Leitrim County Council

Decarbonisation Zone

Report
June 2023

Comhairle Chontae Liatroma
Leitrim County Council

KPMG Sustainable Futures

KPMG Future Analytics

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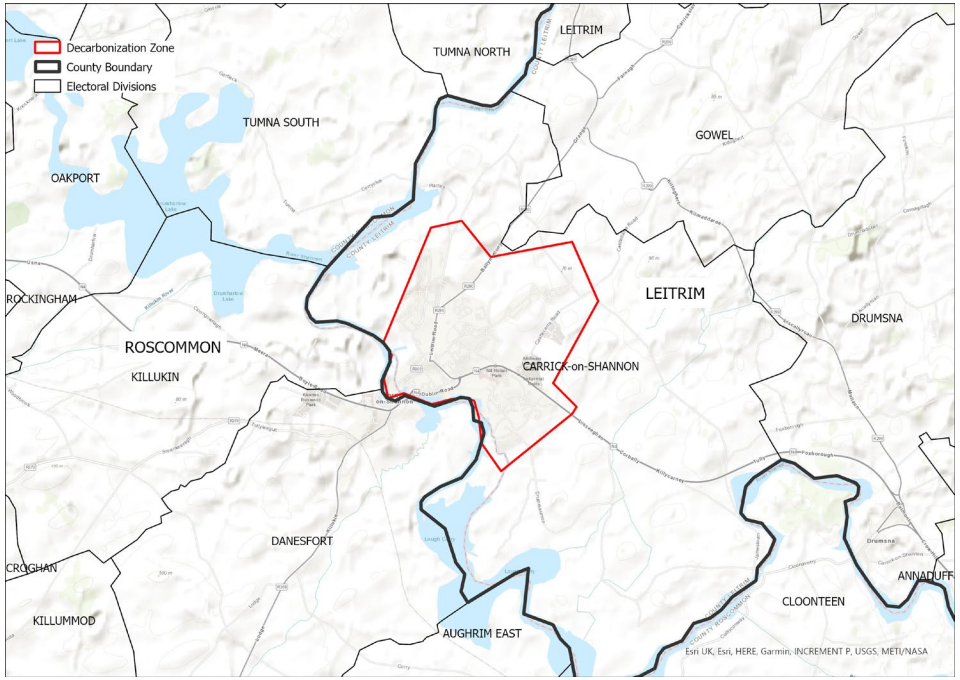
Executive Summary

1.1 Executive Summary

A **Decarbonisation Zone (DZ)** is a spatial area, identified by each local authority in Ireland, in which a range of climate change mitigation measures are identified to contribute to meeting national climate action targets. DZs are a demonstration and testbed of what is possible for decarbonisation and climate action at a local and community level. Through a feedback loop of experimentation and evaluation, the DZ enables a flexible, incremental and community-driven approach to ensure that its objectives are delivered.

Carrick-on-Shannon has been designated as the DZ for Leitrim County Council based on its socioeconomic and physical environmental characteristics which have been deemed an appropriate fit against a set of defined DZ criteria. The DZ area is shown on the map below. The Carrick-on-Shannon DZ area contains (or overlaps) 21 townlands, from Keenaghan in the east to Townparks in the west and from Ballynamony in the north and Attirory in the south.



Once a DZ area is identified and the associated overarching vision and objectives are set, each local authority must kickstart the next stage of the DZ - the development of the DZ area's **Baseline Emissions Inventory (BEI)**.

The BEI is an overview of the area's total carbon emissions at a point in time. It is a key instrument to support and enable a local authority to measure the impact of planned actions relating to emission reductions across its own operations as well as relevant sectors of society.

Leitrim County Council's BEI for the DZ area is informed by the guidance document Technical Annex C: Climate Mitigation Assessment and Technical Annex D Decarbonising Zones and follows a **Tier 3 approach**, i.e. a 'bottom-up, spatially led' approach.

2018 is used as the baseline year for the BEI assessment. This year has been purposefully chosen to align with Ireland's national targets which are set against a 2018 baseline year.

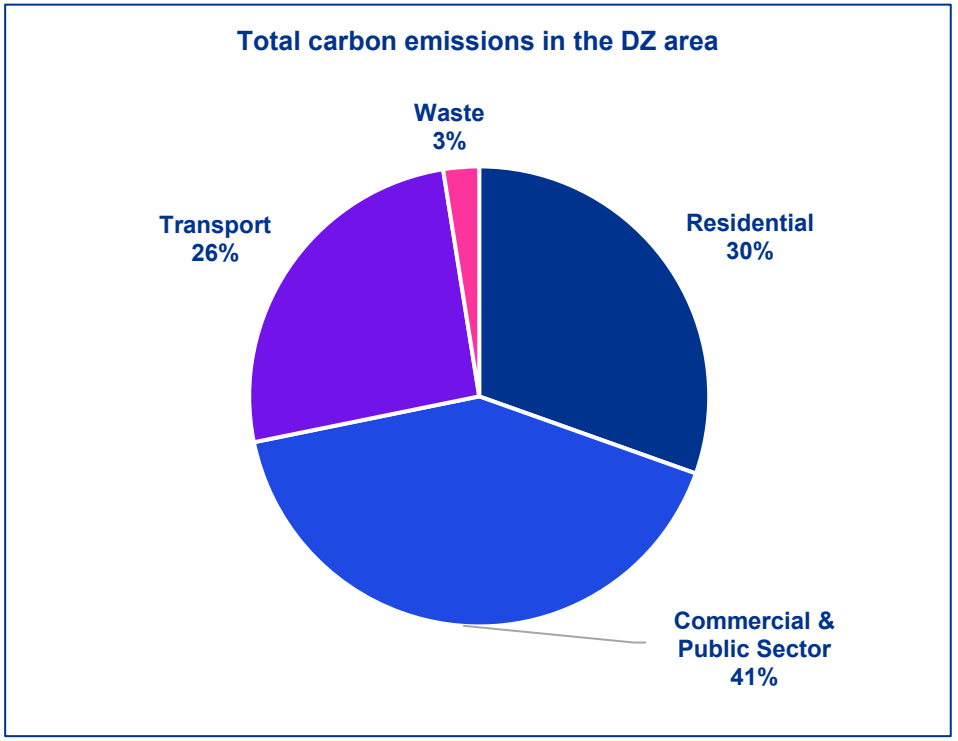
Emissions associated with the following sectors are considered in this BEI assessment due to their relevance in the DZ area: **Residential, Commercial & Public Sector, Transport and Waste.**

A summary of the results of the DZ area BEI assessment is provided on the next page.

1.2 Executive Summary

The results of the 'bottom-up' Tier 3 assessment are presented on the table and chart below. Total carbon emissions equate to approximately **28,919 tCO_2e**.

	Carbon emissions (tCO_2e)
Residential	8,804
Commercial & Public Sector	11,961
Transport	7,427
Waste	727
Total carbon emissions	**28,919**
Total carbon emissions per capita (tCO_2e/capita)	**8.35**



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Introduction

2.1 Global & National Response to Climate Change

Global responses to climate change are accelerating as exemplified by the signing of the COP21 Paris Agreement by 195 countries in 2015. Ireland's climate policies are evolving in line with national and international requirements and aims to "pursue and achieve, by no later than the end of 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy."

Climate change has become one of the most pressing global public policy challenges facing governments today.

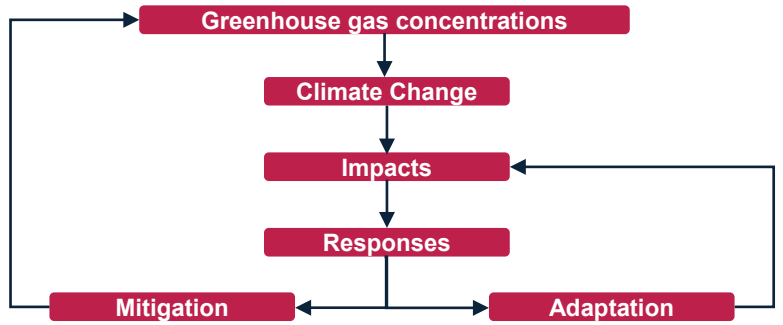
International organisations, national and local governments are increasingly compelled to take ambitious action through mitigation (decreasing emissions that cause climate change) and adaptation (enhancing resilience to climate change impacts and risks).

Ireland's Local Authorities are developing Local Authority Climate Action Plans (LACAPs) to play their part in meeting national emissions objectives and to transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy. These plans need to be underpinned by a robust evidence base detailing sources of emissions as well as the current and future climate-related risks faced by the Local Authority.

In response to the challenges posed by climate change, two complementary approaches are being adopted.

Mitigation: ensuring the impacts of climate change are less severe by preventing or reducing carbon emissions. Mitigation is achieved either by reducing the sources of these gases (e.g. by increasing the share of renewable energies, or establishing a cleaner mobility system), or by enhancing the storage of these gases (e.g. by increasing the size of forests).

Adaptation: anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise. Examples of adaptation measures include large-scale infrastructure changes, such as building defences to protect against sea-level rise, as well as behavioural shifts, such as individuals reducing their food waste.



2.2 Global & National Response to Climate Change

Paris Agreement, 2015

The Paris Agreement, adopted in 2015 provides an internationally accepted and legally binding global framework to addressing climate change challenges. It has two clearly defined goals aimed at supporting progressive and ambitious climate action to avoid dangerous climate change:

I. holding global average temperature increase to well below 2°C and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels (i.e. **mitigation**);

II. increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience (i.e. **adaptation**).

European Climate Law, 2021

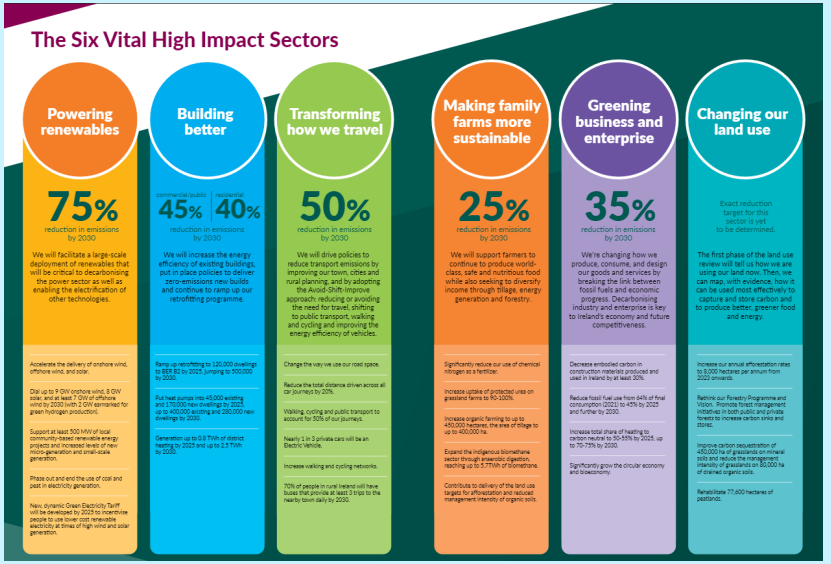
The EU adopted a legislative proposal for the European Climate Law in June 2021 to frame the climate neutrality objective by 2050 across the EU with an intermediate target of **reducing net greenhouse gas emissions by at least 55% by 2030**. The European Commission (EC) is clear in the commitment required by all Member States, and the use of all policy levers and instruments, to fight against the urgent challenge of climate change and to activate leadership efforts to reach climate neutrality by 2050.

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

Climate policy in Ireland reflects the ambition of the EU and that required to confront the challenges of climate change. The Climate Action and Low Carbon Development (Amendment) Act, 2021 frames Ireland's legally binding climate ambition to delivering a **reduction in greenhouse gas emissions of 51% by 2030**, to achieve climate neutrality by the end of 2050.

Through progressive economy-wide carbon budgets, sectoral ceilings, a suite of strategies devised to promote a **combination of adaptation and mitigation measures**, and robust oversight and reporting arrangements, climate policy is working to scale up efforts across all of society and deliver a step change on ambitious and transformative climate action to 2030 and beyond to 2050.

Climate Action Plan 2023



Regional & Local Policies:

- Leitrim County Development Plan 2023 – 2029; 2015-2021

2.3 Identification of the Decarbonisation Zones

Local Authorities have a key role to play in addressing and driving forward climate change mitigation. In addition to meeting their 2030 and 2050 energy and emission targets, they are well placed to assess, exploit and support opportunities within their administrative areas, in cooperation with each other and with national bodies, and through the involvement and support of local communities.

Action 80 of the Government's Climate Action Plan 2019 states that they will support, monitor and assess Local Authority Climate Action.

Action 165 of the Government's Climate Action Plan 2019, requires Local Authorities to identify and develop plans for one Decarbonising Zone.

A **Decarbonisation Zone (DZ)** is a spatial area, identified by each local authority in Ireland, in which a range of climate change mitigation measures are identified, whilst enhancing and embracing adaptation and biodiversity measures to contribute to reaching wider national climate action targets.

DZs are a demonstration and testbed of what is possible for decarbonisation and climate action at a local and community level. Through a feedback loop of experimentation and evaluation, the DZ enables a flexible, incremental and community-driven approach to ensure that its objectives are delivered.

The criteria for selecting a DZ are:

- Urban areas and agglomerations with a population not less than 5000 persons, **or**
- Rural areas with an area of not less than 4 km^2
- Other location/areas that can demonstrate decarbonisation at a replicable scale.

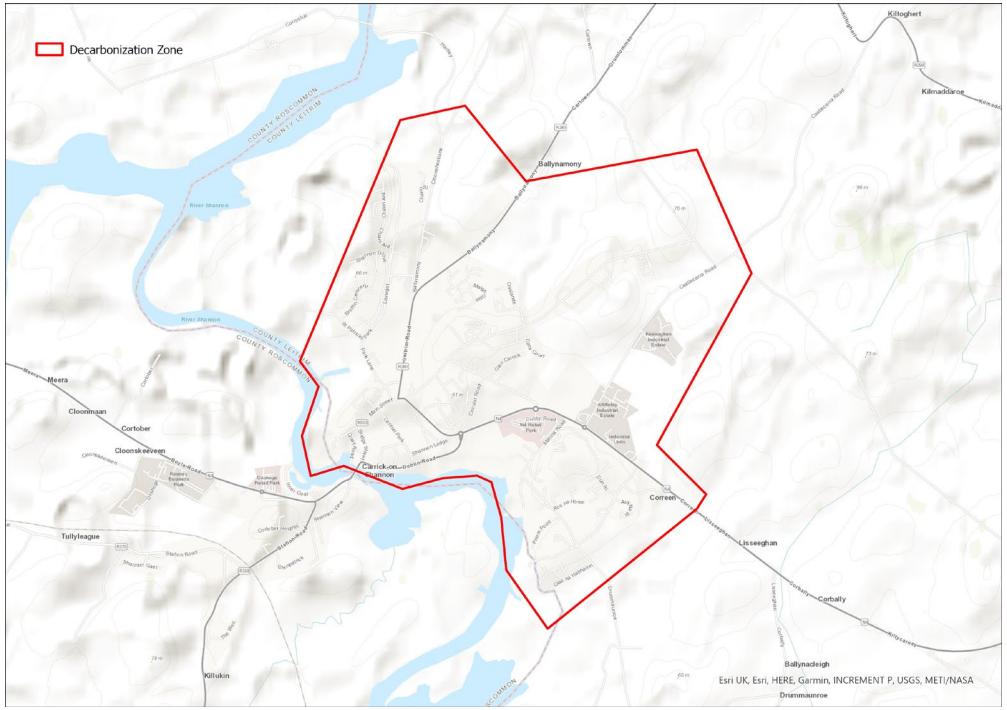
Once a DZ area is identified and the associated overarching vision and objectives are set, each local authority must kickstart the next stages of the DZ, as illustrated on the right.

2.4 Identification of the Decarbonisation Zones

Leitrim County Council has also set an overarching vison for the area:

"Carrick-On-Shannon DZ is the regional gateway to the River Shannon and the Shannon – Erne waterway to the north and the Lakelands of Lough Allen and Lough Key. The town is renowned for its attractiveness, rich culture and heritage and has a vibrant arts scene. This rich environment and the natural facilities have made Carrick-on-Shannon an inland tourism hub on which the town has thrived."*

Carrick-on-Shannon has been designated as the spatial area in which a range of climate mitigation, adaptation and biodiversity measures and actions are identified to address local low carbon energy, greenhouse gas emissions and climate needs to contribute to national climate action targets. Its socioeconomic and physical environmental characteristics have been reviewed and identified as an appropriate fit for the defined DZ criteria.



Zoning

The Carrick-on-Shannon DZ includes 18 small areas (SAs) under 1 Electoral Divisions (EDs) (as shown within the red line boundary on the left).

Population

The total population of the Carrick-on-Shannon DZ area was estimated at 3,464 (2016 Central Statistic Office (CSO) data).

Land Area

The Carrick-on-Shannon DZ has a total land area of approximately 5.09 km^2.

Scalability

The Carrick-on-Shannon DZ is considered to be an appropriate demonstration area and testbed for urban decarbonisation measures to be adopted in other urban areas as well as scaled up across Leitrim County and wider.

***Source: Leitrim County Council DZ RFP**

2.5 Establishment of the Baseline Emissions Inventory

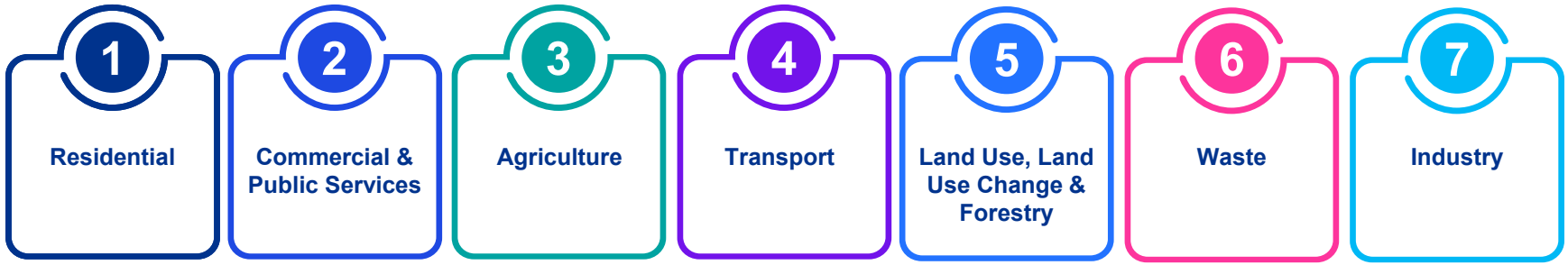
The baseline emissions inventory (BEI) is an overview of an area's or region's total carbon emissions at a point in time. The BEI is a key instrument that enables a local authority to measure the impact of planned actions related to emission reductions across its own operations as well as relevant sectors of society. The BEI represents an evidence-based approach to not only inform appropriate emission reduction actions but also measure progress over time.

The BEI is required to be undertaken for the purpose of informing climate change action planning. Local authorities are encouraged to update their emissions baseline where and/or when more up to date versions of relevant datasets become available (for example, when new census data is released) or upon any review or update of the national climate action plan. The BEI should be treated as a live inventory and regularly updated to assess progress against actions as well as to improve accuracy with the inclusion of new and better datasets as they evolve.

Leitrim County Council's BEI for the DZ area is informed by the guidance document Technical Annex C: Climate Mitigation Assessment and Technical Annex D Decarbonising Zones. These guidance documents support a robust approach to the assessment and reporting of baseline energy and carbon emissions for all local authorities. 3 approaches to the development of a BEI are outlined – Tier 1, Tier 2 and Tier 3 – each of which allow for local authorities at varying levels of experience and maturity to produce a BEI. This BEI assessment for Leitrim County Council DZ follows a Tier 3 approach, i.e. a 'bottom-up, spatially led' approach to BEI development.

2018 is used as the baseline year for the BEI assessment. This year has been purposefully chosen to align with Ireland's national targets which are set against a 2018 baseline year. This BEI assessment provides a snapshot in time of the carbon emissions across all identified sectors of the economy within the boundaries of a specific local authority. The baseline assessment covers both direct and indirect emission sources within the administrative area, as well as the level of control and influence a local authority has over these emissions.

Emissions associated with the following sectors are considered in this BEI assessment, aligning with Ireland's National Emissions Inventory. Note that 'Industrial Processes', 'Agriculture' and 'Land Use, Land Use Change & Forestry (LULUCF)' are excluded from the assessment given the negligible activities in the DZ area.



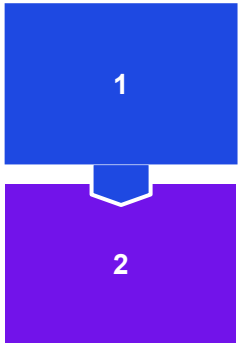
03

DZ BEI Tier 3 Assessment

3.1 Approach to Assessment

3.1.1 Approach to BEI Assessment

This section of the report sets out the analysis of energy and carbon emissions associated with the main activities, and emissions sources, presented by sector, within the DZ area. Two steps have been undertaken to inform a robust understanding of the energy and carbon emissions within the DZ area, as summarised below:



A ‘top-down’ overview of carbon emissions within the DZ area, informed by data gathered from the Environmental Protection Agency’s (EPA) MapEire database, has been undertaken. This assessment allows for a ‘helicopter’ overview of the magnitude of emissions within the area and the sectoral hotspots. The purpose of this ‘top-down’ assessment is not to override the ‘bottom-up’ assessment outcomes, but rather to provide an additional layer of context to inform decision making. The results of this assessment is contained in the **Appendix**.

This ‘top-down’ overview is followed by the **Tier 3** ‘Bottom-Up’ assessment approach, informed predominantly by spatial data and the use of geographical information systems (GIS) software and processes. This allows for the mapping of data and information within the DZ area, supporting effective communication and engagement with key internal and external stakeholders. The assessment also includes non-spatial data to support the analysis and future action planning.

Although the Tier 3 approach can provide a more robust evidence base on which to inform the action planning, it relies heavily on the quantity, quality, and variety of the data available for analysis. As more datasets and methodologies are made available, BEIs will improve further and better equip local authorities in their decision making and action planning supporting decarbonisation and climate action.

A full list of data sources, assumptions & limitations are included in the **Appendix**.

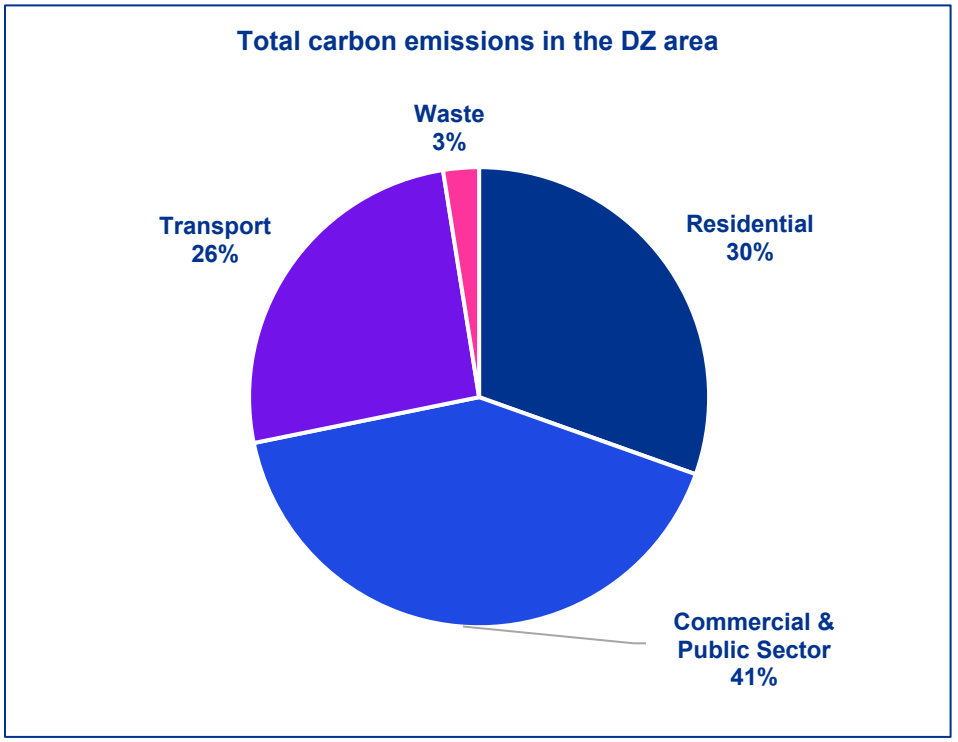
3.2 BEI Assessment

3.2.1 Summary

3.2.1.1 Summary Results

The results of the 'bottom-up' Tier 3 assessment are presented on the table and chart below. Total carbon emissions equate to approximately **28,919 tCO_2e (tonnes of carbon dioxide equivalent)*.** This translates to **8.35 tCO_2e per capita** based on 2016 census population data. In 2018, Ireland's national carbon emissions equated to approximately 12.6 tCO_2e per capita. While the DZ's carbon emissions per capita is lower than the national equivalent, Ireland is higher than the EU average of 8.2 tCO_2e per capita.**

	Carbon emissions (tCO_2e)
Residential	8,804
Commercial & Public Sector	11,961
Transport	7,427
Waste	727
Total carbon emissions	**28,919**
Total carbon emissions per capita (tCO_2e/capita)	**8.35**



CO_2e is a unit of measurement that is used to standardise the climate effects of various greenhouse gases on the basis of their global-warming potential (GWP)

* *Source: https://www.cso.ie/en/releasesandpublications/ep/p-eii/environmentalindicatorsireland2020/greenhousegasesandclimatechange/#:~:text=In%202018%2C%20Ireland%20had%20the,EU28%20average%20of%208.2%20tonnes.*

3.2.2 Socio-Economic

3.2.2.1 Socio-Economic overview

Overview of the Socio-Economic analysis

01

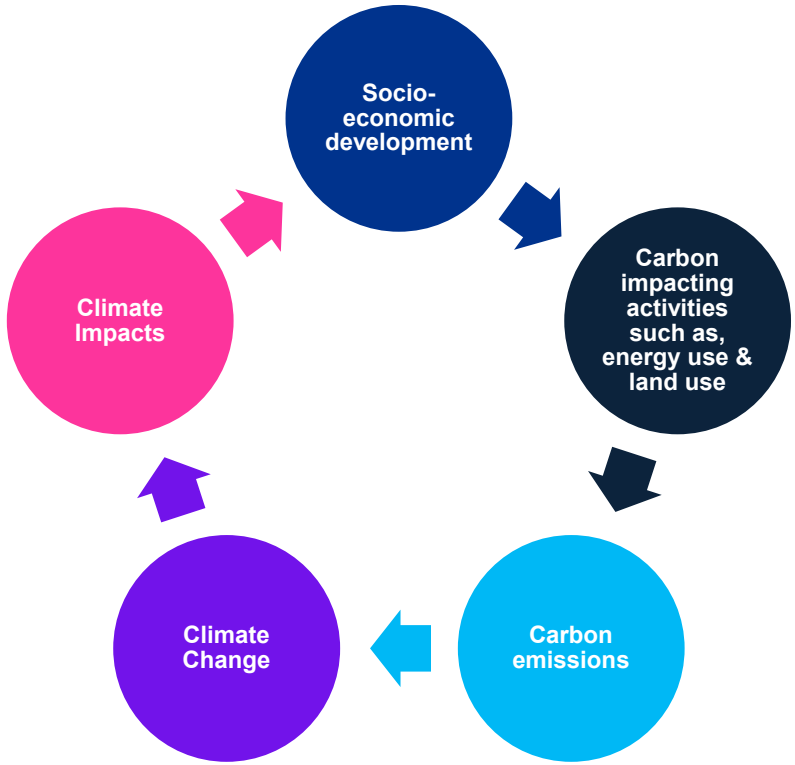
Socio-economic development and decarbonisation are intricately linked, with social and economic activities impacting on carbon emissions, for example, through energy use and land use. Carbon emissions contribute and influence the severity of climate change – climate change has a direct effect on socio-economic development, often contributing to and/or heightening various social issues.

02

Socio-economic factors including income, wealth, and industrialisation can contribute significantly to carbon emissions. Addressing these socio-economic factors as part of a holistic approach to decarbonisation and climate change action planning and decision making will result in effective solutions, supporting the shift to a more sustainable and just society.

03

The following pages focus on socio-economic factors including population and zoning associated with the DZ area. This overview is based on data from the 2016 CSO which is considered to be an appropriate proxy for activities in the baseline year of 2018.



3.2.2.2 Socio-Economic context

Socio- Economic Snapshot of the DZ area

The population of the Carrick on Shannon DZ area is 3,464. A 49% male : 51% female split in gender is seen in the demographics of the region.

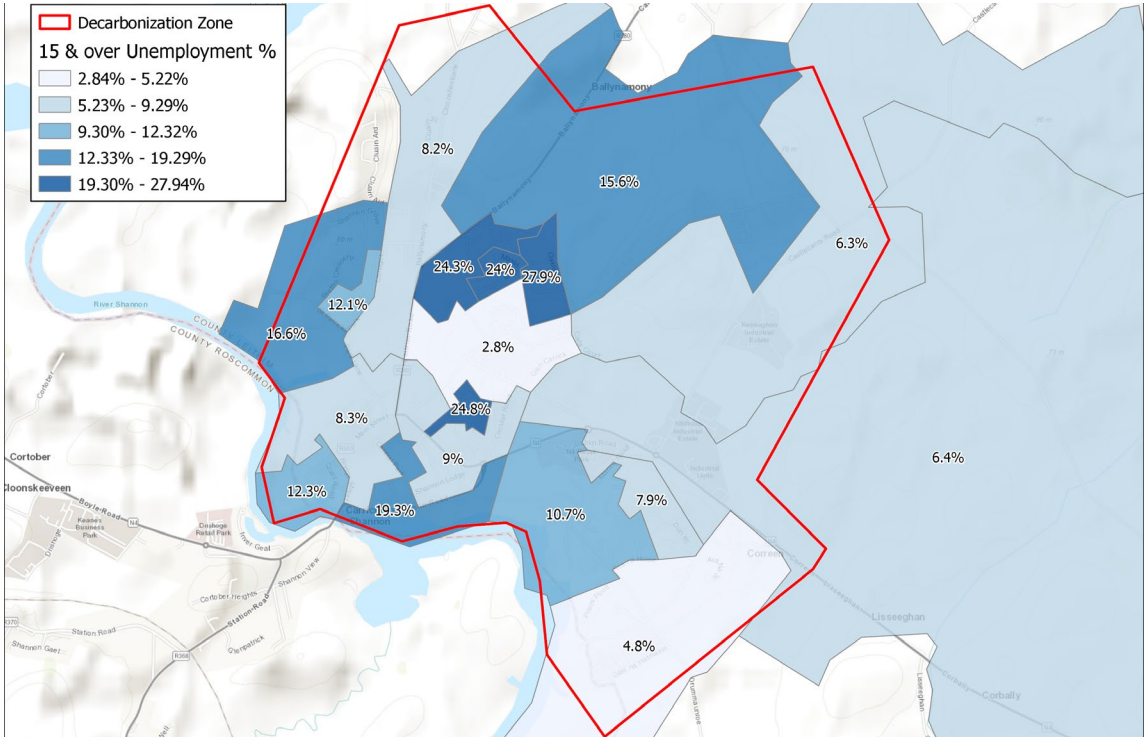
The largest age cohort was the 30-39 bracket, representing 20.3% of the population. The smallest cohort being 80+ which accounted for 4.1%.

The nationality breakdown of the DZ area found that 27.5% of the population is non-Irish. This was higher than the state average, Polish was the largest non-Irish cohort (8.0%).

The average household income within the DZ area was €33,947 - this is 24% lower than the state average of €44,477.
Employment rates were equal to the national average of 53.4% with the study area at a level of 53.4%.

The average unemployment rate within the area was 12.2%, higher than the state figure of 7.9%. 17% of population in the DZ area is retired.

2016 Pobal data highlighted a mixture of marginally above and marginally below average across the study area, with a pocket in the north of the study area noted as 'Disadvantaged'.

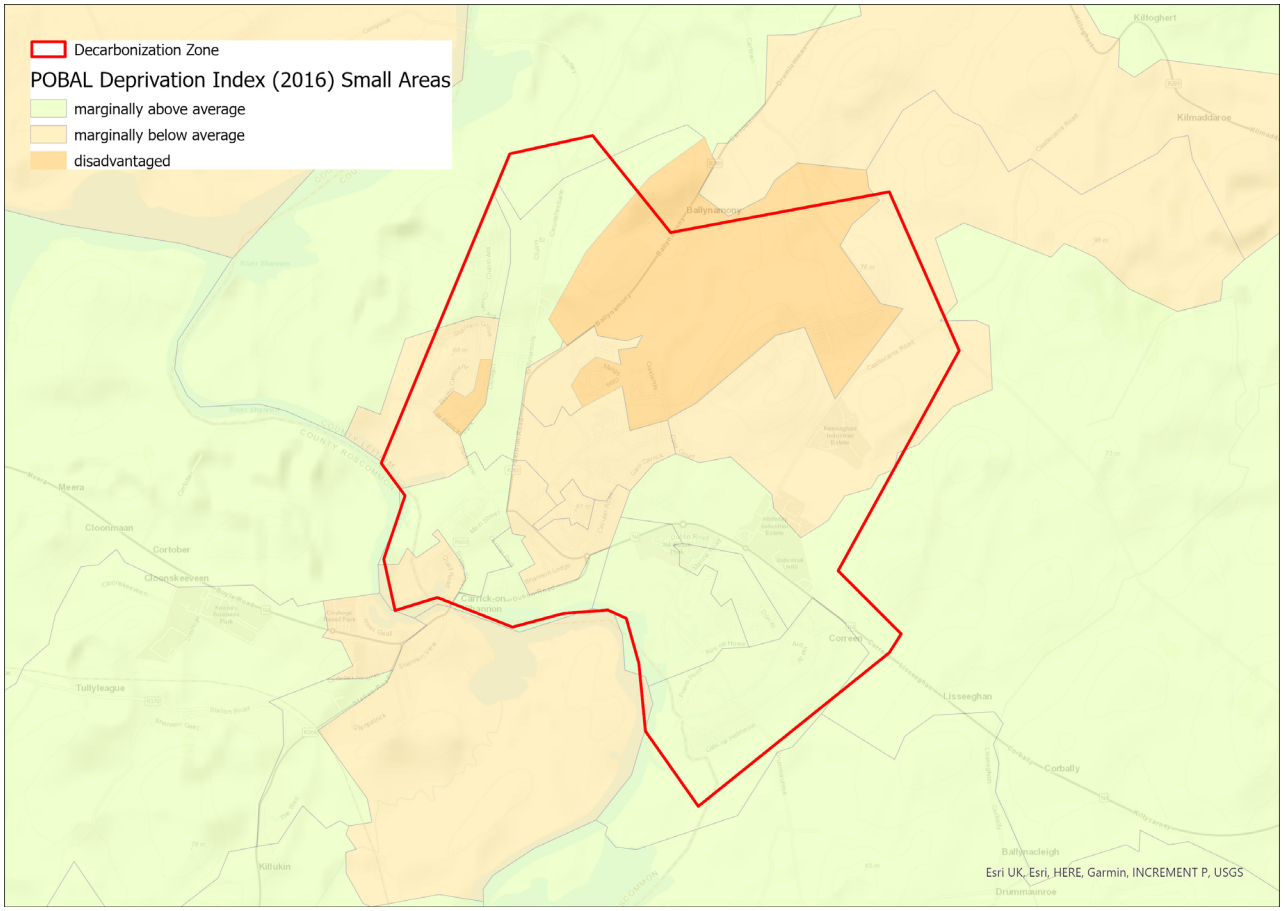


Please note, depending on the data sources available, some information beyond the DZ boundary is included in the maps contained within this report.

3.2.2.3 Socio-Economic context

Socio- Economic Snapshot of the DZ area

- The Pobal data, or Deprivation Index provides a measurement of the affluence or deprivation of a given area relative to the national mean at a specific point in time. By comparing 'Deprivation Index' scores for a particular area at two different points in time, Pobal can assess whether it has moved up or down in its position relative to the rest of the country.
- Knowledge and understanding of these areas of unemployment and deprivation is vital when planning for climate change action. Some socio-economic groups will need assistance and encouragement to adopt climate change and decarbonisation measures to combat influencing factors such as affordability, social isolation, and housing types.
- For example, while higher socio-economic groups may be able to afford home energy saving and efficiency initiatives such as smart technology, solar panels, these initiatives are likely unaffordable for some socio-economic groups.



3.2.2.4 Socio-Economic context

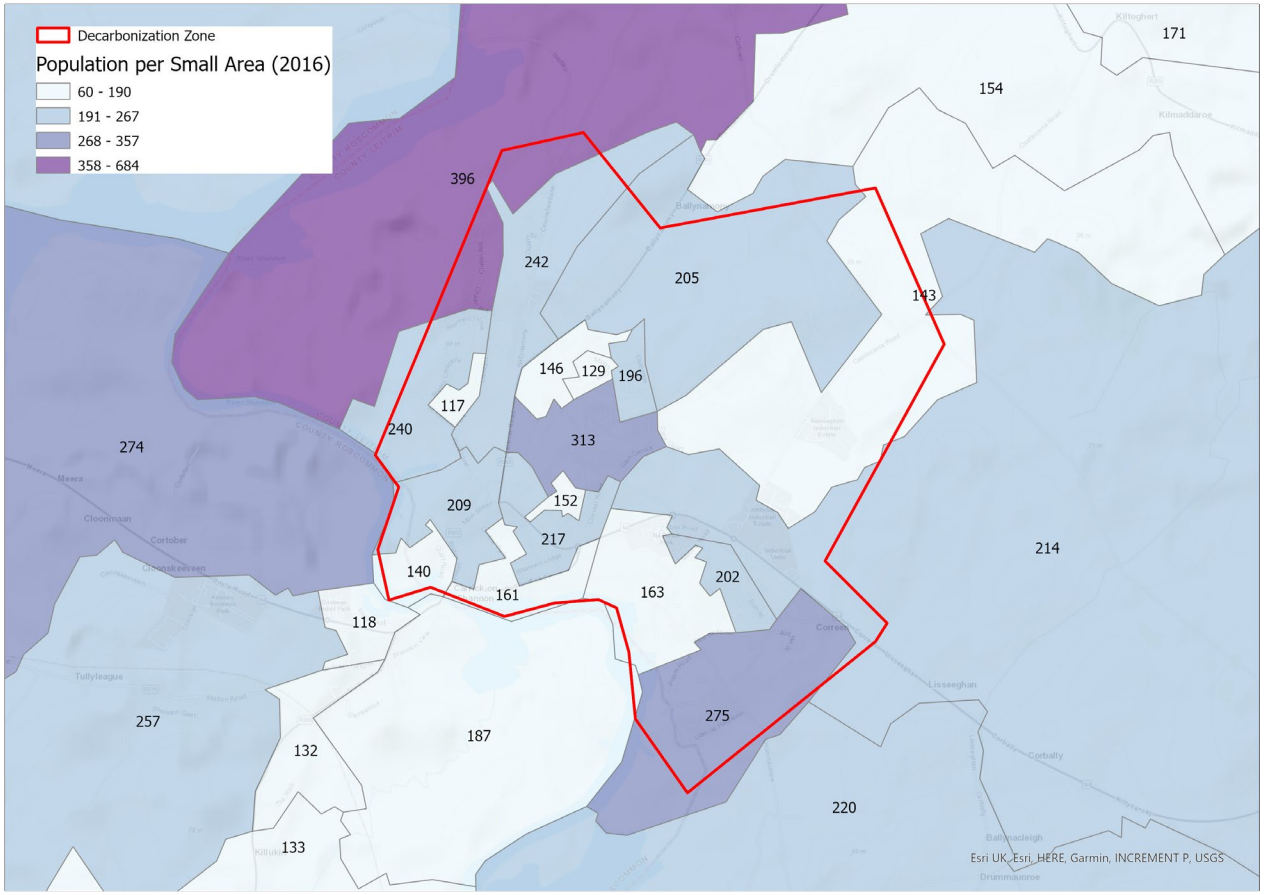
Population Density

- The highest population density within the study area is found in the central and southern sections of the study area, with a densely populated area bounding the North West of the DZ.

- Central Statistics Office (CSO) data indicated that the average household size was 2.38 in 2016. This was slightly lower than the state average of 2.75. There is a higher propensity of single person households (32.2%) than the national average (23%).

- Overall the average population density of the study area was 680 people per km^2. Regionally, the population density is higher than Monaghan Town's DZ's average of 504 people per km^2 and lower than Cavan Town's DZ's average of 818 people per km^2.

- Population density is a key decision making consideration in decarbonisation and climate change action. For example, areas with higher population densities are more suited to certain renewable energy infrastructure projects such as district heating.



3.2.2.5 Socio-Economic context

Zoning and Development Profile

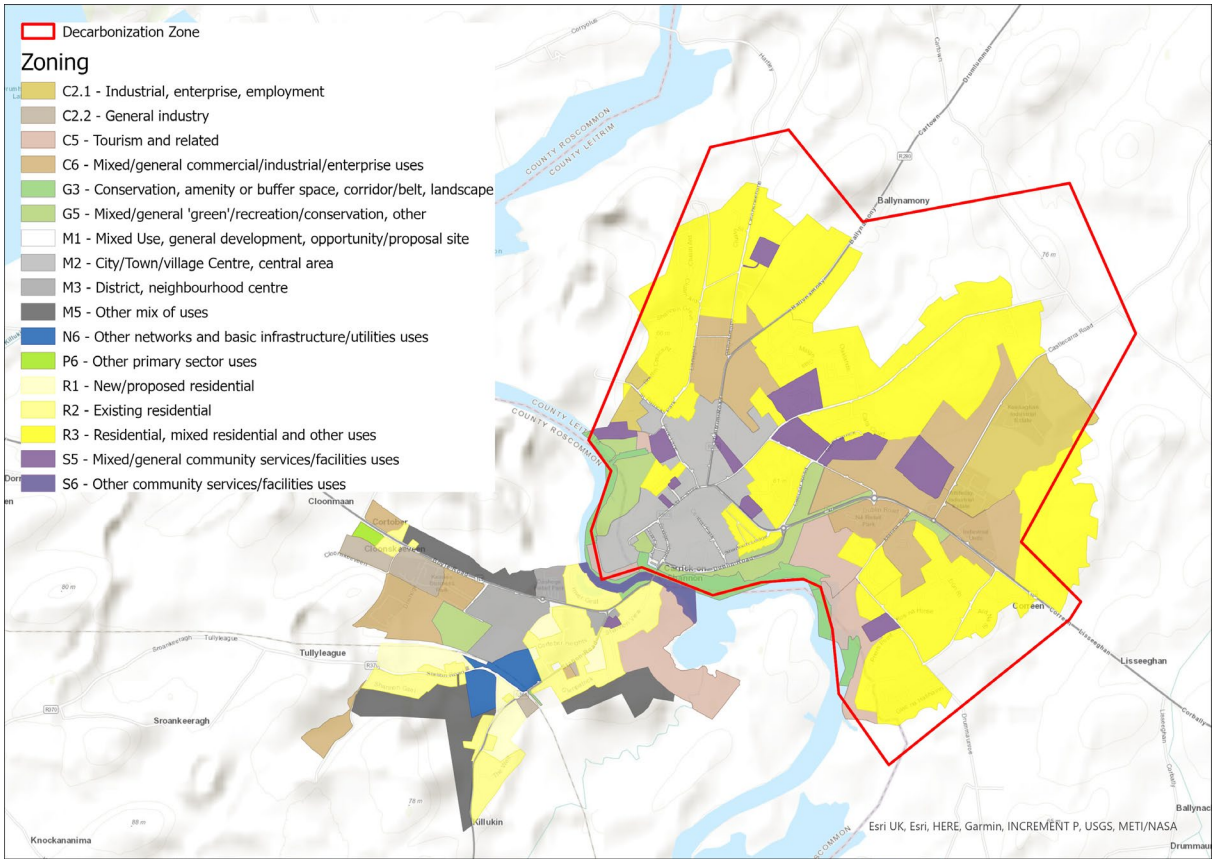
- The map to the right sets out the zoning and development profile for the DZ area, identifying the use and/or proposed use of land. Typically land may be designated for residential use; for industrial, commercial, agricultural or recreational use; as open space; or a mixture of those uses.

- According to the latest CSO figures, there are 1,577 occupied dwellings in Carrick-on-Shannon, with an additional 430 vacant dwellings.

- The average year of construction is 1990, with 47.9%, approximately, of the housing stock being built in this century. Approximately 15% of the housing stock have been built prior to 1970. This will likely have a impact on energy efficiency requirements and retrofitting needs in the DZ area.

- The area also contains 162 social housing units which the local authority will have responsibility for retrofitting. The could be used as a pilot scheme to show the medium to long term benefits of energy efficiency.

Average Year of Construction of Residential Housing Stock	
Pre 1919	3.8%
1919 to 1970	12.5%
1971-1990	15.7%
1991-2000	16.1%
2001-2005	25.3%
2006-2011	25.3%
2012 onwards	1.4%



Please note, depending on the data sources used, some information within the DZ boundary is unavailable for some of the maps contained within this report.

3.2.3 Residential sector

3.2.3.1 Residential Sector Overview

Overview of the Residential Sector

Ireland's domestic properties face a significant decarbonisation challenge. Our housing stock is one of the least energy efficient within the EU while our heating systems have a particularly low level of renewables in the energy mix – the SEAI have indicated that fossil fuels are used as the heat source in 73% of dwellings. The ongoing cost of the energy crisis has highlighted Ireland's dependence on imported fossil fuels (these provide approximately 75% of our home heating), leaving Irish households highly vulnerable to global energy prices.

The residential sector accounted for approximately 10% of Ireland's carbon emissions in the baseline year of 2018 with similar levels seen in the latest reported figures. To achieve Ireland's climate goals, the sector is required to reduce its emissions by 40% by 2030 (compared to a 2018 baseline).

CAP 2023 sets out a number of actions and targets for the residential sector to meet its overarching goal, including:

- All new dwellings designed and constructed to Nearly Zero Energy Building (NZEB) standard by 2025 and Zero Emission Building (ZEB) standard by 2030;
- Equivalent of 120,000 dwellings retrofitted to BER B2 or cost optimal equivalent by 2025, and 500,000 dwellings by 2030;
- Up to 0.8 TWh of district heating installed capacity by 2025, and up to 2.5 TWh by 2030;
- 170,000 new dwellings using heat pumps by 2025, and 280,000 by 2030;
- 45,000 existing dwellings using heat pumps by 2025, and 400,000 by 2030;
- Up to 0.4 TWh of heating provided by renewable gas by 2025, and up to 0.7 TWh by 2030.

To achieve theses highly ambitious targets, the DZ area must significantly reduce its use of fossil fuels, including, coal, peat and oil, and increase dependence on renewables and electricity, to heat existing residential buildings while also optimising and enabling energy efficiency. Retrofit activity must be supported to underpin this reduction, with resulting benefits for homeowners in terms of efficiency, comfort, and health and wellbeing.

Leitrim County Council's Local Economic and Community Plan (LECP) will support the DZ on its journey to significantly reduce the use of fossil fuels within the residential sector. Supporting initiatives to tackle and adapt to climate change is one of the Sustainable Community Objectives (SCO2) outlined within the LECP.

The following sections present an overview of the residential sector related activities, energy and emissions within the DZ area. Further detail on data sources, assumptions and limitations is included in the **Appendix**.

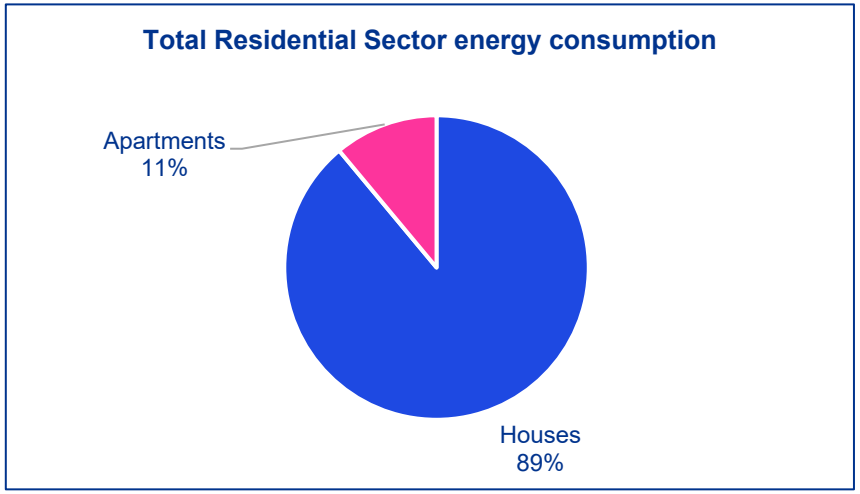
3.2.3.2 Residential Sector Summary Results

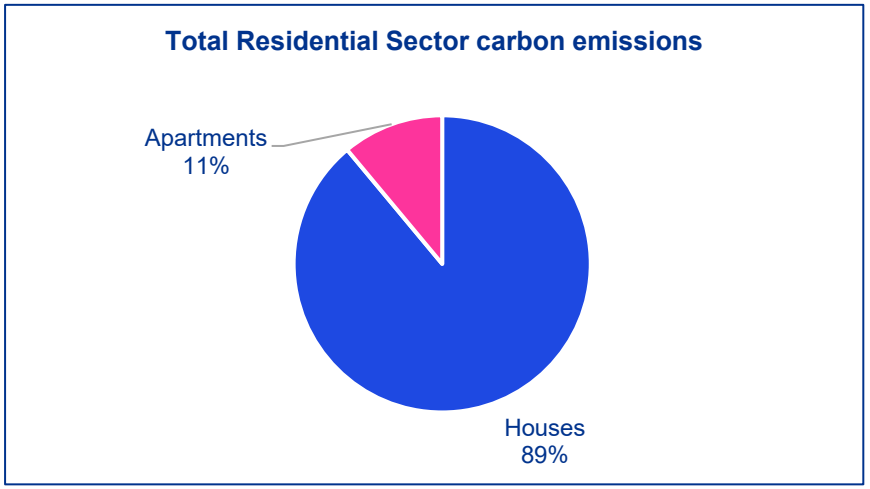
The results of the residential sector assessment are presented in the table and chart below. Note that, for the purposes of this assessment, 'occupied' residential dwellings have been focussed on. These account for the majority of residential homes in the DZ area.

Total energy consumption of the sector equates to **29,407 MWh**. The associated carbon emissions of the sector equate to approximately **8,804 tCO_2e**. The 1,274 'houses' within the DZ account for ~89% of the sector's energy consumption and ~89% of the sector's total carbon emissions. Whereas, the 296 apartments within the DZ account for the remaining ~11% of total residential energy consumption and ~11% of carbon emissions.

	Energy Consumption (MWh)
Houses	26,157
Apartments	3,250
Total	**29,407**

	Carbon emissions (tCO_2e)
Houses	7,831
Apartments	973
Total	**8,804**





3.2.3.3 Residential Sector Analysis

Residential Sector: Age of Housing Stock

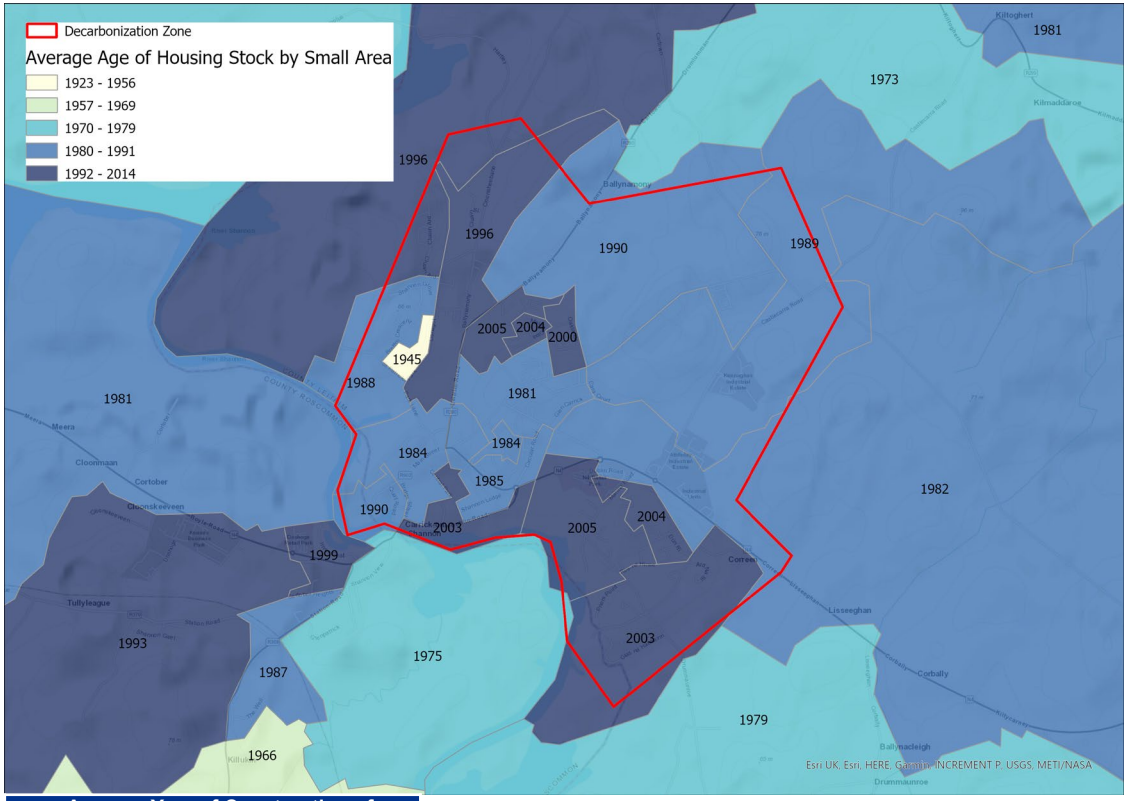
- The age of housing stock in an area has a strong correlation with energy efficiency, consumption and demand, including this DZ area. Energy use is a proxy for carbon emissions and therefore, in general, older housing stock may mean higher carbon emissions.

- Age of construction of residential housing stock ranges from pre-1919 to 2018. The average year of construction is 1990, with approximately 83.7% of the housing stock being built since 1970. Approximately 16.3% of the residential units have been built pre-1970s. This is summarised on the table below.

- The map on the right provides an overview of the average year of construction of residential housing stock within each SA. This is based on the average year of construction of the housing stock combined with the frequency of each residential housing stock to estimate average construction year by SA.

- Focussing on the more populated area of Carrick-on-Shannon town centre, there is a similar trend – the average housing stock for the small areas is dated at the older end of the stock (~1980s), whereas the younger housing stock is in the immediate perimeter of the town centre (particularly the south) before aging again into more rural areas.

- As the DZ area includes relatively older housing including in the most populated region of Carrick-on-Shannon town centre, it is likely that energy efficiency is low and energy demand and consumption is high, leading to higher carbon emissions.



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2006-2011	25.3%
2012 onwards	1.4%

***Note:** The figures in the map included above have been derived from CSO SA data. This data has been broken out into various bands e.g., "1970-1979". The average of these bands and their frequency within each SA are used to find the average year of the residential housing stock in the SA.*

3.2.3.4 Residential Sector Analysis

Residential Sector: Energy Efficiency & BER rating

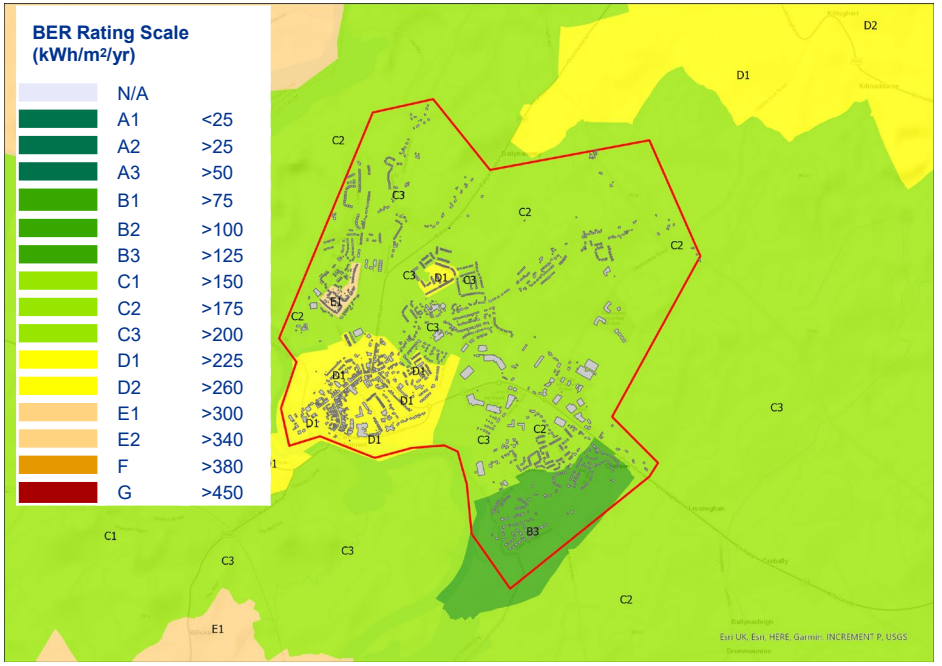
- A Building Energy Rating (BER) Certificate supports the understanding of the energy efficiency of a home. It is a helpful indicator for the likely energy consumption of a home and its associated carbon emissions. It uses a scale of A to G, with A-rated homes being the most energy-efficient and comfortable and G-rated homes the least energy efficient.

- BER ratings in the Carrick-on-Shannon DZ area range from B3 rated buildings to E1. The map on the right presents the range of BER ratings across the DZ area by small areas. Note that these BER ratings are average ratings.

- The table below sets out the average BER rating by residential type, displayed by ED.

- Note that residential BER ratings are only available for a limited number of residential dwellings.

- Energy efficiency opportunities should be explored, including the use of heat pumps and other renewable energy sources to support the decarbonisation of the DZ area as well as to contribute to wider national energy and climate targets.



Average BER rating by residential building type

Unit: kWh/m2/year	Residential building type			
ED	Apartment	Terraced	Semi detached	Detached
Carrick-on-Shannon	257	253	238	215

3.2.3.5 Residential Sector Analysis

Residential Sector: Energy Consumption & Heat Demand

- Heat demand maps allow users to explore Ireland's heating and cooling demands. Heat mapping describes the spatial disaggregation of national heat demand into smaller geographic areas. This disaggregation is based on the characteristics of the buildings within each area and include:

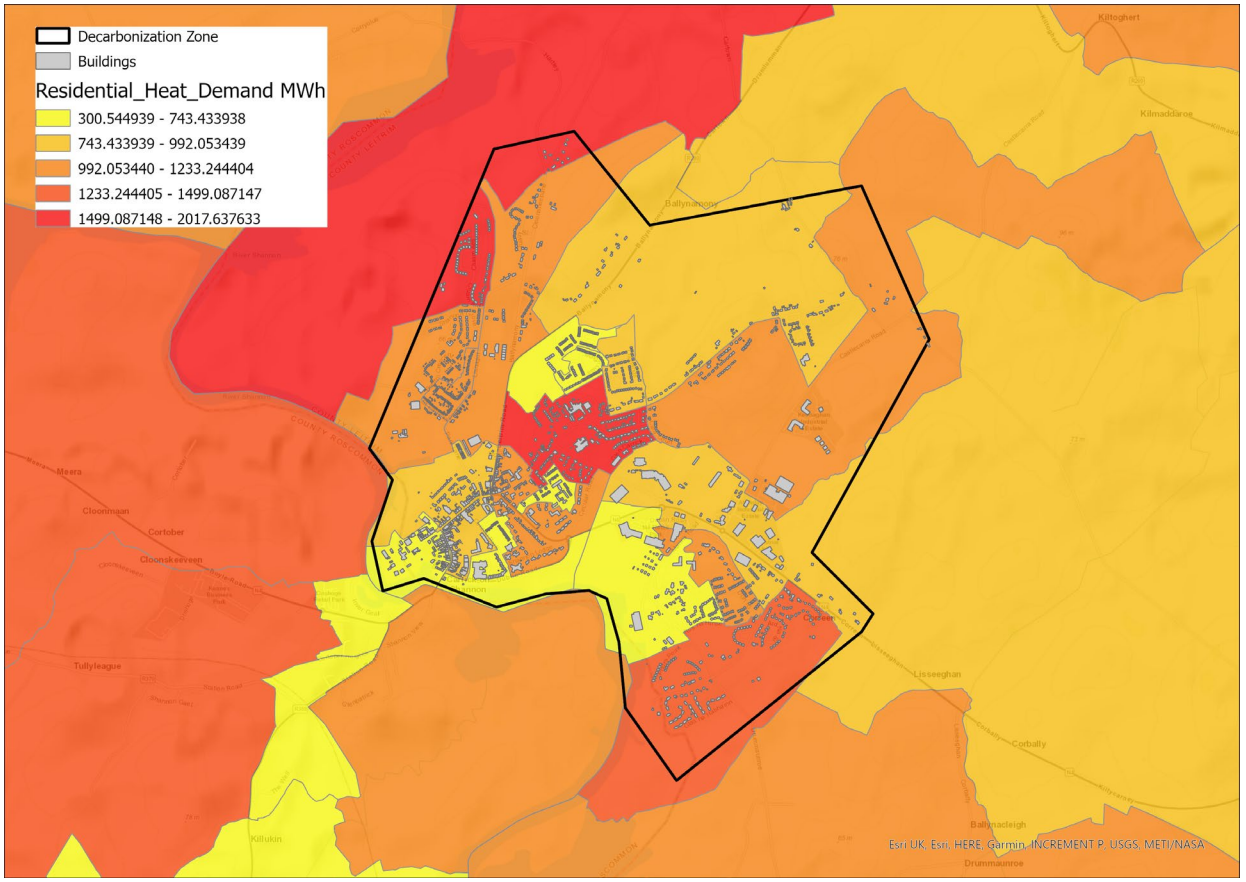
Building type (a residential dwelling, a commercial or public sector building or an industrial site)

Type of fuel used to generate the heat

Other metrics such as the area of buildings, and current and planned energy efficiency measures

- Heat demand in the Carrick-on-Shannon DZ follows a similar pattern across the SAs, with higher heat demand observed in the north west and southern area of the DZ area. These areas should be considered as priority areas with targeted actions to reduce this demand.

- Heat demand is further explored in the Energy & Electricity Sector section.

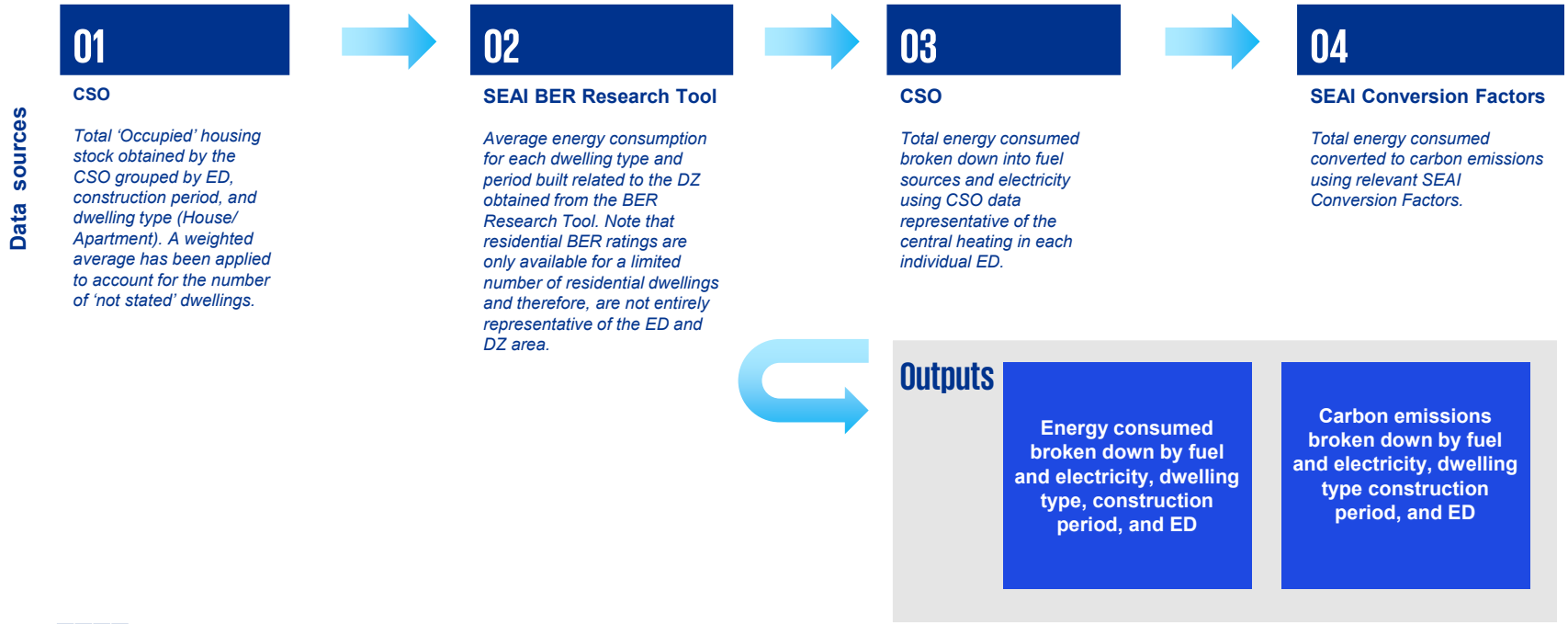


3.2.3.6 Residential Sector Analysis

Residential Sector: Energy & Carbon Emissions

To estimate residential sector energy consumption and associated carbon emissions within the DZ area, a number of non-spatial data points have been used. 'Occupied' homes, as defined by the 2016 CSO database, account for the majority of residential homes in the DZ area, at 70.5%. These 'Occupied' homes are included in the assessment. 'Other vacant dwellings' (19.2%), 'temporarily absent' (2.3%), and 'unoccupied holiday homes' (8.0%) account for the remaining ~30% of residential stock – these are excluded from the assessment. An overview of the approach used is outlined below with results of the assessment on the following pages.

Further information on data sources, assumptions and limitations is included in the **Appendix**.



3.2.3.7 Residential Sector Analysis

Residential Sector: Occupied Dwellings: Energy & Carbon Emissions

Total residential sector energy consumption and associated carbon emissions of 'Occupied' homes within the DZ area is presented by energy split and residential dwelling type below. Note that as a result of the data available, residential dwelling types have been grouped into 'houses' and 'apartments'. The energy split at ED level has been applied to the total energy consumption across all households within the DZ.

	Energy Source	Coal	Peat	Oil	LPG	Natural Gas	Renewables	Electricity	Wood	Total
Energy consumption (MWh)	Houses	1,597	361	16,179	223	223	137	7,007	429	**26,157**
	Apartments	198	45	2,010	28	28	17	871	53	**3,250**
	Total	1,796	405	18,189	251	251	154	7,878	483	**29,407**
Carbon emissions (tCO_2e)	Houses	544	128	4,426	51	46	-	2,629	6	**7,831**
	Apartments	68	16	550	6	6	-	327	1	**973**
	Total	612	144	4,976	58	51	-	2,956	7	**8,804**

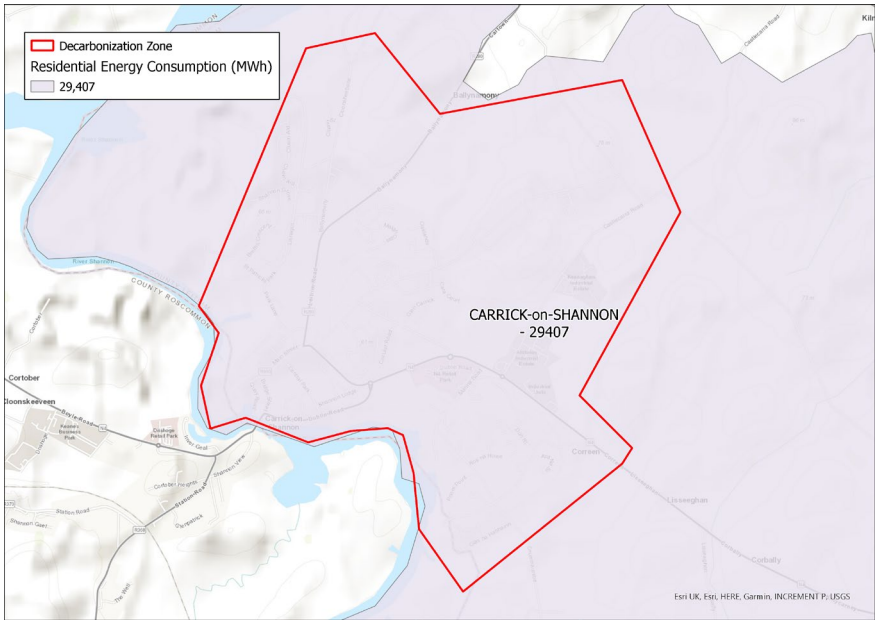
3.2.3.8 Residential Sector Analysis

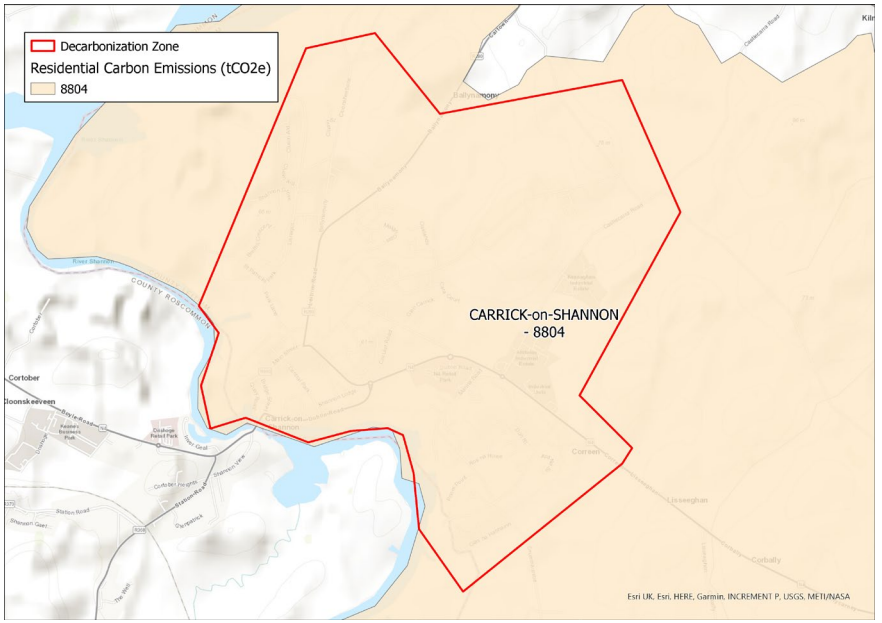
Residential Sector: Occupied Dwellings: Energy & Carbon Emissions

Total residential sector energy consumption and associated carbon emissions within the DZ area is presented by ED below. A visual representation of energy and emissions across the DZ area is presented below.

ED	Energy Consumption (MWh)
Carrick-on-Shannon	29,407
Total	**29.407**

ED	Carbon emissions (tCO_2e)
Carrick-on-Shannon	8,804
Total	**8,804**



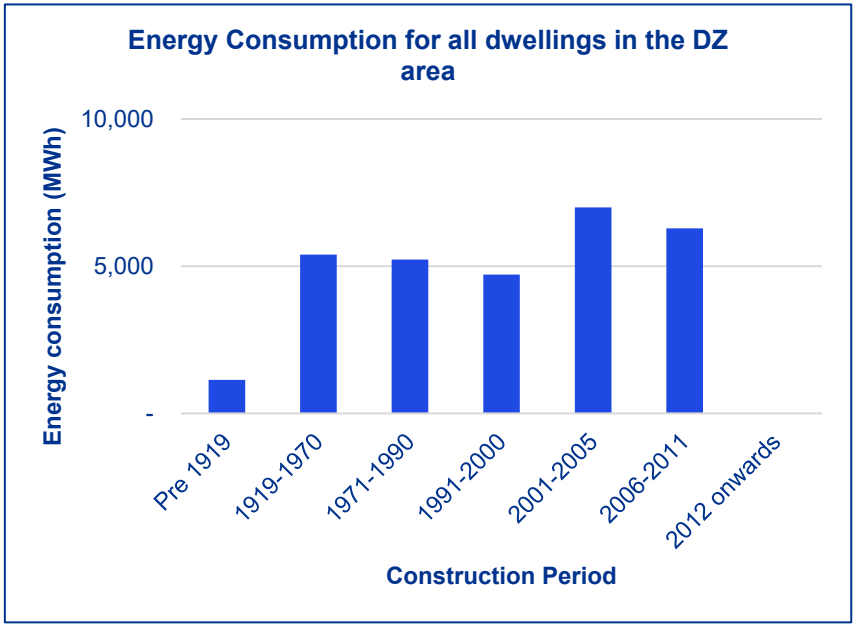


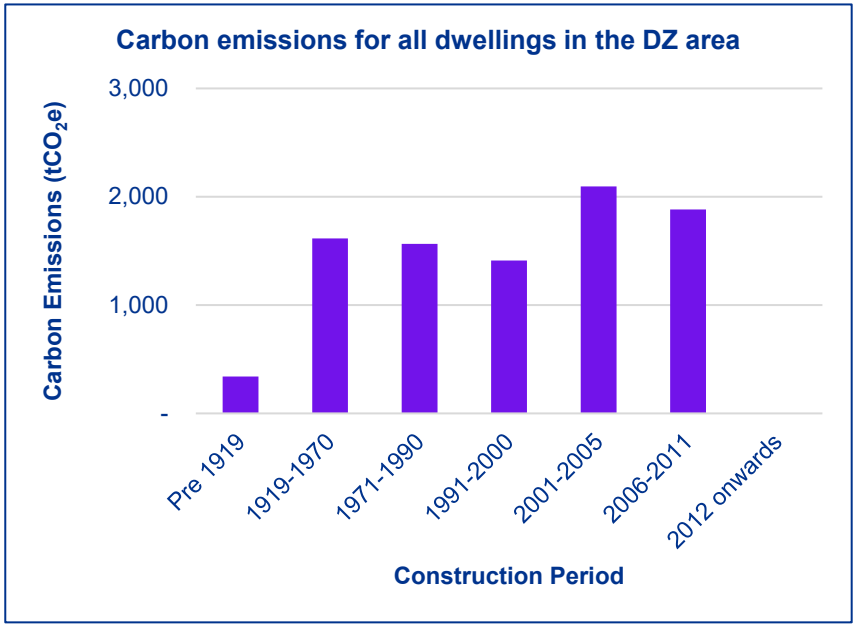
3.2.3.9 Residential Sector Analysis

Residential Sector: Occupied Dwellings: Energy & Carbon Emissions

Total residential sector energy consumption and associated carbon emissions within the Carrick-on-Shannon DZ is presented by construction period for all dwellings below. The majority of households (~51%) in the DZ were built during the construction periods of '2001-2005', and '2006-2011,' and as shown below, these periods account for the highest proportion of both energy consumption and carbon emissions (~45% of total energy consumption and carbon emissions).

Although only approximately ~12.5% of all dwellings were constructed during the '1919-1970' construction period, these dwellings account for ~18% of both total energy consumption and carbon emissions. The older building fabric of these dwelling leading to lower energy efficiency likely result in their high energy consumption and carbon emissions.





3.2.3.10 Residential Sector Analysis

Residential Sector: Social Housing: Energy & Carbon Emissions

Social housing (within the residential sector) energy consumption and associated carbon emissions within the Carrick-on-Shannon DZ area has also been included in our analysis using a number of non-spatial data points to inform the assessment. Total number of social housing units has been extracted from CSO data. To understand energy consumption and carbon emissions associated with social housing units, Step 2-4 outlined in Section 3.2.3.6 has been applied. Further information on data sources and methodology is included in the Appendix.

	Energy source	Coal	Peat	Oil	LPG	Natural Gas	Renewables	Electricity	Wood	Total
Energy consumption (MWh)	Social Housing units	192	43	1,943	27	27	16	841	52	**3,141**
Carbon emissions (tCO_2e)	Social Housing units	65	15	531	6	5	-	316	1	**940**

The table below sets out the average BER rating for social housing units by dwelling type and ED. Note that BER ratings are only available for a limited number of social housing units (56 out of 182 total) and therefore, are not entirely representative of social housing in the ED and DZ area.

The social housing units in the DZ area account for approximately 11.6% of the total residential stock. When compared to the entire DZ area, the social housing units account for approximately 10.7% of total residential energy consumption and 10.7% of total residential carbon emissions. These findings suggest that the number of social housing units is proportional to the energy consumption and carbon emissions it produces.

Average BER rating by residential building type

Unit: kWh/m2/year	ED
Residential building type	**Carrick-on-Shannon DZ**
Apartment	271
Terraced	223
Semi-detached	277
Detached	253

BER Rating Scale (kWm/m²/yr)

N/A	
A1	<25
A2	>25
A3	>50
B1	>75
B2	>100
B3	>125
C1	>150
C2	>175
C3	>200
D1	>225
D2	>260
E1	>300
E2	>340
F	>360
G	>450

3.2.4 Commercial & Public sector

3.2.4.1 Commercial & Public Sector Overview

Overview of the commercial & public sector

- The built environment comprises the residential, commercial and public sectors, of which the commercial and public sector account for approximately 2% of Ireland's carbon emissions in the baseline year of 2018. The emissions from commercial and public sectors are typically from fuel combustion for space and hot water heating in commercial and public/institutional buildings in Ireland. Emissions from commercial services and public services decreased by 3.0% and 3.8% respectively in 2021 compared to 2020 emissions due to a decrease in natural gas use.

- The sector is required to reduce its emissions by 45% by 2030, compared to the 2018 baseline. Actions and targets to support the achievement of this target are set out in the CAP 2023 and include:
  - decarbonising heating in commercial and public buildings;
  - determining optimum management of property portfolios for decarbonisation;
  - installing rooftop solar PV (e.g. in schools);
  - retrofitting buildings owned by public bodies;
  - promoting and supporting building automation and control optimisation and smart building technologies to increase energy efficiency and monitoring;
  - upgrading existing building energy management systems to high-efficiency and zero-carbon equivalents.

- To achieve this ambitious target, the use of all fossil fuels (coal, natural gas, oil, and peat) to heat our buildings must be reduced and the support for a major expansion in retrofit activity must be realised. The challenge facing the commercial and public sector is that its existing buildings will require the most effort to decarbonise. Technologies such as heat pumps in the residential sector are also suitable for commercial buildings and the scaling-up in deployment of solutions such as district heating and renewable gases will also benefit commercial and public buildings – these will be important levers for the DZ area to consider. This chapter explores the various factors impacting the decarbonisation of commercial and public sector buildings, whilst also considering the constraints associated with protected buildings.

- Reinforcing the commercial viability and attractiveness of Leitrim's towns and villages is a key Sustainable Economic Development Objective (SEDO) of the 2015-2021 LECP for County Leitrim. In a recent survey as part of the consultation for the next LECP, it was found that over 85% of respondents were employed, highlighting the socioeconomic importance of the commercial and public sector in Leitrim. This figure is further supported by approximately 61% of respondents both living and working in the County. The survey also found that over 70% of respondents would choose to work remotely if given the option, with the remaining 30% opting for a hybrid model. The shift to more hybrid working dynamics is an important consideration for the development of commercial and public sectors properties in the DZ.

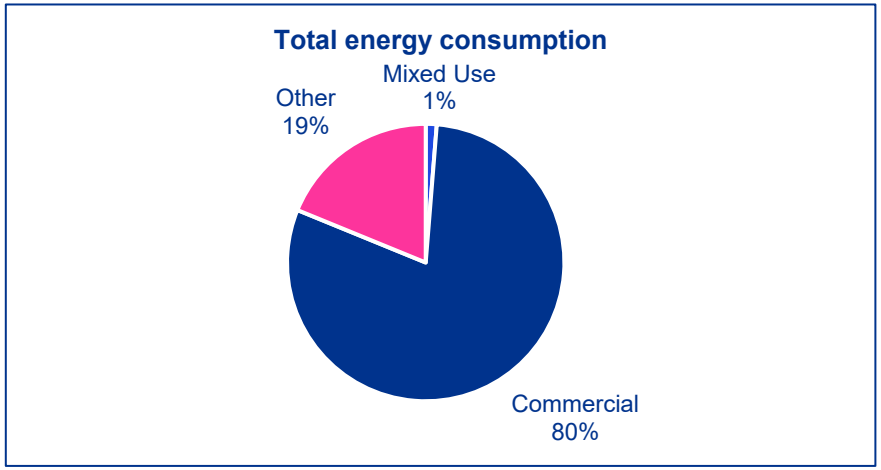
3.2.4.2 Commercial & Public Sector Summary Results

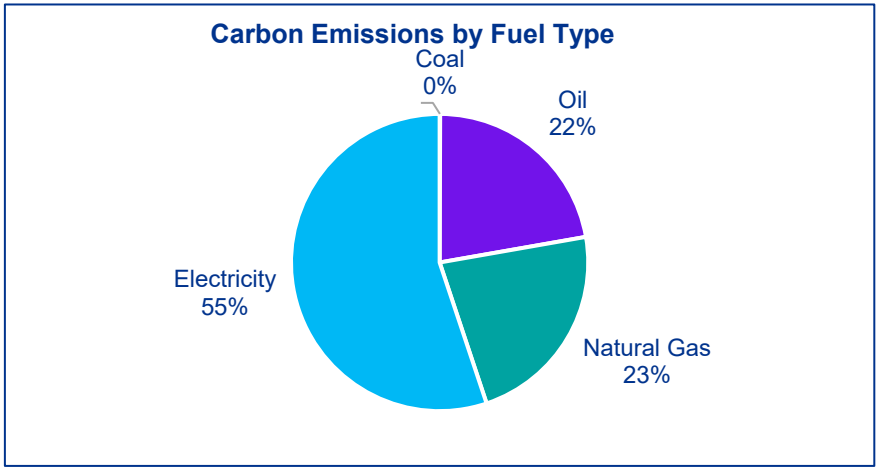
The results of the commercial and public sector assessment are presented in the table and chart below. Note that, for the purposes of this assessment, commercial and public sector buildings have been sub-categorised into 'mixed use', 'commercial' and 'other', as per the OSI dataset from which they are derived from. Further detail on the types of buildings contained within these categories are provided in the pages that follow. These account for the majority of commercial and public sector buildings in the DZ area.

Total energy consumption of the sector equates to **42,104 MWh**. The associated carbon emissions of the sector equate to approximately **11,961 tCO_2e**. The 113 commercial buildings within the DZ primarily rely upon electricity as their primary fuel source. Electricity is used to power 55% of commercial buildings in the DZ.

Building type	Total energy use (MWh)	Total carbon emissions (tCO_2e)
Mixed Use	538	157
Commercial	33,643	9,567
Other	7,924	2,238
Total	**42,104**	**11,961**

Energy source	Carbon emissions (tCO_2e)
Coal	7
Oil	2,653
Natural Gas	2,708
Electricity	6,593
Total	**11,961**





3.2.4.3 Commercial & Public Sector Analysis

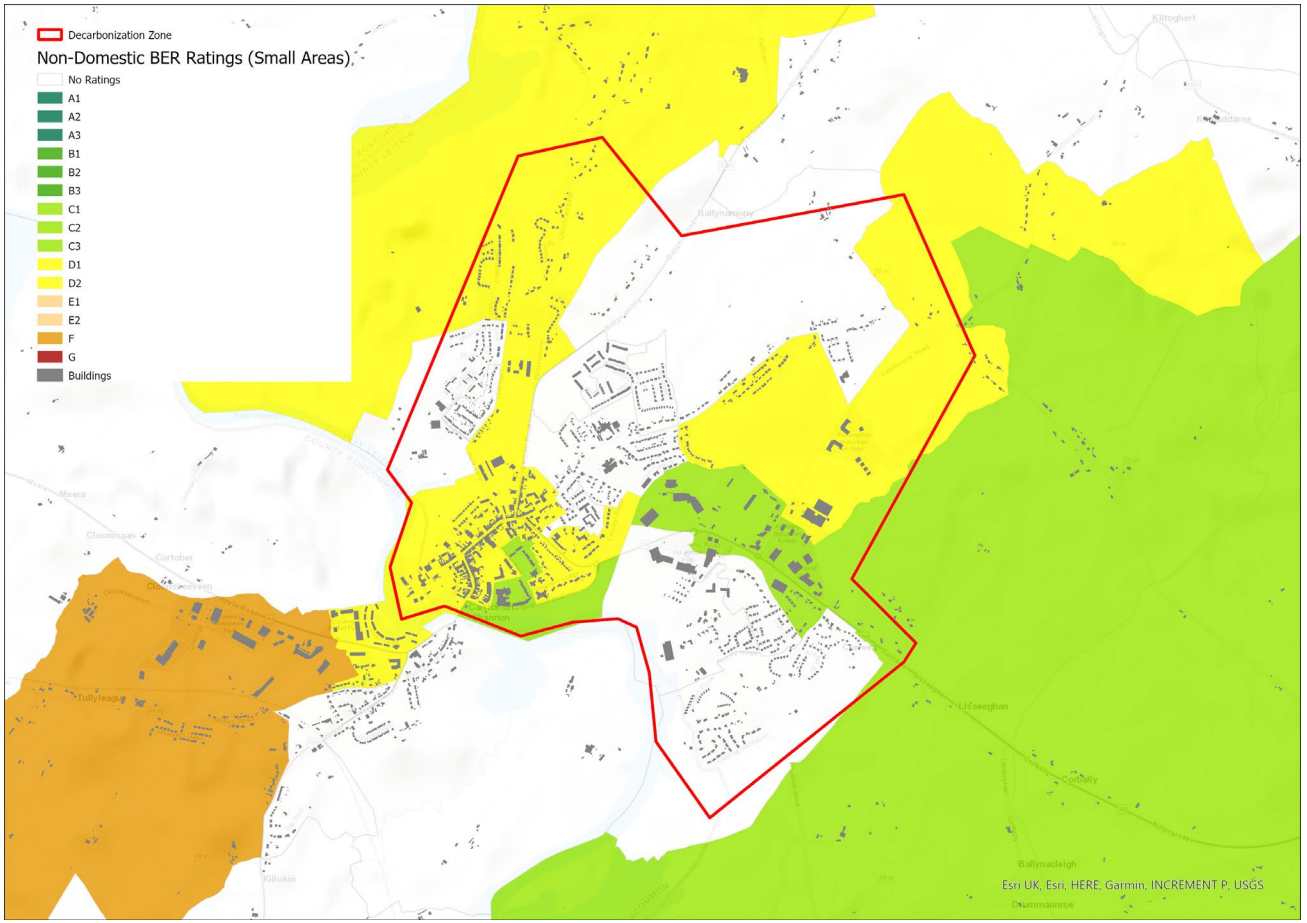
Commercial & Public Sector: Energy Efficiency & BER Rating

- A Building Energy Rating (BER) Certificate supports the understanding of the energy efficiency of buildings. It is a helpful indicator for the likely energy consumption and its associated carbon emissions in commercial and public settings. Similar to residential sector, it uses a scale of A to G, with A-rated homes being the most energy-efficient and comfortable and G-rated homes the least energy efficient.

- Average BER ratings in the Leitrim DZ area range from C1 rated buildings to D2. The map on the right presents the range of BER ratings across the DZ area. Note that these BER ratings are average ratings.

- Note that BER ratings are only available for a limited number of commercial & public sector buildings.

- Energy efficiency opportunities should be explored, including the use of heat pumps and other renewable energy sources to support the decarbonisation of the DZ area as well as to contribute to wider national energy and climate targets.



3.2.4.4 Commercial & Public Sector Analysis

Commercial & Public Sector: Energy Consumption & Heat Demand

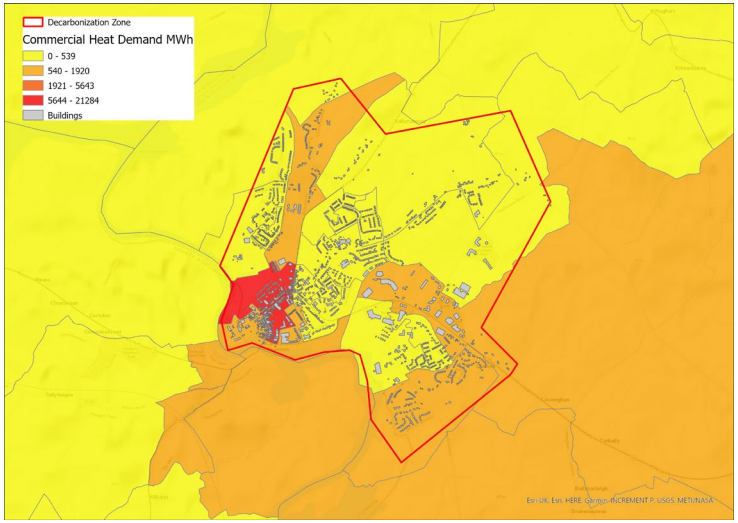
Heat demand maps allow users to explore Ireland's heating and cooling demands. Heat mapping describes the spatial disaggregation of national heat demand into smaller geographic areas. This disaggregation is based on the characteristics of the buildings within each area and include:

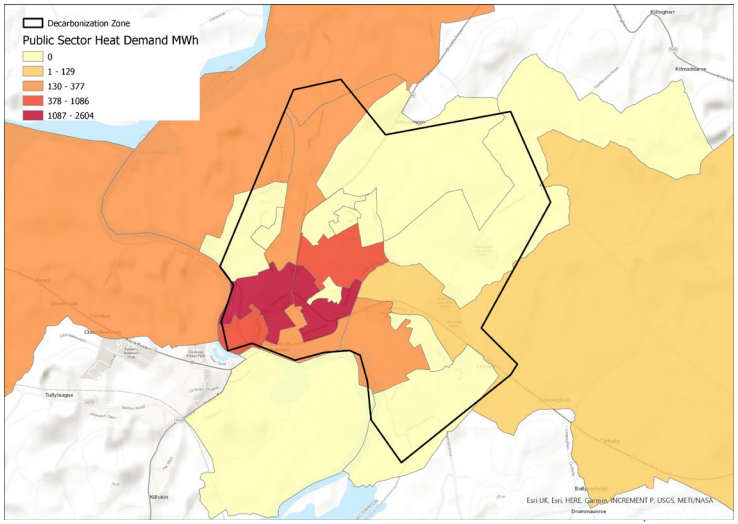
- Building type (a residential dwelling, a commercial or public sector building or industrial site),
- The type of fuel used to generate the heat,
- Other metrics such as the area of the buildings, and current planned energy efficiency measures

- Heat demand in the Leitrim DZ area is categorised into 3 different levels, with the highest heat demand observed in and around the more populated and active region of Carrick-On-Shannon west – this area should be considered and prioritised with targeted actions to reduce this demand.

- The maps provided here provide a visualisation of heat demand across the DZ area.

- Heat demand is further explored in the Energy & Electricity Sector section.





3.2.4.5 Commercial & Public Sector Analysis

Commercial & Public Sector: Energy & Carbon Emissions

To estimate commercial and public sector energy consumption and associated carbon emissions within the DZ area, a number of non-spatial data points have been used. An overview of the approach used is outlined below. Further information on data sources, assumptions and limitations is included in the **Appendix**.

Data sources

01

Ordnance Survey Ireland (OSI)

Total commercial and public sector buildings broken down by building use and total floor area (m^2).

02

CIBSE Energy Benchmarks

Fuel and electricity consumption benchmarks (kWh/m^2) to estimate energy use for each of the building types based on their floor area

03

SEAI National Breakdown of Fuel/Electricity

Total energy consumed broken down into fuel sources and electricity using the national energy breakdown for the commercial and public sector. Note that data directly representative of the DZ area has not been available.

04

SEAI Conversion Factors

Total energy consumed converted to carbon emissions using SEAI Conversion Factors

Outputs

- **Energy consumed broken down by fuel and electricity, building type and ED**
- **Carbon emissions broken down by fuel and electricity , building type and ED**

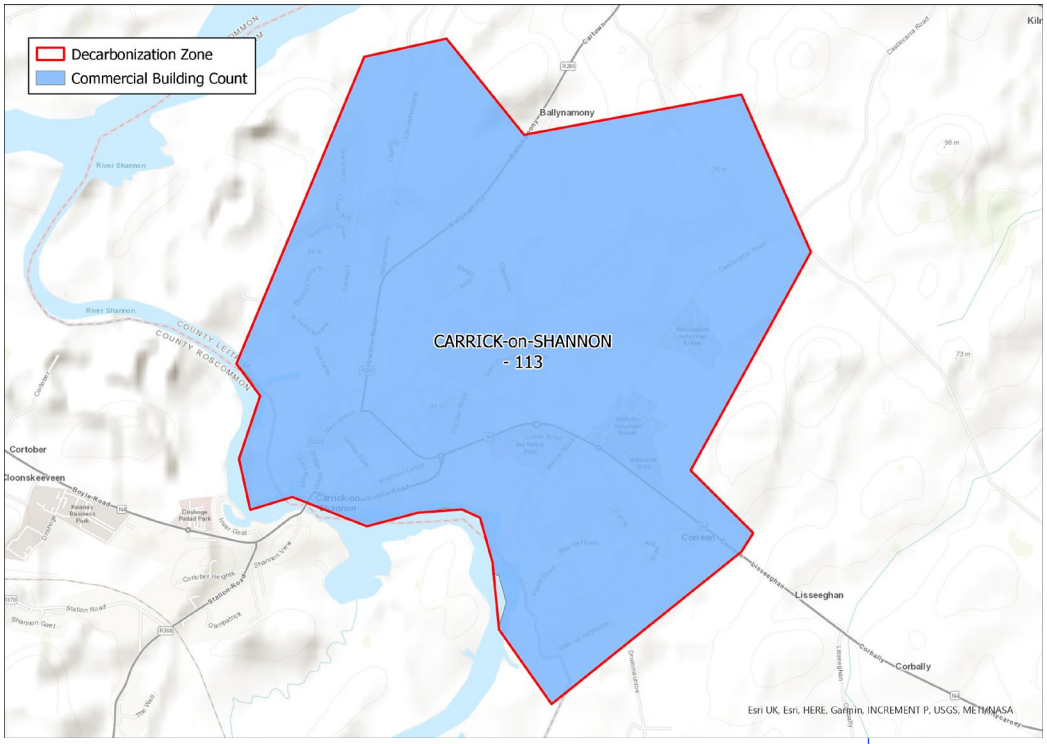
3.2.4.6 Commercial & Public Sector Analysis

Commercial & Public Sector: Buildings Number & Locations

Commercial and public sector building types are shown in the table below. The table below breaks commercial and public sector building types into three categories: ‘Mixed Use’, ‘Commercial’ and ‘Other’. The ‘Mixed Use’ category refers to buildings with multiple uses, such as commercial and retail. The ‘Commercial’ category refers to building types including churches, clubhouses, hotels and garda stations. The ‘Other’ category refers to building types including offices, car parks and warehouses.

Further information on data sources, assumptions and limitations is included in the **Appendix**.

	Building Type		
ED	**Mixed Use**	**Commercial**	**Other**
Carrick-on-Shannon	5	67	41



3.2.4.7 Commercial & Public Sector Analysis

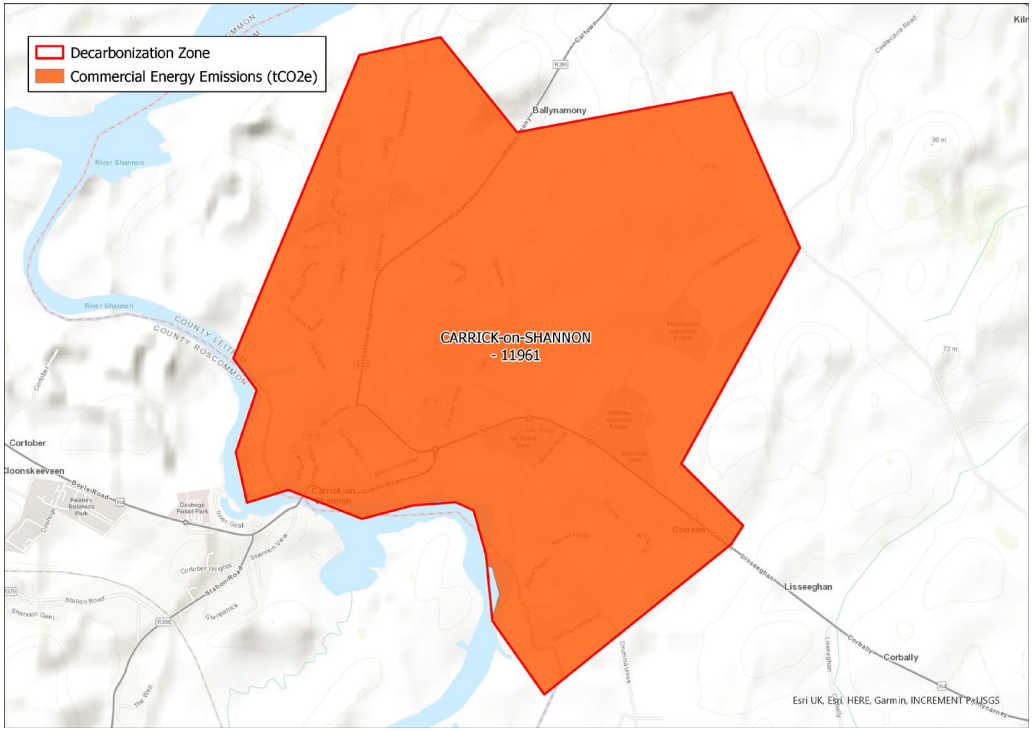
Commercial & Public Sector: Energy & Carbon Emissions

Total commercial and public sector energy consumption and associated carbon emissions within the DZ area is presented by building type and energy split below. As noted, energy split assumed for this analysis is representative of the national energy split for the commercial and public sector and may not reflect the actual energy split within the DZ area.

The map to the right provides a visual presentation of carbon emissions in the DZ area.

Building type	Fuel use (MWh)	Electricity use (MWh)	Fuel related carbon emissions (tCO_2e)	Electricity related carbon emissions (tCO_2e)
Mixed Use	289	249	63	93
Commercial	19,540	14,102	4,275	5,291
Other	4,702	3,221	1,029	1,209
Total	**24,531**	**17,573**	**5,367**	**6,593**
Total	**42,104**		**11,961**	

Energy source	Energy consumption (MWh)	Carbon emissions (tCO_2e)
Coal	21	7
Oil	9,695	2,653
Natural Gas	13,228	2,708
Renewables	1,587	-
Electricity	17,573	6,593
Total	**42,104**	**11,961**



3.2.5 Transport Sector

3.2.5.1 Transport Sector Overview

Overview of the transport sector

- Despite the growing focus on achieving Ireland's climate ambitions, Ireland's road transport emissions are increasing. In 2018, the transport sector accounted for approximately 17% of Ireland's total carbon emissions. Although the impact of COVID-19 supported the decrease in transport related emissions, 2021 saw a 6.1% increase in emissions over 2020 levels, largely driven by the cessation of public health restrictions that had artificially reduced transport demand.

- Ireland's transport sector must reduce its emissions by 50% by 2030. The actions and targets outlined in CAP 23 are pivotal in encouraging a shift to 'active travel' and overcoming the challenges deeply embedded through our settlement patterns, policies, and mindsets which favour private car usage over more sustainable transport modes. These targets will require a transformational shift in how we travel, as well as investment and innovation efforts into electric vehicles (EVs), increased charging facilities, and alternative fuels. Achieving a shift to transport modes with zero- or low-carbon emissions, such as active travel (walking and cycling) and public transport, will require unprecedented levels of public buy-in and engagement.

- Transport is highlighted a key infrastructure sector in Leitrim County Council's LECP due to the county being largely rural and dispersed. One of the actions outlined in the plan is to maintain and a develop a range of transport options to facilitate access between the main towns in the county. Similar to the actions and targets outlined in CAP 23, this action will be key enabler in the shift towards 'active travel' across the County.

- The following pages present an overview of the transport sector related activities and associated energy and carbon emissions within the DZ area.

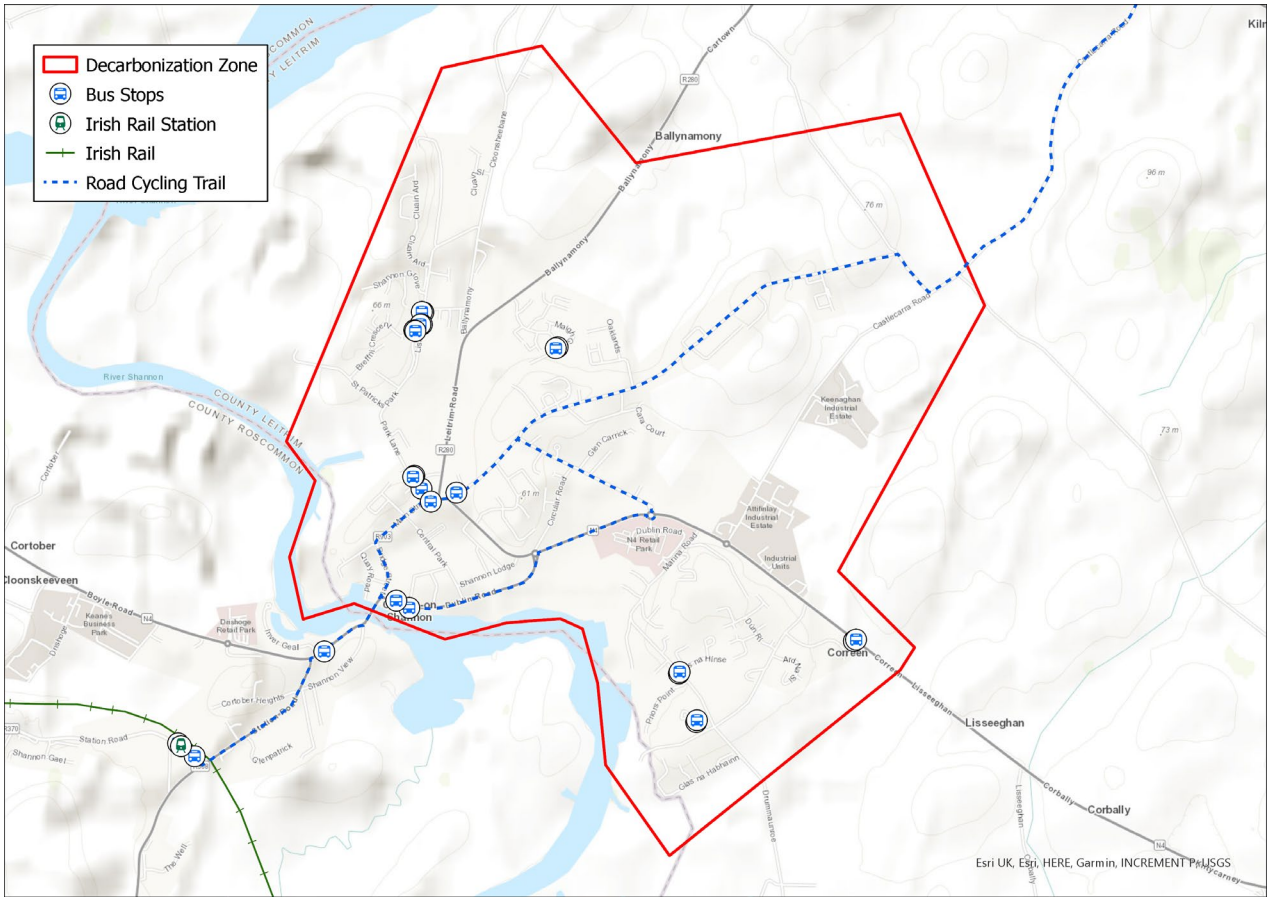
3.2.5.2 Transport Sector Analysis

Transport Sector: Public Transport

- Buses are the key public transport within the study area with a mixture of both public and private sector operators such as Bus Eireann, Local Link and Westlink Coaches. In total there are 21 bus stops within the DZ area.

- The map shown here provides a visual of the locations of bus stops within the DZ area as well as an overview of the Carrick-on-Shannon DZ cycling route and Irish rails vicinity to the DZ.

- The uptake of ‘Green’ transport methods such as Buses, Trains, Electric vehicles and walking are vital in the reduction of Irelands overall emissions and an increase in the general health of a population through reduced air pollutants.



3.2.5.3 Transport Sector Analysis

Transport Sector: Energy & Carbon Emissions

To estimate transport sector energy consumption and associated carbon emissions within the DZ area, a number of non-spatial data points have been used. An overview of the approach used is outlined below. Note that this approach reflects vehicles owned and licenced within the area and does not reflect all transport movements within the DZ area. Further information on data sources, assumptions and limitations is included in the **Appendix**.

Data sources

01

Transport Omnibus

Number of vehicles licenced by end of 2018 in Leitrim. These numbers have been proportioned down to the DZ area based on population.

02

SEAI National Energy Balance

Total energy consumed per transport mode broken down into fuel sources and electricity, supported by the SEAI National Energy Balance

03

SEAI Conversion Factors

Total energy consumed per transport mode converted to carbon emissions using SEAI Conversion Factors

Outputs

- **Energy consumed broken down by fuel and electricity source, and transport mode**
- **Carbon emissions broken down by fuel and electricity source, and transport mode**

3.2.5.4 Transport Sector Analysis

Transport Sector: Energy & Carbon Emissions

Total transport sector related energy consumption and associated carbon emissions within the DZ area, broken down by transport mode and energy type are shown below. As mentioned on the previous page, energy consumption and carbon emissions presented below reflect vehicles owned and licenced within the DZ area based on the entire Leitrim area, factored down by population in the DZ area. Although this approach does not provide total energy consumption and associated carbon emissions of all transport movements in the DZ area in the baseline year, it provides a useful overview of vehicle ownership in the DZ area and impact of their usage.

Private cars account for the highest carbon emissions. Petrol and diesel are the most common sources of fuel with just a small proportion relying on electricity.

Transport mode	Total energy consumption by transport mode in the DZ area (MWh)				
	Oil	Natural Gas	Renewables	Electricity	Total
Road Freight	6,167	0.3	264	-	**6,431**
Road Light Goods Vehicle	4,236	-	182	-	**4,418**
Road Private Car	17,101	-	676	9	**17,786**
Public Passenger Services	893	-	38	-	**931**
Total	**28,397**	**0.3**	**1,160**	**9**	**29,566**

Transport mode	Total carbon emissions by transport mode in the DZ area (tCO_2e)				
	Oil	Natural Gas	Renewables	Electricity	Total
Road Freight	1,627	0.1	-	-	**1,627**
Road Light Goods Vehicle	1,118	-	-	-	**1,118**
Road Private Car	4,443	-	-	3	**4,446**
Public Passenger Services	235	-	-	-	**235**
Total	**7,423**	**0.1**	**-**	**3**	**7,427**

3.2.5.5 Transport Sector Analysis

Transport Sector: Commuting & Carbon Emissions

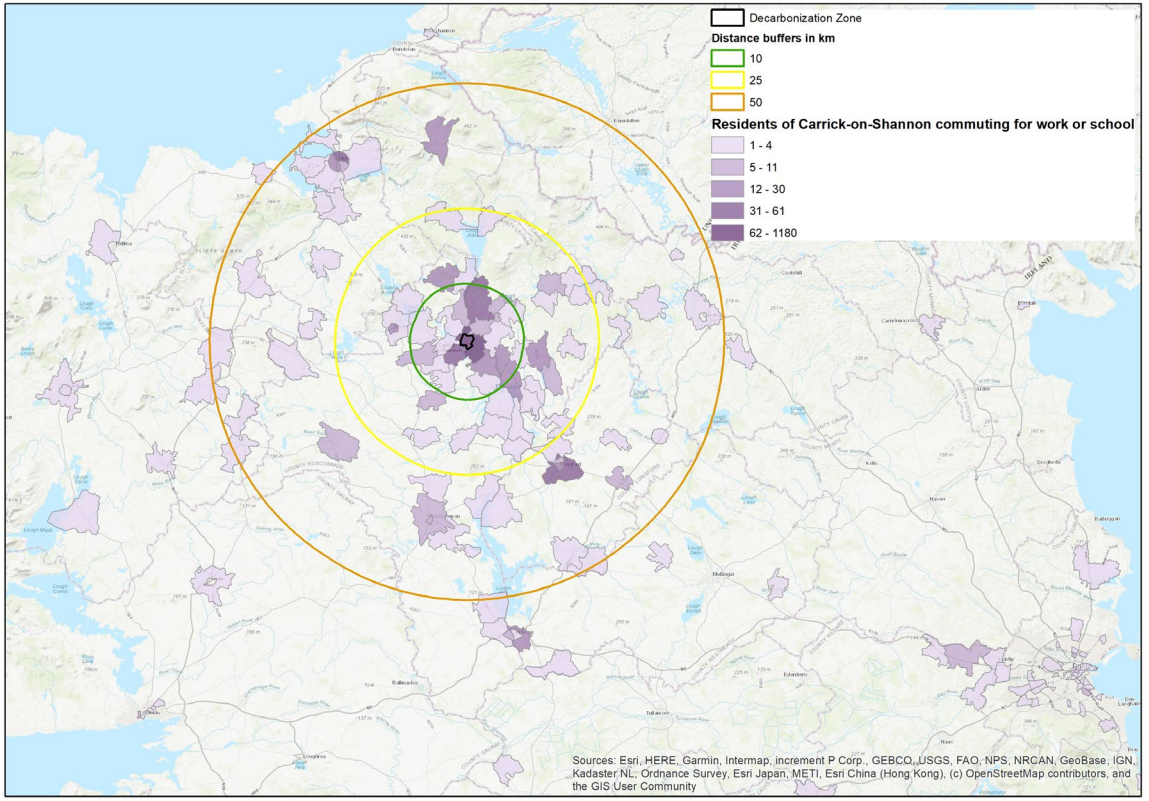
Using POWSCAR data, commuters to the DZ area and from the DZ area to attend work, college or school on a daily basis from within the DZ area and from surrounding areas has been explored. Carbon emissions associated with these commuting patterns are estimated using distances taken from POWSCAR and assumptions on transport modes used in the DZ area – this results of which are shown on the next pages.

61% of these commutes are made in a car, while 30% are made using public transport, bicycle or on foot. The remaining commuters take a van or motorcycle with some 'telecommuting' (i.e. work from home). In addition, within the DZ area, approximately 49% of households own a car, approximately 25% own two cars and approximately 21% of households do not own a car.

Note that although these commuting patterns focus on commuters travelling in and out of the DZ area, the impact of which are not entirely associated with the DZ area boundary itself, it is important to understand opportunities for decarbonisation through both control and influencing mechanisms available to the Council.

3.2.5.6 Transport Sector Analysis

Transport Sector: Commuting & Carbon Emissions



- The map on the left provides an illustration of commuters leaving the DZ area and travelling to surrounding EDs on a daily basis.

- For the purposes of this assessment, the starting point for all commuters is assumed to be Carrick-on-Shannon ED. To provide for a proportional assessment, commuters travelling to the top 90% of EDs are included in the carbon emissions estimate. An uplift is then applied to the resulting carbon emissions to represent 100% of commuters.

- It is estimated that these daily commuter trips leaving the DZ area, and assumed to then return, contribute approximately **2,453 tCO_2e** on an annual basis.

- Further information on data sources, assumptions and limitations included in the **Appendix**.

Emissions source	Total per year (return journey)
Total carbon emissions (tCO_2e) associated with commuter travel out of the DZ area to surrounding EDs	**2,453**

3.2.5.7 Transport Sector Analysis

Transport Sector: Commuting & Carbon Emissions

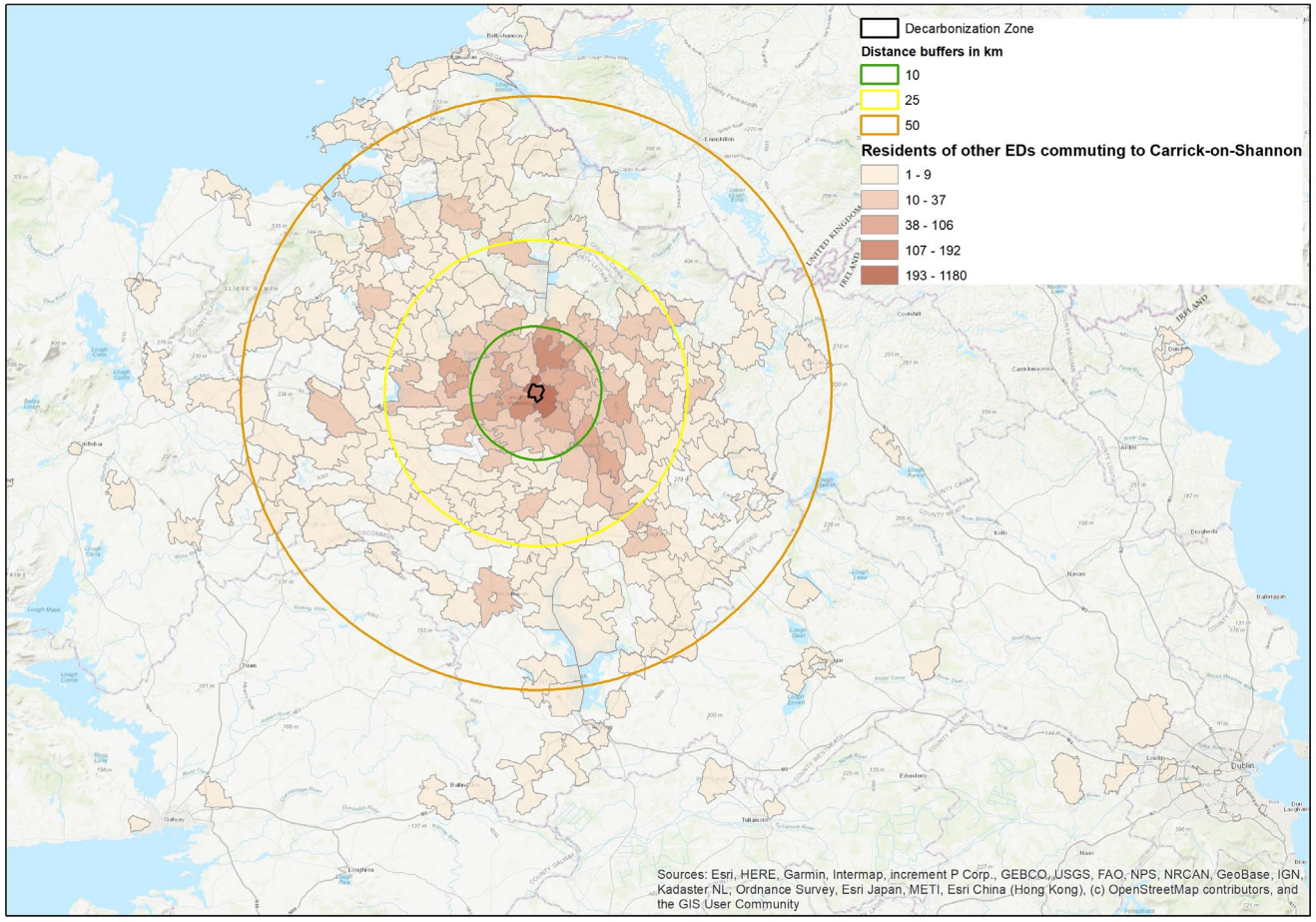
- The map on the right provides an illustration of commuters travelling into the DZ area from surrounding EDs on a daily basis.

- For the purposes of this assessment, the end point for all commuters is assumed to be Carrick-on-Shannon ED. To provide for a proportional assessment, commuters travelling to the top 90% of EDs are included in the carbon emissions estimate. An uplift is then applied to the resulting carbon emissions to represent 100% of commuters.

- It is estimated that these daily commuter trips travelling into the DZ area, and assumed to then return, contribute approximately **3,542 tCO_2e** on an annual basis.

- Further information on data sources, assumptions and limitations included in the **Appendix**.

Emissions source	Total per year (return journey)
Total carbon emissions (tCO_2e) associated with commuter travel into the DZ area from surrounding EDs	**3,542**



3.2.6 Waste Sector

3.2.6.1 Waste Sector Overview

Overview of the waste sector

- Waste emissions are predominantly associated with methane emissions arising from disposal to landfill. The waste sector accounts for approximately 1% of Ireland's annual carbon emissions. Waste emissions per head of population are lower in Ireland compared to the EU average and carbon emissions have decreased since 2005. Minimising waste generation, and improving segregation, reuse and recycling will lead to a continued reduction in carbon emissions.

- A number of targets and goals have been set in Ireland to meet both its climate and circular economy objective – for example, Ireland has set a plastic recycling target of 55% by 2030, with a 90% collection target for beverage containers.
- Ireland has made significant progress in managing waste streams, particularly in improving recycling rates and diversion from landfill but substantial change is needed to pivot towards a more circular economy in Ireland. Businesses and households play a vital role in enabling this change by influencing and facilitating sustainable consumer behaviour.

- A number of initiatives outlined in CAP 2023 will be beneficial to DZ area as areas to focus on, including:
    - Deposit and return schemes for plastic and aluminium beverage containers;
    - Promotion of trials for better public recycling opportunities on street and at Bring Centres;
    - Improvement of segregation and collection performance to increase recycling and reduce contamination.

- Waste falls under the SEDO (Sustainable Economic Development Objectives) for local infrastructure, which aims to '*Support and facilitate the development and maintenance of an infrastructure across Leitrim which will meet current and projected economic, social, community and sustainability needs". (LECP 2015 – 2021)*
- According to the public consultation survey for the next LECP unveiled that 48% of respondents would like to see increased initiatives to reduce the amount of plastic waste in the County.

- The following sections present an overview of the waste sector related activities and emissions within the DZ area.

3.2.6.2 Waste Sector Analysis

Waste Sector: Locations & Carbon Emissions

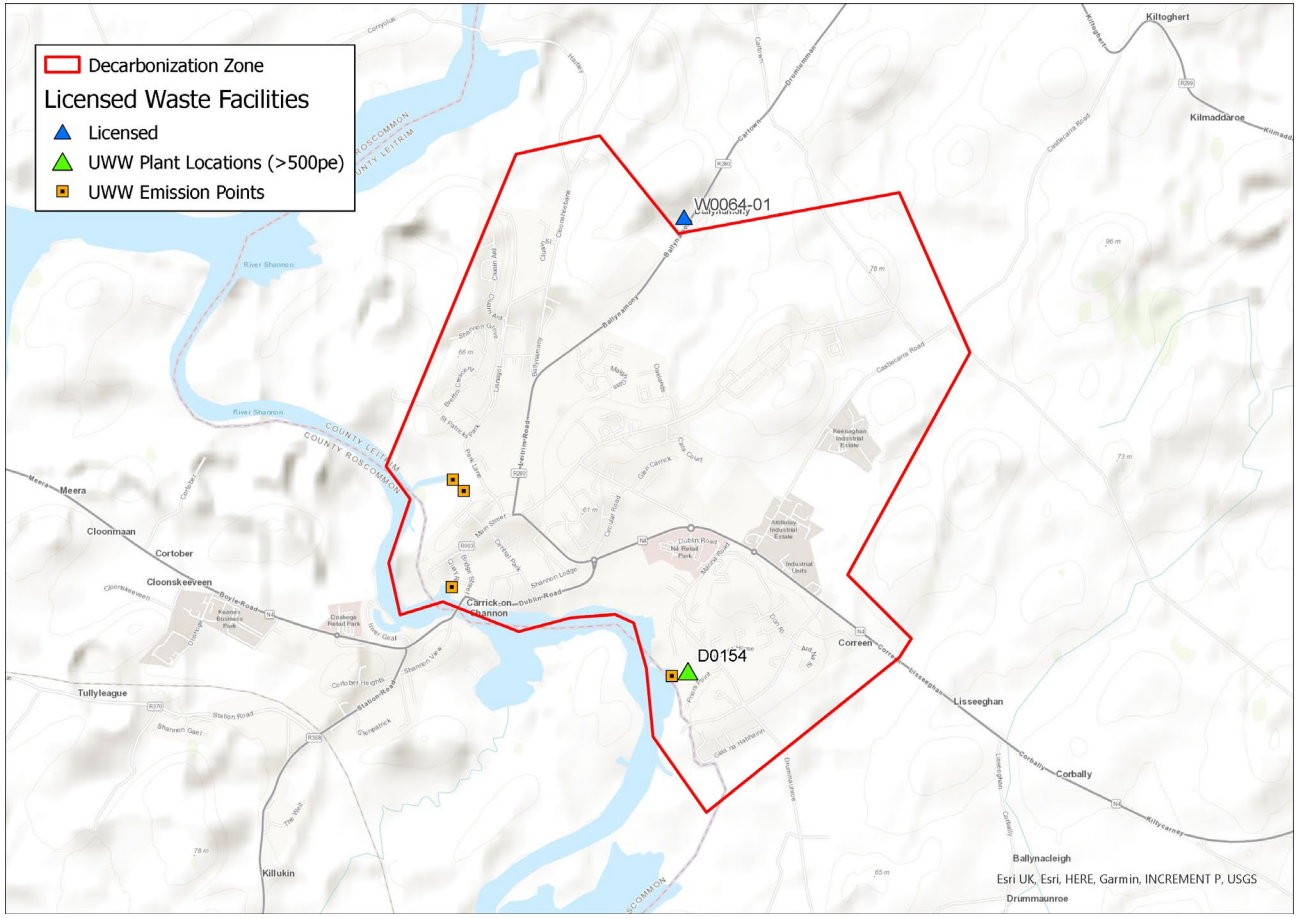
- A waste facility (Carrick-On-Shannon Landfill) is located just outside the DZ boundary. An urban wastewater treatment plant lies within the DZ area, with several emissions points located along the eastern river bank.

- Irish water has been reviewed to understand carbon emissions associated with the wastewater treatment plant within the DZ area. No emissions data has been made available.

- The EPA's Pollutant Release & Transfer Register (PRTR) has been reviewed to understand carbon emissions associated with the landfill site just outside the DZ boundary. Methane emissions were recorded at 174.27 tCH_4 in 2018, which translates to 4,862 tCO_2e.

- Using a benchmark for waste related carbon emissions of 0.21 tCO_2e/head of population*, it can be estimated that waste related carbon emissions within the boundary of DZ area is approximately **727 tCO_2e**.

* Benchmark is estimated using 2018 national waste sector emissions divided by national population (2016 CSO data). This benchmark is then multiplied by total population of the DZ area (3,464).



3.2.7 Energy & Electricity Sector

3.2.7.1 Energy & Electricity Sector Overview

Overview of energy & electricity sector

- Considerable progress has been made in decarbonising the electricity sector over the last decade, resulting in electricity emissions falling by 45% between 2005 and 2020. This has been possible through the deployment of renewables and their successful integration into the power grid, and the increased use of higher-efficiency gas turbines. The deployment of renewable energy has enabled emissions reductions during a period of increased demand, with electricity accounting for just 14.4% of Ireland's carbon emissions in 2021.

- Since 2021, there have been significant increases in prices in the international oil and gas markets, due to increased demand as the post-COVID 19 recovery continues and the disruption to traditional energy supplies following the Russian invasion of Ukraine. The resultant sharp increase in energy prices underlines the importance for Ireland to eliminate our dependency on fossil fuels and that an increase in renewable energy generation, along with supporting flexibility and demand management measures, is necessary for our future energy security.

- Targets and actions outlined in CAP 2023 focus on an acceleration towards renewable energy generation, with the aim of renewables accounting for at least 75% of energy demand by 2030. Key to the success of decarbonising the energy sector will be increased flexibility during Ireland's transition to a renewable electricity grid. The development of dynamic tariffs to incentivise consumers to move their demand to times of high renewable penetration will reduce the strain on the network at peak times.

- In particular, of relevant to the DZ area is the CAP 2023 measure which looks to support at least 500 MW of local community-based renewable energy projects and increased levels of new micro-generation and small-scale generation.

- Leitrim's LECP outlines that one of the aims is to 'enhance the potential for economic and development in the energy and green economy sector so that the county will be an exemplar county for climate change' (SEDO 5A). The creation of a multi-agency group to oversee the development of renewable energy in Leitrim and the conversion of Local Authority buildings using renewable energy technology are two of the actions outlined within the plan that aim to support the fulfilment of SEDO 5A.

- The following section presents an overview of the potential opportunities for the DZ area in terms of energy efficiency and reduction as well as opportunities to support national energy decarbonisation targets.

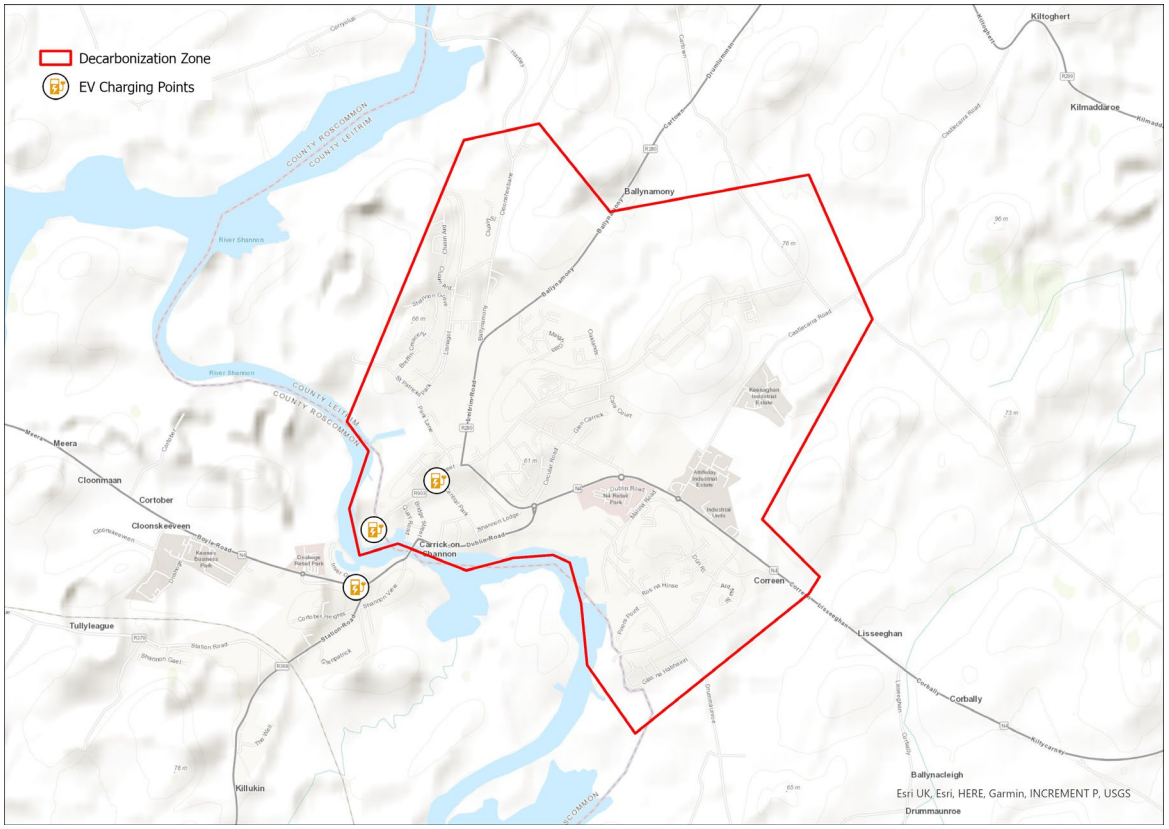
3.2.7.2 Energy & Electricity Sector Analysis

Energy & Electricity Sector: Electric Vehicle charging points

- As previously mentioned, to support the decarbonisation of the transport sector, an increased proportion of EVs in the vehicle fleet as well as the electrification of freight and public transport is required to shift away from fossil fuels.

- The current level of Electric Vehicle (EV) charging infrastructure is shown on the map to the right, with a total of 2 charging stations located within the DZ boundary and one immediately outside.

- In order to expand the production of green energy in this region, a strong grid connection and a number of substations are needed.
- The next page provides an overview of grid connections and substations in the area.



3.2.7.3 Energy & Electricity Sector Analysis

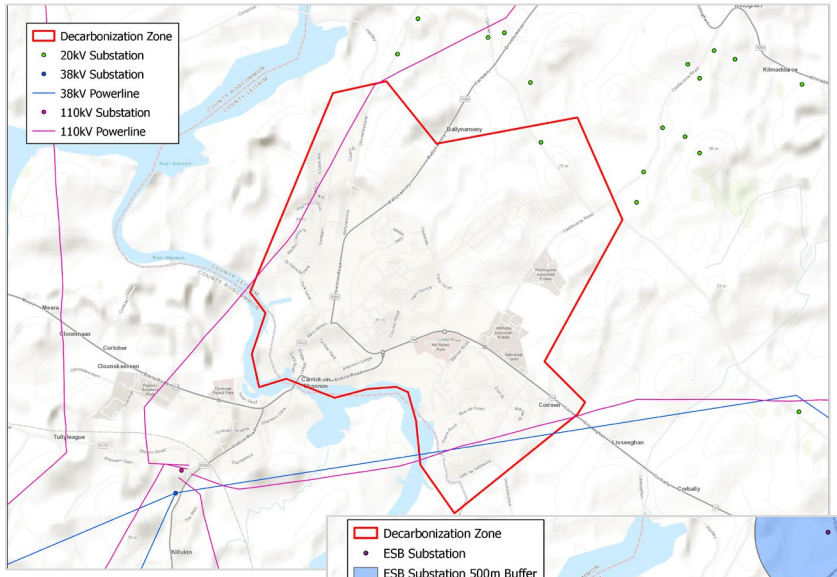
Energy & Electricity Sector: Power Line & Substation Locations

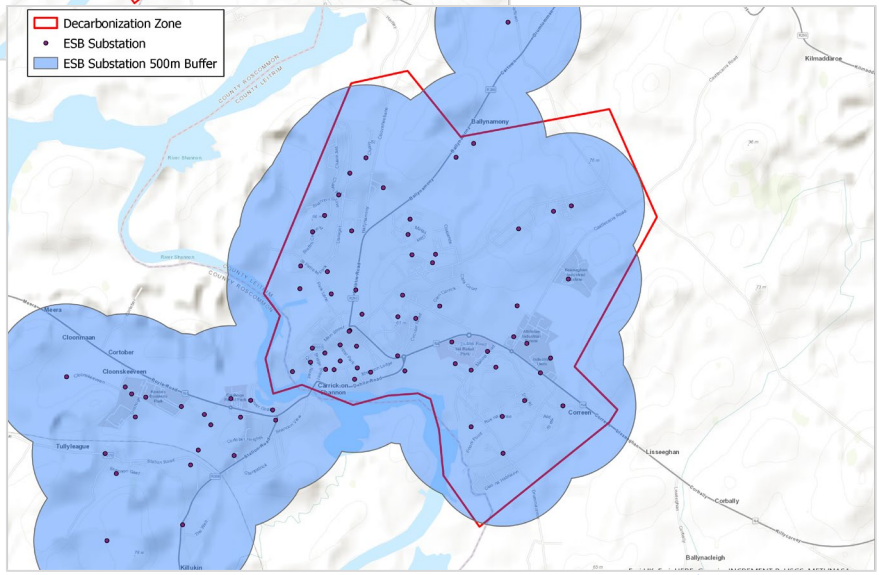
- The Carrick-on-Shannon DZ area has one 20kV power substation located within it's boundary. There are also 2 110kV power lines and one 38kV powerline running through the DZ.

- Locations of substations located outside the DZ boundaries are shown on the map to the right, and the locations of ESB substations with a 500m buffer are shown in the map on the bottom right.

- There is a relatively high density of ESB substations in the DZ, with a less-dense substation presence in the western region. The density of ESB substations in the DZ can be considered to be reflective of the population density and commercial activity of the region.

- In order to expand the production of renewable energy in the region, including supporting EV charging points, there will be a requirement to have strong grid connections and sub stations.





3.3 Conclusions and Recommendations

3.3.1 Conclusions and Recommendations

Carbon emissions within an area, such as the DZ area, generally reflect trends such as the level of economic activity, energy use and potentially growth. The challenge for the DZ area (and other areas) is to allow for continued growth and improvement whilst reducing carbon emissions in a just and meaningful manner.

This report highlights the carbon hotspots within the DZ area. A range of sectoral specific measures to reduce carbon emissions can be explored by Leitrim County Council during the next stages of the DZ development, including stakeholder engagement and register of opportunities for action planning. Examples of key measures specific to these sectors to consider are set out on the following pages.

In addition to sectoral specific measures, local authorities can also engage with relevant government departments to develop and resource programmes which will directly and indirectly provide the necessary tools to enable an effective transition to a low carbon economy. These include but are not limited to:

- Citizen engagement and awareness raising to promote behavioural change across the DZ area;
- Internal capacity building to equip employees with the knowledge and skills to promote decarbonisation;
- Support for external initiatives such as innovation and knowledge sharing hubs.

3.3.2 Conclusions and Recommendations

Residential (including Social Housing):

Achieving a low carbon housing stock is an important part of the DZ area successfully achieving national carbon reduction targets.

Targeting existing and proposed and/or new residential developments with suitable measures to optimise energy efficiencies and carbon emissions reductions is a key part of decarbonising the residential sector.

National, government resourced programmes to incentivise retrofit of private and social housing will be critical. The government has committed to providing increased funding to accelerate retrofitting, including free upgrades for low-income households.

Roll-out of energy management systems and smart meters to council owned buildings, such as social housing is an effective measure to manage and understand energy use and trends in demand.

Potential for renewable energy heat sources is also encouraged by the CAP, including the installation of heat pumps at existing residential units as well as new developments and use of renewable gas.

District heating is also a key part of achieving and optimising decarbonisation of the residential sector.

For proposed and new residential developments, National Building Standards revision will be required to reach net zero targets.

Commercial & Public Sector:

Similar to the residential sector, optimising the energy efficiency of existing commercial and public sector buildings is key to meeting national carbon targets.

The CAP provides an overview of key potential measures to drive decarbonisation across the commercial & public sector. For example:

- A retrofitting programme to upgrade existing buildings could optimise the energy efficiency of current building stock which range between C1 BER rated to G BER rated buildings.
- In addition, opportunities for the use of renewable energy are also encouraged including the use of heat pumps and renewable gas for commercial buildings.
- Public sector buildings can avail of SEAI supports promoting energy efficiency including the ‘Gap to Target’ tool as well as the Building Pathfinder Programme which supports building retrofits.
- Appropriate knowledge and skills are required to enable energy efficiency improvements in protected buildings – to understand, specify and install appropriate retrofitting within these protected buildings, specialists are required.
- Potential for renewable energy heat sources should be explored including the use of renewable gas as well as district heating opportunities to reduce energy consumption and carbon emissions at public and protected buildings.
- Leveraging the public procurement process can embed low carbon, sustainable criteria at the earliest stages of new public sector building developments.

3.3.3 Conclusions and Recommendations

Transport:

A shift to active travel and increased uptake of public transport is key to the achievement of Ireland's national carbon targets.

A key focus of the CAP and also mentioned in the National Planning Framework (NPF) is sustainable mobility. The provision of sustainable modes of travel such as public transport, walking and cycling will contribute towards reducing greenhouse gas emissions.

As highlighted in the report, the DZ area acts as a public transport centre with a number of bus stops and the rail network passing through.

In addition, investment in electric vehicles (EVs), increased charging facilities are part of the solution. Provision of EV charging is driven by the Department of Transport (DOT) and Department of the Environment, Climate and Communications (DECC).

Waste & Circular Economy:

Local authorities can play a key role in minimising waste and embracing circular economy principles. Leitrim County Council can consider the implementation of targeted initiatives to reduce waste related emissions and embrace circular economy principles, including:

- Deposit and return schemes for plastic and aluminium beverage containers;
- Promotion of trials for better public recycling opportunities on street and at Bring Centres;
- Improvement of segregation and collection performance to increase recycling and reduce contamination.

In addition, capacity building will play a key role in closing Ireland's circularity gap at a local level. Current measures in place to support this include the Local Authority Prevention Network (LAPN), which involves co-operation between the EPA and local authorities to build local authority expertise and capacity in waste prevention and circular economy at the local level.

04

Appendices

4.1 Data Sources, Assumptions & Limitations: Spatial Data

Sector	Data source	Data source link	Data assumption	Data limitation
Socio-economic	Unemployment 2016	https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics	Number of unemployed by small area	2016 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2016 data is deemed a reasonable proxy for 2018.
	POBAL Deprivation 2016	https://www.pobal.ie/research-analysis/open-data	Deprivation Index 2016 by ED	2016 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2016 data is deemed a reasonable proxy for 2018.
	Population Density	https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics	Total Population per Small Area	2016 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2016 data is deemed a reasonable proxy for 2018.
	Zoning	https://viewer.myplan.ie	Leitrim County Development Plan 2023 - 2029	No limitation in data set.
Residential	Housing Stock	https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics	Average Built Year of Housing Stock by Small Area	2016 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2016 data is deemed a reasonable proxy for 2018.
	BER Ratings	https://gis.seai.ie/server/services	Domestic BER Ratings	No limitation in data set. Additional information on the data source can be found here: Understand BER Ratings | Home Energy | SEAI
	Annual Heat Demand	https://gis.seai.ie/server/services	Residential Sector – Annual Heat Demand	No limitation in data set. Additional information on the data source can be found here: Map Of Heat Demand In Ireland | SEAI GIS Maps | SEAI

4.2 Data Sources, Assumptions & Limitations: Spatial Data

Sector	Data source	Data source link	Data assumption	Data limitation
Commercial & Public	BER Ratings	https://gis.seai.ie/server/services	Non-Domestic BER Ratings	No limitation in data set. Additional information on the data source can be found here: Understand BER Ratings | Home Energy | SEAI
	Annual Heat Demand	https://gis.seai.ie/server/services	Commercial and Public Sector – Annual Heat Demand	No limitation in data set. Additional information on the data source can be found here: Map Of Heat Demand In Ireland | SEAI GIS Maps | SEAI
	Buildings Number and Locations	Leitrim County Council	Geodirectory Building Use Locations	2022 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2022 data is deemed a reasonable proxy for 2018.
Energy & Electricity	Total Heat Demand with Building Use	https://gis.seai.ie/server/services Leitrim County Council	Heat Demand and Geodirectory Building Use Locations	No limitation in data set. Additional information on the data source can be found here: Map Of Heat Demand In Ireland | SEAI GIS Maps | SEAI
	Electric Vehicle Charging Points	Data.gov.ie	Electric Vehicle Charging Points	No limitation in data set.

4.3 Data Sources, Assumptions & Limitations: Spatial Data

Sector	Data source	Data source link	Data assumption	Data limitation
Waste	Waste Facilities and Wastewater Treatment Plants	https://gis.epa.ie/arcgis/services	Waste Facilities and Wastewater Treatment Plants	No limitation in dataset.
Transport	Transport Carbon Emissions	https://projects.au.dk/mapeire/spatial-results/download	MapEire modelled transport carbon emissions	No limitation in data set. Additional information on the data source can be found here: https://projects.au.dk/mapeire/spatial-results
	POWSCAR (Place of Work, School or College)	Census 2016 Place of Work, School or College - Census of Anonymised Records (POWSCAR) - CSO - Central Statistics Office	Commuting and Carbon Emissions	2016 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2016 data is deemed a reasonable proxy for 2018.
	Bus Stops	Data.gov.ie	Bus stops Locations	No limitation in data set.

4.4 Data Sources, Assumptions & Limitations: Non-Spatial Data

Sector	Data source name & description	Data source link	Data assumption	Data limitation	Overview of methodology used
Residential	CSO	https://data.cso.ie/	No. of housing units in the DZ area	Data used is representative of 2016 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2016 data is deemed a reasonable proxy for 2018	CSO data on number of residential buildings has been combined with BER Research Tool data to estimate total energy consumption
	SEAI BER Research Tool	https://ndber.seai.ie/BERResearchTool/ber/search.aspx	The average energy consumption per dwelling type and built period	The research tool does not contain total delivered energy consumption of all houses in the DZ area but can be considered a good proxy.	
	CSO	https://data.cso.ie/	Fuel breakdown of the residential sector within the DZ	CSO data reflective of 2016 has been used to inform fuel type breakdown within the residential sector. This data is reflective of Carrick-on-Shannon residential sector activities.	
	SEAI Conversion Factors	https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/	Carbon intensity factors for each energy source	The SEAI conversion factors represent some of the most robust carbon benchmarks for fuel types in Ireland and would be considered a strong proxy for carbon calculations in the DZ	

4.5 Data Sources, Assumptions & Limitations: Non-Spatial Data

Sector	Data source name & description	Data source link	Data assumption	Data limitation	Overview of methodology used
Commercial & Public Sector	OSI (PRIME2 dataset)	https://osi.ie/wp-content/uploads/2018/04/PRIME2-Client-Documentation-Concepts-V-02.4.pdf	Number of buildings by type in the DZ area reflecting the 2018 baseline year	The OSI PRIME2 dataset is considered a strong proxy for spatial data pertaining to commercial building types across Ireland, however a potential limitation could be the generic classification of some buildings that were removed from our analysis (e.g., general buildings, which could be either residential or commercial)	The OSI data combined with CIBSE benchmarks has been used to calculate the estimated energy consumption for each of the building types in the DZ area. National commercial and public sector energy split (%) has been applied to energy consumption and converted to carbon emissions.
	CIBSE (energy benchmarks for building types)	https://www.cibse.org/knowledge-research/knowledge-resources/knowledge-toolbox/benchmarking-registration#:~:text=CIBSE's%20Energy%20Benchmarking%20Tool%20is,of%20energy%20use%20in%20buildings.	CIBSE benchmarks are assumed to be representative of same building types in the DZ	CIBSE benchmarks are a UK data source based on energy consumption data gathered in the UK. The benchmarks do not reflect actual energy consumption in the DZ area but are considered a good proxy.	
	SEAI (national energy breakdown for commercial and public sector)	https://www.seai.ie/publications/Previous-Energy-Balances.xlsx	National fuel energy split was used, in conjunction with local knowledge and energy SME input to decide on the most relevant energy split for the commercial and public sector in Leitrim DZ	The national energy split reflects energy consumption of the commercial and public sector at a national level. Although not an actual reflection of energy consumption at the DZ area level, it is a considered to be a good proxy.	
	SEAI Conversion Factors	https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/	Carbon intensity factors for each energy source	The SEAI conversion factors represent some of the most robust carbon benchmarks for fuel types in Ireland and would be considered a strong proxy for carbon calculations in the DZ	

4.6 Data Sources, Assumptions & Limitations: Non-Spatial Data

Sector	Data source name & description	Data source link	Data assumption	Data limitation	Overview of methodology used
Transport	Transport Omnibus	https://www.cso.ie/en/statistics/transport/transportomnibus/	Number of vehicles licenced by end of 2018 in Leitrim.	Number of vehicles for Leitrim County have only been made available. To estimate number of vehicles in the DZ area, total numbers have been proportioned down based on population.	To estimate transport emissions in the DZ area number of vehicles by vehicle type has been combined with transport energy split provided by SEAI to understand energy consumption by transport mode. This energy consumption has then been converted into carbon emissions using robust SEAI factors. Note that this assessment accounts for vehicles owned and licenced within the area and does not reflect all transport movements within the DZ area.
	SEAI National Energy Balance	https://www.seai.ie/publications/Previous-Energy-Balances.xlsx	Total energy consumed per transport mode presented by energy source	Representative of national data rather than the DZ area.	
	SEAI Conversion Factors	https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/	Carbon intensity factors for each transport energy source	n/a	
	POWSCAR (Place of Work, School or College)	Census 2016 Place of Work, School or College - Census of Anonymised Records (POWSCAR) - CSO - Central Statistics Office	Commuting patterns into and out of Carrick-on-Shannon to surrounding EDs for work, school and college. Trips are assumed to be daily, single trips.	2016 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2016 data is deemed a reasonable proxy for 2018.	To estimate carbon emissions associated with commuting patterns in the DZ area, POWSCAR data has been relied upon to understand distances travelled from start to end point by residents travelling in and out of the Carrick-on-Shannon area. Distances have been applied to the travel mode split typical of the DZ area. Total distances by travel mode have then been converted into carbon emissions using robust UK Government factors.
	CSO	https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics	Travel modes for work, school and college for residents of the DZ area	2016 data is used to reflect 2018 baseline year. This is due to no 2018 specific data being made available. 2016 data is deemed a reasonable proxy for 2018.	
	CSO	https://www.cso.ie/en/releasesandpublications/er/vlftm/vehicleslicensedforthefirsttimedecemberandyear2018/	Private car fuel split	n/a	
	UK Government Conversion Factors	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/715426/Conversion_Factors_2018_-_Full_set__for_advanced_users__v01-01.xls	Carbon intensity factors for each transport mode	n/a	

4.7 Supporting Data: Residential Sector

Residential Sector: Energy & Carbon Emissions

Weighted average of CSO data of dwelling types in DZ area. ***Note that number of house/bungalow & flat/apartment by construction period is not available from the CSO.***

	Number
Dwelling type	**Carrick-on-Shannon**
All years	1,567
Before 1919	59
1919 to 1970	196
1971-1990	246
1991-2000	252
2001-2005	396
2006-2011	396
2012 onwards	23

Weighted average of CSO data of dwelling types in DZ area

	Number
Dwelling type	**Carrick-on-Shannon**
All households	1,570
House/Bungalow	1,274
Flat/Apartment	296

4.8 Supporting Data: Residential Sector

Residential Sector: Energy & Carbon Emissions

KPMG calculation of average energy consumption for housing units in the DZ grouped by dwelling type

	kWh/year
Dwelling type	**All years**
House/Bungalow	20,547
Flat/Apartment	10,587

Calculation of average energy consumption for housing units in the DZ grouped by dwelling type and construction period

	kWh/year							
Dwelling type	**All years**	**Before 1919**	**1919-1970**	**1971-1990**	**1991-2000**	**2001-2005**	**2006-2011**	**2012 onwards**
All dwellings	19,213	19,213	27,544	21,307	18,722	17,696	15,898	-

Central heating energy source split of housing units across EDs within the DZ

	%
Dwelling type	**Carrick-on-Shannon**
Coal	6%
Peat	1%
Oil	62%
LPG	1%
Natural Gas	1%
Renewables	1%
Electricity	27%
Wood	2%
Total	100%

4.9 Supporting Data: Residential Sector

Residential Sector: Energy & Carbon Emissions

Number of social housing units in the DZ area

	Number
Electoral District	**Social Housing units**
Carrick-on-Shannon	182

Calculation of average energy use for all social housing units in the DZ

	kWh/year
Dwelling type	**All years**
All households	17,270

SEAI carbon emission conversion factors

Energy source	gCO_2/kWh
Coal	340.6
Peat	355.9
Residual Oil	273.6
LPG	229.3
Natural Gas	204.7
Renewables	0
Electricity	375.2
Wood	15.1

4.10 Supporting Data: Commercial & Public Sector

Commercial & Public Sector: Energy & Carbon Emissions

Breakdown of commercial building types in the DZ area

Building type	Number	Area m²
Mixed use	**5**	**1,129**
Commercial/Retail	4	529
Multiple Use	1	599
Commercial	**67**	**82,639**
Commercial/Retail	22	24,434
Local Government Building	2	1,576
Multiple Use	1	1,137
na	13	19,122
Office	6	10,996
Post Office	1	701
Public House	2	566
Unknown	3	1,752
Warehouse	2	4,975
Church	2	1,426
Clubhouse	2	296
Garda Station	1	498
Hotel	3	6,772
NA	2	1,673
School	5	6,715
Other	**41**	**21,919**
Commercial/Residential	1	296
Commercial/Retail	11	4,730
na	6	5,993
Office	1	2,811
Unknown	7	2,043
Warehouse	1	1,395
Clubhouse	3	748
Glasshouse	9	47
Multi-Storey Car park	1	3,837
NA	1	19
Total	**113**	**105,687**

4.11 Supporting Data: Commercial & Public Sector

Commercial & Public Sector: Energy & Carbon Emissions

Energy benchmarks used for commercial buildings types in the DZ area

Building type	Typical practice fossil fuels (kWh/m^2)	Typical practice electricity (kWh/m^2)
Retail	169	287
Office	151	85
Restaurant/ public house	1250	730
Hotel	400	140
Warehouses	169	67
Workshops/ maintenance depot	311	39
Industrial process building	96	0
Hospitals and primary health care	267	113
Community/ day centre	139	47
Nursing residential homes and hostels	337	83
Schools and colleges	111	41
Sports facilities	598	152
Church	150	20
Sports ground changing facility	216	164
Police Station	164	143
Fire station	173	83
Town Hall	159	101
Car Park (enclosed)	0	15
Other	333	162
Department Stores	248	294
Banks and building societies	98	101
Cinema	620	160
Courts (combined County/Crown)	122	82
Library	106	69
Post offices	210	70
Ambulance station	460	70
Museum	109	72
Theatre	237	202

National Commercial and Public Sector energy consumption breakdown

Fuel split in commercial sector	Commercial/Public Services	%	% fossil fuel only
Coal	0.52	0.03%	0.1%
Oil	241	14%	40%
Natural Gas	329	20%	54%
Renewables	39	2%	7%
Electricity	1,079	64%	-
TOTAL	**1,688**	**100%**	**100%**

Carbon emissions factors

Energy source	gCO_2/kWh
Oil	274
Coal	341
Natural Gas	205
Electricity	375
Renewables	0

4.12 Supporting Data: Transport Sector

Transport Sector: Energy & Carbon Emissions

Licenced vehicles in the DZ area in 2018

Licenced vehicles categories (Transport Omnibus)	DZ area (number)*	Leitrim County Council (number)
Road Freight	3	27
Road Light Goods Vehicle	596	5,515
Road Private Car	1,587	14,681
Public Passenger Services	19	174
Total	**2,205**	**20,397**

Carbon emissions factors

Energy source	gCO_2/kWh
Gasoline	251.9
Gasoil / Diesel /DERV	263.9
LPG	229.3
Natural Gas	204.7
Electricity	375.2

11% of Leitrim County Council residents reside in the DZ area. Numbers of licenced vehicles in the DZ area have been estimated by multiplying Leitrim County Council licenced vehicles (made available by the CSO Transport Omnibus) by 11% to reflect likely licenced vehicles numbers in the DZ area.

National Transport Energy consumption broken down by transport mode and energy source. ***Note that 'Oil' is a sum of 'Gasoline', 'LPG', 'Gasoil/Diesel/DERV' and 'Renewables' is a sum of 'Biodiesel' and 'Bioethanol'. These 'sub-categories' are included in italics below for completeness.***

	Energy consumption (MWh)									
Transport mode	**Oil**	***Gasoline***	***LPG***	***Gasoil / Diesel /DERV***	**Natural Gas**	**Renewables**	***Biodiesel***	***Bioethanol***	**Electricity**	**Total**
Road Freight	8,182,762	-	-	*8,182,762*	346	350,788	*350,788*	-	-	8,533,895
Road Light Goods Vehicle	3,828,407	-	-	*3,828,407*	-	164,120	*164,120*	-	-	3,992,528
Road Private Car	23,129,880	*7,845,370*	*21,540*	*15,262,970*	-	914,095	*654,310*	*259,785*	12,389	24,056,364
Public Passenger Services	1,537,385	*75,657*	-	*1,461,728*	-	65,168	*62,663*	*2,505*	-	1,602,553
Total	**36,678,434**	***7,921,027***	***21,540***	***28,735,867***	**346**	**1,494,171**	***1,231,881***	***262,290***	**12,389**	**38,185,340**

4.13 Supporting Data: Transport Sector

Transport Sector: Commuting & Carbon Emissions

Transport mode to work or school in the DZ area in 2018

Transport Mode	%
On foot	**22%**
Bicycle	**2%**
Bus minibus or coach	**4%**
Train DART or LUAS	**1%**
Motorcycle or scooter	**1%**
Car driver	***61%***
Diesel	**39%**
Petrol	**18%**
Plug-in Hybrid Electric Vehicle	**4%**
Battery Electric Vehicle	**1%**
Hybrid	**0%**
Van	**4%**
Work mainly at or from home	**3%**
Total	**100%**

Carbon emissions factors

Transport Mode	Carbon factor (kg CO_2e/pass.km or kg CO_2e/km)
On foot	-
Bicycle	-
Bus minibus or coach	0.10
Train DART or LUAS	0.04
Motorcycle or scooter	0.12
Diesel	0.18
Petrol	0.18
Plug-in Hybrid Electric Vehicle	0.12
Battery Electric Vehicle	0.07
Hybrid	0.13
Van: Diesel	0.26

Private car fuel type, national data

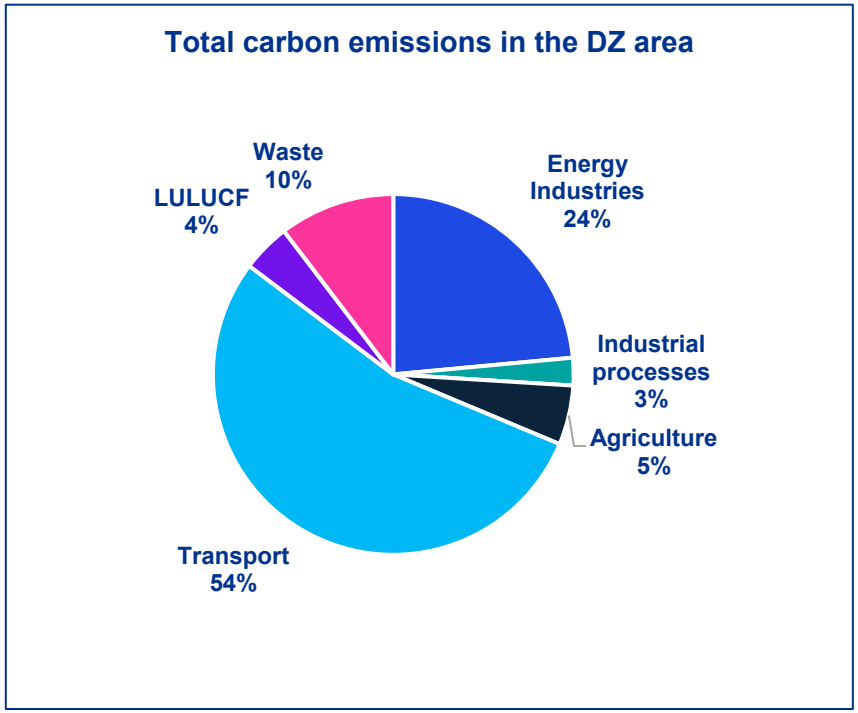
Fuel type	Petrol	Diesel	Electric	Hybrid	Other	Total
% of private cars using fuel type	29%	64%	1%	6%	0%	100%

4.14 Supporting Data: 'Top-down' Assessment Results

Top-Down Assessment of the DZ area

The EPA's MapEire database has been used to inform a 'top-down' assessment of carbon emissions within the Carrick-on-Shannon DZ area – the results of this 'top-down' analysis are shown on the chart and table below.

Note that the MapEire database does not include analysis of residential and commercial and public sector. Note that the majority of emissions associated with Energy Industries are associated with electricity generation rather than consumption of energy.



Sector	Total tCH_4	Total tCO_2	Total tN_2O	Total tCO_2e
Energy Industries	107	5,801	14	**5,922**
Industrial processes	2	587	34	**622**
Agriculture	889	59	393	**1,341**
Transport	17	13,448	126	**13,590**
LULUCF	54	922	121	**1,097**
Waste	2,429	0	181	**2,611**
Total	**3,498**	**20,816**	**868**	**25,183**