputs resulting from the BEI analysis that will add to the evidence-base for mitigation planning in the Local Authority administrative area.
- Presenting the findings to Waterford City & County Council Climate Action Team.

The GHG Protocol Corporate Standard categorise greenhouse gas emissions as Scope 1, Scope 2, and Scope 3 emissions. This report analyses Scope 1 emissions, which are direct emissions associated with the direct consumption and activity. This does not include emissions associated with the purchase of energy (Scope 2) or indirect emissions from the value chain (Scope 3).

- **Scope 1 emissions** – This covers the GHG emissions that are made directly – for example running boilers and vehicles
- **Scope 2 emissions** – This covers the GHG emissions that are produced indirectly – like buying electricity or energy it buys for heating and cooling buildings
- **Scope 3 emissions** – This covers the GHG emissions associated not with the organisation itself, but that the organisation is indirectly responsible for in the supply chain – for example when we use products from suppliers

The Scope 1 emissions included in this report includes all emissions locally produced from the following sectors:

- Large Industries
- Buildings (residential and commercial)
- Industrial processes
- Waste
- Transport
- Agriculture
- Fluorinated gases and land-use

³ <https://assets.gov.ie/250051/e165c6b5-3eed-487d-b4ec-1db46dcec7e1.pdf>

3.0 METHODOLOGY

The methodology on how to complete the Climate Mitigation Assessment is outlined in “Technical Annex C: Climate Mitigation Assessment” of the Local Authority Climate Action Plan Guidelines” published in September 2022 (pages 24-30) (DECC, 2023).

The Baseline Emissions Inventory (BEI) is a key instrument that will enable Waterford City & County Council to measure the impact of all actions related to emission reductions across its own operations as well as varying sectors of society. The BEI represents an evidence-based approach to not only inform appropriate emission reduction actions, but also measure progress overtime.

It is important to note that the BEI is a ‘snapshot in time’ of an area’s GHG emissions sources, and it is not an inventory of emission reduction opportunities ((page 17 (DECC, 2023)).

3.1 WATERFORD CITY & COUNTY COUNCILS DIRECT GHG EMISSIONS

Waterford City & County Council maintains responsibility to deliver its own targets for emission reductions and establishing the baseline is a necessary starting point. Data for the Local Authorities direct energy-based emissions are reported annually to the SEAI under the mandatory Monitoring & Reporting system⁴. The M&R system is the tool that tracks the public sectors progress towards the 2030 targets, based on the annual submission of energy data. The methodology for reporting Waterford City & County Councils data to the SEAI via the Monitoring & Reporting system is set out by the SEAI. Waterford City & County Council have reported using this system since 2012, and all data has been verified and accepted by SEAI, and is published in the Annual Report on Public Sector Energy Efficiency Performance (see most recent 2021 report - Sustainable Authority of Ireland, 2021⁵)

It is necessary that Waterford City & County Council addresses its own GHG emissions and clearly identifies the sources and level of emissions and energy use from across the range of activities performed. The required data extracted from the local authority’s M&R system provides an energy and carbon based BEI distinct to Waterford City & County Council. This BEI should be used to inform the development of targeted and specific actions to further reduce the local authority’s own emissions.

3.2 COUNTY WIDE GHG EMISSIONS

This report focuses on energy use and GHG emissions from different sectors which align with the sectors addressed by the National Emissions Inventory (Environmental Protection Agency, 2020).

⁴ <https://psmr.seai.ie/Account/LogOn?ReturnUrl=%2f>

⁵ <https://www.seai.ie/publications/Public-Sector-Annual-Report-2021.pdf>

The sectors are:

1. Residential
2. Manufacturing & Commercial
3. Industrial Processes
4. Agriculture
5. Transport
6. Waste
7. Land Use, Land Use Change & Forestry (LULUCF)
8. Fluorinated Gases (F-Gases)

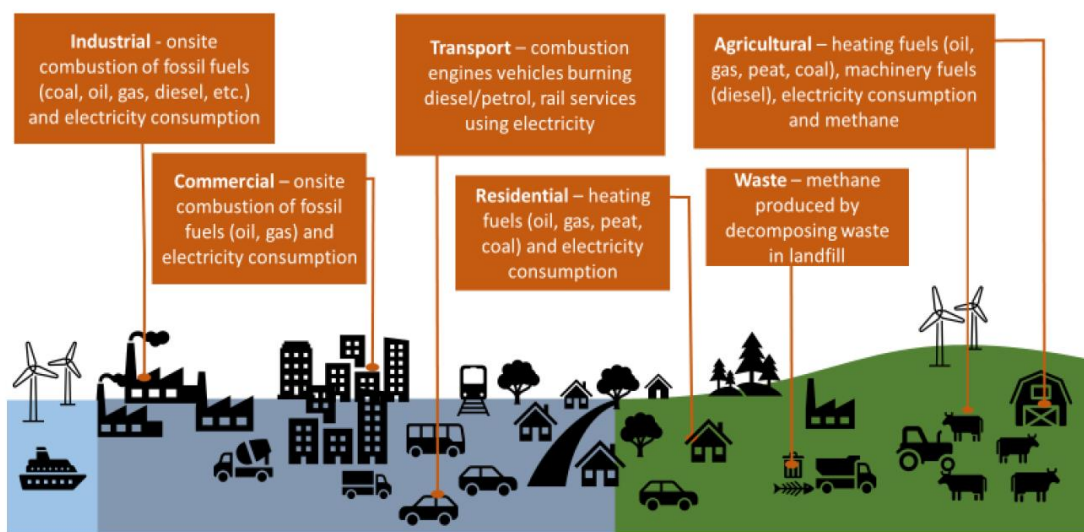


Figure 4. Representative Sectoral Sources of GHG Emissions (Source: Codema)

The Local Authority’s own emissions are captured within the Manufacturing & Commercial and Transport sectors datasets provided by MapElre. For this report Waterford City & County Councils data is reported separately and have been extracted from the data reported for the Manufacturing & Commercial sector to avoid ‘double-counting’. The transport emissions attributed to Waterford City & County Council are also extracted from the general Transport data and reported under Waterford City & County Council direct emissions.

The analysis focused on the current energy demand and fuels that used to provide energy, and the associated CO₂e emissions and GHG emissions related to activities within County Waterford. Non-energy related emissions were also reported where available and are mainly outlined in the Waste, Land Use, Land Use Change & Forestry (LULUCF) and Agriculture sections.

3.3 EMISSIONS SCOPE

The emissions accounted for in the MapElre data source includes both ‘emissions trading scheme’ (ETS) and ‘non-emissions trading scheme’ (non-ETS) sectors and emissions. This includes all emissions locally produced from sectors, those produced by large industries, buildings (residential and commercial), industrial processes, waste, transport, agriculture and land-use. Domestic aviation is also accounted for however, it does not include emissions from intra-EU aviation as those are not considered part of Ireland’s total reportable greenhouse gas emissions. More detail can be found in the EPA 2022 Report (EPA, 2022).

- **Emissions Trading Scheme (ETS)** – This means that GHG from certain sectors are treated as a commodity or product that can be traded on the EU carbon market. This includes emissions from large industries, electricity generators, and the aviation industry.
- **Non Emissions Trading Scheme (Non-ETS)** – This means that GHG from sectors that cannot be traded on the EU carbon market. Non-ETS emissions include greenhouse gas emissions from homes, cars, small businesses and agriculture.

3.4 EMISSION FACTORS

Emission factors are used to convert energy use to CO₂eq emissions. Emissions factors for different fuel types are published by SEAI annually and the 2018 factors were used for this report as the baseline year is 2018⁶. The emission factors are dependent on the type of fuel used, as different fuels have different emission factors. **Error! Reference source not found.** below illustrates the emission factors for different fuel types. It should be noted that Peat has the highest emission factor, as it has the highest emissions in kgCO₂eq for every 1 kWh of energy use.

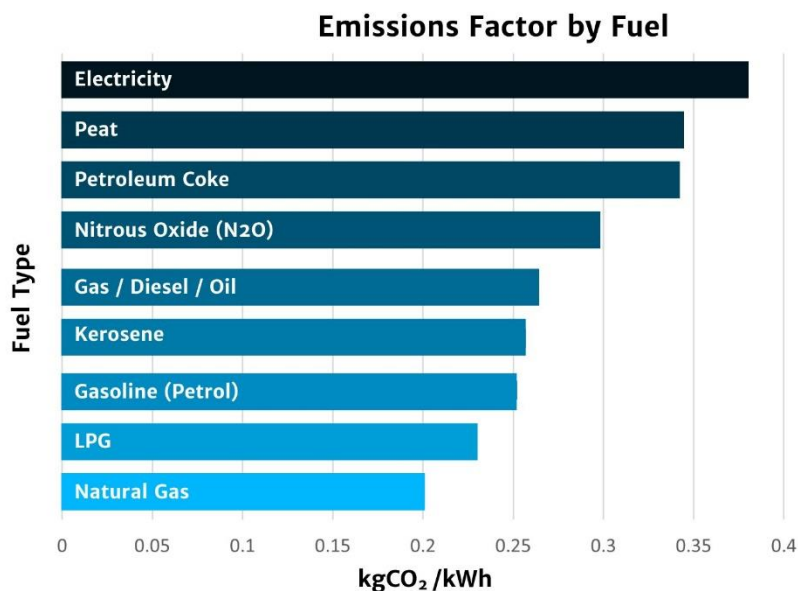


Figure 5. Emission Factors for Different Fuel Types

⁶ <https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/>

3.5 CARBON-OFFSETTING

Calculations on ‘carbon offsetting’ are not included in this analysis as currently offsetting cannot be used to meet the public sector’s mandatory emissions and energy targets. Carbon offsetting is a practice which involves an organisation removing or offsetting the same amount of carbon emissions from the atmosphere to compensate for the carbon emissions that it emits.

Large renewable energy projects like wind and solar farms that are connected to the national electricity grid contribute to the reduction of emissions at a national level and are reflected in reduced emissions intensity of electricity generation. Therefore, the associated reductions cannot be counted separately at a local level, as this would be ‘double-counting’ the emission reduction.

3.6 ASSUMPTIONS

It is important to note that there are assumptions used in all methodologies for local level emissions baseline. These are required as it is impossible to create a completely accurate picture of all emissions.

All data from the Central Statistics Office is from the Census 2016 data set. The Census 2022 data was not fully available at time of analysis. This is as per the Technical Annex C: Climate Mitigation Assessment” of the Local Authority Climate Action Plan Guidelines” (DECC, 2023).

Assumptions and data sources for each sector are outlined in **Appendix A**.



SECTORAL GHG EMISSIONS 2018 IN COUNTY WATERFORD

This section of the report outlines the GHG emissions associated with the individual sections highlighted above, the methodology and results of each and summarises the emissions from each sector in 2018. They are presented in the following order:

- Waterford City & County Council
- Residential
- Manufacturing & Commercial
- Industrial Processes
- Agriculture
- Transport
- Waste
- Land Use, Land Use Change & Forestry (LULUCF)
- Fluorinated Gases (F-Gases)

4.0 WATERFORD CITY & COUNTY COUNCIL

Waterford City & County Council (WCCC) is responsible for the energy use and emissions from its buildings and facilities, its public lighting, and its vehicle fleet.

This Chapter outlines the 2018 data for Waterford City & County Council, which is used for the County Wide Inventory. The public sector baseline data for the period 2016-2018 is reported in Appendix B. The 2018 data is used in the overall County Wide final figures and 2030 target, and the 2016-2018 data is used for Waterford City & County Councils own 2030 target.

4.1 METHODOLOGY

In Ireland, public sector bodies are required to report on their annual energy use to the Sustainable Energy Authority of Ireland (SEAI). This is done through the Monitoring and Reporting system⁷ (M&R), which is used to track the local authorities progress towards 2030, compared to the baseline year. The baseline year for Waterford City & County Council's energy efficiency targets is 2009, and for GHG emissions the baseline is 2016-2018.

The methodology for reporting Waterford City & County Councils data to the SEAI via the Monitoring & Reporting system is set out by the SEAI⁸. Waterford City & County Council has reported using this system since 2012, and all data has been verified and accepted by SEAI. The results are published in the Annual Report on Public Sector Energy Efficiency Performance (see most recent 2021 report - Sustainable Authority of Ireland, 2021⁹)

From the M&R system, the 2018 energy & CO₂ emissions data for Waterford City & County Council was extracted and is broken down by fuel type:

- Electricity – imports from national grid
- Electricity - generated by on-site PV
- Natural Gas
- LPG
- Gasoil
- Solar Thermal
- Petrol
- Road Diesel
- Marked Diesel

The fuel types are categorised by energy use:

1. Electricity
2. Thermal
3. Transport

⁷ <https://psmr.seai.ie/Account/LogOn?ReturnUrl=%2f>

⁸ <https://www.seai.ie/business-and-public-sector/public-sector/monitoring-and-reporting/supports/MR-2030-Methodology-Guidance.pdf>

⁹ <https://www.seai.ie/publications/Public-Sector-Annual-Report-2021.pdf>

To outline where the energy and GHG emissions are coming from within Waterford City & County Council, the energy use was broken down into three categories for reporting GHG emissions in this BEI. This will allow for targeted projects within the LA Climate Action Plan to reduce GHG emissions most effectively:

- Local Authority Buildings/Facilities
- Public Lighting
- Transport

4.2 RESULTS - 2018 COUNTY WIDE BEI DATA

4.2.1 ENERGY RESULTS

From the results obtained from the M&R system, Waterford City & County Councils energy consumption in 2018 was **28.4 GWh**, see Figure 6.

- Building and Facilities was the highest energy consumer, accounting for 10.4 GWh of the total energy consumption (36.5%)
- Public Lighting accounted for 8.1 GWh (28.5%)
- Transport accounted for 9.9 GWh (35%)

The fuel type breakdown is provided in Table 1: Waterford City & County Council Inventory, Energy and CO₂eq Emissions.

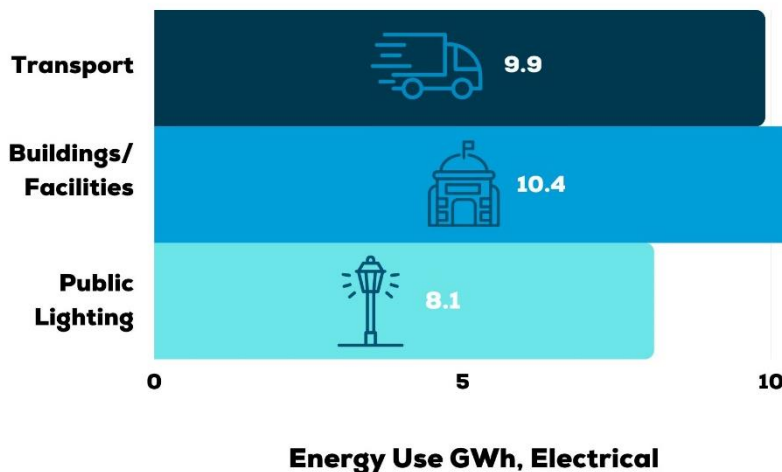


Figure 6. Energy Use in County Waterford grouped by Category

4.2.2 GHG EMISSIONS RESULTS

When energy use was converted into emissions, Waterford City & County Council's total emissions amounted to **8.56 ktCO₂eq**, see Figure 7.

- Public Lighting was the highest contributor, accounting for 3.06ktCO₂eq (36%) of these total emissions
- Building and Facilities contributed 2.97ktCO₂eq (35%)
- Transport contributed 2.52ktCO₂eq (29%)

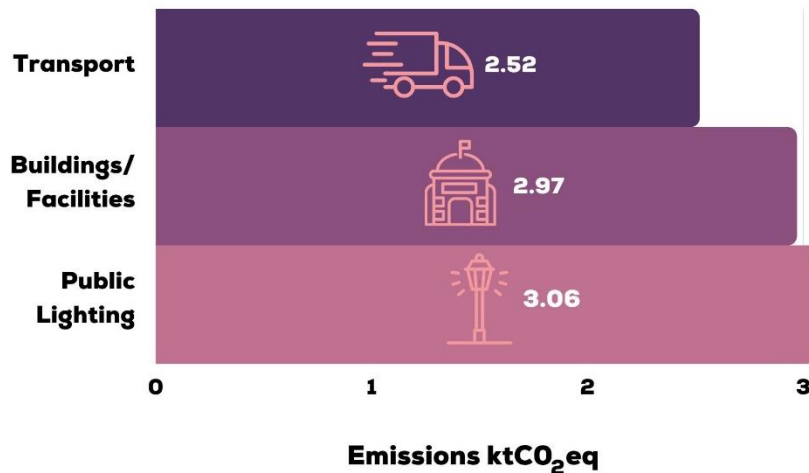


Figure 7. Emissions in ktCO₂eq by sector in County Waterford

4.3 KEY FINDINGS

The key findings from Waterford City & County Council emissions are summarised below.

- Total final energy used in 2018 was 28.44 GWh
- Buildings/Facilities was the largest consumer of energy in the sector, accounting for 36.5% of the total energy consumption, followed by Transport at 35% and Public lighting at 28.5%
- Total final emissions produced by Waterford City & County Council in 2018 were 8.56 ktCO₂eq.
- Public Lighting was responsible for the highest GHG emissions from Waterford City & County Council, with 36%, followed by Buildings/Facilities at 35% and Transport 29%

Kilkenny County Council	Electricity	Fossil Fuels					Renewable Energies			Total
		Thermal			Transport		Electricity	Thermal	Transport	
		Natural Gas	Heating Oils	LPG	Road Diesel	Petrol	Solar PV	Solar Thermal	Biofuel	
Building/ Facilities (GWh)	4.64	4.93	0.70	0.09			0.03	0.03		10.42
Public Lighting (GWh)	8.12									8.12
Transport (GWh)					9.52	0.04			0.33	9.89
Total Energy (GWh)	12.77	4.93	0.70	0.09	9.52	0.04	0.03	0.03	0.33	28.44
Buildings / Facilities (ktCO ₂ eq)	1.76	1.01	0.19	0.02						2.97
Public Lighting (ktCO ₂ eq)	3.06									3.06
Transport (ktCO ₂ eq)					2.51	0.01				2.52
Total Emissions (ktCO₂eq)	4.82	1.01	0.19	0.02	2.51	0.01	-	-	-	8.56

Table 1: Waterford City & County Council Inventory, Energy and CO₂eq Emissions

Waterford City & County Council's Public Sector Baseline data is outlined in Appendix B of this report.

5.0 RESIDENTIAL

This section looks at the emissions arising from the residential sector. In Ireland, the residential sector is the second largest energy user after transportation (SEAI, 2019), thus monitoring energy use and emissions in this sector is crucial.

5.1 METHODOLOGY

Domestic dwellings are responsible for emissions from the use of energy for space heating, hot water and electricity. This methodology is based on five main data sources:

- Central Statistics Office's Census 2016¹⁰ (CSO, 2016)
- EPA's national emissions inventories - MapEire (AARHUS University, 2022)
- SEAI BER research tool (SEAI, 2021)
- Central Statistics Office's Metered Electricity Consumption data
- Central Statistics Office's Natural Gas Consumption data

Firstly, the total number of houses in County Waterford is obtained from the Census data. This is split by category, which was simplified into 4 main house types:

- Semi-detached
- Detached
- Terraced
- Apartment

The Census 2016 data shows that there are 43,455 residential properties in Waterford, see **Error! Reference source not found.**, of which:

- 43% is Detached house,
- 30% is Semi-Detached house,
- 19% are Terraced house and
- 7% are Apartments
- 1% - Not stated

¹⁰ Census 2022 not available at time of analysis. Preliminary data published post analysis

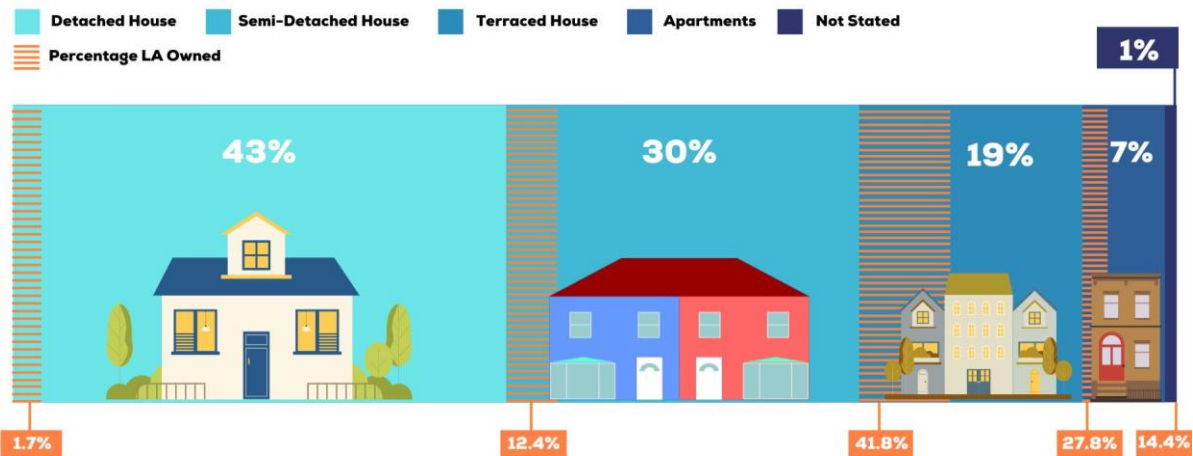


Figure 8. Percentage % of Residential Dwelling Types in County Waterford, Census 2016

LA Owned		% of total
Detached house	328	1.7%
Semi- detached house	1613	12.4%
Terraced house	3398	41.8%
Apartment	829	27.8%
Not Stated	88	14.4%
	6256	14.4%

The total number of houses across the county includes all social houses. Waterford City & County Council in 2018 had a total of 6,256 social houses under its remit, which is equivalent to 14.4% of the total houses in the County. The LA social houses are not included in Section 4 above, which outlines the Local Authority's own energy. That is because even though the homes are owned or under the remit of Waterford City & County Council, it is individual tenants that use the energy, and therefore it is reported under the Residential sector and not the Local Authorities section.

However, the Local Authority still has accountability in relation to upgrading its own social housing stock and therefore GHG savings in the Residential sector can be completed directly by the Local Authority.

These simplified house types allows for comparison with the breakdown provided by the Building Energy Rating Certificates (BER) data, so that the same house type categories are used for the analysis. The BER data is downloaded from SEAI BER research tool¹¹. The database does not provide exact addresses, however the BER data provided the number of houses with BER ratings. All houses constructed after 2018 were removed from the BER data set. The BER data provides a breakdown of BER rating (A1 – G) for each house type categorised above.

¹¹ <https://ndber.seai.ie/BERResearchTool/ber/search.aspx>

Additional data from published Building Energy Rating Certificates (BER) helped further inform the breakdown of emissions based on the average BER rating of the homes across County Waterford. The BERs were filtered per County for County Waterford, and information is available on theoretical energy demand and emissions from those dwellings. The data provides us with detailed information for each BER rating. The average BER rating per house type is then applied to the total domestic dwellings across the County.

Error! Reference source not found. below shows the number of published BERs in 2018 for each BER rating for County Waterford, which totaled 15,300 houses, or 35.2% of the total housing stock in County Waterford.

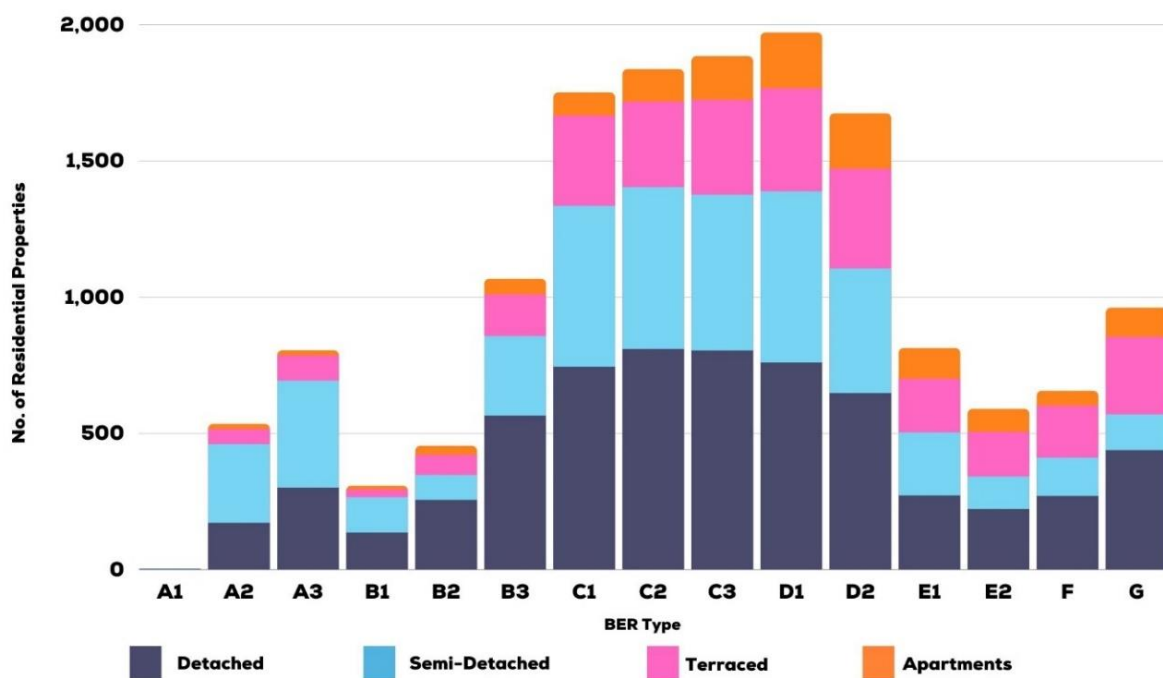


Figure 9. BER ratings of Residential Sector, County Waterford

The BER data was used to calculate the average energy demand for each house type at each BER rating (A1-G). This average demand was then applied to the total number of dwellings of each house type and each BER rating in each category. This gave a total energy and emissions for the residential sector in County Waterford.

The average consumption per house type and BER rating is shown in Table 2 and Figure 10 below.

The total energy consumption for residential sector is then broken down into electricity (non-thermal) & thermal. Using the SEAI Energy in Residential Sector 2018 (SEAI, 2018), the average % of household energy consumption was

- Space heating – 61%
- Water heating – 19%

- Lighting/Appliances/Cooking – 20%

Therefore, the average figure of 80% thermal and 20% electricity was applied to the domestic data.

The electricity and natural gas data comes directly from the Central Statistics Office's Metered Electricity Consumption data¹² and Natural Gas Consumption data¹³.

The Central Statistics Office Energy Balance (2018) was used to get a national average breakdown between the thermal fuel types. The average % breakdown was used to calculate the breakdown of the thermal fuel for County Waterford residential sector.

BER	Detached (kWh)	Semi-Detached (kWh)	Terraced (kWh)	Apartments (kWh)
A1	4,054	8,774	-	-
A2	4,665	2,429	1,898	1,906
A3	7,382	3,242	3,602	4,200
B1	16,702	6,075	6,354	1,314
B2	21,515	10,200	8,757	4,030
B3	26,095	13,546	10,441	6,033
C1	26,470	15,213	12,208	7,425
C2	26,796	16,694	13,515	7,628
C3	27,061	17,720	14,799	8,045
D1	26,991	18,222	16,042	8,354
D2	29,360	19,033	17,451	9,217
E1	32,821	22,263	20,384	11,179
E2	33,162	22,663	23,192	11,404
F	39,140	25,276	23,536	13,320
G	49,680	36,224	36,273	19,369

Table 2: Average Consumption per House and BER Type in County Waterford

¹² <https://www.cso.ie/en/statistics/energy/meteredelectricityconsumption/>

¹³ <https://www.cso.ie/en/statistics/energy/networkedgasconsumption/>

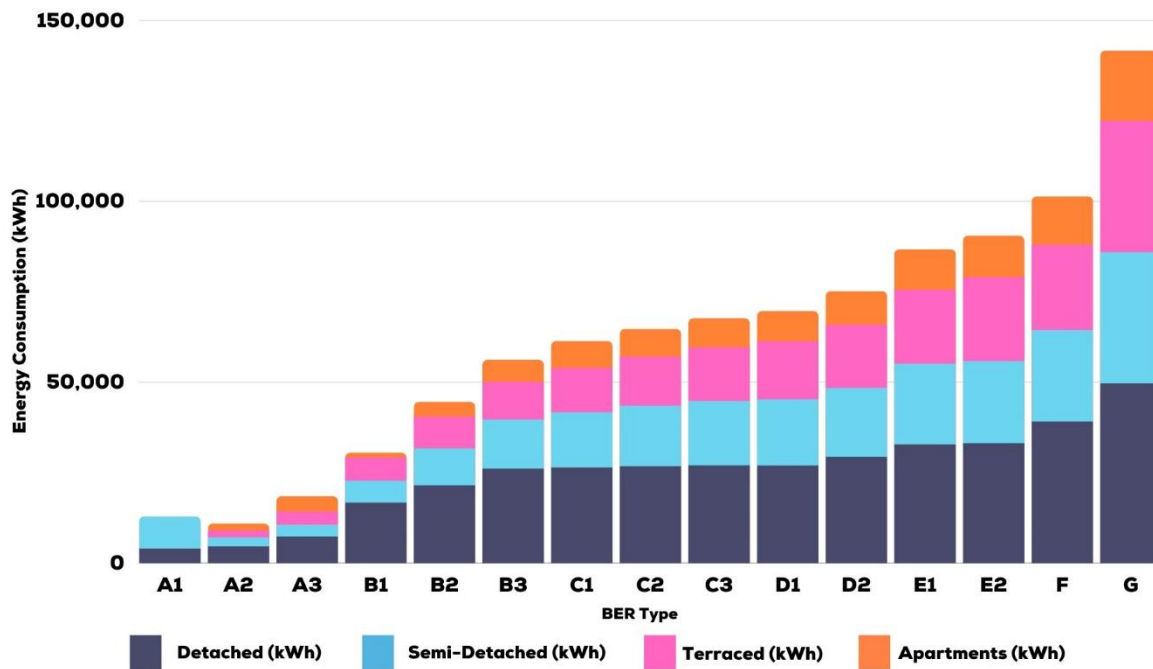


Figure 10. Average Consumption per House and BER Type County Waterford

To summarise, the total thermal energy consumption was found from the BER data. This was assumed to be equivalent to 80% of the total residential energy consumption. The thermal breakdown, in terms of what fuel is used to heat a home, was calculated using the actual metered gas data and the national average fuel mix breakdown from the Residential Fuel Mix in 2018¹⁴ taken from the CSO data.

The remaining 20% was non-thermal electricity.

All energy data was then converted into equivalent GHG emissions using the CO₂eq. conversion factors for each fuel type.

MapElre data set provides additional emissions produced in the form of Methane (CH₄) and Nitrous Oxide (N₂O) by residential sectors, i.e. in addition to CO₂ emissions from the combustion of fossil fuels such as natural gas, heating oil, coal, etc. These emissions are converted into CO₂eq using the conversion factors provided by EPA ((EPA, 2023)

5.2 RESULTS

The total number of houses in County Waterford from the 2016 Census data was 43,455. The BER ratings for County Waterford showed that 15,300 houses had a BER rating – this is equal to 35.2% of the total domestic dwellings in the County.

¹⁴ <https://data.cso.ie/table/SEI01>

The breakdown of heating fuel types for houses is shown in Table 3 and Figure 11. This shows that 44.5% of homes in County Waterford use heating oils to heat their homes, and 9.6% used coal as their primary heating source in 2018. Over 85% of homes are heated by fossil fuels.

Type of Central Heating	No of Houses	% of homes
No central heating	703	1.6%
Heating Oil	19,321	44.5%
Natural Gas	12,913	29.7%
Electricity	3,406	7.8%
Coal (incl. anthracite)	4,193	9.6%
Peat (incl. turf)	98	0.2%
Liquid Petroleum Gas (LPG)	263	0.6%
Wood (incl. wood pellets)	1,310	3.0%
Other fuels	286	0.7%
Not stated	962	2.2%

Table 3: Thermal Fuel Sources for Houses, County Waterford

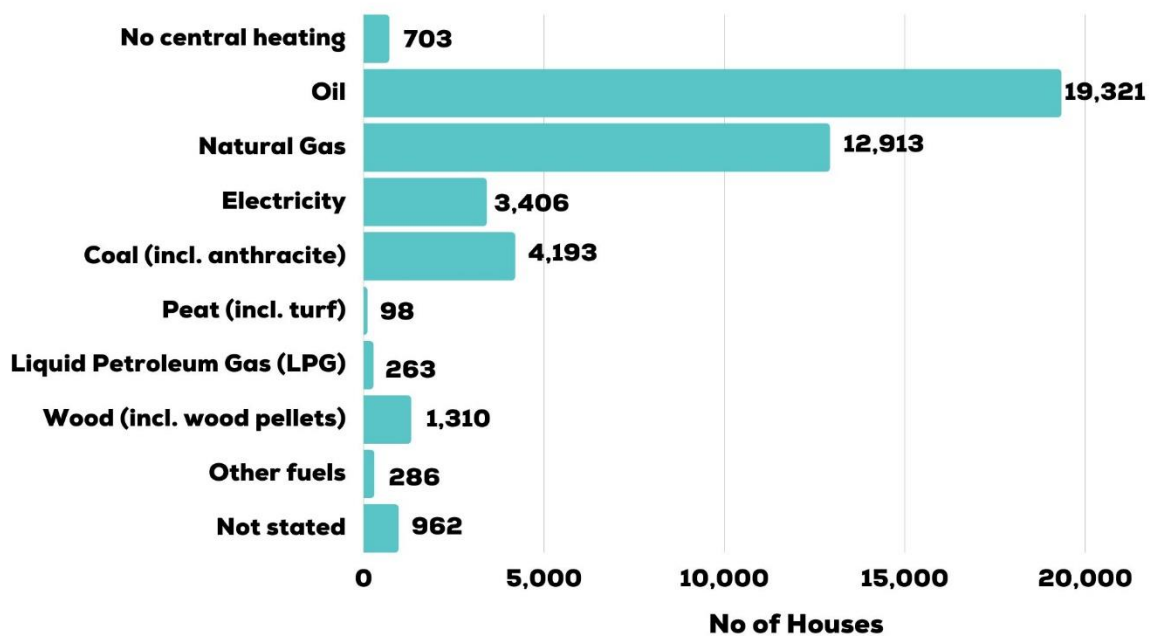


Figure 11. Thermal Fuel Sources for Houses in County Waterford

5.2.1 ENERGY RESULTS

Total energy use in the residential sector was **1,065.3 GWh**. The residential fuel split is shown in Table 4 and Figure 12, and mainly comes from:

- Electricity - making up 22.2% of the fuel mix
- Heating Oils accounts for 42.7%

- Natural Gas accounts for 15.5% of the fuel mix
- Total renewable fuels only accounted for 2.9% of the final energy consumption. The majority of this came from biomass sources (mainly wood)

Total Consumption GWh	GWh	%
Electricity (non-thermal)	213.1	20.0%
Electricity (thermal)	22.9	2.2%
Coal	69.7	6.5%
Peat	88.3	8.3%
Heating Oils	454.5	42.7%
LPG	19.6	1.8%
Petroleum Coke	1.6	0.1%
Natural Gas	165.0	15.5%
Renewables	30.7	2.9%
Total Energy Consumption	1065.3	

Table 4: Breakdown of Energy Consumption by Fuel Type

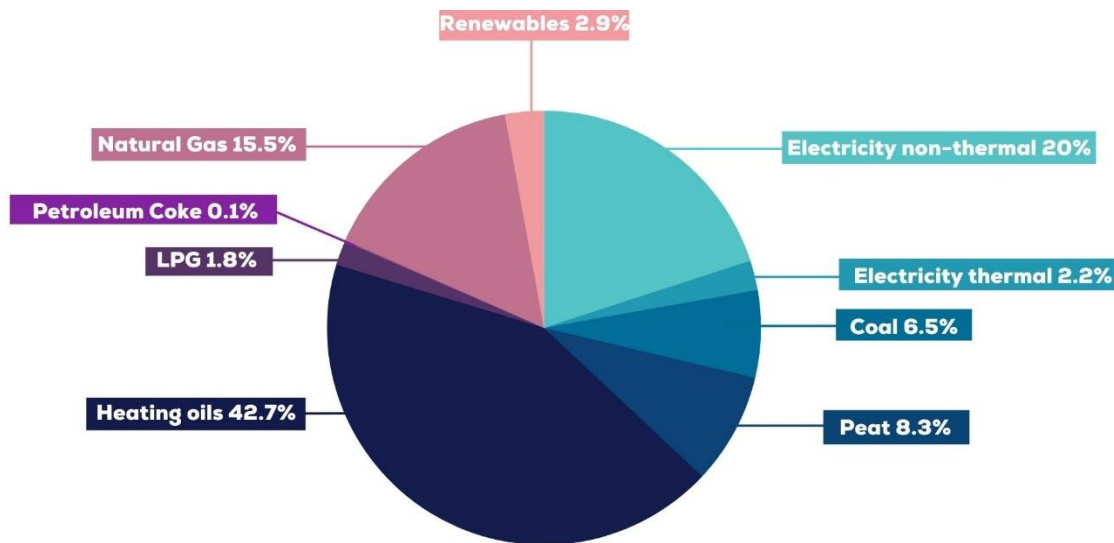


Figure 12. Share of Total Energy Demand in the Residential Sector by Fuel Mix

The social houses under the control of Waterford City & County Council accounts for x GWh of energy.

5.2.2 GHG EMISSION RESULTS

The GHG emissions from methane (CH₄), and nitrous Oxide (N₂O) obtained from the MapElre data equates to 1.4 ktCO₂eq. When energy use was converted into GHG emissions, the total GHG emissions in 2018 for the Residential Sector in County Waterford was **304.9ktCO₂eq.**

Figure 13 below shows the total emissions for the residential sector in County Waterford by fuel type. The highest emissions in the residential sector come from heating oils and electricity, which contribute 38.3% and 28.9% respectively. 18.6% of the residential sectors emissions comes from burning coal and peat in the home.

The social houses under the control of Waterford City & County Council accounts for x **ktCO₂eq.** of GHG.

Total GHG Emissions	ktCO ₂ Eq	%
Electricity (non-thermal)	79.7	26.1%
Electricity (thermal)	8.6	2.8%
Coal	23.7	7.8%
Peat	33.0	10.8%
Heating Oils	116.8	38.3%
LPG	4.5	1.5%
Petroleum Coke	0.4	0.1%
Natural Gas	33.8	11.1%
Renewables	0.0	0.0%
CH ₄ to CO ₂ eq	3.9	1.3%
N ₂ O to CO ₂ eq	0.5	0.2%
Total GHG Emissions	304.9	

Table 5: Breakdown of GHG emissions

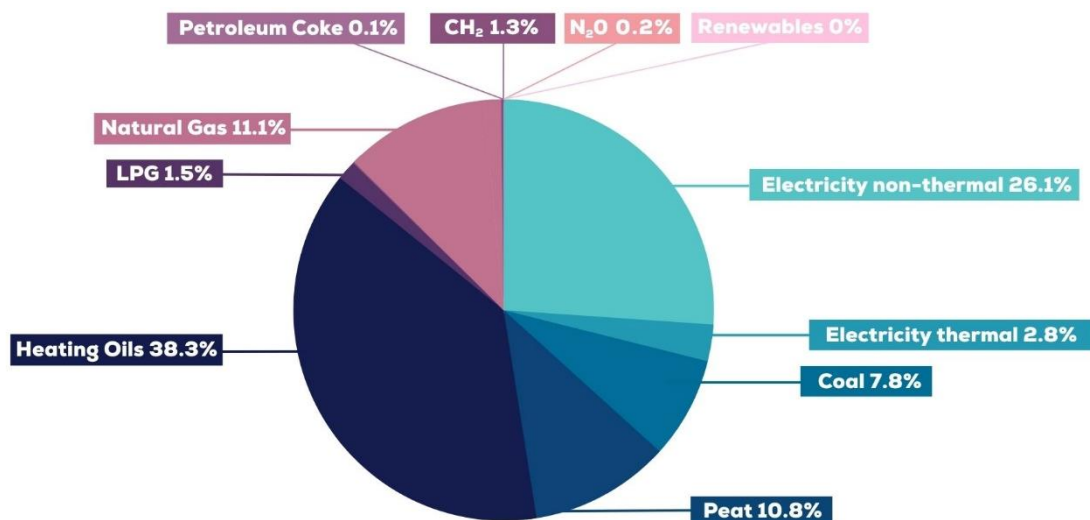


Figure 13. Share of Total Emissions (%) in the Residential Sector by Fuel Type

5.3 KEY FINDING - 2018

- Total energy consumed by residential sector in 2018 was 1,065.3 GWh
- 42.7% of the residential fuel mix was made up heating oil followed by 22.2% electricity and 15.5% natural gas
- Total residential emissions were 304.9 ktCO₂eq in 2018
- 38.3% of residential emissions came from heating oils, 28.9% from electricity and 18.6% from coal & peat

Residential Sector					Total
	Electricity	Fossil Fuels	Renewable Energies	CH ₄ /N ₂ O	
Total Energy (GWh)	236.0	798.58	30.71	0	1065.3
Total Emissions (ktCO₂eq)	88.3	212.3	0.0	4.4	304.9

Table 6: County Waterford Residential Inventory; Energy and CO₂eq Emissions

6.0 MANUFACTURING & COMMERCIAL

Manufacturing & Commercial data is reported as one sector as outlined in “Technical Annex C: Climate Mitigation Assessment” of the Local Authority Climate Action Plan Guidelines” (DECC, 2023).

The data provided for the Baseline Emissions Inventory (BEI) has Waterford County Councils data included within this sector (EPA, 2022). Waterford County Council’s data is presented and analysed separately in this report (see Section 4 **Error! Reference source not found.**). Therefore, the data presented in this section is for the Manufacturing & Commercial sector only, without the Local Authority data, which has been extracted from this data set.

These sectors are responsible for emissions from the operation of manufacturing plants as well as space heating, water heating, cooking and laundry involved in commercial services. The main data sources for these sectors are MapElre¹⁵, CSO non-residential metered consumption data¹⁶, CSO Energy Balance¹⁷ and Valuation Office¹⁸ data set.

6.1 METHODOLOGY

The CSO data and the data provided from the Valuations Office form the foundation of data collection for this sector.

The Valuation Office (VO) provides data on number of businesses in County Waterford and the associated floor area of each. The properties are categorised by the Valuation Office as follow:

- **Industrial Uses** includes (Warehouse, Workshops, Factory, Livestock Mart, Showrooms, workshop offices)
- **Office** includes (Business parks, industrial offices, studio)
- **Retail (Warehouse)** includes (Garden Yard, Motor showroom Yard)
- **Hospitality** includes (Pubs, Night Clubs, Guesthouse, Funeral homes, Caravan parks, Hostel, Hotels)
- **Health** includes (Nursing home, Clinic, Surgery centers, Surgery office)
- **Fuel/Depot** includes (Oil/Fuel Depot store, Service station, Motorway service station, Oil/Fuel Depot yard)
- **Miscellaneous** includes (Crèche, Car park, Advertising station)
- **Retail (Shops)** includes (retail shops, Supermarket, Restaurant, Post Office, Department store, Café, Bank, ATM, Pharmacy)
- **Leisure** includes (Clubhouse, Community hall, Stable, Stadium, Swimming Pool, Gymnasium/Fitness Centre, Cinema, Equestrian Centre, Theatre)
- **Minerals** includes (Quarries)

¹⁵ <https://projects.au.dk/mapeire/spatial-results/download>

¹⁶ <https://www.cso.ie/en/statistics/energy/meteredelectricityconsumption/>

¹⁷ <https://data.cso.ie/table/SEI01>

¹⁸ <https://maps.valoff.ie/maps/VO.html>

Table 7 shows the total number of businesses and the associated floor area for each category¹⁹. 39% of the commercial properties can be categorised as Retail shops, 26% as Industrial Use and 21% as Offices, see Figure 14.

	No. of Buildings	Total Floor Area (m ²)
Industrial Uses	489	1,987,270
Office	394	124,394
Retail (Warehouse)	51	154,112
Hospitality	74	3,674
Health	7	27,522
Fuel/Depot	30	56,025
Miscellaneous	51	16,084
Retail (Shops)	733	299,575
Leisure	32	89,592
Minerals	1	288,401
TOTAL	1,862	3,046,649

Table 7: Number of Properties & Floor Area of Manufacturing & Commercial Businesses

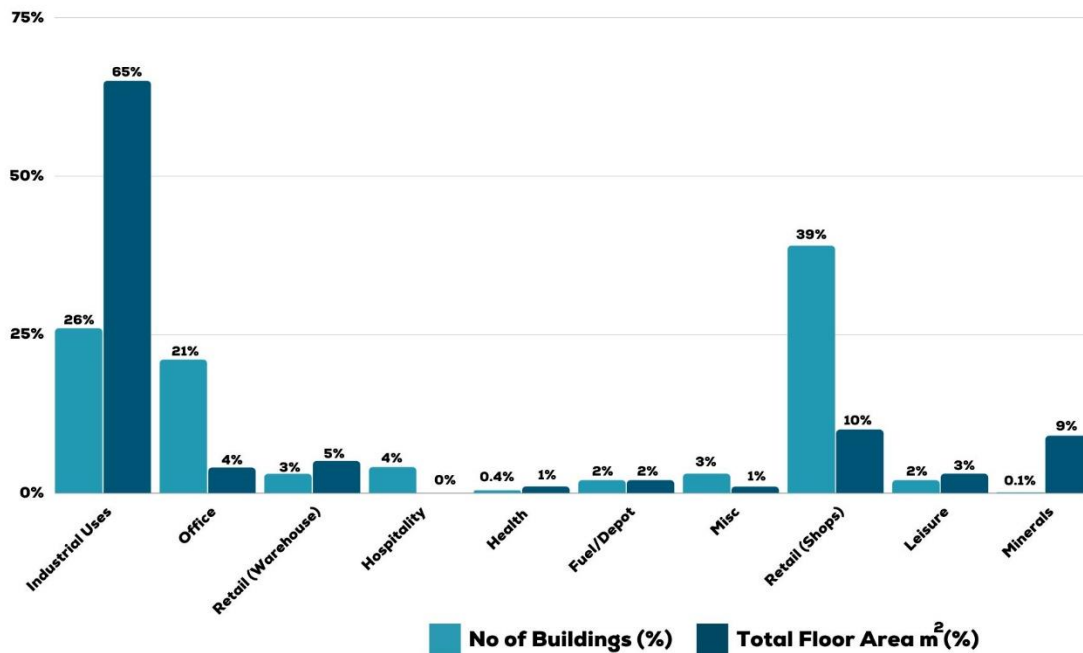


Figure 14. Number of Properties & Floor Area of Manufacturing & Commercial Businesses

¹⁹ There is a known error in the data provided from the Valuations Office for County Waterford for 2018. Therefore, a correction factor of 2.63 has been applied across the data set. The correction factor was calculated taking the actual Electricity Metered Data¹⁹ for non-residential buildings from CSO and comparing it to the electricity used by the number of businesses identified by the VO.

The Chartered Institute for Building Service Engineers (CIBSE, 2008) produce benchmarks, given in kilowatt-hours per meter squared floor area (kWh/m²) for heat and electricity, in each building category.

	kWh/m ²	CO ₂ Eq
Industrial Uses	195	49.7
Office	215	75.1
Retail (Warehouse)	195	49.7
Hospitality	435	120.5
Health	270	76.5
Fuel/Depot	195	49.7
Miscellaneous	70.39	112.6
Retail (Shops)	165	90.8
Leisure	1375	349.5
Minerals	195	49.7

Table 8: CIBSE Benchmarks used for each Manufacturing & Commercial Category

The advantage of using CIBSE energy benchmarks is that they are based on a large sample set, and as Irish building regulations follow the UK regulations, the energy figures are applicable in the Irish context. The relevant benchmarks can be matched by property type and multiplied by the floor areas from the Valuation Office for all Manufacturing & Commercial businesses in the County.

The CSO Natural Gas Consumption data²⁰ and the Electricity Metered Data²¹ for non-residential buildings was obtained from CSO data. The Local Authority data was also used and subtracted from the electricity and thermal data to obtain the split between thermal and electrical consumption for the Manufacturing & Commercial sector.

MapEire data set provides additional emissions produced in the form of Methane (CH₄) and Nitrous Oxide (N₂O) by Manufacturing & Commercial sector. These emissions are converted into CO₂eq using the conversion factors provided by EPA (EPA, 2023).

²⁰ <https://www.cso.ie/en/statistics/energy/networkedgasconsumption/>

²¹ <https://www.cso.ie/en/statistics/energy/meteredelectricityconsumption/>

6.2 RESULTS

6.2.1 ENERGY RESULTS

Total energy use in the Manufacturing & Commercial sector in 2018 was **1,839.8 GWh**. The energy demand mainly comes from thermal consumption, which accounts for 1,153.3 GWh (63%) of the energy. 456.2 GWh (25%) is electricity, and 13% is renewables - see Figure 15.

Fuel Type	Energy GWh
Electricity	456.2
Natural Gas	393.1
Heating Oils	535.2
LPG	112.5
Coal/Peat	112.5
Renewables	230.3
TOTAL	1,839.8

Table 9: Breakdown of Consumption by Fuel Type

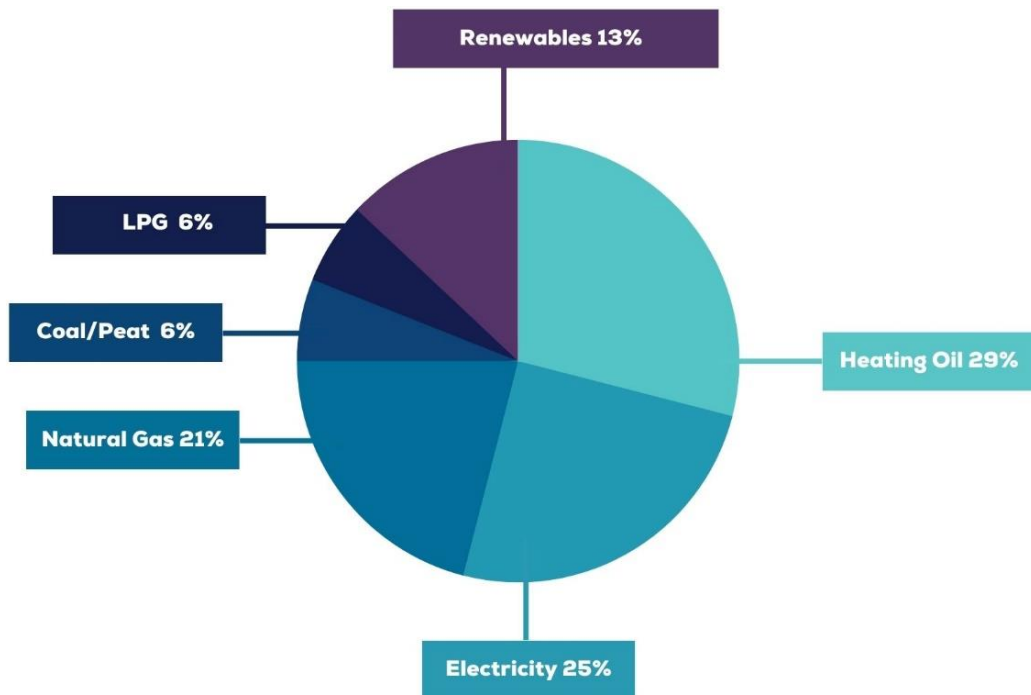


Figure 15. Breakdown of Consumption % by Fuel Type

6.2.2 GHG EMISSION RESULTS

When energy use was converted into GHG emissions, total energy related emissions from the Manufacturing & Commercial sector in 2018 was calculated at 465.7 ktCO₂eq.

As can be seen from Figure 16, the commercial properties that produced the most emissions were:

- Industrial uses: 246.4 ktCO₂eq (52.9%)
- Leisure: 78.3 ktCO₂eq (16.8%)
- Retail (Shops): 48.7 ktCO₂eq (10.5%)
- Minerals: 35.8 ktCO₂eq (7.7%)

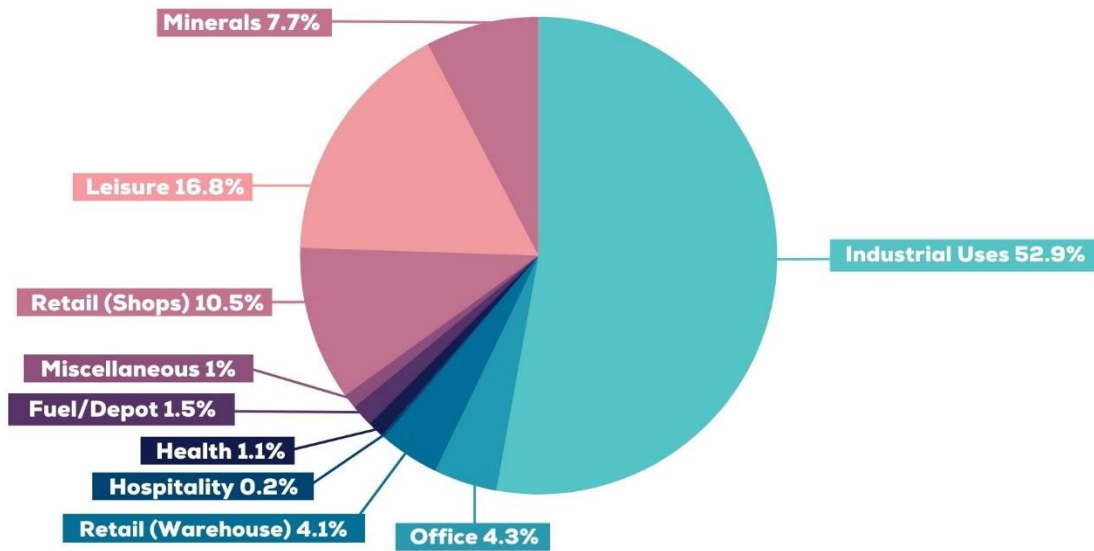


Figure 16. Manufacturing & Commercial Emissions by Property Category

Figure 17 below gives an indication of emissions in comparison to the number of buildings for different commercial properties in the region.

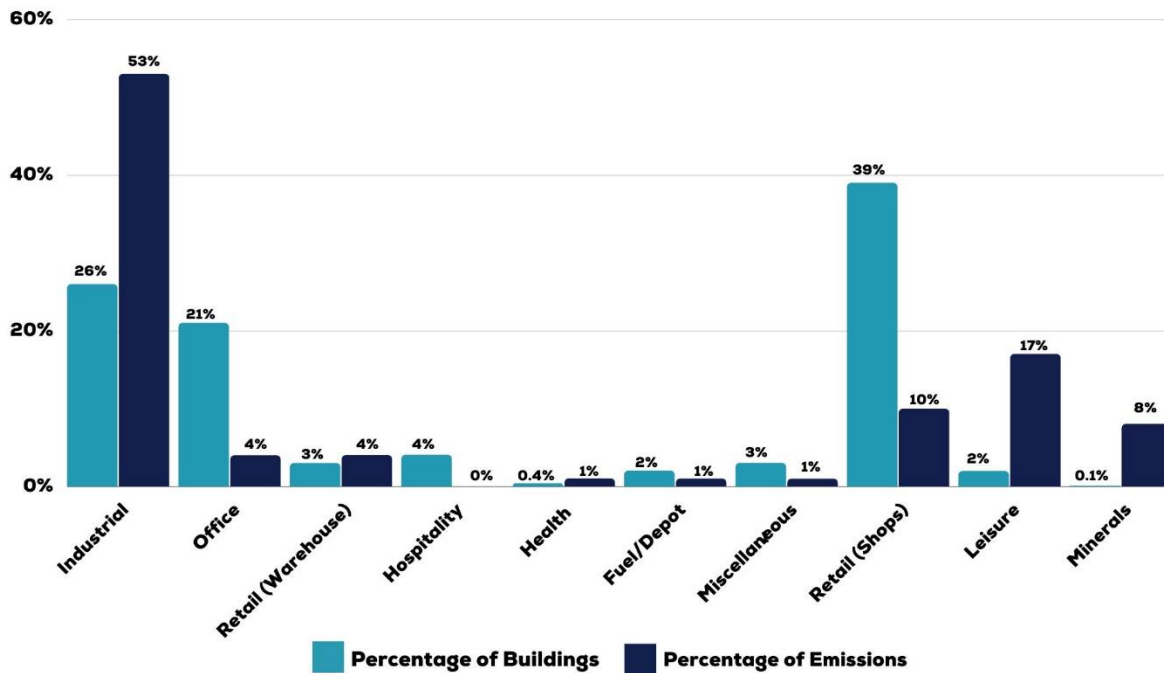


Figure 177. Share of Total Emissions and Number of Commercial Properties in County Waterford

Industrial uses, Leisure and Retail (Shops) are the main CO₂eq emitters, as altogether they make up over 80% of the commercial sector's total emissions. From this analysis, these three categories should be the main targets of energy and emission reduction initiatives within the commercial sector.

Figure 18 below shows the electricity and types of fossil fuel consumption of commercial buildings by category. These figures are representative of the CIBSE energy benchmark. Electricity and heating oils account for the highest share of use (36.6%) and (31.3%) respectively. CIBSE only breaks down fuel use into fossil fuels and electricity. Therefore, CSO energy balance 2018 was used to take a national average use by fuel type to calculate the emissions.

The non-energy related emissions calculated using the MapElre data gave a total of 1.5 ktCO₂eq for County Waterford M&C Sector.

Therefore, there was a total of **467.2 ktCO₂eq** of GHG emissions from the M&C sector in 2018 in County Waterford.

Fuel Type	ktCO ₂ eq emissions
Electricity	171.2
Natural Gas	80.2
Heating Oils	146.4
LPG	25.8
Coal/Peat	42.1
Renewables	-
CH ₄	0.8
N ₂ O	0.7
TOTAL	467.2

Table 10: Manufacturing & Commercial Emissions by Fuel Type

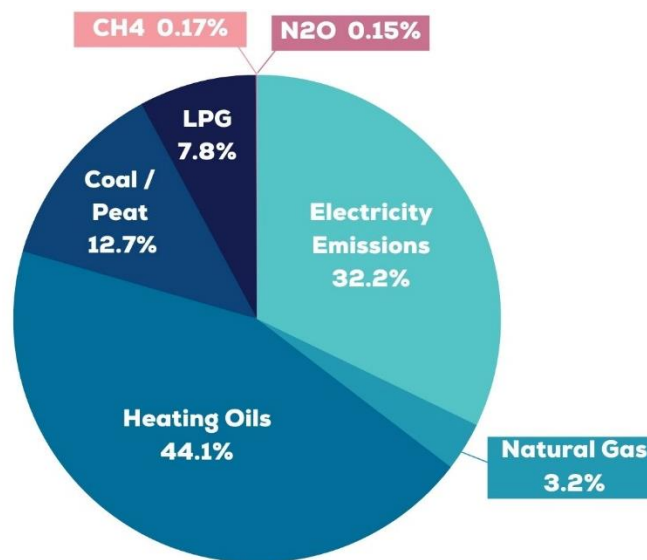


Figure 18. Manufacturing & Commercial Emissions by Fuel Type

6.3 KEY FINDINGS

- Total energy consumed by Manufacturing & Commercial sector in 2018 was 1,839.8 GWh
- 29% of the energy was from Heating Oils, 25% was electricity, 21% was natural gas. 13% was from Renewable energy systems
- Total Manufacturing & Commercial emissions were 467.2 ktCO₂eq in 2018
- 36.6% of the emissions came from electrical consumption, 31.3% from heating oils and 17.2% from natural gas
- 53% of emissions came from Industrial Uses, 17% from Leisure industry and 10% from Retail (shops)

Manufacturing and Commercial Sector				Total
	Electricity	Thermal	CH ₄ & N ₂ O	
Total Energy (GWh)	456.2	1,383.6		1,839.8
Total Emissions (ktCO₂eq)	171.2	294.5	1.5	467.2

Table 11: County Waterford Manufacturing & Commercial Inventory; Energy and CO₂eq Emissions

7.0 INDUSTRIAL PROCESSES

The industrial processes sector estimates greenhouse gas emissions occurring from industrial processes, from the use of greenhouse gases in products, and from non-energy uses of fossil fuel carbon (EPA). For example, emissions caused by the processes that convert raw materials to a range of chemical, mineral or metal products like cement and fertilisers. These are a mix of energy related and non-energy related GHG emissions.

Industrial Processes differs from industrial uses outlined in Section 6 in that industrial uses includes the GHG emissions that come from energy consumption and the manufacturing and delivery of services.

The emission sources relating to this sector include cement production, ceramics, lime production, uses of carbonates, and solvent use.

7.1 METHODOLOGY

As per the methodology provided on page 28 of Technical Annex C: Climate Mitigation Assessment” of the Local Authority Climate Action Plan Guidelines” (DECC, 2023). MapElre provides emission data for industrial processes across County Waterford.

GHG emissions from the processing of cement, lime and other solvents is split by MapElre into main categories including:

- Lime Production
- Ceramic
- Lubricant use
- Paraffin wax use
- Food and Beverages Industry
- Domestic solvent use
- Other solvent use

The non-energy related GHG emissions include Methane (CH₄), Nitrous Oxide (N₂O), sulfur Hexafluoride (SF₆). These are all converted into CO₂eq using the conversion factors from EPA²²

GHG	CO ₂ eq/kg
CO ₂	1
CH ₄	25
N ₂ O	298
SF ₆	22,8000

Table 12: CO₂eq. Conversion Factors for Various GHG Emissions

²² <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results>

7.2 RESULTS

Using the methodology outlined in the Technical Annex C: Climate Mitigation Assessment (EPA, 2023), the CO₂eq emissions from the industrial processes are **13.91ktCO₂eq**.

Figure 19 below shows non-energy related emissions breakdown:

- Lime Production: 0 ktCO₂eq
- Ceramic: 0.06 ktCO₂eq
- Lubricant use: 0.52 ktCO₂eq
- Paraffin wax use: 0.71 ktCO₂eq
- Food and Beverages Industry: 2.54 ktCO₂eq
- Domestic solvent use: 1.16ktCO₂eq
- Other solvent use: 8.93 ktCO₂eq

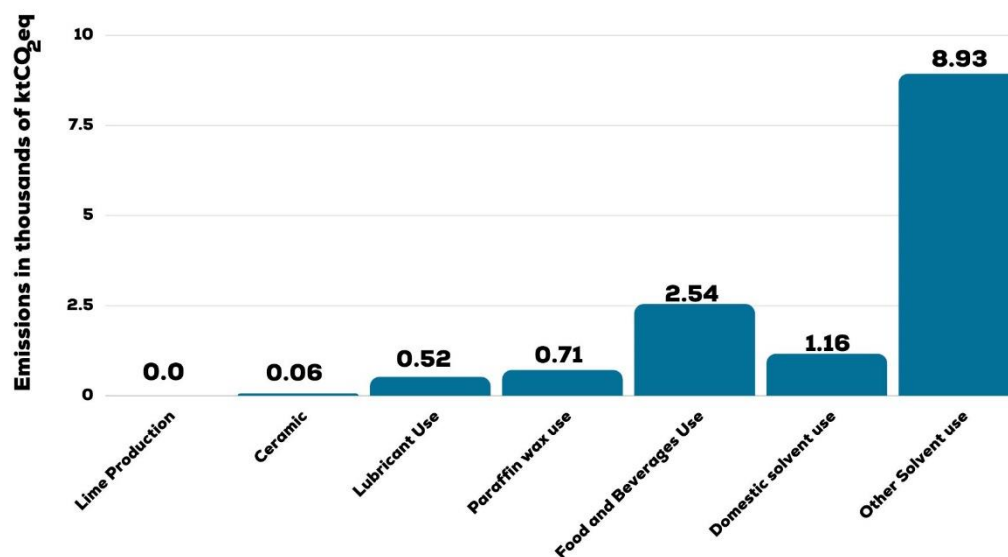


Figure 19. CO₂ Emissions from the Industrial Processes, ktCO₂eq

7.3 KEY FINDINGS

- Total emissions from industrial processes are 13.91 ktCO₂eq.
- 8.93 ktCO₂eq (64%) emissions were from other solvent use
- 2.54 ktCO₂eq (18%) emissions were from food and beverage industry
- The remaining 2.45 ktCO₂eq emissions were from ceramics, lubricant use, paraffin wax use, and domestic solvents

Industrial Process Sector	Lime Production	Ceramics	Lubricant Use	Paraffin Wax Use	Food Industry	Domestic Solvent use	Other Solvent Use	Total
Total Emissions (ktCO₂eq)	0.00	0.06	0.52	0.71	2.54	1.16	8.93	13.91

Table 13: County Waterford Industrial Processes CO₂eq emissions

8.0 AGRICULTURE

This sector's emissions are from both energy and non-energy related actions.

The non-energy related emissions come from a range of sources, including, livestock units (dairy cows, sheep, horses, poultry, fisheries), enteric fermentation, manure management, agricultural soils, liming, and use of fertilisers and urea.

Energy related emissions are for electricity and fuels used within the agricultural sector.

Transport related emissions from the Agricultural sector are reported under the Transport Sector, as per the methodology outlined page 28 of the Technical Annex C: Baseline Mitigation Assessment.

8.1 METHODOLOGY

MapEire data provides a breakdown of emissions within this sector covering a wide range of categories, including:

- Agriculture/ Forestry/ Fisheries: Stationary
- Dairy Cattle
- Non-dairy Cattle
- Sheep
- Swine
- Goats
- Horses
- Mules and asses
- Manure management - Dairy Cattle
- Manure management - Non-Dairy Cattle
- Manure management - Sheep
- Manure management - Swine
- Manure management - Goats
- Manure management - Horses
- Manure management - Mules and asses
- Liming
- Inorganic N-fertilizers
- Animal manure applied to soils
- Sewage sludge applied to soils
- Urine and dung deposited by grazing animals
- Crop residues applied to soils
- Mineralization
- Atmospheric deposition
- Nitrogen leaching and run-off
- Urea application

The data from MapElre categorized as ' off-road vehicles' has been removed from this data set and is reported under the Transport Data (Section 9 of this report). This is reported under the Tractors & Machinery heading.

MapElre data set provides emissions produced in the form of Methane (CH₄) and Nitrous Oxide (N₂O). These emissions are converted into CO₂eq using the conversion factors provided by EPA²³. This data is for both energy and non-energy related emissions.

For the energy related emissions, additional data from CSO Census of Agriculture is broken down to County level and gives information on the number of farms, the number of livestock units (dairy cow, sheep, pig, poultry etc.), and the crops grown (Central Statistics Office, 2020), (EPA, 2022), see Figure 20. In County Waterford there are a total of:

- 270,583 cows of which 89,900 dairy cows and 180,683 other cattle in 1,987 farms.
- 92,146 sheep of which 46,805 are Ewes and 45,341 are other sheep, in 383 farms.
- 660,900 poultry of which 558,600 fowl and 102,300 other poultry in 137 farms.
- 104,500 pigs of which 9,300 are breeding pigs and 65,200 are other pigs over 20 kgs and 30,000 are pigs under 20kg, in 33 farms.

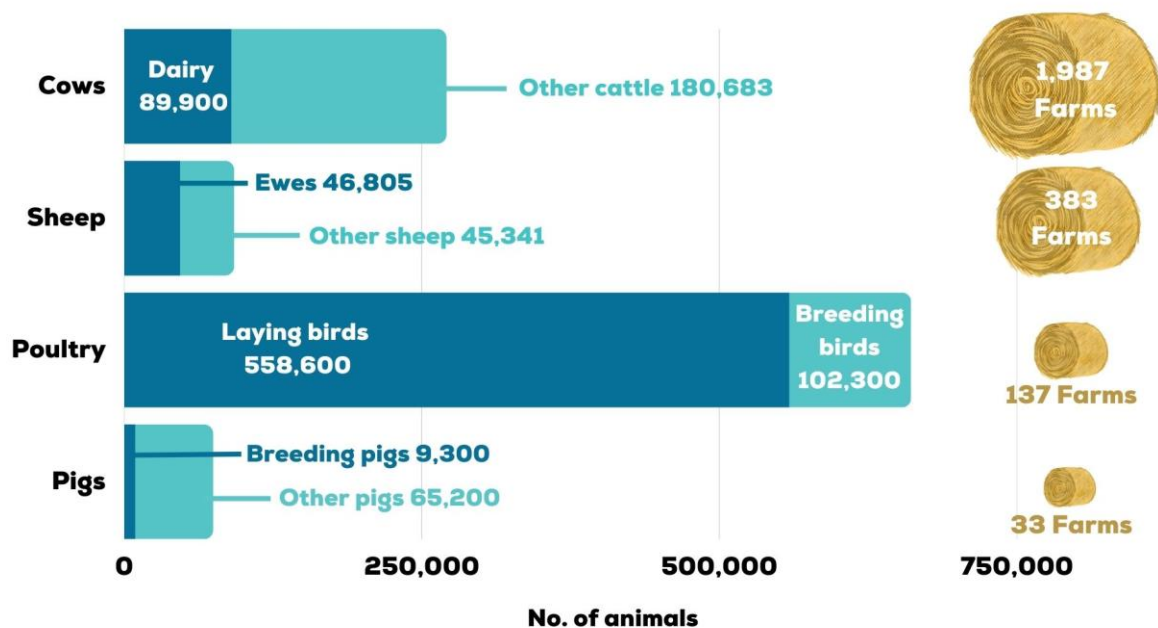


Figure 20. Breakdown of Livestock Units and a Number of Farms in County Waterford

²³ <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results>

Benchmarks from Teagasc were used to estimate energy and non-energy related emissions (Teagasc, 2017). These provide benchmarks in formats such as kWh electricity/dairy, cow/year, methane/dairy, cow/year, kWh. This methodology allows a detailed breakdown of agricultural emissions. Average energy consumption in the agriculture sector, by livestock, in Ireland are:

- 350 kWh of energy per cow
- 280 kWh of energy by sheep
- 10.7 kWh of energy by poultry
- 6.55 kWh of energy by pigs

The energy related emissions calculated from the CSO data and Teagasc benchmarks is subtracted from the total emissions provided by MapEire to give energy and non-energy related GHG emissions for the agricultural sector.

8.2 RESULTS

8.2.1 ENERGY RESULTS

Using the Teagasc Benchmarks and the number of different livestock from the CSO data, as outlined above, the total Energy related emissions associated with the Agriculture sector in County Waterford in 2018 was **130.5GWh**.

73% of this is associated with cattle and 20% associated with sheep.

	Electrical GWh	Thermal GWh	Total	%
Cattle	94.7	-	94.7	73%
Sheep	25.8	-	25.8	20%
Poultry	0.9	6.2	7.1	5%
Pigs	2.9	0.1	2.9	2%
TOTAL	124.2	6.3	130.5	

Table 14: Energy Related Energy Consumption Associated with the Livestock in County Waterford

8.2.2 GHG EMISSION RESULTS

The GHG emissions are split between energy related and non-energy related emissions.

The energy related emissions associated with the 130.5GWh outlined above are calculated using the electricity and thermal conversion factors.

The total energy related emissions are 48.3 ktCO₂eq, see Figure 21.

	ktCO ₂ eq	%
Cattle	35.5	74%
Sheep	9.7	20%
Poultry	2.0	4%
Pigs	1.1	2%
TOTAL	48.3	

Table 15: Energy Related GHG Emissions Associated with the Livestock in County Waterford

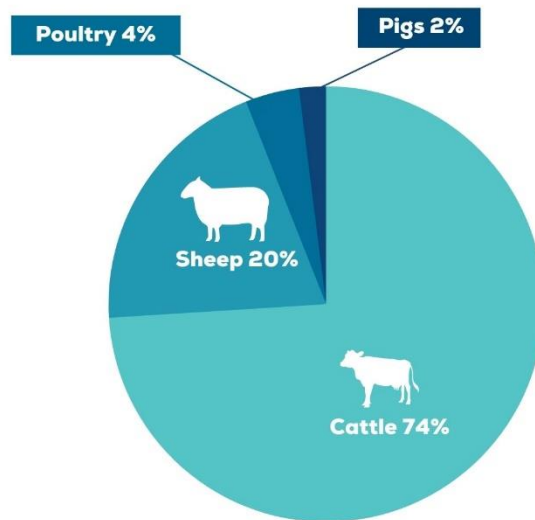


Figure 21. Breakdown of Energy Related GHG Emissions Associated with the Livestock in County Waterford

The non-energy related emissions calculated using the MapElre data and the energy related emissions above, gave a total of 719.8 ktCO₂eq, see Figure 22.

NFR_Code	NFR Name	ktCO₂eq
1A4ci	Agriculture/ Forestry/ Fisheries: Stationary	1.56
1A4ciii	Agriculture/ Forestry/ Fisheries: National fishing	0.05
3A1a	Dairy Cattle	222.35
3A1b	Non-dairy Cattle	211.17
3A2	Sheep	13.22
3A3	Swine	2.78
3A4d	Goats	0.02
3A4e	Horses	1.15
3A4f	Mules and asses	0.08
3B1a	Manure management - Dairy Cattle	25.96
3B1b	Manure management - Non-Dairy Cattle	33.91
3B2	Manure management - Sheep	1.60
3B3	Manure management - Swine	15.89
3B4d	Manure management - Goats	0.01
3B4e	Manure management - Horses	0.28
3B4f	Manure management - Mules and asses	0.02
3G	liming	9.41
3Da1	Inorganic N-fertilizers	83.90
3Da2a	Animal manure applied to soils	23.17
3Da2b	Sewage sludge applied to soils	0.36
3Da3	Urine and dung deposited by grazing animals	48.16
3Da4	Crop residues applied to soils	6.19
3Da5	Mineralization	0.56
3Da6	Cultivation of organic soils	0.47
3Db1	Atmospheric deposition	7.03
3Db2	Nitrogen leaching and run-off	7.79
3H	Urea application	2.72
	Total	719.81

Table 16: Non-Energy Related Emissions from the Agriculture sector in County Waterford by Category

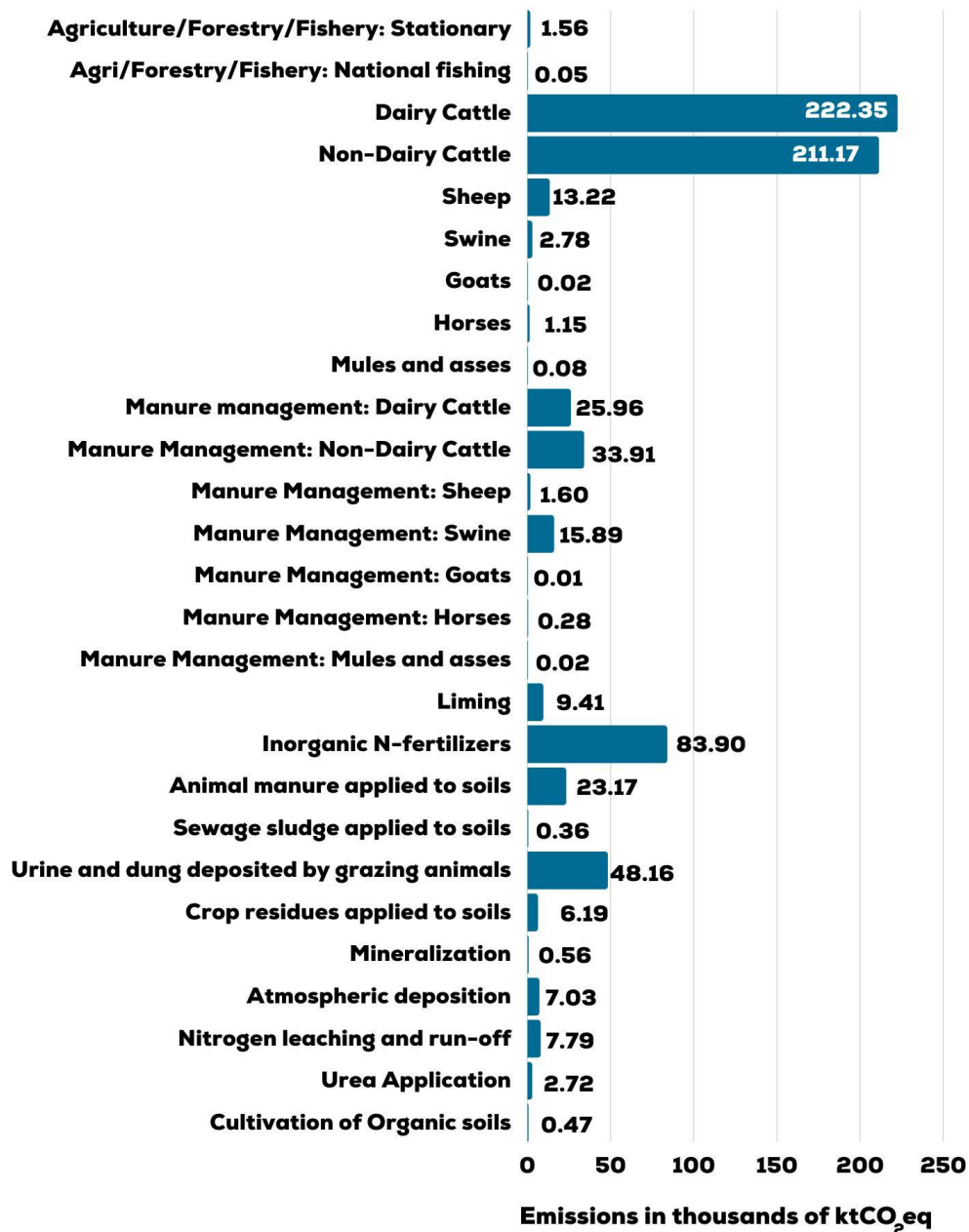


Figure 22. Non-Energy Related Emissions from the Agriculture sector in County Waterford by Category

Therefore, the total emission from agriculture is **768.1 ktCO₂eq** in 2018.

8.3 KEY FINDINGS

- Energy Consumption from agriculture sector accounts for 130.5 GWh
- Non-energy related GHG emissions totaled 719.8 ktCO₂eq
- Total emissions from agriculture sector accounts for 768.1 ktCO₂eq

Agriculture Sector				Total
	Electricity	Thermal	CH ₄ & N ₂ O	
Total Energy (GWh)	124.2	6.3		130.5
Total Emissions (ktCO₂eq)	46.6	1.7	719.81	768.1

Table 17: County Waterford Agriculture Sector CO₂eq emissions

9.0 TRANSPORT

Transport is a complicated sector to develop an accurate baseline for an area due to the number of different transport modes and movement across boundaries.

This section does not include Waterford City & County Councils direct transport emissions, which is presented separately in Section 4 of this report. This data was subtracted from the total transport emissions for this sector to avoid 'double-counting'.

The Central Statistics Office (CSO) published 'Census 2018, Commuting in Ireland', which shows that commuting has increased nationally, and is in line with the changes and growth in the Irish economy (SEAI, 2019).

Comparing 2016²⁴ and 2011 census data, the number of people commuting to work increased by 11%. Nationally, commuting by car increased by 8%, public transport rose by 21%, walking by 3%, and cycling was up by 43% in 2018.

Significant improvements have been made to the sustainability of the transport system in recent years at national levels. The national vehicle road tax system was revised, and as of July 2008, the system moved away from assessing vehicles based on their engine size to one that is based on CO₂eq emissions per kilometer (CSO- transport, 2018).

9.1 METHODOLOGY

The primary source of the Transport sector's GHG emissions come from the burning of diesel and petrol in combustion engines. MapEire data and CSO Transport Omnibus (CSO- transport, 2018) data both provide a breakdown of transport emissions at a County wide level, covering a range of vehicle type categories as outlined below. As seen in Figure 23, County Waterford had a total number of vehicles of 70,009 in 2018, of which:

- 57,594 are private cars
- 8,161 are goods vehicles
- 1,293 motorcycles
- 2,474 tractors and machinery
- 308 small PSVs (Public Service Vehicle)
- 179 large PSVs

²⁴ Census 2022 not available at time of analysis. Preliminary data published post analysis

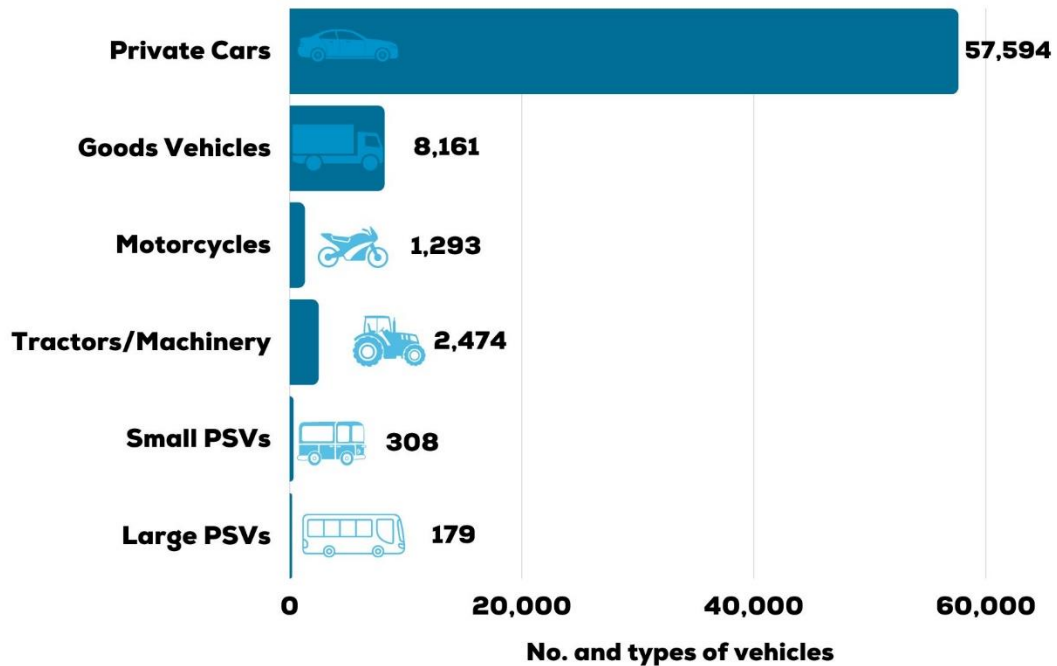


Figure 23. Number and Types of Vehicles in County Waterford in 2018

**A public service vehicle is a vehicle that carries passengers for a fee. Small PSV is defined as vehicle that carries up to 8 passengers, and large PSV is defined as more than 8 passengers²⁵.*

The SEAI’s ‘Energy in Ireland 2019’ (SEAI, 2019) includes the section on the share of emissions in Transport and gives a breakdown of average fuel use in Ireland in 2018 for Transport Vehicles. The 2018 fuel mix from this report was used to find an average national fuel type associated with energy use from transportation. The national dataset shows that an average of 1% of transport fuel is related to Compressed Natural Gas (CNG). Without data specific to County Waterford, this national average has been used to estimate the fuel mix breakdown. It is not known if there are any actual CNG vehicles in County Waterford in 2018.

This data was then combined with vehicular efficiency and GHG emissions data from the SEAI report on ‘Energy in Transport 2014’ (SEAI, 2014) as well as average age of private cars to estimate the overall average energy usage and fuel breakdown for each vehicle type and therefore the Transport Sector as a whole across County Waterford. Carbon emission factors for transport fuels was then used to convert energy to GHG emissions in 2018 for the Transport sector.

For public transport, providers of public transport differ in each county. Public Service Vehicles are reported as above, and MapElre provides for rail emissions as a subcategory.

The transport data associated with Waterford City & County Council as reported in Section 4 of this report was subtracted from the total Transport data to avoid ‘double-counting’.

²⁵ Road Safety Authority [https://www.rsa.ie/road-safety/road-users/special-purpose-vehicles/small-public-service-vehicles-\(spsv\)#:~:text=What%20is%20a%20small%20public,Yes.](https://www.rsa.ie/road-safety/road-users/special-purpose-vehicles/small-public-service-vehicles-(spsv)#:~:text=What%20is%20a%20small%20public,Yes.)

9.2 RESULTS

9.2.1 ENERGY RESULTS

The total energy consumption related to Transport in 2018 for County Waterford was **1,043.0 GWh**.

As seen in Figure 24, road diesel was the main fuel source for both public and private transport, accounting for 78.4% of fuel consumption. This was followed by petrol at 20.9%.

Fuel Type	GWh	%
Petrol	285.9	27.3%
Road Diesel	748.5	71.5%
CNG	10.0	1.0%
Electricity	2.2	0.2%
TOTAL	1,046.6	

Table 18: County Waterford Total Energy Consumption Related to Transport in 2018

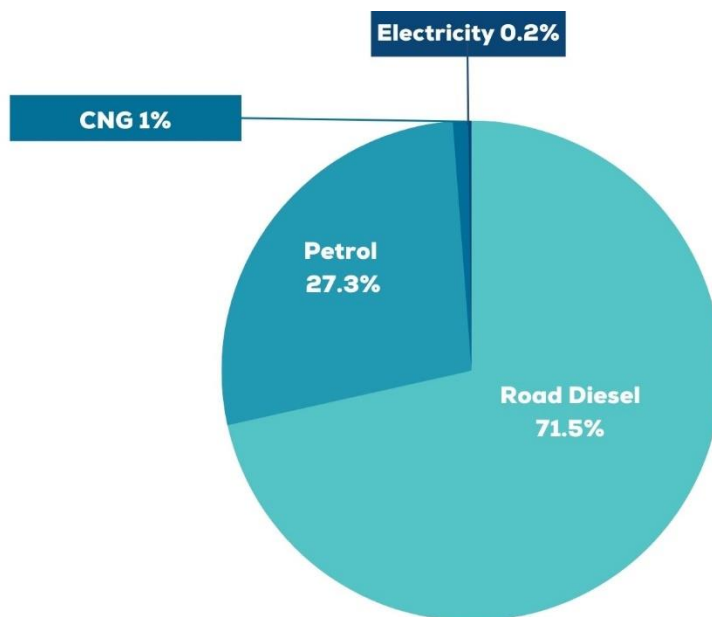


Figure 24. County Waterford Transport Energy Use %

9.2.2 GHG EMISSION RESULTS

The total energy related emissions from Transport in 2018 were the equivalent of 274.9 ktCO₂eq of which:

- 195.6 ktCO₂ from private vehicles
- 52.9 ktCO₂ from goods vehicles
- 0.7 ktCO₂ from motorcycles
- 13.6 ktCO₂ from tractors and machinery
- 4.2 ktCO₂ from small PSVs
- 4.2 ktCO₂ from large PSVs
- 2.54 ktCO₂ from railways
- 1.14 ktCO₂ from National Navigation (Shipping)

The LA Transport emissions were removed from the Transport emissions above, to give a total of 272.42 ktCO₂eq.

As seen in Figure 25, the split of emissions from the different fuel types is

Fuel Type	ktCO ₂ eq	%
Petrol	72.0	26.1%
Road Diesel	197.5	71.5%
CNG	2.0	0.7%
Electricity	0.8	0.3%
TOTAL	272.4	

Table 19: Split of Transportation Emissions from different fuel types

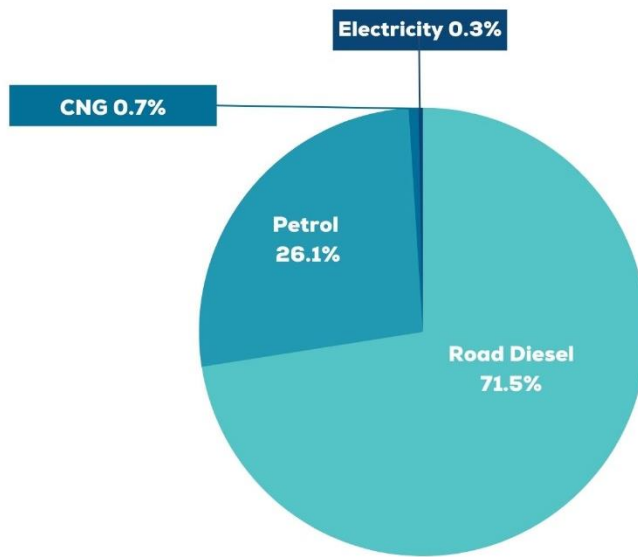


Figure 25. Split of Transportation Emissions from different fuel types %

The GHG emissions from methane (CH₄), and nitrous Oxide (N₂O) obtained from the MapEire data equates to 3.7 ktCO₂eq.

This gives a total GHG emissions for the Transport Sector of **276.2 ktCO₂eq.**

9.3 KEY FINDINGS

- Total energy use in transport was 1,043.0 GWh
- Total final emissions from transport were 276.2 ktCO₂eq
- Transport emissions came primarily from diesel (78%) and Petrol (20%)

Transport Sector	Electricity	Fossil Fuels			Other Emissions		Total
		CNG	Road Diesel	Petrol	CH ₄	N ₂ O	
Total Emissions (ktCO₂eq)	0.8	2.0	197.5	72.0	0.2	3.5	276.2

Table 20: County Waterford Transport Inventory, ktCO₂eq Emissions

10.0 LAND USE, LAND USE CHANGE & FORESTRY (LULUCF)

Land Use, Land-use Change and Forestry covers the following categories: Forest land, Cropland, Grassland, Wetlands, Settlements, Other land and Harvested Wood products (EPA, 2022). The emissions associated with LULUCF is determined by the CO₂eq emissions from Grassland and Wetlands, due to drainage of organic soils. This is offset somewhat by Forest Land and harvested wood products, which acts as a carbon sinks. (EPA, 2022).

10.1 METHODOLOGY

MapElre²⁶ provides data on the level of emissions and carbon sinks on a County wide level including forest land, cropland, wetlands, settlements as well as for harvested wood products (EPA, 2022). The data is taken directly from this data source.

The non-energy related GHG emissions include Carbon Dioxide (CO₂), Methane (CH₄) and Nitrous Oxide (N₂O).

10.2 RESULTS

10.2.1 ENERGY RESULTS

There are no energy related results in this Section. GHG emissions in this sector are all non-energy related.

10.2.2 GHG EMISSION RESULTS

CO₂ emissions from LULUCF sector is 60.66kt. CH₄ and N₂O emissions from LULUCF sector is 12.2kt CO₂eq. This is equivalent to total emissions from LULUCF sector of **60.9ktCO₂eq.**

See Figure 26, emissions from different sectors in LULUCF account for the following:

- Grassland accounts for 230.2 ktCO₂eq.
- Wetlands accounts for 27.9 ktCO₂eq.
- Settlements accounts for 6.9 ktCO₂eq.
- Other Land accounts for 1.4 ktCO₂eq.
- Cropland accounts for -2.1 ktCO₂eq.
- Harvested wood products accounts for -17.2 ktCO₂eq.
- Forest land accounts for -186.2 ktCO₂eq.

²⁶ <https://projects.au.dk/mapeire/spatial-results/download>

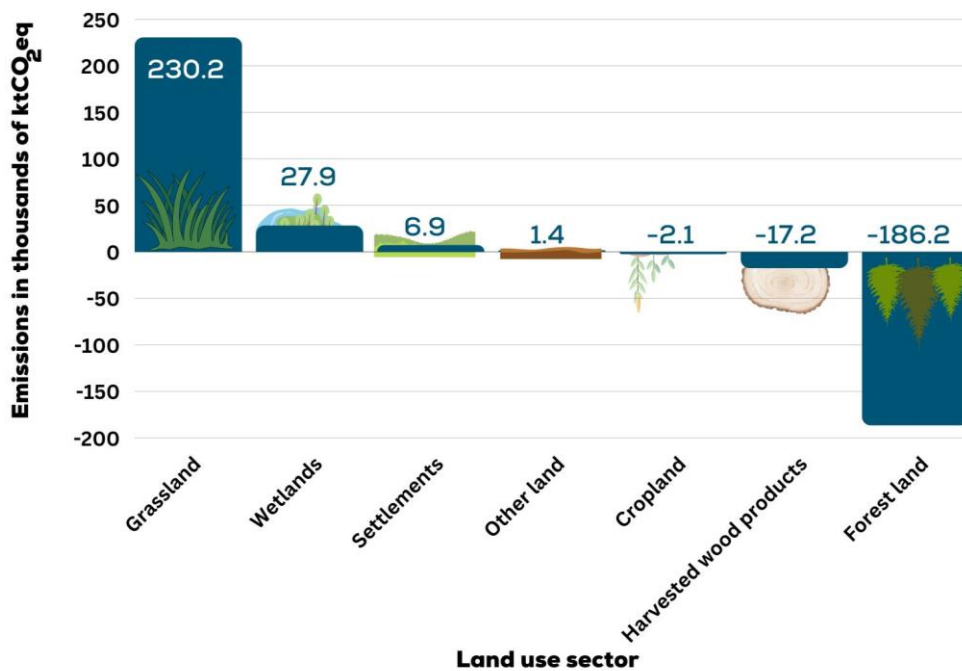


Figure 26. Emissions From Different Sectors in LULUCF

Negative emissions accounts for that the amount for CO₂eq absorbed by the forests, crops and harvested woods.

10.3 KEY FINDINGS

- Total emissions from LULUCF sector accounts for 60.9 ktCO₂eq.

LULUCF Sector	Grasslands	Wetlands	Settlements	Croplands	Harvested Wood Products	Forest land	Other land	Total
Total Emissions (ktCO₂eq)	230.2	27.9	6.9	-2.1	-17.2	-186.2	1.4	60.9

Table 21: County Waterford LULUCF sector CO₂eq emission

11.0 WASTE

This sector is responsible from handling of waste, incineration of waste (without energy utilisation), composting, and wastewater handling (EPA, 2022). This sector accounts for non-energy related emissions. Energy related emissions for waste services is covered under Manufacturing & Commercial emissions reported in Section 7 of this report (under industrial uses).

11.1 METHODOLOGY

MapEire provides data on the emission levels within this sector (EPA, 2022). For County Waterford the data is split into GHG emissions related to the following waste categories:

- Composting
- Solid waste disposal on land
- Open burning of waste
- Domestic waste-water handling

Additional data collection such as number of landfills and wastewater treatment plants provides further breakdown of emissions within this sector.

The National Waste Collection Permit Office (NWCPO) grant waste collection licenses for providers in each County. In 2018, there was one provider in County Waterford who has a permit for waste collection.

The Pollutant Release and Transfer (PRTR)²⁷ shows that in 2018 there were 5 facilities reporting under waste and wastewater management for County Waterford.

11.2 RESULTS

11.2.1 ENERGY RESULTS

There are no energy related emissions for Waste covered in this section. Energy related emissions for waste services is covered under Manufacturing & Commercial emissions reported in Section 7 of this report (under industrial uses).

11.2.2 GHG EMISSION RESULTS

The total emissions from the waste sector accounts for **53.8 ktCO₂eq** of this:

- 40.0 ktCO₂eq from solid waste disposal on land
- 6.9 ktCO₂eq from domestic wastewater handling
- 6.8 ktCO₂eq from composting and the remaining
- 0.1 ktCO₂eq from open burning of waste

²⁷ <https://gis.epa.ie/EPAMaps/PRTR>

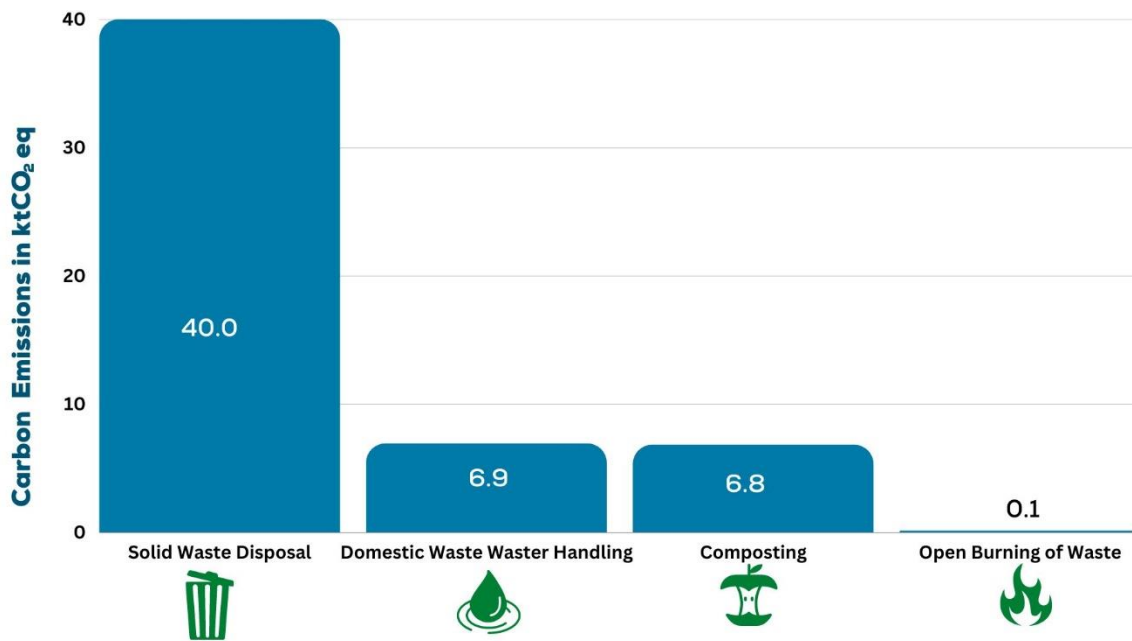


Figure 27. Waste GHG emissions by category, County Waterford, 2018

11.3 KEY FINDINGS

- Total emissions from waste sector accounts for 53.8 ktCO₂eq.

Waste Sector	Solid Waste Disposal	Domestic Wastewater Handling	Composting	Open Burning of Waste	Total
Total Emissions (ktCO₂eq)	40.0	6.9	6.8	0.1	53.8

Table 22: County Waterford Waste sector CO₂eq emission

12.0 F-GASES

These gases comprise of HFCs (Hydrofluorocarbons), PFCs (Perfluorocarbons), SF₆ (Sulphur Hexafluoride) and NF₃ (Nitrogen Trifluoride). They are much more potent than the naturally occurring greenhouse gas emissions. These were extracted from MapEire dataset for the local authority area and is presented as CO₂eq (EPA, 2022).

For County Waterford there are no emissions from these gases. The only recorded producers of these emissions in Ireland are in Limerick city and county, and Kildare County

13.0 RESULTS SUMMARY

This section examines total emission from the different carbon emitting sectors in County Waterford, as outlined in Chapters 4 – 12.

The total baseline GHG emission for 2018 for County Waterford is **1,955.1kt CO₂eq.**

At 39.3%, agriculture accounted for the greatest percentage of total emissions in the County. This was followed by Manufacturing & Commercial (23.9%), Residential (15.6%) and Transport (14.1%). Figure below illustrates the total emissions by sector.

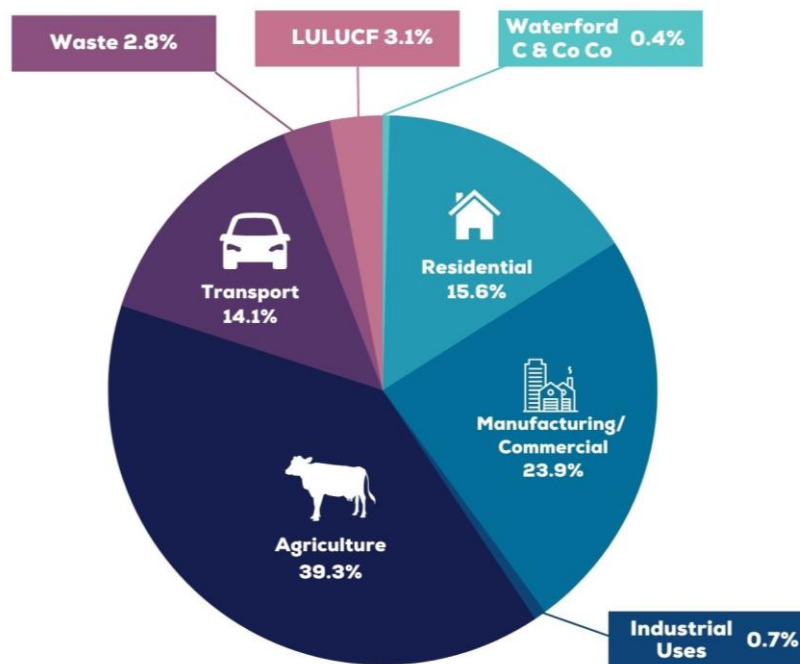


Figure 28. Share of Total Emission in County Waterford

County Waterford													Total
	Electricity	Fossil Fuels							CH ₄	N ₂ O	CO ₂	SF ₆	
		Natural Gas	Heating Oil	Diesel	Petrol	LPG	Coal	Peat					
Waterford City & County Council (ktCO ₂ eq)	4.8	1.0	0.2	2.5	0.0	0.0							8.6
Residential (ktCO ₂ eq)	88.3	33.8	116.8			4.5	24.2	33.0	3.9	0.5			304.9
Manufacturing and Commercial (ktCO ₂ eq)	171.2	80.2	146.4			25.8	41.7	0.4	0.8	0.7			467.2
Industrial Processes (ktCO ₂ eq)									-	1.2	5.4	7.3	13.9
Agriculture (ktCO ₂ eq)	46.6		1.7						527.8	192.0			768.1
Transport (ktCO ₂ eq)	0.8	2.0		197.5	72.0				0.2	3.5			276.2
LULUCF (ktCO ₂ eq)									12.5	14.2	34.2		60.9
Waste (ktCO ₂ eq)									46.8	8.4	0.1		55.3
Total Emissions (ktCO₂)	311.7	117.0	265.1	200.0	72.0	30.3	65.9	33.4	592.0	220.6	39.6	7.3	1,955.1

Table 23: BEI Summary Table for County Waterford

14.0 CONCLUSION

The total baseline GHG emission for 2018 for County Waterford is **1,955.1 ktCO₂eq.**

The 2030 target for GHG emissions by 2030 is 51% reduction from the baseline year of 2018.

Therefore, the allowable GHG emissions in 2030 is **958.0kt CO₂eq.**

GHG emissions for Waterford City & County Council in 2018 was **8.56ktCO₂eq.**

Therefore, the allowable GHG emissions in 2030 by Waterford City & County Council is **4.19 ktCO₂eq.**

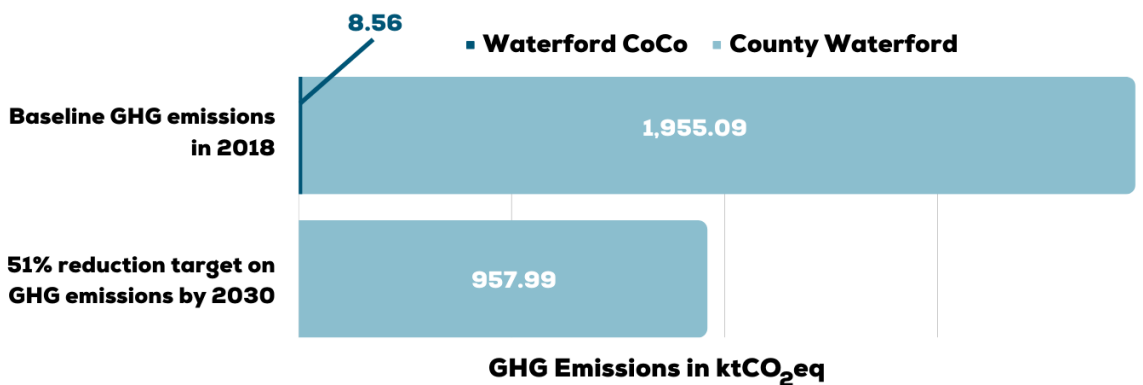


Figure 27. Baseline Emissions and Allowable GHG emissions

The resulting Climate Action Plan for County Waterford must define and outline a clear pathway to achieve this reduction. As part of the climate action plan the individual local authority will be responsible for reducing greenhouse gas emissions from across its own assets and infrastructure, whilst also taking on a broader role of influencing and facilitating others to meet their own targets. This is necessary to ensure the environmental, social and economic benefits that come with climate action can be fully realised.

Waterford City & County Council must demonstrate alignment with the key principles of the Local Authority Climate Action Planning Guidelines to ensure that the local authority climate action plan is: **Ambitious, Action-focused, Evidence-based, Participative** and **Transparent**.

15.0 APPENDIX A – ASSUMPTIONS

Sector	Data source	Data source link	Data assumption
Waterford City & County Council	SEAI Monitoring & Reporting (M&R)	https://psmr.seai.ie/Account/LogOn?ReturnUrl=%2f	Data on the M&R system has been submitted as per the SEAI methodology guidelines and are categorised correctly by the Local Authority at submission. Energy and carbon conversion factors used in the system are set by the SEAI.
Residential	Census data 2016	https://data.cso.ie/	2016 Census data was used - there is no specific 2018 census data so 2016 data was closest to the baseline period of 2018. The house types provided by the Census were grouped into 4 main house types of semi-detached, detached, terraced and apartments. All bedsits were assumed to be apartments.
	BER data	https://ndber.seai.ie/BERResearchTool/ber/search.aspx	All BER's for properties published post 2018 were removed from the data sets analysed. The remaining BERs are used to ascertain the average energy consumption per house type and per BER rating. These averages are used to estimate the total energy consumption per house type for all houses across the county.
	SEAI Energy in Residential Sector 2018	https://www.seai.ie/publications/Energy-in-the-Residential-Sector-2018-Final.pdf	This data was used to give an average breakdown between electricity, space heating & hot water in the residential sector. It was assumed that 20% of energy is electrical energy and 80% is thermal energy
	SEAI Energy Balance 2018	https://www.seai.ie/publications/2018-National-Energy-Balance-Final.pdf	This gives the national average breakdown of fuel types used for thermal energy in homes for 2018. This was used to calculate the average consumption per fuel type across the residential sector
	CSO Metered electricity data	https://www.cso.ie/en/statistics/energy/meteredelectricityconsumption/	The total metered electrical data for residential sector for County Waterford was downloaded from CSO
	CSO metered natural gas data	https://www.cso.ie/en/statistics/energy/networkedgasconsumption/	The total metered natural gas data for residential sector for County Waterford was downloaded from CSO
	SEAI Conversion Factors	https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/	The fuel type was used to ascertain GHG emissions using the conversion factors per fuel type from the SEAI

	Map Eire	https://projects.au.dk/mapeire/spatial-results/download	Methane and nitrous oxide emissions relating to the residential sector were obtained from the MapEire datasets and added to the total energy related GHG emissions calculated from the localised data sets.
	US EPA GHG Conversion Factors	https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results	GHG conversion factors were used to convert methane and nitrous oxide into CO2 equivalents. 1 unit of methane emissions is equivalent to 25 units of CO2eq. 1 unit of nitrous oxide is equivalent to 298 units of CO2eq.
Manufacturing & Commercial	Map Eire	https://projects.au.dk/mapeire/spatial-results/download	This data set includes Local Authority data. As such the total Waterford City & Co Co data as outlined in Section 4 of the report was removed from the final M&C data results so as not to double account
	CSO non-residential Metered Electricity data	https://www.cso.ie/en/statistics/energy/meteredelectricityconsumption/	assume that all data provided in this data set was associated with M&C sector, minus the LA specific data
	CSO non-residential Natural gas consumption data	https://www.cso.ie/en/statistics/energy/networkedgasconsumption/	assume that all data provided in this data set was associated with M&C sector, minus the LA specific data
	CSO Energy Balance	https://data.cso.ie/table/SEI01	National averages for fuel types provided from the Energy Balance was used to calculate the thermal breakdown of fuels, other than the natural gas and electricity which was provided by the CSO metered data sets
	Valuations Office	https://maps.valoff.ie/maps/VO.html	Assume that the number and categories provided by the Valuations Office for 2018 is correct in terms of number of businesses and floor areas
Industrial Processes	Map Eire	https://projects.au.dk/mapeire/spatial-results/download	No localised data sets available for this sector so a full breakdown was taken from MapEire
Agriculture	Map Eire	https://projects.au.dk/mapeire/spatial-results/download	The data from MapEire categorized as 'off-road vehicles' has been removed from this data set and is reported under the Transport Data (Section 9 of this report). This is reported under the Tractors & Machinery heading. This data was used for the non energy related GHG emissions
	CSO Census of Agriculture	https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020-preliminaryresults/kf/	Provides the number of livestock (sheep, Pigs, cows and poultry).

	Teagasc	https://www.teagasc.ie/media/website/rural-economy/rural-development/diversification/Energy-12_Poultry-Energy-Efficiency-in-Poultry-Units.pdf	Provides the average energy consumption per poultry.
	Teagasc	https://www.teagasc.ie/media/website/rural-economy/rural-development/diversification/Energy-14-Energy-Use-on-Pig-Farms.pdf	Provides the average energy consumption per pig
	Teagasc	https://www.teagasc.ie/rural-economy/rural-development/diversification/energy-auditing-in-agriculture/	Provides the average energy consumption per cow
Transport	CSO Transport Omnibus 2018	https://www.cso.ie/en/statistics/transport/transportomnibus/	Waterford City & County Council transport data was removed from the Transport sector data as it is reported separately under Section 4 of this report. This data provides the number and breakdown of vehicle types in County Waterford. The data also provides the average breakdown of fuel types and km travelled by each vehicle type. This average was used against the number of vehicles specified for County Waterford. The national dataset shows that an average of 1% of transport fuel is related to Compressed Natural Gas (CNG). Without data specific to County Waterford, this national average has been used to estimate the fuel mix breakdown. It is not known if there are any actual CNG vehicles in County Waterford.
	Map Eire	https://projects.au.dk/mapeire/spatial-results/download	Provides rail data for County Waterford
	SEAI Energy in Transport 2014	https://www.seai.ie/publications/Energy-in-Transport-2014-report.pdf	gCO ₂ /km travelled for the different vehicle types - factors used to calculate the overall GHG emissions from the road vehicle in County Waterford
LULUCF	Map Eire	https://projects.au.dk/mapeire/spatial-results/download	
Waste	Map Eire	https://projects.au.dk/mapeire/spatial-results/download	This sector accounts for non-energy related emissions. Energy related emissions for waste services is covered under Manufacturing & Commercial emissions reported in Section 7 of this report (under industrial uses)
	National Waste Collection Permit Office	https://www.nwcpo.ie/permitsearch.aspx	Provided the number of waste collection licences in the County. No other data was provided

	Pollutant Release and Transfer	https://gis.epa.ie/EPAMaps/PRTR	Provided the number of facilities reporting under waste & waste water management in the County. No other data was provided
F-Gases	Map Eire	https://projects.au.dk/mapeire/spatial-results/download	There are no F-gases related GHG emissions attributed to County Waterford

APPENDIX B – WATERFORD CITY & COUNTY COUNCILS 2016-2018 BASELINE DATA

The National Climate Action Plan 2023, Section 10 requires all public sector bodies including local authorities to calculate their baseline GHG's using an average of years 2016-2018. The Local Authorities 51% target is set against this baseline, and calculated by SEAI on the Monitoring and Reporting System. The LACAP will outline the pathway for Waterford City & County Council to reduce its Greenhouse Gas Emissions (GHG) by the required 51% in non-electricity emissions and by SEAI's projection for supply-side emissions reduction for the electricity grid (77%) by 2030.

ENERGY RESULTS

From the results obtained from the M&R system, Waterford City & County Councils energy consumption in 2018 was **27.11 GWh**, see Figure 28.

- Building and Facilities was the highest energy consumer, accounting for 10.5 GWh of the total energy consumption (38.6%)
- Public Lighting accounted for 8.4 GWh (30.8%)
- Transport accounted for 8.3 GWh (30.6%)

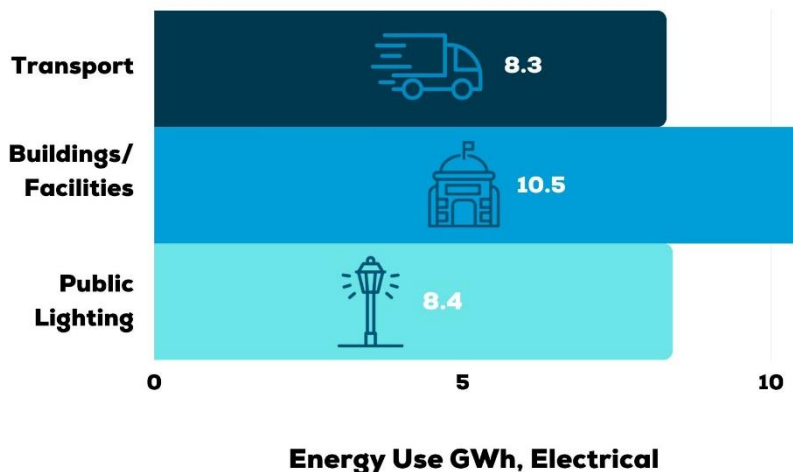


Figure 28. Energy Use in County Waterford grouped by Category

GHG EMISSIONS RESULTS

When energy use was converted into emissions, Waterford City & County Council's total emissions amounted to **8.96 ktCO₂eq**, see Figure 29.

- Public Lighting was the highest contributor, accounting for 3.62ktCO₂eq (40%) of these total emissions
- Building and Facilities contributed 3.23ktCO₂eq (36%)
- Transport contributed 2.12ktCO₂eq (24%)

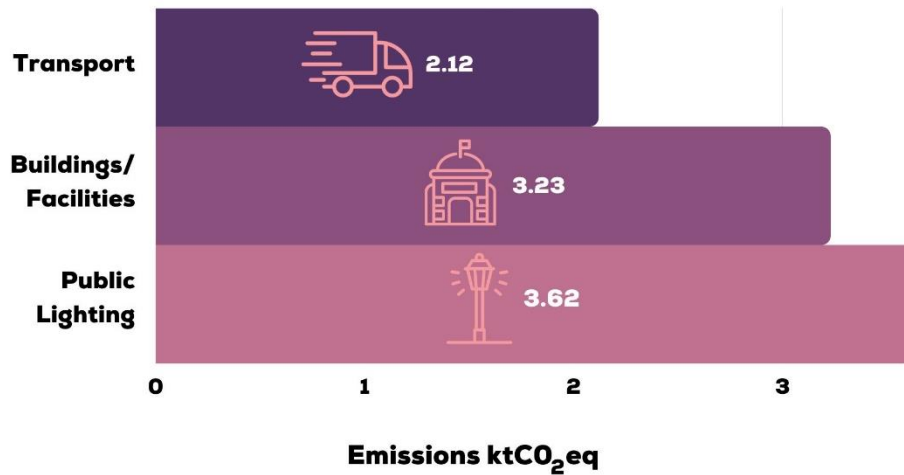


Figure 29. Emissions in ktCO₂eq by sector in County Waterford

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