Climate Emergency Annual Report 2025: Evidence Base

- 6 December 2024
- Arthur King, Principal Climate Change Officer, Rotherham Metropolitan Borough Council

Net Zero by 2030

Emissions from the Council's Own Operations

For reporting progress towards the Council's Net Zero by 2030 (NZ30) climate change target, 'the Council's carbon emissions'[17] are taken to comprise 'scope 1' and 'scope 2' greenhouse gas emissions, plus emissions from official business travel[21]. This is the same scope boundary as applies to central government bodies' mandatory emissions accounting[11].

Scope 1 emissions are from sources directly owned or controlled by the Council, such as its corporate fleet vehicles, back-up diesel generators and mains gas heating and fugitive emissions of fluorinated gases (F-gases), from refrigeration, air conditioning units and heat pumps. Scope 2 emissions are from electricity used for street lighting and in Council buildings but may also be from other forms of purchased energy, such as heat supplied through a heat network connection. Emissions from grey fleet mileage and other business travel are examples of scope 3 emissions.

Emissions are estimated from conversion factors published by the Department for Energy Security and Net Zero[3].

1. NZ30 Emissions.

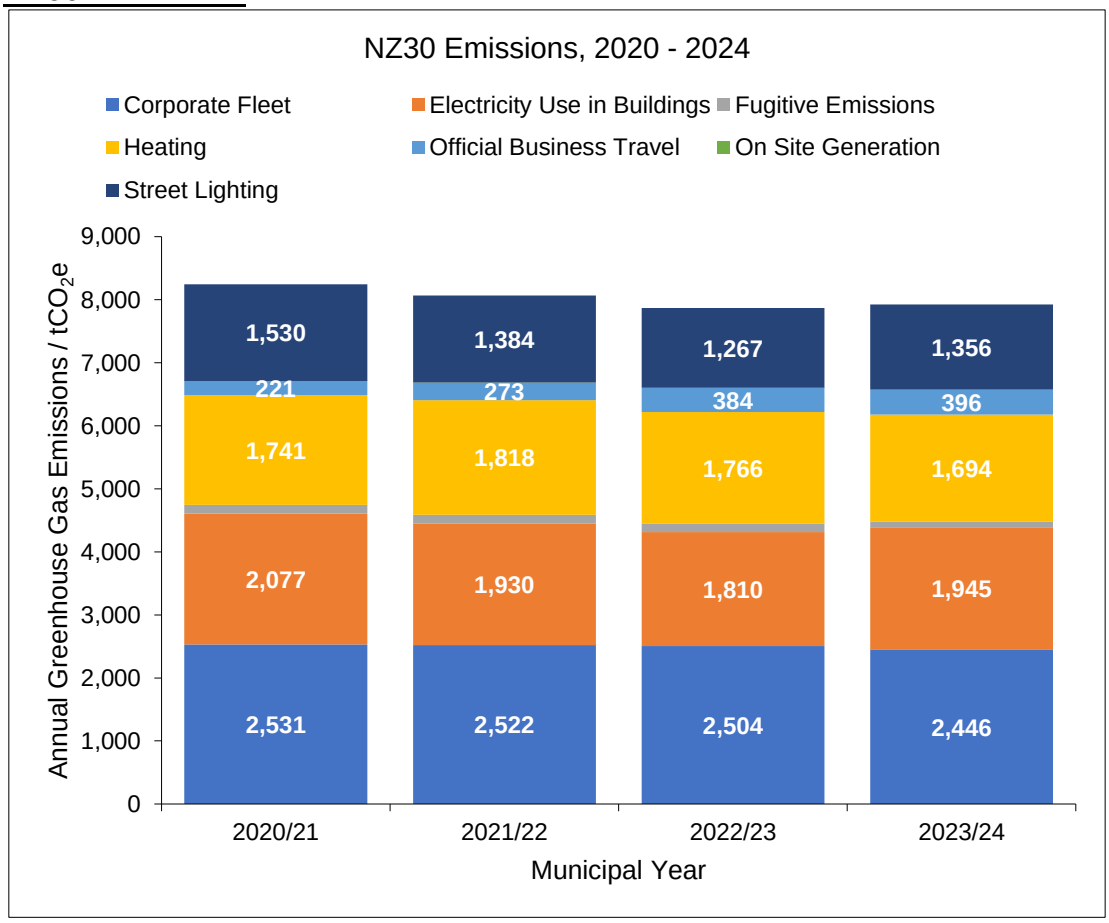


Figure 1. Annual greenhouse gas emissions within scope of the Council's NZ30 climate change target, over a municipal year reporting period. Annual NZ30 emissions have decreased 3.82% since March 2020, when the target was first set. In 2023/24, emissions increased year-on-year for the first time in four years by a little less than 1%, driven by an increase in the carbon factor for UK electricity, to **7,927 tCO_2e**.

Corporate Fleet

Greenhouse gas emissions from fuel use in the Council's corporate fleet vehicles have decreased by **3.20%**, year on year. Since the 2022/23 municipal year, emissions from petrol fuelled vehicles, tools and plant have been included within scope of these emissions and estimated retrospectively for previous reporting years, which had included just those emissions arising from the Council's fuelled sites, such as Hellaby Maintenance Depot[21].

In previous reporting years, a generic conversion factor for diesel, based on the average biofuel blend supplied at forecourts, was used to estimate corporate fleet emissions. In 2023/24, a more accurate emissions factor has been determined, reflecting the B7 blend (7% ME biodiesel, 93% mineral diesel) supplied at the Council's fuelled sites. In figure 1 above, the more accurate conversion factor is applied retrospectively to previous years' data, to present a consistent series.

A 7-month trial of HVO biodiesel in 10 corporate fleet vehicles during the 2023/24 reporting period cut emissions by ca. **80 tCO_2e**. Since scope 3 'well-to-tank' emissions are outside the scope of the Council's NZ30 target and carbon dioxide emissions from biofuels are taken to be 'net zero' in conversion factors for reporting, NZ30 emissions per litre of HVO are **98.6%** less than emissions from B7 diesel[3,21].

A Fleet Replacement Plan was presented to Cabinet in March 2023, proposing the procurement of 64 battery electric vehicles[19]. Notwithstanding the plan's continued delivery, no new electric vehicles have yet been added to the Council's corporate fleet, as the first contract lots have been to procure specialist vehicles and road-going plant, for which electric models have not yet offered an economic alternative.

Heating

Emissions from natural gas and one biomass boiler in the Council's operational estate decreased by **2.4%** year on year, as demand for heating also declined. Heat decarbonisation works at three operational sites in the Climate Change Action Plan for 2025/26 will begin to shift emissions from heating to lower carbon electricity. On the Council's present annual reporting timescales, the carbon saving from these works may not be reported until Quarter 4 of the 2026/27 municipal year.

Fugitive Emissions

Fugitive emissions of fluorinated gases (F-gases) are accidental leaks from plant and equipment such as refrigeration, air conditioning units and heat pumps (RACHP)[9,11]. Amounts of F-gases released into the atmosphere in such accidental leaks may be small, but their environmental impact is disproportionately great: common refrigerants such as R410a, a blend of two hydrofluorocarbons, have global warming potentials thousands of times greater than carbon dioxide, over an hundred-year period.

In previous reporting years, a screening method[9] provided the best estimate of emissions then available. This year, data were available from the Council's maintenance contractor to estimate fugitive emissions by a 'material balance' method for the first time: hence the step change from 138 tCO_2e each year, to **90 tCO_2e** in 2023/24. Fugitive emissions' relative importance in the Council's NZ30 emissions inventory may increase in time, as natural gas boilers are replaced by air source heat pumps. Regular inspections, servicing and maintenance can mitigate the risk of accidental leaks from RACHP equipment.

Electricity Use in Buildings

Greenhouse gas emissions from electricity use at the Council's operational sites increased by **8.3%** year on year, driven by an increase in the conversion factor for reporting emissions from UK electricity, from **0.19338**, to **0.20707** $kgCO_2e$ per kWh (**7%**)[3,21].

Greenhouse gas conversion factors for electricity are variable between years, reflecting the intermittent output of renewables, the amount of electricity imported through grid interconnectors and ongoing decarbonisation of the UK electricity system. Like other conversion factors, they are also determined in arrears: the emissions factor for the 2023/24 reporting year is derived from the carbon intensity of UK electricity in the 2021 calendar year[3].

Greenhouse gas emissions in the 2024/25 reporting year will be calculated from an emissions factor of **0.20705** $kgCO_2e$ per kWh, based on the carbon intensity of the UK electricity system in 2022.

Since the 2024 General Election, Government has brought forward its target to decarbonise the UK electricity system from 2035 to 2030, based on 95% renewable generating capacity by 2030 (with a remaining 5% 'strategic reserve' of natural gas with carbon capture and storage, in the generation mix)[16].

Street Lighting

A 7% increase in the conversion factor for UK electricity is directly reflected in the **7.0**% increase in greenhouse gas emissions from street lighting. There are additional challenges to decarbonise electricity use for street lighting compared with electricity use in buildings, since peak demand for street lighting is oppositely aligned to peak output from solar PV.

Business Travel

Business mileage claims have increased year on year, every year as working patterns have continued to change in the wake of the COVID-19 pandemic, to **396 tCO_2e** in 2023/24 (**3.9%** increase, year on year).

Other Scope 3 Emissions

Emissions from sources which are not directly owned or controlled by the Council, other than business travel, are outside the scope of the Council's Net Zero by 2030 climate change target[11,21]. However, the Council has a significant degree of influence over, and responsibility for, its scope 3 emissions, which are a measure of its wider carbon impact. In its report *Local Authorities and the Sixth Carbon Budget*, the Climate Change Committee estimated that 2-5% of emissions in their respective areas were within local authorities' direct influence or control, including emissions from councils' procurement, commissioning, and commercial activities[2]. Albeit they are outside the scope of the Council's NZ30 target, scope 3 emissions are a principal 'lever of influence' to cut local area emissions i.e., to achieve Net Zero by 2040.

Carbon dioxide emissions from bioenergy sources such as biomass wood pellets and HVO biodiesel are outside the scope even of scope 3 emissions accounting[3]. Emissions from these sources were estimated at **1,112 tCO_2e** in 2023/24.

2. Emissions by Scope.

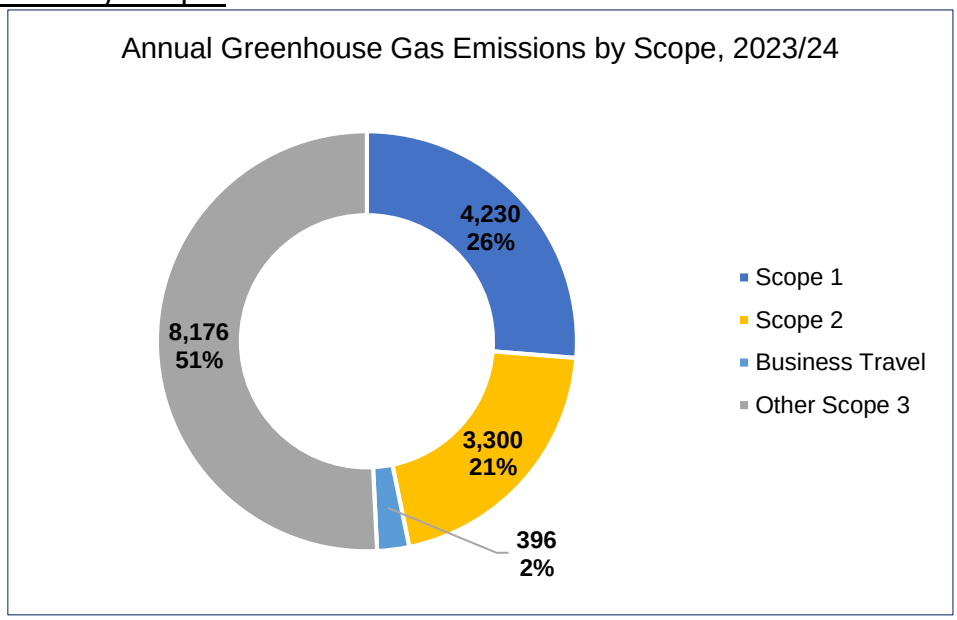


Figure 2. Greenhouse gas emissions within scope of the Council's 'Net Zero by 2030' (NZ30) target comprise scope 1 and scope 2 emissions and emissions from business travel, reflecting the scope of central government departments' mandatory emissions accounting[11]. In the 2022 calendar year, NZ30 emissions' magnitude was equivalent to just **0.56%** of local area emissions[8].

In the 2023/24 municipal year, other scope 3 emissions' magnitude was roughly equal to the combined magnitude of scope 1 and scope 2 emissions and emissions from business travel, making up some of the difference between the Council's NZ30 emissions and the minimum **2%** of local area emissions which the Climate Change Committee estimates are within scope of local authorities' direct influence or control[2].

As the Council has increased its capacity to monitor scope 3 emissions each year since Net Zero targets were adopted, few meaningful comparisons between emissions in successive years are available.

3. Scope 3 Emissions by Source.

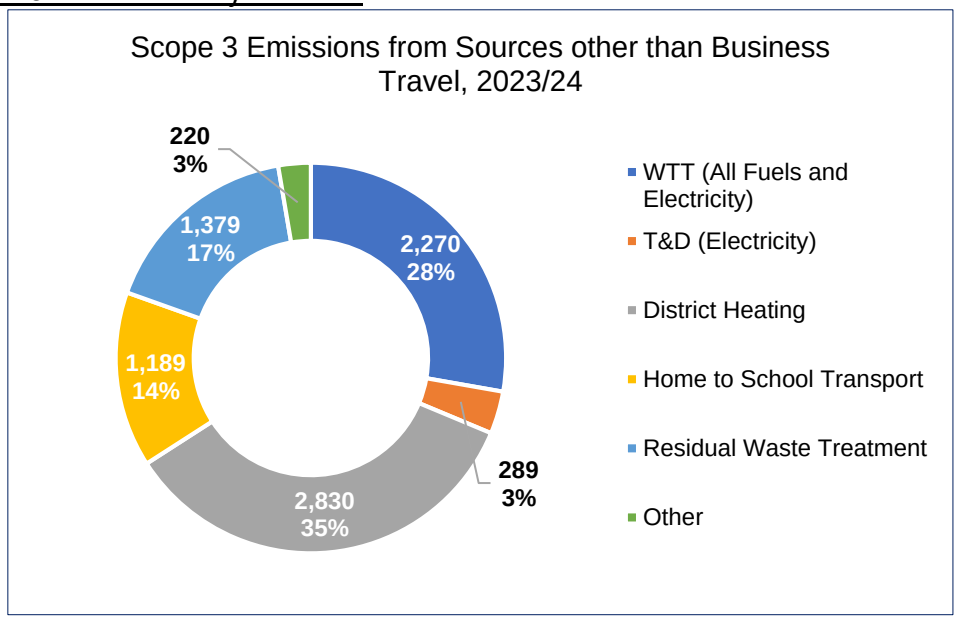


Figure 3. Scope 3 emissions from sources outside the scope of the Council's Net Zero by 2030 target comprised *ca*. **8,176 tCO_2e** in the 2023/24 municipal year.

WTT indicates so-called 'well-to-tank' emissions, which measure the upstream carbon impact of fuels' processing and supply chains, including sources of bioenergy and the fuel mix used to generate UK electricity. T&D indicates emissions associated with transmission and distribution losses from the UK electricity system. Other emissions include those from water supply and treatment, third party EV charging, bereavement services and other gas and electricity use, such as in pupil referral units and sheltered housing.

Scope 3 conversion factors for waste incineration and recycling only reflect the average emissions from transporting waste to a downstream waste treatment facility[3]. Since fuel use in the Council's refuse collection vehicles is already reported within scope 1 and less than 1% of all residual waste collected by the Council goes to landfill, using these conversion factors would lead to double-counting. Emissions from residual waste treatment in figure 3 above are reported as scope 3 emissions under the Council's contract with BDR Waste Partnership.

There are 21 existing, combined heat and power district heat networks serving Council homes in Rotherham, of which 18 are fuelled with natural gas, three with biomass in the form of wood pellets.

Some children and young people with special educational needs and disabilities qualify for home to school transport (HST), provided by the Council in its own vehicles or commissioned from external providers. Fuel use in the Council own vehicles is reported under scope 1: scope 3 emissions above are estimated from HST routes served by external providers.

Themes: *Responding to the Climate Emergency*

Local Area Emissions

UK greenhouse gas emissions as reported in the National Atmospheric Emissions Inventory are assigned to local areas in a series of *Local Authority and Regional Greenhouse Gas Emissions Statistics*, published by the Department for Energy Security and Net Zero[8]. There is a two-year lag in the preparation of these statistics, such that annual greenhouse gas emissions for the calendar year 2022 were published in June 2024. Emissions are assigned to local areas by a method which varies between sectors e.g., emissions from electricity are assigned by end-user, emissions from transport, by modelled use of road and rail networks. To date, these statistics have been used to monitor emissions within scope of the Council's 'Net Zero by 2040' climate change target, but the Council may wish to investigate alternative or supplementary measures reflecting e.g., the degree of influence the Council has over local area emissions (see figures 5a and 5b, below).

Energy, Transport, Housing and Waste are the four sectors identified by the Climate Change Committee, in which local authorities hold levers to influence greenhouse gas emissions within their respective areas[2].

4. NZ40 Emissions by Calendar Year, 2005 – 2022.

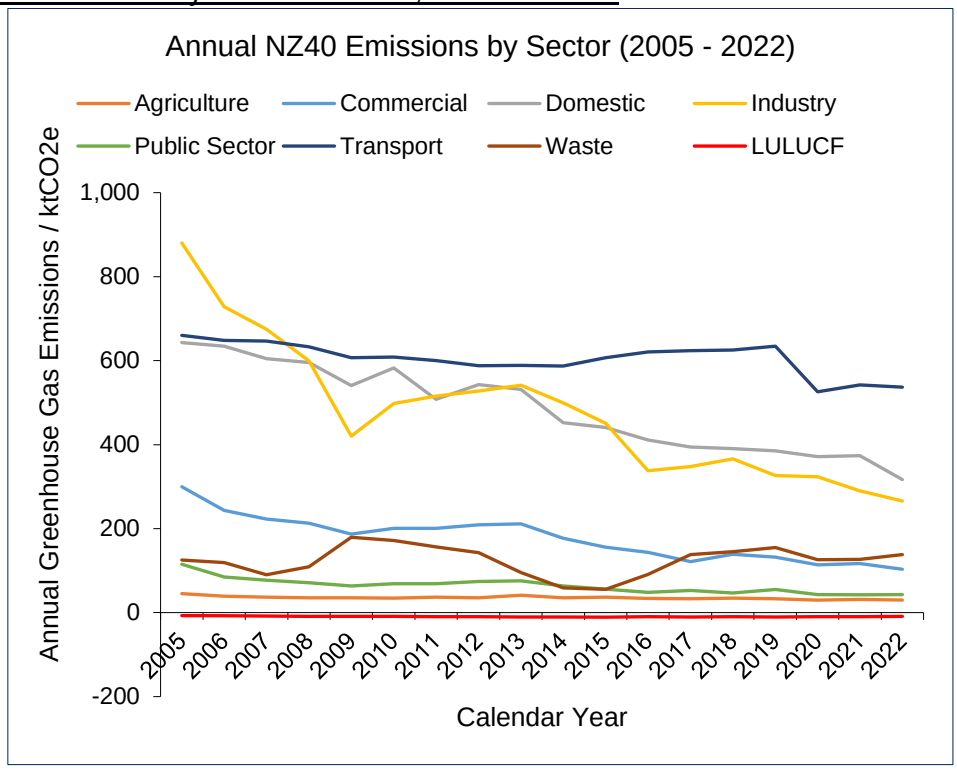


Figure 4a. Local area greenhouse gas emissions in the Borough of Rotherham i.e., emissions within scope of the Council's Net Zero by 2040 climate change target, had decreased **48%** from a 2005 baseline by 2022, the latest year for which *Local Authority and Regional Greenhouse Gas Emissions Statistics* were available.

Emissions from transport decreased in 2020, as the COVID-19 pandemic precipitated social changes and working practices which continue to affect demand for travel. Similarly, though emissions from industry have fallen

consistently over the last twenty years with the phase out of coal from the UK energy mix, their steepest decline was in 2009, as industrial output slowed in the aftermath of the 2008 financial crisis and subsequent recession.

Emissions from the 'LULUCF' (Land Use, Land Use Change and Forestry) sector are net negative, principally because woodland and grassland sequester carbon in soils and living biomass. Between 2005 and 2022, net negative emissions' magnitude was equivalent to *ca*. 1.25% of 'gross' emissions.

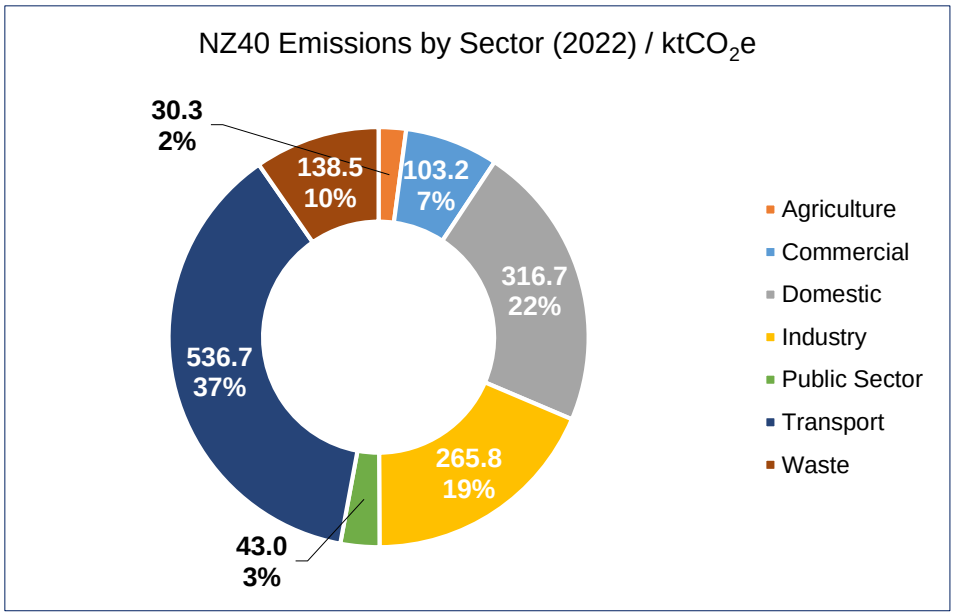


Figure 4b. Transport has remained the single greatest source of emissions in Rotherham since 2008, albeit emissions from natural gas and electricity use by industry, in the commercial and public sectors and in domestic settings could all be identified with the single 'Energy' theme, adopted by the Council in its Climate Change Annual Reports.

Net negative emissions from Land Use, Land Use Change and Forestry are not represented in Figure 4b, above. Sectors' relative contributions to NZ40 emissions are represented as percentages of total emissions from all non-LULUCF sectors. This measure is not the same as total 'gross' emissions, since it excludes gross emissions from the LULUCF sector (comprising 15.1 $ktCO_2e$, in 2022[8]).

Just 2% of NZ40 emissions are from agriculture, despite agricultural land comprising 53% of the Borough's area[10]. This partly reflects the chosen measure of territorial emissions: according to the *IMPACT Community Carbon Calculator*, emissions from food and diet comprise about 22% of all *consumption-based* emissions in the Borough of Rotherham[1].

5. Local Area Emissions within Scope of the Council's Influence.

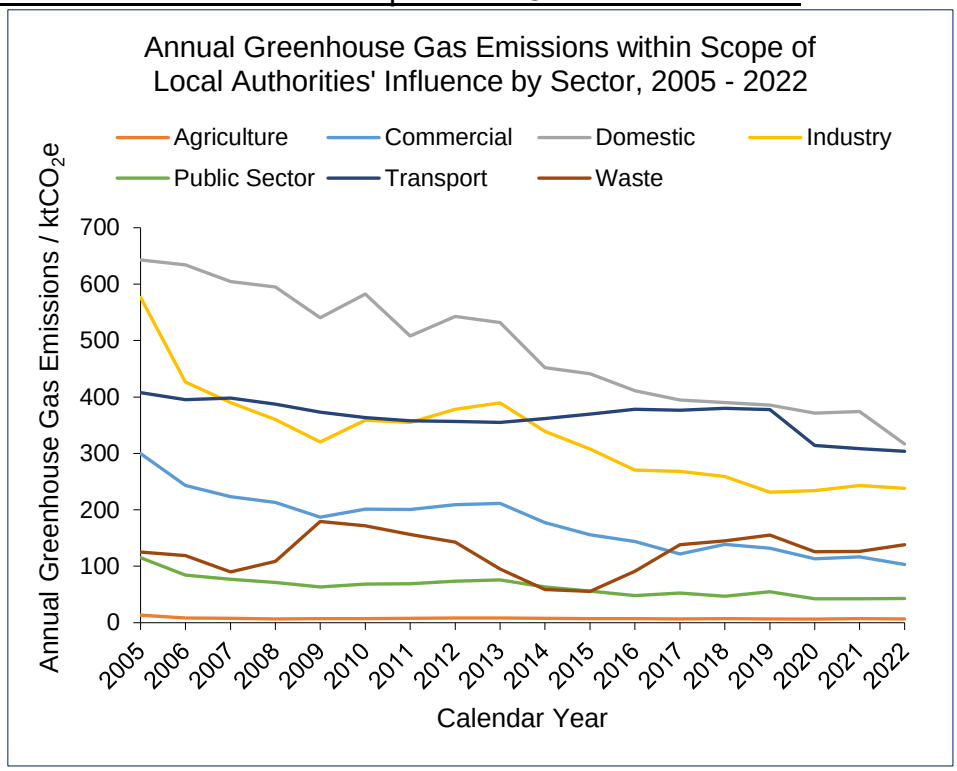


Figure 5a. *Local Authority and Regional Greenhouse Gas Emissions Statistics* exclude emissions from large industrial sites, travel on railways and motorways, land use, livestock and soils from the scope of local authorities' influence[8]. This leaves *ca*. 80% of emissions in the Borough of Rotherham within scope of the Council's influence: more than two times the level proposed by the Climate Change Committee in its report *Local Authorities and the Sixth Carbon Budget*[2].

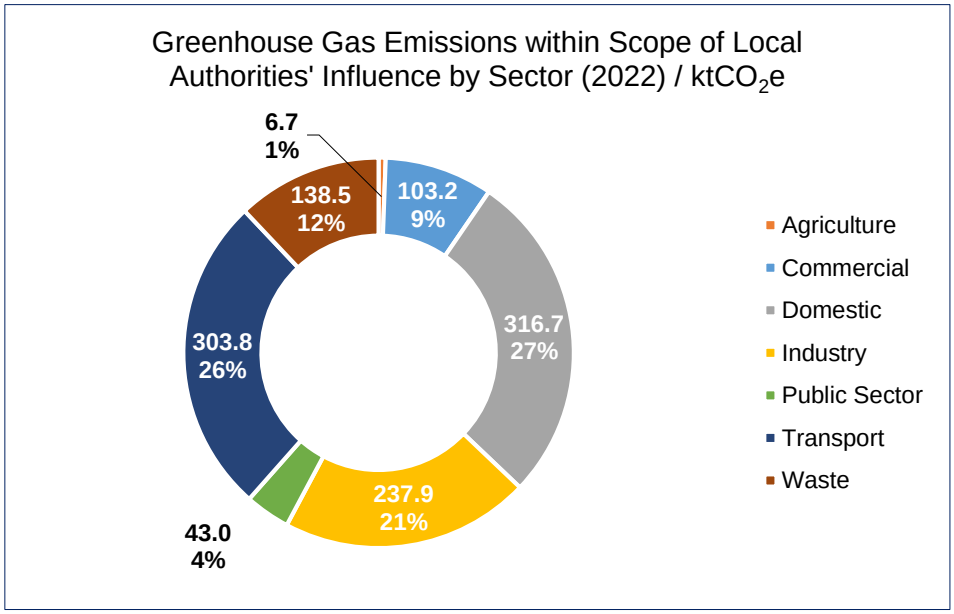


Figure 5b. This discrepancy (between the scope of local authorities' influence, as reckoned by the Climate Change Committee *versus* that implied by Local Authority Emissions Statistics: see figure 5a, above) may be partly explained by the limits of the Council's regulatory and other powers, in sectors where it

nonetheless holds some 'levers of influence'. For example, excluding travel on railways and motorways from the scope of local authorities' influence makes domestic energy use appear the single greatest source of local area emissions; however, the Council can only imperfectly influence those emissions which remain from travel on the local road network, notwithstanding its powers as a local highway authority alongside SYMCA.

6. Carbon Budgets for Rotherham.

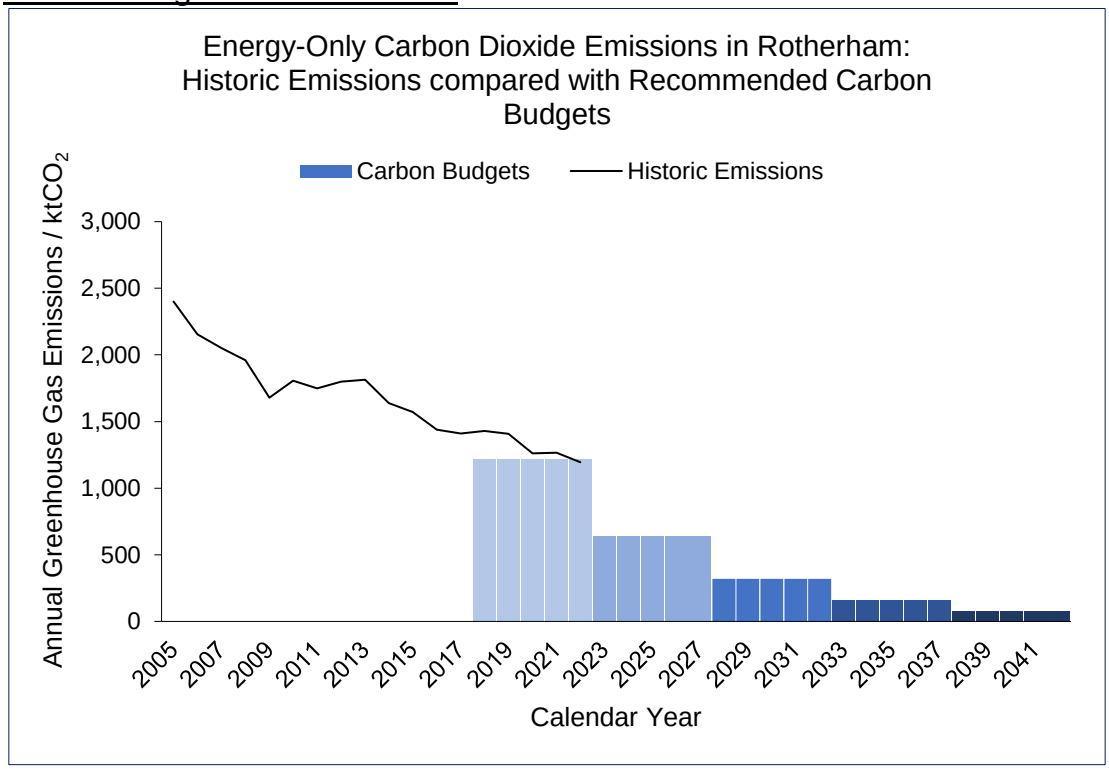


Figure 6. When Cabinet adopted the Policy Statement *Responding to the Climate Emergency*, research published by the Tyndall Centre for Climate Research was referenced in setting the Council's Net Zero by 2040 climate change target[12,17]. To inform climate action by local authorities, the research sought to determine local authority areas' respective, proportionate contributions to mitigating climate change, limiting global average temperature increases to within 2°C of pre-industrial average temperatures (66% confidence)[12].

An output of this research was to recommend five-year carbon budgets. Unlike figures 4a - 5b above, past local area emissions and future carbon budgets in figure 6 are for carbon dioxide (CO_2) emissions from energy use only: CO_2 emissions from soils, methane from landfill etc. are excluded. Annual emissions were within a recommended level in just one of five years in the 2018 - 2022 carbon budget period[8], implying steeper cuts in future if the Borough is to stay within its total, recommended carbon budget.

Agreeing the Council's own carbon budgets for local area emissions, aligned e.g., with the duration of its corporate plan, would provide interim targets against which to measure the progress of local climate action, with due focus

on the physical reality of atmospheric carbon budgets: the original motivation for local climate action.

Energy

Emissions from energy use are assigned to local authority areas by end-user[8]. Domestic and commercial energy use, energy use by industry and by the public sector principally comprise electricity use and natural gas, albeit some coal remained in Rotherham's energy mix by 2022[7]. Bioenergy and energy from waste have increased their share of local energy supply, from 0.2% in 2005, to 4.2% in 2022[7].

Local area energy consumption figures for the Borough of Rotherham presented below are prepared from a sub-national statistical release by the Department for Energy Security and Net Zero[7]. Domestic energy consumption and the transport sector are included, notwithstanding the separate Transport and Housing themes in the Council's Climate Change Action Plan.

7. Local Energy Demand.

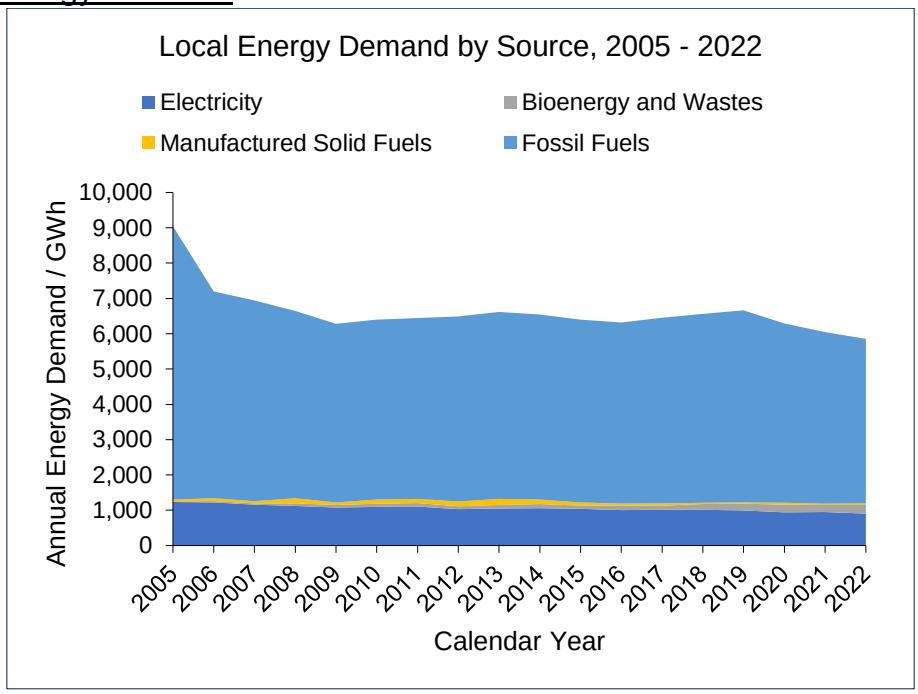


Figure 7a. Local energy demand was broadly unchanged over much of the last two decades, after an early decline. A more recent decline since 2020 has been driven first by decreasing energy use for transport, as social distancing restrictions introduced in response to the COVID-19 pandemic affected demand for travel; then, as demand for travel partly recovered, a cost-of-living crisis precipitated by war in Ukraine, volatile international energy prices and high inflation, which has suppressed domestic energy consumption: see figure 7c, below.

Throughout these changes in local energy demand, the balance between electricity and fossil fuels in the local energy mix has remained almost constant: see figure 7b, below. Much of the cut to local area greenhouse gas emissions since 2005 has been delivered by the phase out of coal generation from the UK electricity system and an early, lasting decline in industrial energy demand.

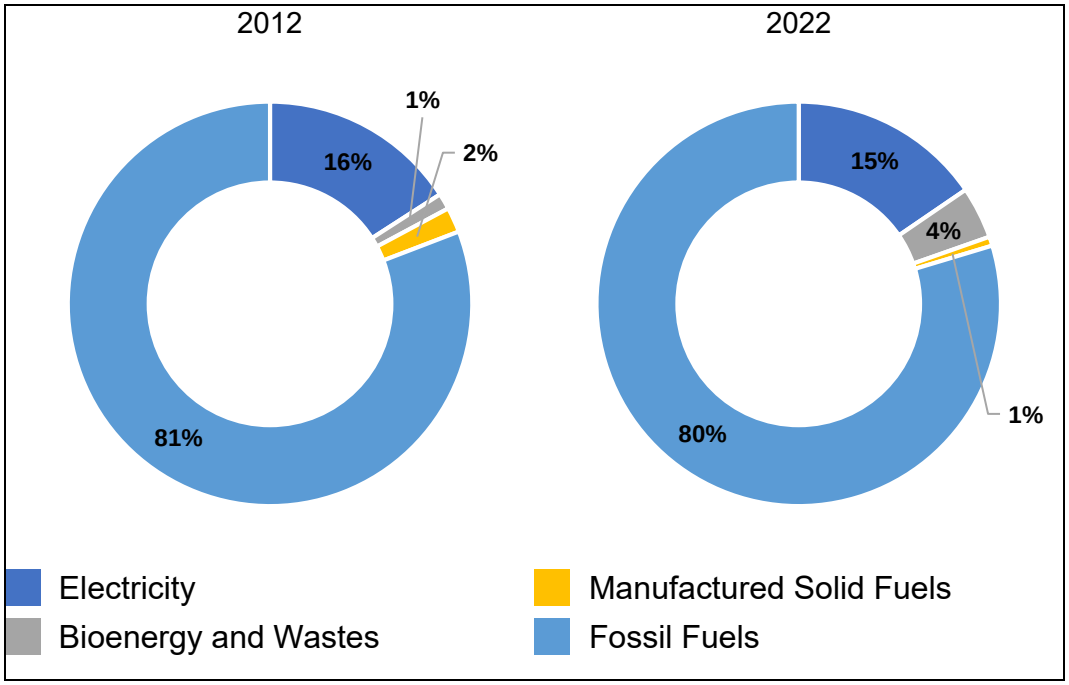


Figure 7b. Fossil fuels' relative contribution to local energy demand has consistently been *ca*. 80%, over much of the last two decades. Cutting greenhouse gas emissions in the Borough of Rotherham to Net Zero by 2040 will require large-scale electrification of industrial processes, domestic and commercial energy use and transport, decarbonisation of the UK electricity system and increased, local renewable electricity generation.

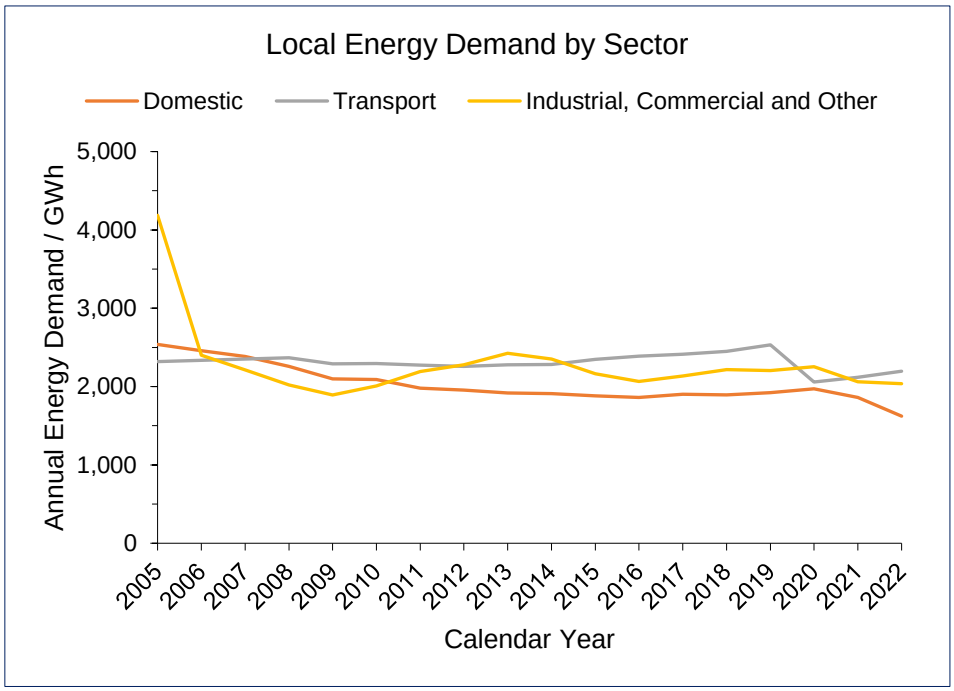


Figure 7c. Annual domestic energy demand was broadly unchanged over much of the last two decades, at 1,981 and 1,973 GWh in 2011 and 2020, respectively: a more recent decline since 2020 was associated with decreasing demand for natural gas, partly in response to pressures on the cost of living.

Energy use followed a similar trend in the transport sector, increasing slightly up to 2019 before a steep decline, as demand was affected by the COVID-19 pandemic. Energy use for transport had not recovered to its pre-pandemic level by 2022, the last year for which data were available. Other sectors have been more variable, though falling industrial energy demand appears to coincide with actual or narrowly avoided recessions, in the UK economy.

8. Existing and Planned Renewable Energy Infrastructure.

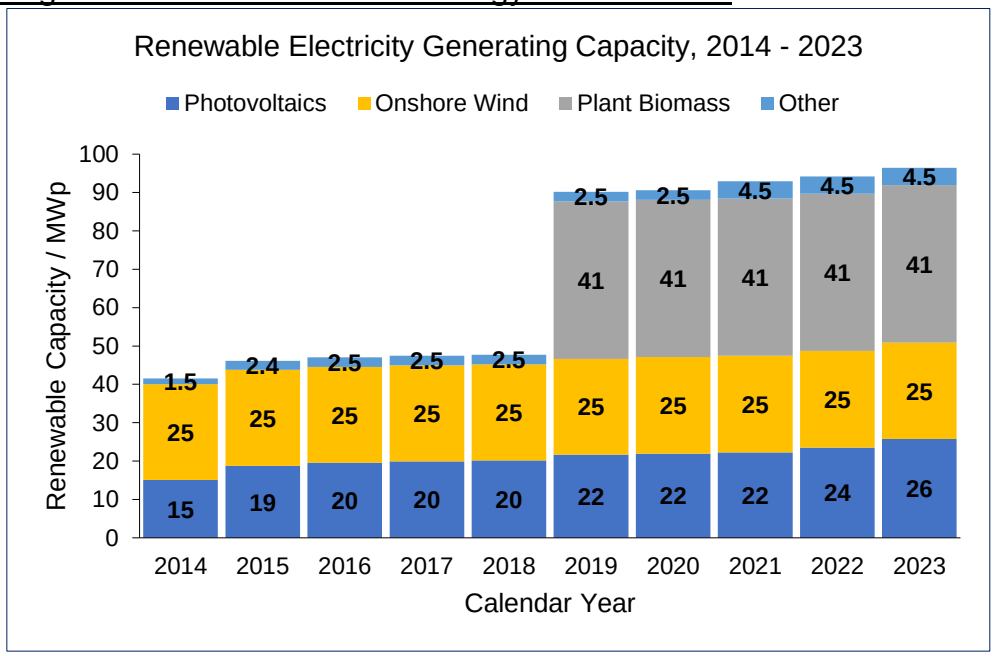


Figure 8. There are three existing onshore wind installations with a capacity greater than 150kW in the Borough of Rotherham, at the Advanced Manufacturing Research Centre, Penny Hill Lane and Loscar Farm, with a combined peak capacity of 25MW[5,6]. In 2019, the Templeborough Biomass Power Plant came online[6]. 'Other' sources of renewable electricity in the Borough include hydropower, landfill gas and anaerobic digestion[5].

Solar PV capacity has crept up over the last decade, as the number of micro-generation installations has increased from *ca*. 4,200 in 2014, to *ca*. 7,000 in 2023[5]. Six additional solar PV installations each with a capacity greater than 150kW are awaiting construction or seeking planning approval, including a proposed 49.9 MW installation at Common Farm, near Dinnington[6].

There are two operational Battery Energy Storage Systems in the Borough, with a combined capacity of *ca*. 50MW, which are not included in the above figure[6].

Energy Source	**Number of Sites**	**Combined Capacity / MW**
Solar PV	6	53
'Advanced Conversion Technology'	1	23
Battery Energy Storage System	4	76
Total	**11**	**152**

Table 1. Planned renewable electricity generating capacity: planning applications and sites with planning consent but awaiting construction, in the Borough of Rotherham. Not all sites identified in the Renewable Energy Planning Database[6] have a stated capacity, hence combined capacities in the table are lower bounds.

During the preparation of this evidence base, a Nationally Significant Infrastructure Project application was received for a 750MW solar development with associated battery storage, to connect to the National Grid at Brinsworth, in the Borough of Rotherham. Potential sites for solar and associated infrastructure identified in consultation documents are all within the Council's local authority boundary, except for land at Conisbrough Parks, which falls within the Borough of Doncaster. Notwithstanding the outcome of the NSIP application in this case, development on such a scale would increase local renewable generating capacity to more than seven times its existing level.

Transport

9. Emissions by Transport Mode.

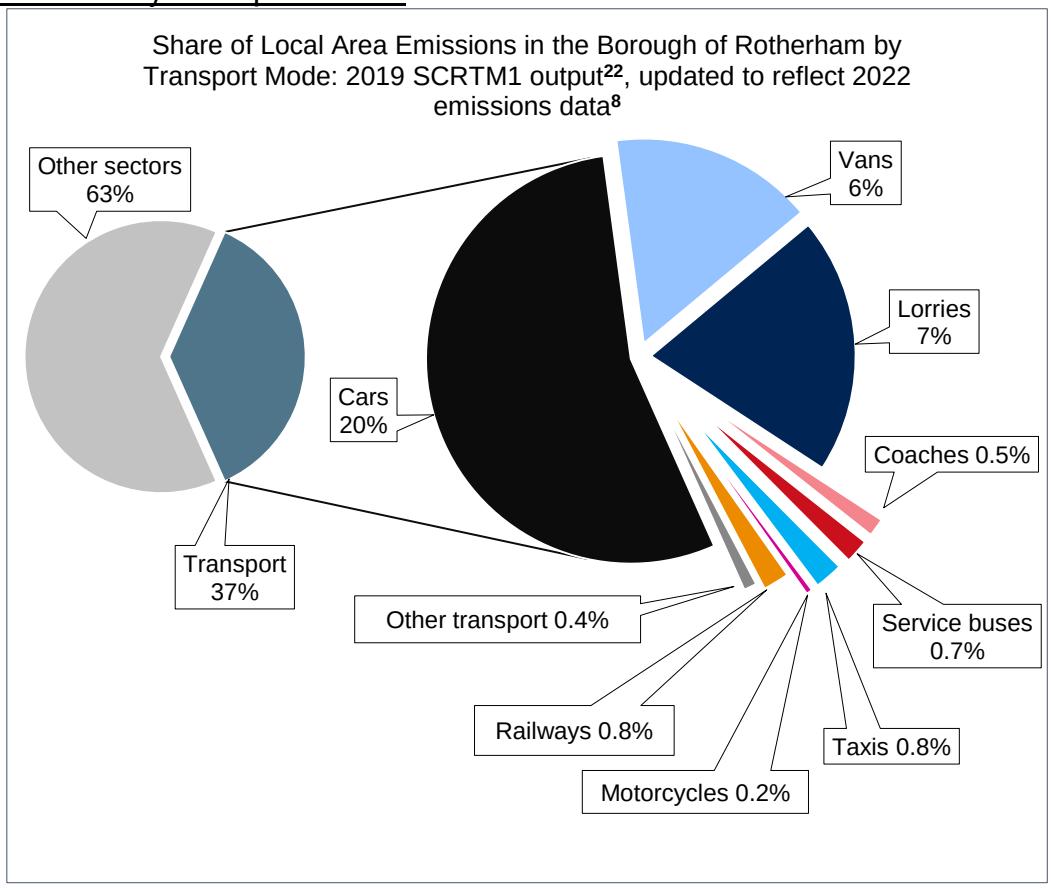
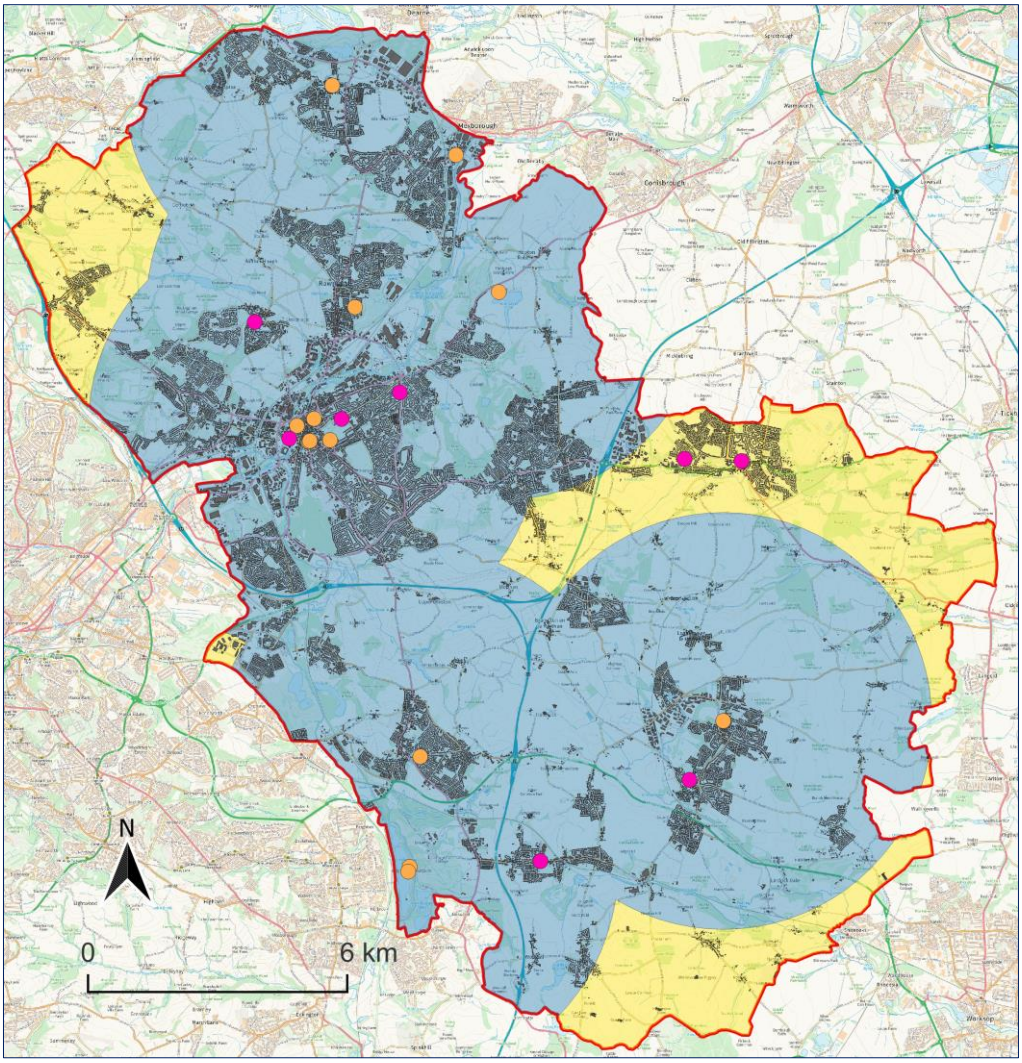


Figure 9. Transport modes' respective contributions to local area emissions in the Borough of Rotherham: an output from the Sheffield City Region Transport Model (SCRTM1)[22]. Funding has been agreed to develop an updated model, whose procurement is being led by SYMCA. According to SCRTM1, **54%** of all emissions from transport are from car travel: equivalent to **20%** of all emissions in the Borough of Rotherham.

Whereas other local area emissions are assigned by end-user, emissions from transport are assigned to the local road or rail network[7]. This means that a large share of transport emissions in Rotherham is from trips which pass through the Borough[22], limiting the Council's ability to influence them.

A further model output from SCRTM1 shows that trips less than 10 km long contribute only **17%** of road transport emissions in the Borough[22]. Notwithstanding the additional benefits of active travel, a greater carbon saving may be available from trips which could not reasonably be made by bicycle or on foot.

10. Existing and Proposed Extent of Public Electric Vehicle Charging Infrastructure.



Map Symbol	Key
●	Existing, Council-owned, public EV charge point.
●	Additional EV charge point location as previously approved[20].
	Area within 3 miles of the Council's existing network.
	Additional coverage provided by an extended network.
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Figure 10. 100% of residences in the Borough of Rotherham would be within 3 miles of a public, Council-owned EV charge point, if additional charge points were commissioned at all locations suggested in a Cabinet report of 16 October 2023[20]. Actual coverage will be reviewed following the commissioning of the sites above which at the time of writing are on track for delivery by March 25.

Housing

Emissions from domestic energy use are included within scope of the Energy theme, above: the Housing theme instead concerns homes' energy efficiency. The Council is a large social housing provider, with a total stock of nearly 20,000 homes: at the 2021 Census, 16.7% of households in the Borough of Rotherham rented from the Council[14]. The Council has additional responsibilities for the condition and supply of housing in the Borough, including the enforcement of minimum energy efficiency standards for private rented homes.

11. EPC Ratings Less Than Band C per LSOA in the Borough of Rotherham.

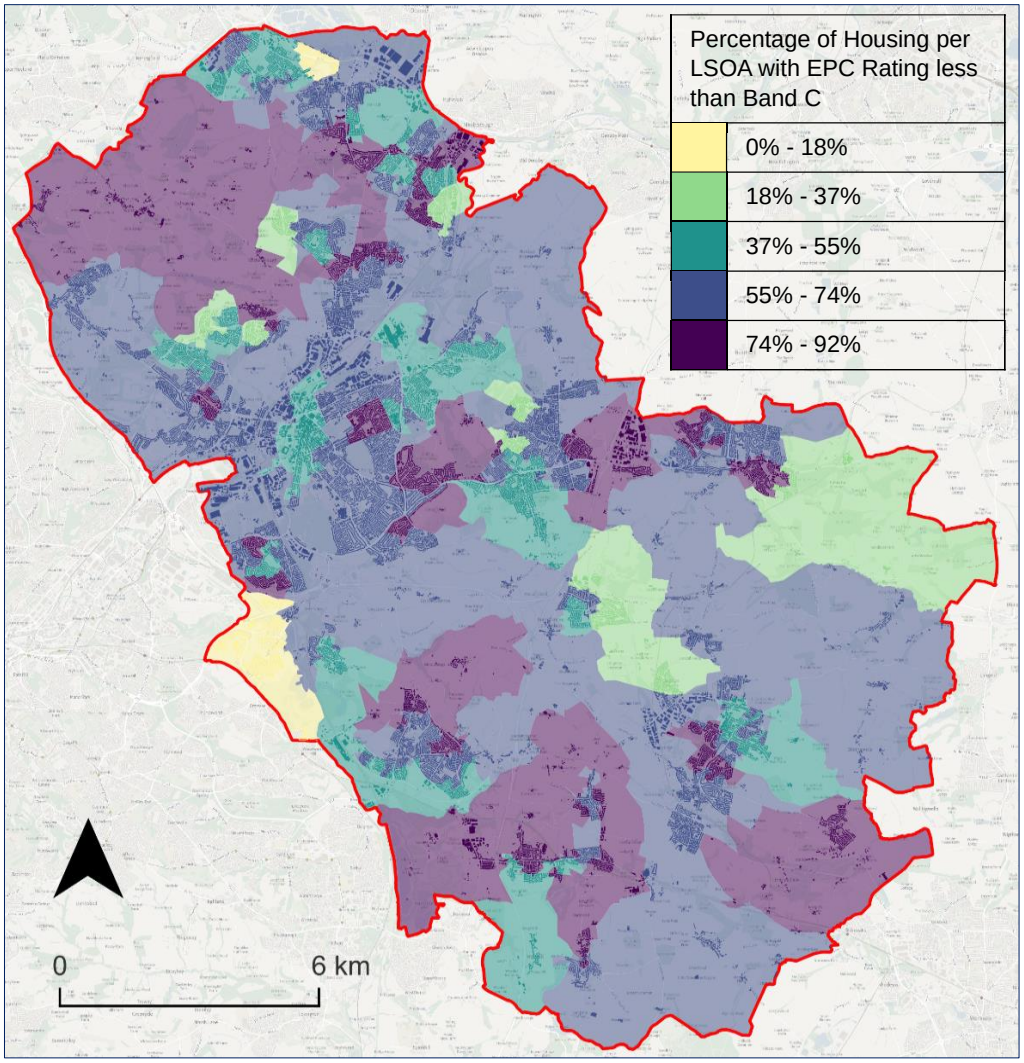

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Figure 11. Percentage of housing per LSOA in the Borough of Rotherham with an EPC rating less than band C[15]. Households with an EPC rating less than band C are compared with the total number of EPC 'lodgements' over a 10-year period up to March 2023, to determine a percentage rate in each LSOA. By this measure, **58.62%** of homes in the Borough have an EPC rating less than band C.

Not all housing in each LSOA has a valid EPC. EPCs are valid for 10 years and are required when a building is constructed, sold or let. EPC bands are determined at the time an EPC assessment is completed: a dwelling's actual energy performance may be affected by any subsequent alterations, most of which do not require a new EPC assessment.

Government has committed to consult on increasing minimum energy efficiency standards for private and social rented homes to EPC band C, by 2030[4]. Energy efficient building fabric is a pre-requisite for cost-effective air source heating, one of the principal alternative technologies available to replace natural gas boilers in domestic settings.

12. Council-Owned Homes.

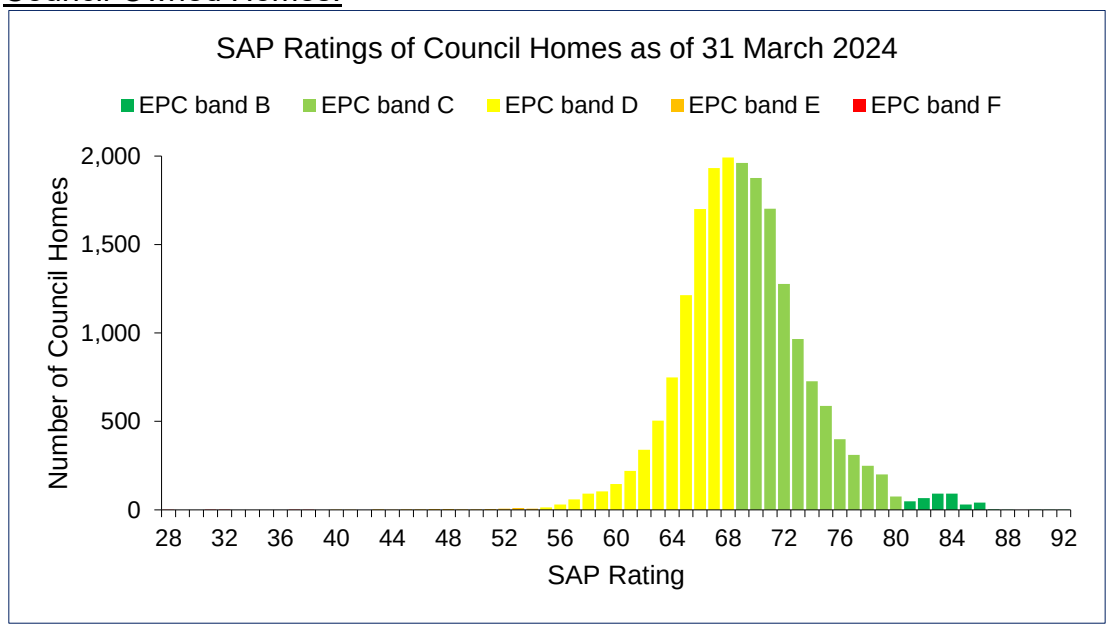

Figure 12. Distribution of Council homes' SAP scores (standard assessment procedure scores, from which EPC bands are determined) grouped by EPC band, as of 31 March 2024. There were too few homes rated less than band D to be viewed clearly in the figure above: 59 were rated EPC band E, 7 were rated band F. **54%** of homes were rated EPC band C or above. The Council is committed to increasing the energy performance of the remaining 46% of its housing stock to at least EPC band C, by 2030.

Energy performance upgrades to Council homes have been delivered under previous Climate Change Action Plans. Retrofitted triple glazing, external doors, insulation and energy efficient boilers had an estimated carbon saving of 1.5 tCO_2e (37%) per household in the first year, in 217 Council homes in The Lanes, East Dene. External wall insulation, loft and cavity insulation and A-

rated windows and doors installed at an additional 130 Council homes in Maltby saved an estimated £400 each from households' energy bills, based on prices in the same year. The Council has applied to the Warm Homes: Local Grant, to fund further retrofit works on Council homes.

Waste

Local area emissions from waste principally comprise emissions of methane, as a component of landfill gas: other emissions from waste are assigned to other sectors e.g., emissions from waste incineration for energy recovery are counted as emissions from electricity generation[8]. Emissions from landfill are assigned to the local area where the waste has been produced, therefore some emissions from landfill sites outside Rotherham are nonetheless assigned to the Borough. Emissions include those from past disposals to landfill, to account for the continuing degradation of organic material. Methane and nitrous oxide emissions from sewage treatment are also assigned to the waste sector[8].

Since the Council varied its residual waste contract to incentivise diversion from landfill, very little waste collected by the Council has been disposed to landfill[18]. There may be few, additional opportunities for the Council to cut NZ40 emissions from waste. Historic landfill sites in Rotherham might not have been capped with compacted clay to such a standard as recommended by current practice, which could mean that fugitive emissions of landfill gas are able to escape from those sites. However, the cost of re-capping any such site would be prohibitively expensive, while all historic landfills in the Borough that were previously operated by the Council already flare landfill gas, to remove its methane fraction by combustion. There may be opportunities to influence producers of waste in the Borough, so that less waste is sent to landfill.

13. Recycling and Contamination

Municipal Year	Contamination Rate	Recycling Rate	Effective Recycling Rate
2015/16	7.80%	40.90%	37.71%
2016/17	7.40%	42.10%	38.98%
2017/18	5.30%	43.60%	41.29%
2018/19	1.00%	44.60%	44.15%
2019/20	5.40%	45.40%	42.95%
2020/21	7.70%	43.30%	39.97%
2021/22	6.70%	45.00%	41.99%
2022/23	6.40%	44.50%	41.65%

Table 2. Household recycling and contamination rates in the Borough of Rotherham, as reported by Oflog (the Office for Local Government) in its Local Authority Data Explorer[13]. An effective recycling rate is also presented, calculated by adjusting the overall recycling rate to account for material presented for recycling which could not be recycled i.e., contamination. Recycling rates have only an indirect bearing on local emissions from waste: their principal carbon impact is from avoided primary material production, albeit recycling processes themselves may be carbon intensive.

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