Appendix 1

Cambridgeshire County Council

Annual Carbon Footprint Report

April 2022 – March 2023

This is the Council's Fifth Annual Carbon Footprint Report.

Updated 10 January 2024

www.cambridgeshire.gov.uk/climate-change

Contents

1. Introduction

1.1 About this report

This is Cambridgeshire County Council's annual carbon footprint report for the period April 2022 to March 2023. This report examines both the carbon footprint of Cambridgeshire County Council as an organisation (for the financial year 1 April 2022 to 31 March 2023), and also that of the geographical area of Cambridgeshire as a whole (for which the most recent data available is the calendar year 2021).

Cambridgeshire County Council updated its Climate Change and Environment Strategy in 2022, setting a number of targets relating to reducing greenhouse gas emissions, including reducing the Council's own 'scopes 1 and 2' (direct) emissions to net zero by 2030, reducing 'scope 3' (indirect) emissions by 50.4% by 2030, and to deliver net zero for the county of Cambridgeshire by 2045. In order to monitor progress against these targets, it is necessary to measure the Council's carbon footprint each year.

Recovering from COVID-19

Two years ago, 2020-21, was an exceptionally unusual year. The global COVID-19 pandemic led to nationwide lockdowns, reduced travel and changed ways of working for many people, combined with unprecedented demands on public health and social care services. Greenhouse gas emissions globally fell 4% during that year and carbon reductions were also experienced both in Cambridgeshire and across the UK. Last year in 2021-22, as we started to recover from the impacts of COVID-19, there were inevitably some increases in emissions in 2021-22, compared to 2020-21, as services began to return to pre-pandemic levels. This year in 2022-23, that journey of a gradual return to normality has continued.

1.2 What is a carbon footprint?

A carbon footprint is a measure of greenhouse gases (GHGs) emitted into the atmosphere. The most common GHG is carbon dioxide (CO_2), which makes up around 80% of UK GHGs. Other GHGs such as methane (CH_4) or nitrous oxide (N_2O) are measured in 'carbon dioxide equivalent' (CO_2e), which takes into account the different global warming potential (GWP) of different gases.

GHGs are produced by a variety of activities, including energy generation (burning fossil fuels such as coal, oil and gas), transport (burning fossil fuels like petrol and diesel), agriculture (such as methane from livestock and nitrous oxide from fertilisers), waste management (such as methane from landfill sites) and land use (such as carbon loss from soil erosion or deforestation).

We can measure the carbon footprint of a geographical area, or of an organisation, or of a product or an activity. In this report we have included both the carbon footprint of Cambridgeshire County Council as an organisation, and that of the geographical area of Cambridgeshire.

Nationwide, emissions of CO_2 make up about 80% of GHG emissions, with the remainder from methane (12%), nitrous oxide (5%) and fluorinated gases (3%), when weighted by GWP, as shown in Figure 1.

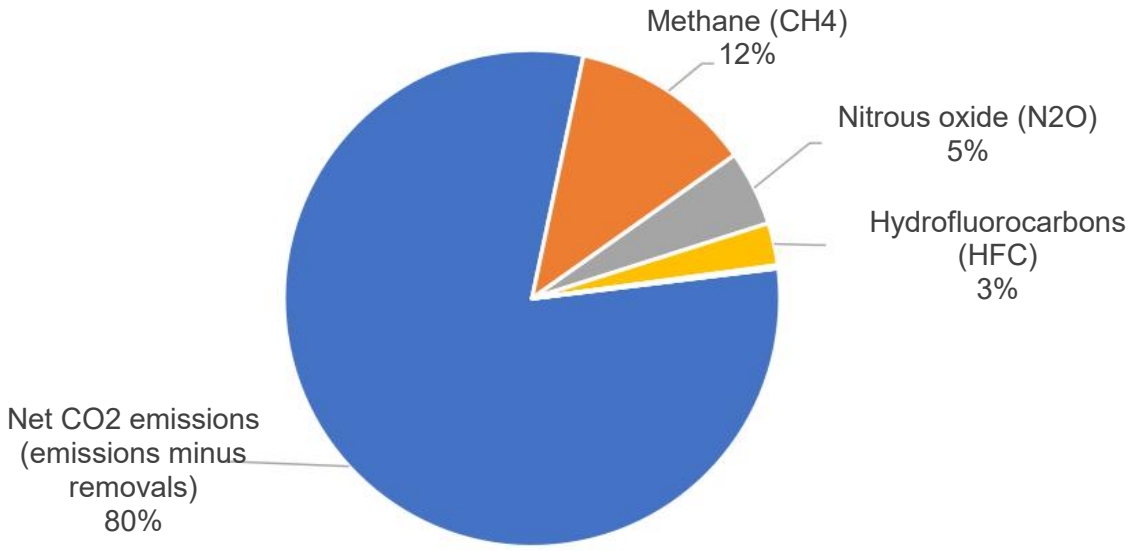

Figure 1: UK-wide Greenhouse Gas Emissions, 2019, by type of gas (tonnes CO_2e) (data from BEIS)

1.3 What are scopes 1, 2 and 3?

Emissions-releasing activities of organisations are classified in the GHG Protocol Corporate Standard into three groups known as scopes. These are described in Table *1* and illustrated in Figure 2 below.

Table 1: Scopes

Scope	Description
Scope 1 (Direct)	Emissions that occur directly from sites or assets owned or controlled by the organisation (e.g. gas boilers at own premises, fleet vehicles).
Scope 2 (Energy indirect)	Emissions from purchased electricity, heat or steam.
Scope 3 (Other indirect)	Emissions that occur due to the organisation's activities / products / services, but at assets not owned or controlled by that organisation (e.g. travel in employee-owned vehicles or public transport, purchased goods and services).

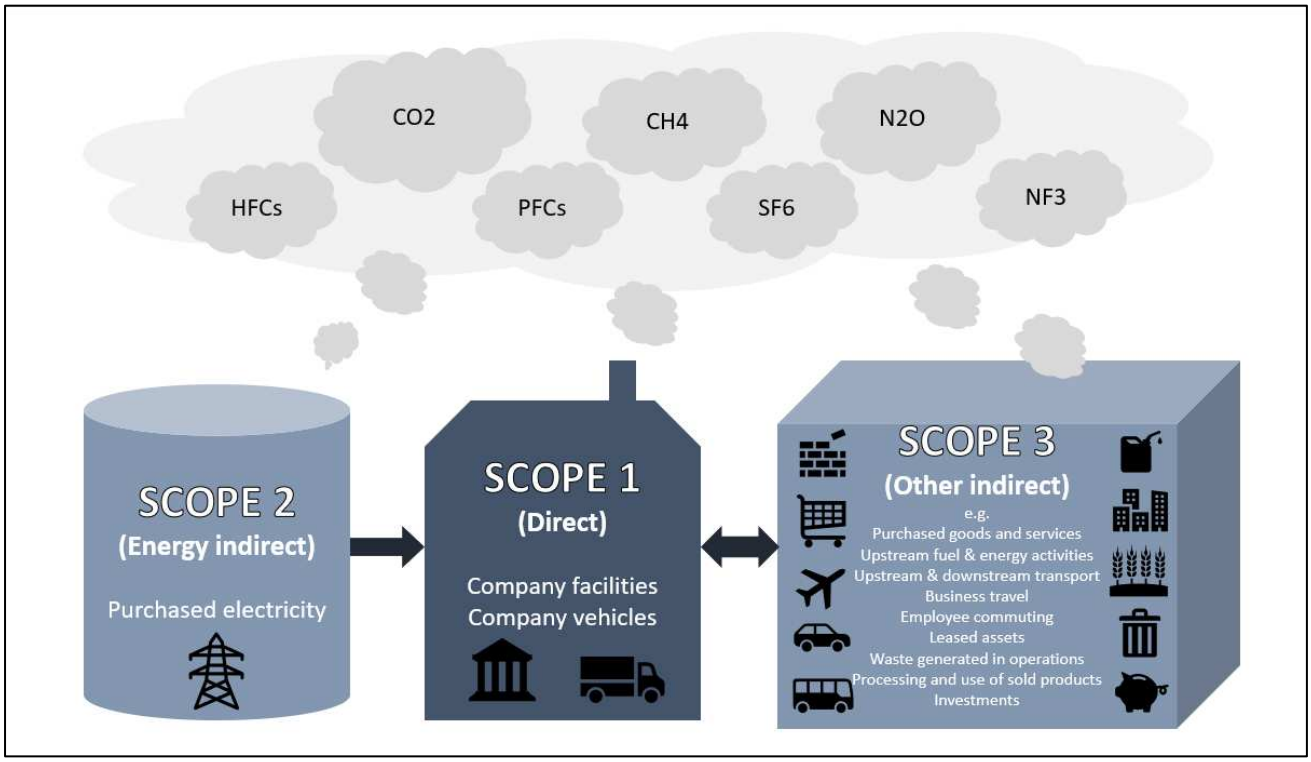

Figure 2: Diagram of scopes 1, 2 and 3 GHG emissions

Activities in all three scopes have been included in this report. However, Scope 3 emissions are more difficult to account for, because the required data often lies with other organisations. As a result, there is a higher degree of estimation in the scope 3 categories.

The vast majority (99%) of the Council's GHG emissions fall under 'scope 3', which means these are indirect emissions from assets outside of the Council's direct control.

1.4 Reducing our carbon footprint

Cambridgeshire County Council's Climate Change and Environment Strategy and Action Plan sets out the work we are already doing, and plan to do, to reduce our impact on the climate and on nature.

The Council has already taken a variety of measures to reduce our carbon footprint. For example, our programme of low carbon heating works has already reduced our scope 1 carbon emissions, and these will reduce further over the next few years, as we replace gas and oil heating with low carbon air source heat pumps at more sites. We have already decarbonised 22 of our buildings and are working on more this year. An example of one of these projects is shown in case study 1 below.

CASE STUDY 1

– LOW CARBON HEATING AT HUNTINGDON COMMUNITY CENTRE

Technologies installed	Strebel air source heat pumps
Total project cost	£353k
Grant funding obtained from the Public Sector Decarbonisation Scheme	£271k (covered 77% of project costs)
Project status	Completed October 2021
Estimated carbon saving	33 tonnes CO_2e per year

Scope 1 emissions have also been further reduced by swapping diesel for Hydrotreated Vegetable Oil (HVO) biofuel on some larger fleet vehicles for our highways service.

Our scope 2 emissions are zero, using the market-based method, because we purchase a 100% zero carbon electricity tariff through our supply contract. (See section 2.13 on methodology.)

The Council already has several other key measures in place too, to reduce our carbon footprint and help mitigate against climate change. These include a range of energy efficiency projects across our property portfolio, such as on-site renewable generation assets (e.g. rooftop solar PV), Building Energy Management Systems (BEMS), and installation of LED lighting. Without these projects, the Council's carbon footprint would have been higher.

As well our own buildings, the Council has been running a programme to retrofit energy conservation measures in both maintained and academy schools in Cambridgeshire since 2014. To date the Council has worked with 69 schools, to invest more than £17m in energy efficiency, energy generation and low carbon heating measures. The schools energy

CASE STUDY 2

– SAWTRY INFANT SCHOOL ENERGY PROJECT

Technologies installed	Rooftop solar PV, air source heat pumps, and LED lighting
Total project cost	£218k
Grant funding obtained from the Public Sector Decarbonisation Scheme	£178k (covered 81% of project costs)
Project status	Completed October 2023
Estimated carbon saving	30 tonnes CO_2e per year

programme is delivering significant savings on both energy bills and carbon emissions for schools. One example of this is at Sawtry Infant School, featured in case study 2.

In addition, the Council has a number of large scale renewable energy projects. Our solar assets, including our 12MW solar farm in Soham (pictured in Figure 3) and several rooftop solar PV installations across multiple Council buildings, between them generated enough electricity to power over 5,000 homes, and avoid 2,710 tonnes CO_2e of greenhouse gas emissions in 2022-23.

Figure 3. CCC's Triangle Farm solar park in Soham

We are also working on more large scale renewable energy projects such as a Smart Energy Grid at St Ives Park and Ride (featured in Case Study 3 on the next page).

CASE STUDY 3

– ST IVES PARK AND RIDE SMART ENERGY GRID

Technologies installed	Microgrid including Solar PV on carports, battery storage and EV chargepoints.
Project Funding	Supported by the European Regional Development Fund and Cambridgeshire County Council
Project status	Construction in progress (as at December 2023)
Estimated renewable electricity output	26 GWh over 30 years
Estimated carbon saving	14,000 tonnes CO_2 savings over 30 years
Other benefits	• controlled export of electricity directly to local businesses via new infrastructure • excess electricity will be used to enable the park and ride site to provide energy for all on-site needs, such as lighting, CCTV cameras and electric vehicle charging. • Low Carbon Business Support Programme for SMEs in Cambridgeshire.

2. Cambridgeshire County Council's Carbon Footprint

2.1 Key findings for 2022-23 – scope 1 and 2 emissions

Scopes 1 and 2 are those that the council has the most control over, as they comprise of emissions from our own assets, such as council buildings or vehicles. Scope 1 comprises of direct emissions from the council's assets and includes emissions from gas and oil boilers for heating our buildings, fugitive refrigerant gases and emissions from fleet vehicles.

Scope 2 is emissions from purchased electricity for our buildings and street lighting etc.

We found that our scopes 1 (direct) and 2 (purchased electricity) emissions, together amounted to **1,412 tonnes CO_2e**, using the market-based method. All of the emissions for scope 2 are zero, because the Council purchases 100% renewable electricity through our supply contract. The breakdown of this is shown in Figure 4 below, with the largest share coming from gas to heat our buildings.

The council's target to reach net zero carbon for scopes 1 and 2 by 2030 is for *net* emissions and is based on the market-based method. However, for transparency, and to align with the GHG Protocol Scope 2 Guidance, we are reporting both methods. Using the location-based method for scope 2, total emissions for scopes 1 and 2 would have been **4,899 tonnes CO_2e**. The breakdown of this is shown in Figure 5. The largest share was for purchased electricity for street lighting.

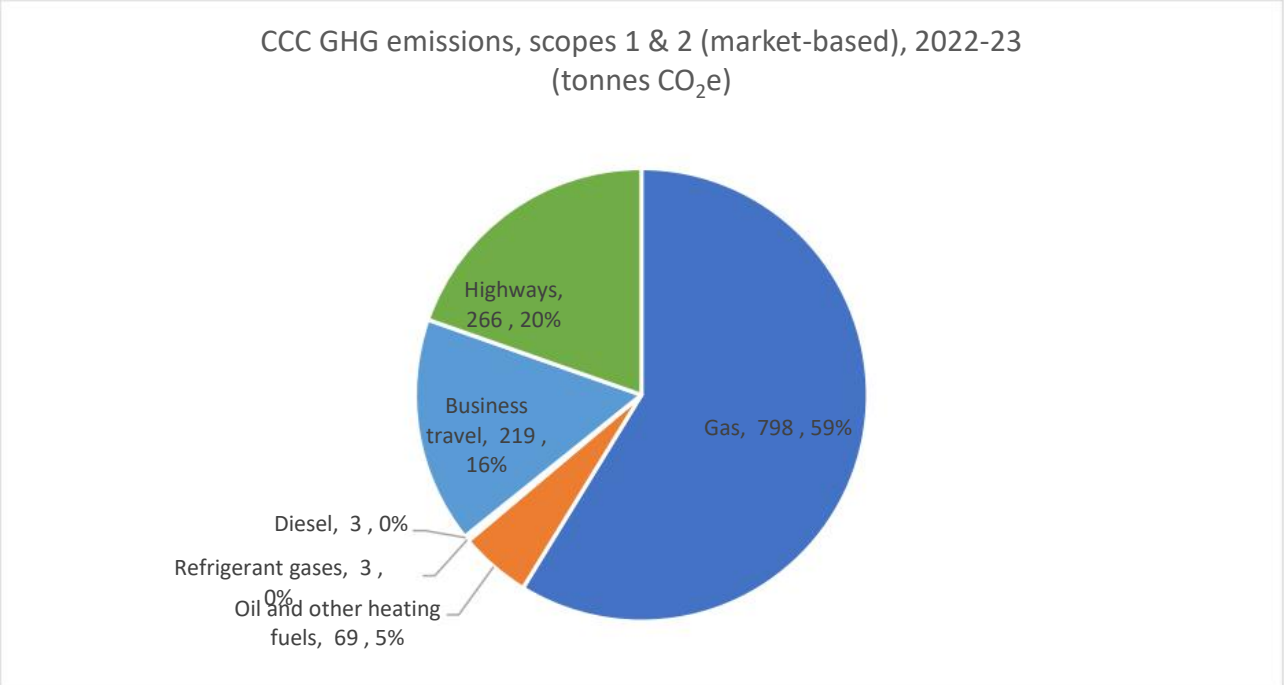

Figure 4

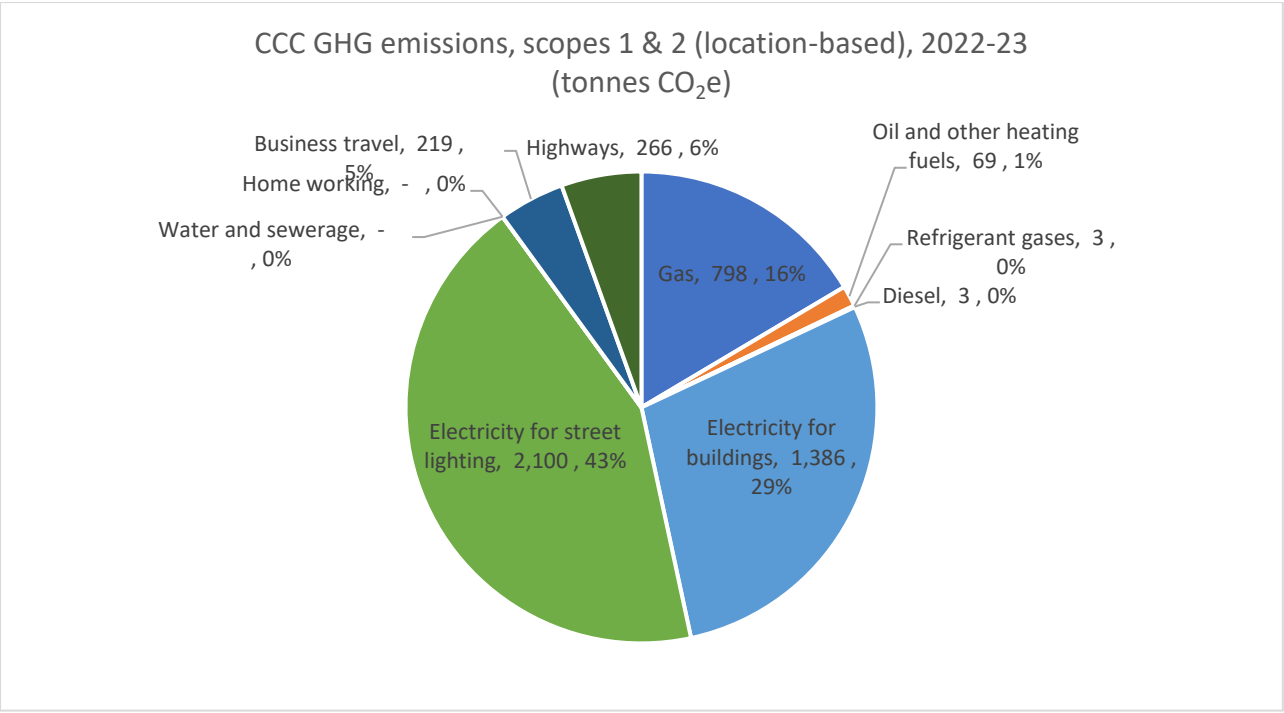

Figure 5

2.2 Key findings for 2022-23 - scope 3 emissions

We have also calculated our scope 3 emissions where we can. Scope 3 means indirect emissions from assets outside of the Council's control, such as those of our contractors and suppliers. Scope 3 emissions were **97,692 tonnes CO_2e** in 2022-23.

The vast majority (~99%) of all known emissions were scope 3 (indirect). This includes transport emissions from vehicles not under Council control (such as employee's own cars or contractors' vehicles), emissions from county waste disposal and treatment, emissions from Local Authority maintained schools' energy usage, and emissions associated with purchased goods and services delivered by third parties, such as capital construction works.

Some additional emissions associated with purchased goods and services are not included, because we do not have the relevant data to calculate these. However, this could potentially account for a significant quantity of additional unknown scope 3 emissions. Our action plan includes steps to identify more of this data in future. A full list of what has been included and what is excluded, together with reasons for exclusions, is in section 2.15.

2.3 Key findings for 2022-23 - all scopes

The Council's total known GHG emissions in 2022-23 for all 3 scopes amounted to **99,104 tonnes CO_2e** (using the market-based method for scope 2). (This would have been 102,590 tonnes CO_2e using the location-based method for scope 2.)

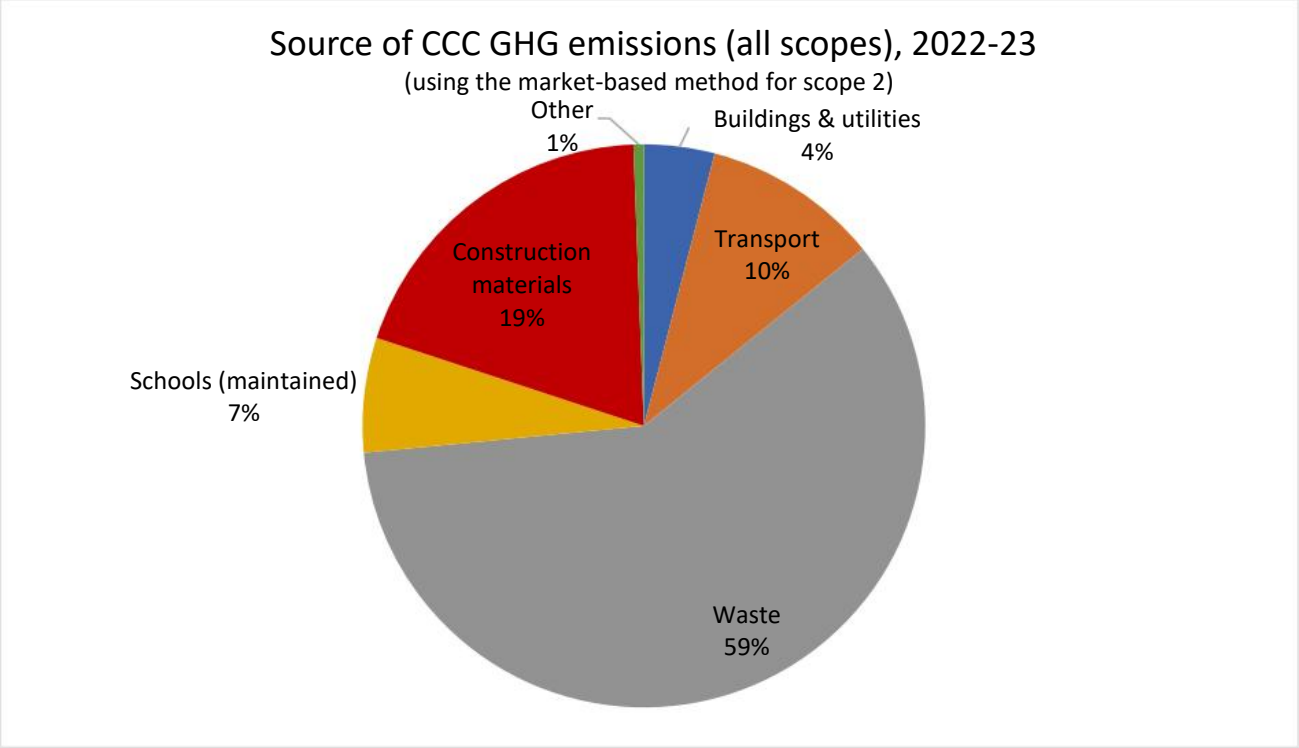

Figure 6

The largest share of emissions was from waste, largely due to the Council's statutory duty as the Waste Disposal Authority. The breakdown of all these known emissions sources is shown in Figure 6, and there is also a more detailed breakdown in Table 4 on page 15.

Net GHG emissions for all scopes, after deducting the emissions avoided through our renewable electricity generation assets, were **96,394 tonnes CO_2e**.

2.4 Comparison to previous years

Emissions from all previous years back to our baseline year of 2018-19 have been recalculated where possible, in order to be more accurate where updated data becomes available, and to ensure consistency with emissions reported now, in terms of what is included and the calculation methodology. These changes along with some other minor updates mean that the baseline year net emissions for 2018-19, in total for all three scopes, are now calculated at **181,756** tonnes CO_2e (using the market-based method for scope 2), as shown in Table 2.

The Council's total known GHG emissions in 2022-23 for all 3 scopes amounted to **96,394 tonnes CO_2e** (net, after reductions). This is 20% higher than the equivalent emissions in the previous year, but 46% lower than our baseline year of 2018-19.

The tables below show the Council's total carbon emissions across all 3 scopes, for each year since 2018-19, using both the market-based method (Table 2) and the location-based method (Table 3) for scope 2.

Table 2 CCC Annual GHG emissions – using market-based method for scope 2

(tonnes CO_2e)	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Scope 1	2,073	2,480	1,896	2,142	1,412
Scope 2 (market-based)	0	0	0	0	0
Scope 3	183,548	171,455	67,768	79,600	97,692
Gross total scopes 1-3	**185,621**	**173,935**	**69,664**	**81,742**	**99,104**
Reductions	-3,864	-3,589	-3,384	-3,131	-2,710
Net total in scope after reductions	**181,756**	**170,346**	**66,280**	**78,611**	**96,394**

Table 3: CCC Annual GHG emissions – using location-based method for scope 2

(tonnes CO_2e)	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Scope 1	2,073	2,480	1,896	2,142	1,412
Scope 2 (location-based)	5,619	4,966	4,089	3,861	3,486
Scope 3	183,548	171,455	67,768	79,600	97,692
Gross total scopes 1-3	**191,240**	**178,901**	**73,753**	**85,603**	**102,590**
Reductions	-3,864	-3,589	-3,384	-3,131	-2,710
Net total in scope after reductions	**187,376**	**175,313**	**70,369**	**82,472**	**99,880**

Our scopes 1 and 2 emissions (market-based) were 34% lower in 2022-23 than the previous year, and 32% lower than in our baseline reporting year of 2018-19. (Scopes 1+2 was the same as scope 1 alone, since scope 2 emissions were zero using that method.)

Scopes 1 and 2 emissions
down 32%
since 2018-19 baseline
(using market-based method for scope 2)

There are two main reasons for the reduction in scope 1 emissions this year. The first reason is due to our programme of low carbon heating projects, where we have been removing fossil fuel based heating systems (such as gas or oil boilers) at some sites, and installing low carbon air source heat pumps instead. We are continuing our programme of low carbon heating projects in order to further reduce gas and oil usage in future, as more sites switch to using heat pumps. The beneficial impact of the low carbon heating programme in reducing our scope 1 carbon emissions is illustrated in Figure 7, in the blue sections. Predictions have also been made for the next three years, based on the expected outcomes of further projects currently in progress or planned.

The second reason for the reduction in scope 1 emissions is due to the highways service switching away from diesel and using Hydrotreated Vegetable Oil (HVO) biofuel for some of our largest vehicles. This is shown in pale orange in Figure 7, showing a reduction in 2022-23 compared to 2021-22.

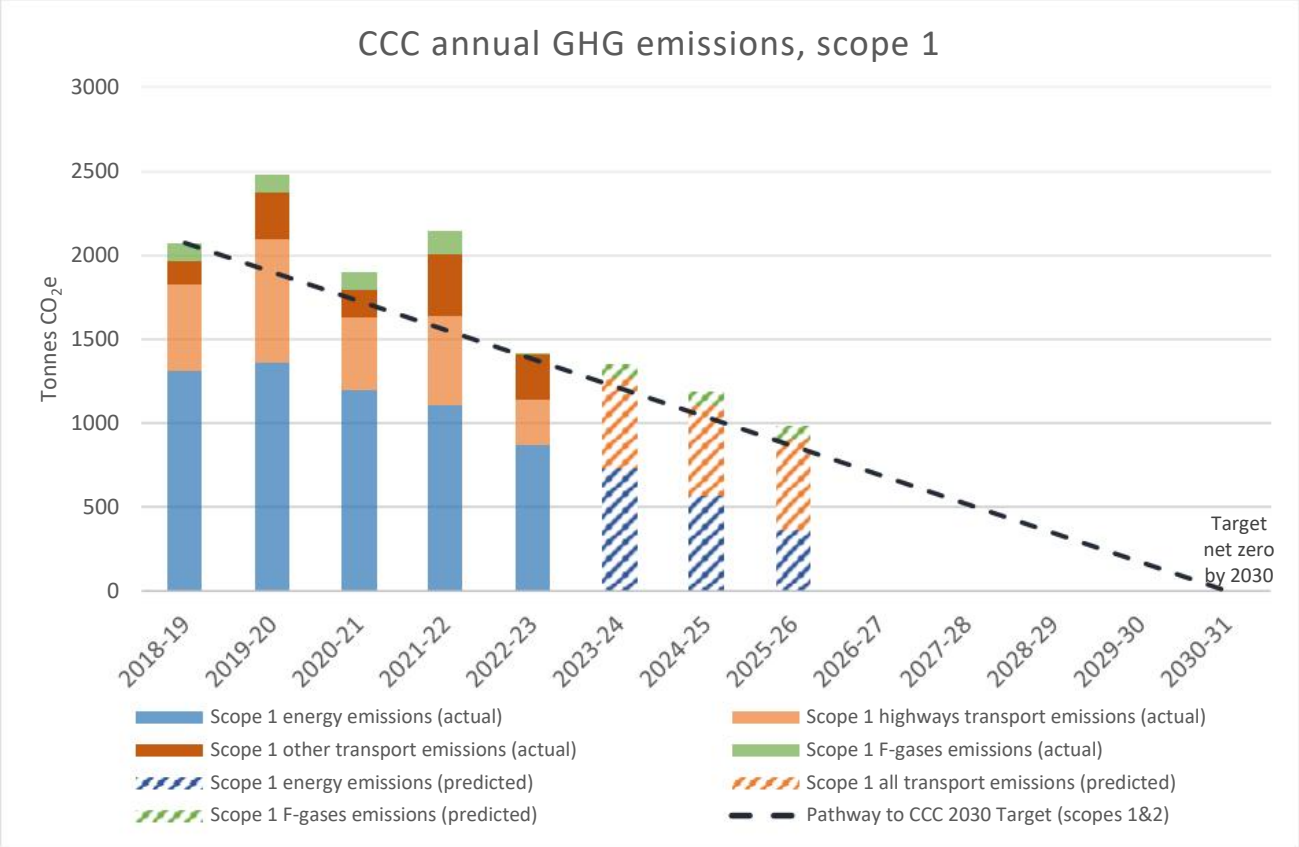

Figure 7

Scope 3 emissions were 23% higher in 2022-23 than in the previous year, but 47% lower than in our baseline year of 2018-19.

Scope 3 emissions **down 47%** since 2018-19 baseline

The change in scope 3 emissions is shown in Figure 8 below.

The largest reduction in scope 3 emissions (and overall emissions) since our baseline year is due to reduced construction work. This is shown by the red bars in Figure 9.

Construction activity has been low for the past three years, partially due to the impacts of the COVID-19 restrictions and their impact on the construction sector, followed by a partial recovery in 2021-22 and 2022-23. However, it is anticipated that construction work will increase again in future years. We are working to develop better forecasting of carbon emissions from our capital programme in future.

Further detail on each sector is in the relevant sections (2.6 to 2.12) below.

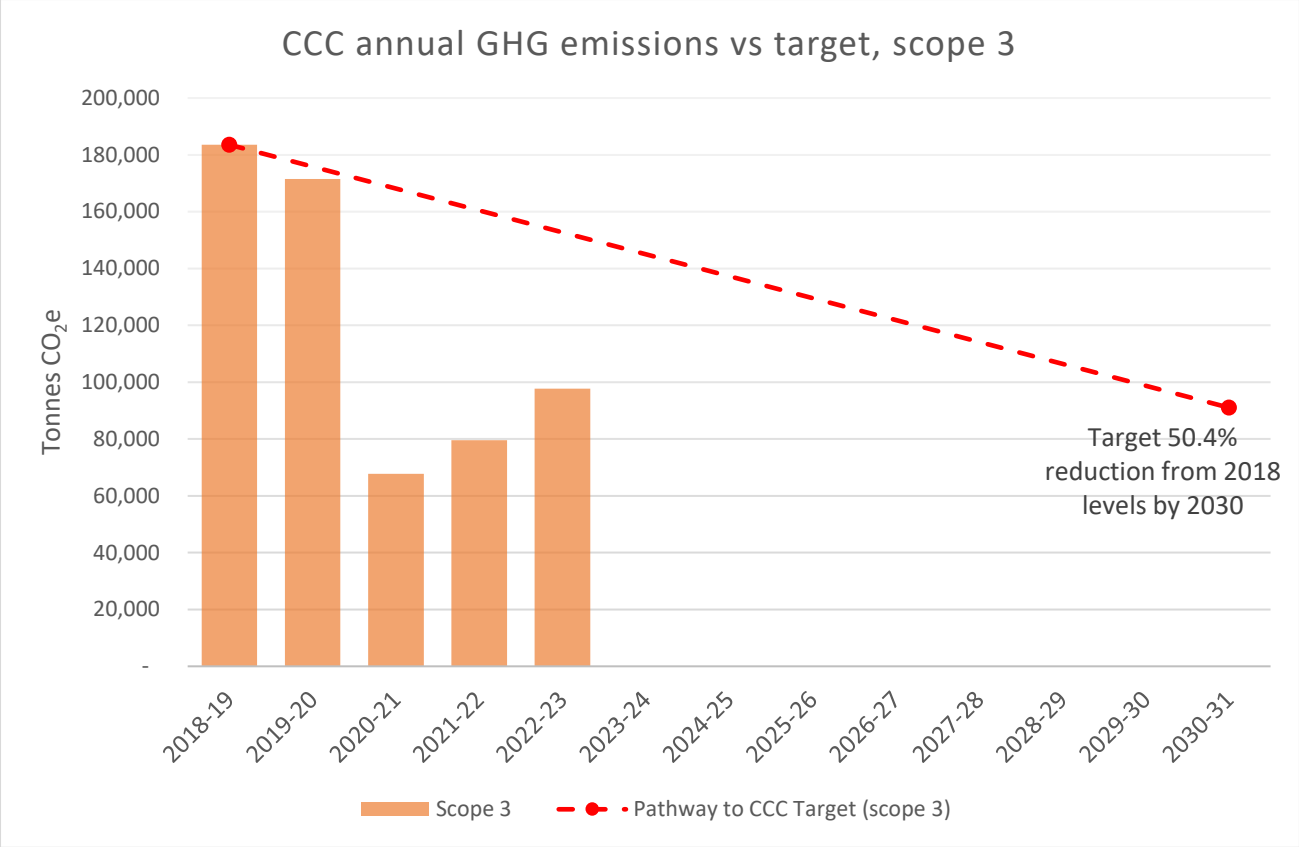

Figure 8

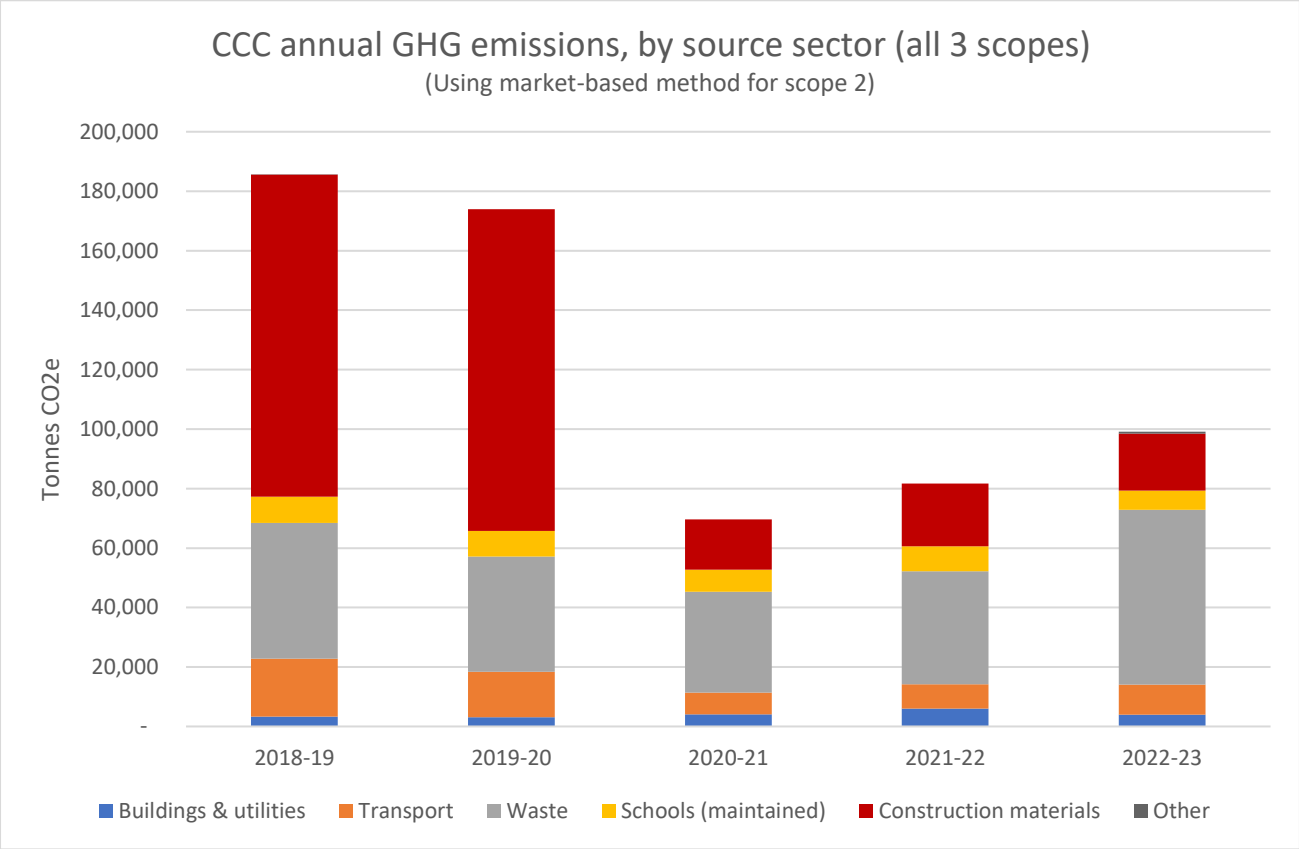

Figure 9

2.5 Full breakdown

Table 4: Cambridgeshire County Council Greenhouse Gas emissions 2022-23, breakdown

Category	GHG emissions (Tonnes CO_2e), 2022-23				
	Scope 1	Scope 2 (market-based)	Scope 3	Total in scopes 1-3	Outside of scopes
Buildings & utilities	872	0	3,145	**4,012**	-
Gas	798	-	136	934	-
Oil / other heating fuels	69	-	15	84	-
Refrigerant gases	3	-	-	3	-
Diesel for generators	3	-	1	3	-
Electricity for CCC buildings	-	0	489	489	-
Electricity for street lighting	-	0	740	740	-
Electricity for data centre	-	-	644	644	-
Water and sewerage for CCC sites	-	-	23	23	-
Employees home working	-	-	1,098	1,098	-
Transport	540	-	9,506	**10,046**	519
Business travel	219	-	1,030	1,249	-
Highways vehicles	266	-	152	418	519
Social & education transport	55	-	4,014	**4,068**	-
Employee commuting	-	-	3,272	3,272	-
Construction transport	-	-	1,038	1,038	-
Waste	-	-	58,754	**58,754**	17,143
Asbestos disposal	-	-	1	1	-
CCC site waste	-	-	138	138	-
Construction waste	-	-	109	109	-
County waste disposal - landfill and MBT	-	-	54,970	54,970	11
County waste disposal – other processes	-	-	3,528	3,528	17,343
Highways waste	-	-	9	9	-
Schools (maintained)	-	-	6,523	**6,523**	-
Electricity	-	-	2,618	2,618	-
Gas	-	-	3,320	3,320	-
Oil	-	-	459	459	-
Other heating fuels	-	-	126	126	-
Construction materials	-	-	19,175	**19,175**	-
Education capital projects	-	-	4,724	4,724	-
Highways and major infrastructure	-	-	12,312	12,312	-
Energy projects construction	-	-	2,086	2,086	-
Minor works	-	-	53	53	-
Other	-	-	588	**588**	-
IT hardware purchased	-	-	588	588	-
Total (gross, before reductions)	**1,412**	**0**	**97,692**	**99,104**	**17,874**
Avoided emissions from solar assets				-2,710	
Net total emissions				**96,394**	

If we had used the location-based method for scope 2 emissions, then scope 2 emissions would have been 3,486 tonnes CO_2e (all within the 'buildings and utilities' category). 2,100 tonnes CO_2e of this was for electricity for street lighting, and the remaining 1,386 tonnes CO_2e was for electricity for buildings and other assets. Emissions in all other categories would be the same as in the table above.

2.6 Buildings and utilities

Buildings and utilities were responsible for 4,017 tonnes CO_2e (4%) of the Council's GHG emissions in 2022-23 (across all 3 scopes, using the market-based method for scope 2). This is a reduction of 34% year on year. Most of this is in scope 3, with some emissions in this category also in scope 1.

This year, for the first time, we have been able to estimate the emissions associated with home energy use for employees working from home. This is estimated at 1,098 tonnes CO_2e. Home working has increased significantly since the start of the Covid-19 pandemic in 2020. However, as people work from home more and travel less, the increased emissions associated with home working are much smaller than the associated reduction in emissions from employee commuting, as shown in Figure 10 below.

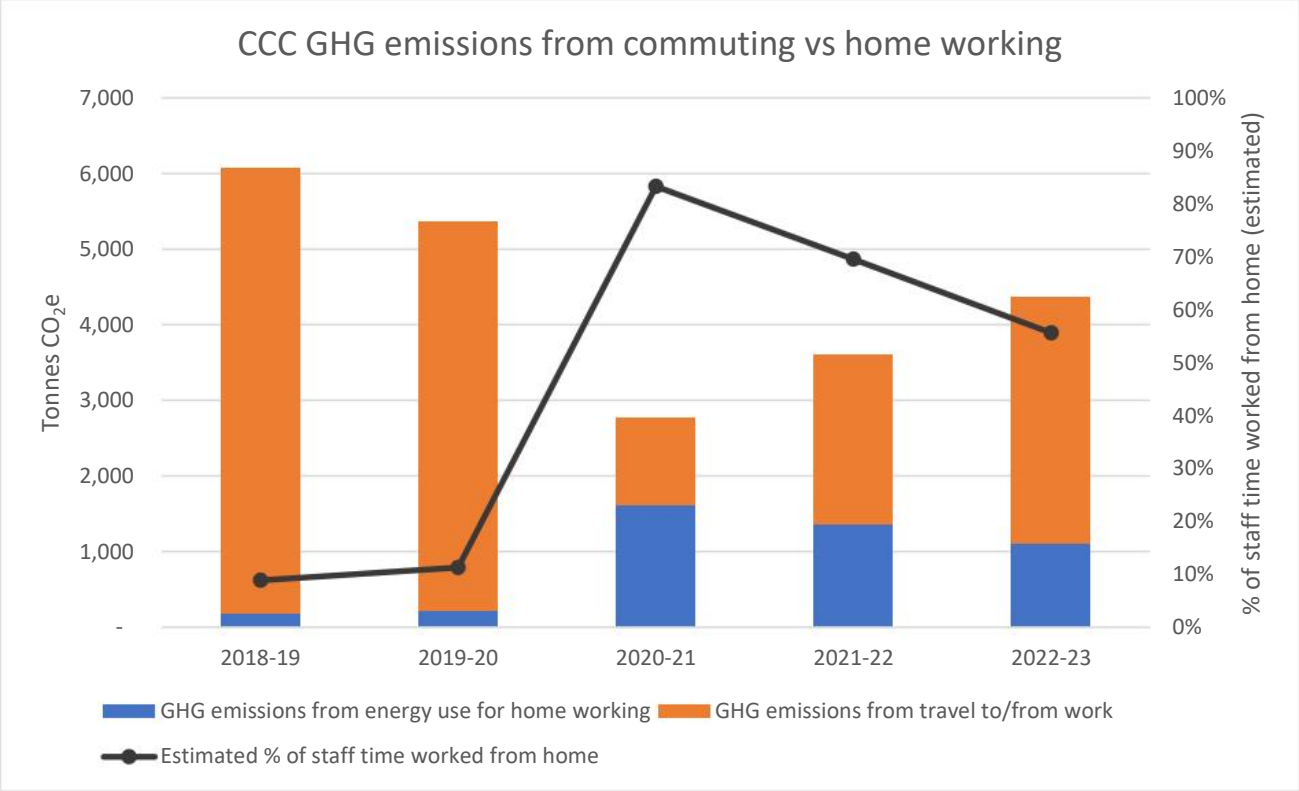

Figure 10

The biggest source of greenhouse gas emissions within the Council's own buildings is gas use, which accounts for 934 tonnes CO_2e. Gas is currently used to heat many of our buildings. The Council purchased 22% less mains gas in 2022-23 compared to the previous year, with the reduction mainly due to the replacement of fossil fuel heating with low carbon air source heat pumps in some buildings, such as those at Hereward Hall in March (pictured below) and those at Huntingdon Community Centre, featured in the case study in section 1.4. More low carbon heating projects completed during 2022-23 and into 2023-24 and beyond will lead to further reductions in future years. To date, 22 buildings have had heat pumps installed and more are being planned.

Burning oil (kerosene) and other heating fuels, although more carbon intensive than gas, accounted for only 84 tonnes CO_2e in 2022-23, because there were very few CCC sites that used oil.

Figure 11. Air source heat pumps at Hereward Hall, March

Scope 2 emissions from electricity use were zero using the market-based method, because the council purchases a green electricity tariff. The Council purchased 18,028,939 kWh of electricity in 2022-23, 60% of which was for street lighting. Scope 3 emissions associated with this electricity still apply though (with either method), which account for transmission and distribution losses in the electricity grid, and 'well-to-tank' emissions associated with extraction and production of fuels used for electricity generation. These scope 3 emissions connected to the council's electricity usage accounted for 740 tonnes CO_2e for street lighting and 489 tonnes CO_2e for electricity used in council buildings and other assets.

Also in scope 3 were 644 tonnes CO_2e for electricity used at non-CCC sites, such as the county council's share of electricity used for our data centre (space shared with Peterborough City Council).

Mains water and sewerage services for all our buildings and sites (where the Council is the bill payer) accounted for 23 tonnes CO_2e in 2022-23.

Finally, fugitive emissions of refrigerant gases from equipment such as air conditioning units accounted for 3 tonnes CO_2e, and diesel for generators led to 3 tonnes CO_2e emissions.

This section does not include school buildings, which have been counted separately.

2.7 Transport

Transport accounts for 10,046 tonnes CO_2e (10%) of council GHG emissions in 2022-23. This includes some scope 1 emissions (from CCC fleet vehicles) and some scope 3 emissions (from vehicles not under the control of the Council, such as vehicles belonging to CCC employees or contractors).

Transport emissions in 2022-23 have increased by 22% compared to the previous year, but were 48% lower than in our baseline year of 2018-19. This is partly due to exceptionally low transport emissions in 2020-21 due to the impact of the Covid-19 pandemic, and 2021-22 transport was still lower than pre-pandemic levels.

Of all the Council's transport emissions in 2022-23, the largest share was from our social and education transport service, at 4,068 tonnes CO_2e, which includes home to school transport as well as social care transport. This year, we have significantly improved the methodology used to calculate emissions from home to school transport, with much better data now available on routes and distances travelled. We have also applied the updated methodology to all previous years' data, for consistency. Education transport emissions have increased over the years due to the rise in demand for this service.

The second largest share of transport emissions (estimated at 3,272 tonnes CO_2e) was from employee commuting. This is a significant increase since the previous year, which is likely to be due to more staff travelling to work sites compared to the previous two years when travelling significantly reduced during the Covid-19 lockdowns and afterwards. However, it should also be noted that data on employee commuting is based on a staff travel survey during October 2022, and relies on assumptions that the survey week was representative of the whole year, and that those who responded to the survey are representative of all staff. There is therefore some uncertainty in the figure for this source of emissions, but it does give us an estimate.

Business travel accounted for 1,249 tonnes CO_2e in 2022-23. This includes emissions associated with our pool cars, vans and other fleet vehicles, as well as business travel in employees' own vehicles and travel by public transport (trains, buses and taxis).

Highways services transport (such as the road gritters pictured below) accounted for 418 tonnes CO_2e in 2022-23. This was a 37% reduction in emissions compared to the previous year, due to the highways service switching away from diesel to use HVO biofuel for some larger vehicles.

Figure 12: Some of the Council's highways gritting fleet

Finally, construction transport accounted for 1,038 tonnes CO_2e.

Travel by contractors other than those mentioned above was not included due to not having access to this data.

2.8 Maintained schools

Schools' emissions (which are all counted as scope 3) for all the Local Authority maintained schools in Cambridgeshire accounted for 6,523 tonnes CO_2e in 2022-23. This is 21% lower than the previous year, and 27% lower than our baseline year 2018-19.

The largest share of this is 3,320 tonnes CO_2e from mains gas, followed by 2,618 tonnes CO_2e from electricity, and 585 tonnes CO_2e from oil and other heating fuels.

This includes data for all Cambridgeshire maintained schools that either purchase their utilities through the ESPO contract or have provided their utilities data to us directly.

We do not currently have any data for schools' water and sewerage services or air conditioning gases in schools.

Academy schools are not included in these figures since these are not under the Council's control.

2.9 Waste

Waste accounts for the largest share of our known emissions in 2022-23, at 58,754 tonnes CO_2e.

The vast majority of this (estimated at 58,499 tonnes CO_2e) is due to the Council's statutory responsibility as the Waste Disposal Authority for treatment and disposal of waste from Cambridgeshire residents.

In 2022-23 there were 289,363 tonnes of waste collected from both the household kerbside collections and the Council's nine Household Waste Recycling Centres. Of that, 36% went directly to landfill, and 11% was processed through a Mechanical-Biological Treatment (MBT) plant, whilst 23% was composted, 27% was recycled and 3% was used for energy generation.

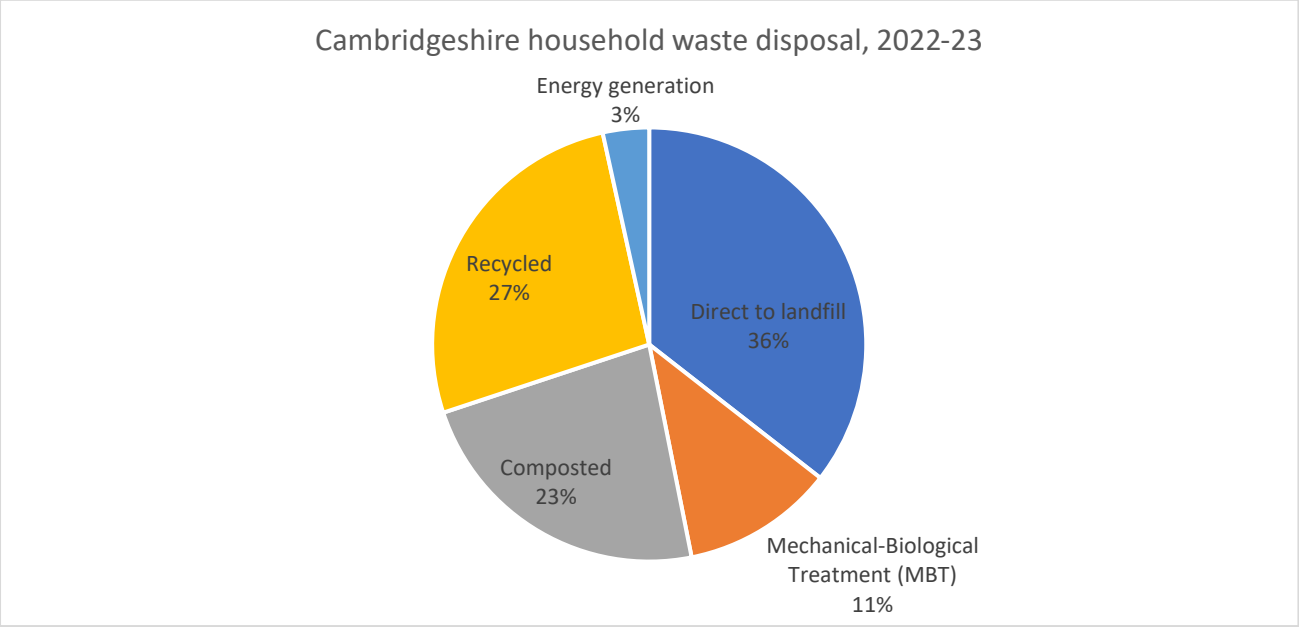

Figure 13

Note that waste collection is the responsibility of the City and District Councils, therefore transport of waste is not included in these figures, whereas treatment and disposal is the responsibility of the County Council and is included.

We have found that emissions from waste were 54% higher than the previous year, and 29% higher than our baseline year 2018-19. Waste emissions have increased in 2022-23 compared to the previous year, due to more waste being sent to landfill.

We have also improved the methodology we use to calculate carbon emissions from waste this year, to more accurately account for the biodegradation of organic matter in the MBT plant before the compost-like output is landfilled. Waste emissions for all previous years since 2018-19 have also been recalculated using the updated methodology, for consistency.

The small remainder of the waste category is from the waste generated at the Council's own sites, accounting for 138 tonnes CO_2e emissions, construction waste (109 tonnes CO_2e), highways waste (9 tonnes CO_2e) and asbestos disposal (1 tonne CO_2e).

2.10 Construction projects and materials use

A 19% share of the Council's 2022-23 carbon footprint (19,175 tonnes CO_2e) is from construction materials used for building projects, highways and major infrastructure. This comprises of emissions associated with extraction/mining, production/manufacture and transportation of materials to the point of purchase. These emissions are also known as 'embodied carbon'. Use of fuels for equipment on site is also included in the construction category.

Construction emissions were 9% lower in 2022-23 than in the previous year, and 82% lower than in our baseline year 2018-19. This is reflective of the very low emissions from construction activity since 2020-21, partially due to the impacts of the COVID-19 restrictions and their impact on the construction sector, followed by a partial recovery in 2021-22 and 2022-23.

12,312 tonnes CO_2e in 2022-23 was for highways and transport work, including roads maintenance and resurfacing works, projects completed through the Council's highways framework contracts, and some major infrastructure projects. There were some projects for which we could not obtain data, but we have included all those highways and major infrastructure projects where data was available.

4,724 tonnes CO_2e was for education capital projects such as building new schools and extensions. This is higher than the previous year since there was more education construction work on site during 2022-23.

2,086 tonnes CO_2e was for construction materials for major energy projects, such as the smart energy grid project at St Ives Park and Ride (featured in a Case Study in section 1.4). This category of energy projects construction materials is included in our report this year for the first time.

Lastly, 53 tonnes CO_2e was for minor capital works such as renovations and maintenance of existing buildings. At the moment we are only able to calculate the emissions from some of these minor works, because we do not have access to the relevant data on materials to be able to calculate the remaining emissions. Although this is a very small share of overall emissions, we are working with our contractors to try to obtain more of this data in future.

2.11 Agriculture and land use, land use change and forestry (LULUCF)

The council owns a large rural estate which is let out to tenant farmers, and therefore these emissions will form part of the council's scope 3 emissions. The vast majority of the County

Farms estate is cropland (arable farms), with a small area allocated to livestock. The council also owns a variety of other land including some parkland, built-up land (buildings and highways) and forest / woodland.

Agricultural emissions occur from various sources including livestock and from application of fertiliser to land. In previous annual reports we have estimated emissions from agricultural sources at around 14,000 tonnes CO2e per year. However, the methodology for this was very inaccurate and the actual emissions could be very different (either higher or lower), depending on a large number of different factors including soil types, fertiliser type and application rate, livestock types and more. For that reason this source has not been included in this year's report.

Land use, land use change and forestry (LULUCF) can either be a source of GHG emissions (for example from soil erosion) or a sink where GHGs are removed (for example through tree growth). In Cambridgeshire, LULUCF is often a source of emissions due to the types of land in our region.

Previously we have estimated emissions from LULUCF for land the council owns, at around 24,000 tonnes CO_2e per year. However, like agriculture, we do not currently have an accurate methodology for calculating LULUCF emissions, and so the estimated figure could potentially be very inaccurate and the actual emissions could be very different (either higher or lower), depending on a large number of different factors. For that reason this source has not been included in this year's report.

Figure 14: Biodiversity Net Gain (BNG) scheme at Lower Valley Farm, Fulbourn

Work is currently being undertaken to better understand both agricultural and land use related GHG emissions from our rural estate, so we are hopeful that we will be able to report a better estimate of these emissions in future years.

As well as looking at GHG emissions, the Council is also making use of some of the rural estate to increase biodiversity, with a scheme at Lower Valley Farm (pictured above) now offering Biodiversity Net Gain (BNG) credits for developers to purchase. The scheme will provide public footpaths, education opportunities, new species, rich chalk grassland and support habitat connectivity across the landscape.

2.12 Other purchased goods and services

There were an estimated 588 tonnes CO_2e emissions in embodied carbon from the purchase of new IT hardware in 2022-23.

Emissions from other purchased goods and services are unknown. This includes:

- Adults and Children's social care provision, commissioned services (other than our own buildings and staff travel, which are included);
- Legal, consultancy, insurance, pensions, investments, banking, telecommunications, post and other business services (other than our own buildings and staff travel);
- Education services (other than education capital construction materials, and energy use in maintained schools);
- Office machinery, furniture and the like;
- Food and drink;
- Other goods and services not mentioned elsewhere.

Since the emissions data for these goods and services lies with other organisations it is more difficult to collect the relevant data. However, we are working to improve this.

2.13 Methodology

The Council's own organisational carbon footprint has been calculated in line with the UK Government's Environmental Reporting Guidelines for Voluntary Greenhouse Gas Reporting[1], which is based on internationally-recognised standards from the World Resources Institute and World Business Council for Sustainable Development: the GHG Protocol Corporate Accounting and Reporting Standard, and the GHG Protocol Scope 3 standard, as far as possible.

Broadly, the methodology used was as follows:

[1] 2019 Environmental Reporting Guidelines, Chapter 3

1. Collect data on all activities under Cambridgeshire County Council control that emit GHGs (e.g. energy used, miles travelled, materials purchased). Actual data has been used wherever it is available.
2. Assumptions and estimates are only used where actual data was not available. Some activities have been excluded in cases where there was no data available and no basis upon which to estimate. Where this is the case, this is clearly stated below.
3. Convert data to metric tonnes of carbon dioxide equivalent (CO_2e), to calculate gross emissions using appropriate carbon conversion factors.
4. Note actions taken to reduce emissions (e.g. solar generation), then also report net emissions.

The reporting period is the financial year 1 April 2022 to 31 March 2023.

The carbon conversion factors used for this reporting period are mostly the 2022 UK Government published carbon conversion factors, except where there is no appropriate emissions factor given, or a more accurate conversion factor is available. Where alternative methodologies have been used, these are explained in Table 3 below.

In line with the international GHG Protocol, Scope 2 emissions are calculated and reported in two different ways; the location-based method and the market-based method[2]. The market-based method is our primary reporting method and the one to which our targets apply.

Scope and boundary of reporting

Emissions-releasing activities of organisations are classified into three groups known as scopes. These are defined in the GHG Protocol Corporate Standard and are described in section 1.3. Activities in all three scopes have been included in this report.

Carbon dioxide produced from biologically-sequestered carbon, e.g. from the combustion of biomass for electricity and / or heat generation, is not included in either scopes 1, 2, or 3. However, this is reported separately as 'outside of scopes'. This is because an equivalent amount of carbon dioxide would have been absorbed from the atmosphere during the plant growth phase. This carbon dioxide would have been emitted when the plants - from which the biomass is derived - decayed naturally at the end of their life. However, two other GHGs – nitrous oxide and methane – are commonly emitted when biomass is combusted. These would not be emitted during natural decay and any nitrous oxide or methane emissions from biomass / biofuel consumption is included in the emissions under the three scopes. This is in line with the approach generally taken in international carbon accounting standards.

[2] There are two accepted methods for calculating emissions from electricity generation. The location-based method is based on the average carbon intensity of the country's electricity grid, meaning that emissions would be the same for everyone in the UK, if they used the same amount of electricity. Alternatively, the market-based method takes into account contractual arrangements, and divides all of the emissions up according to the specific fuel mix of the electricity generated for each tariff of each supplier. This method means that customers who purchase electricity from suppliers using more renewables would have lower emissions than those whose electricity comes more from fossil fuel sources.

All activities under the operational control of Cambridgeshire County Council are within the boundary of reporting, including those outsourced to third parties in cases where the overall control or responsibility still lies with the County Council. A complete list of emissions sources included is shown below in Table 5.

Table 5: CCC Emissions Sources Included

Area	Activity	Methodology / Data source	Accuracy / Confidence level
Buildings and utilities	Gas burned for heating and hot water at CCC buildings	Usage data from utility bills	High
Buildings and utilities	Oil burned for heating and hot water at CCC buildings	Usage data from utility bills	High
Buildings and utilities	Electricity used at CCC buildings	Usage data from utility bills	High
Buildings and utilities	Electricity used for CCC street lighting, traffic signals etc.	Usage data from utility bills	High
Buildings and utilities	Refrigerant gases leakage from air conditioning units in CCC-controlled buildings	Based on leakage identified from top-ups at servicing, applied to CCC list of A/C units, type of refrigerant gas and capacity.	High
Buildings and utilities	Diesel used for on-site generators	Litres of fuel purchased	High
Buildings and utilities	Water supply and wastewater collection and treatment	Usage data from utility bills. Some of this is estimated.	Medium
Buildings and utilities	Energy used for data centre at non-CCC sites	Energy usage data from sub-metering on site	High
Home working	Energy used for heating and IT equipment whilst home working	Estimate of hours worked from home based on staff travel survey and HR data.	Medium
Buildings – maintained schools	Gas burned for heating and hot water at Cambridgeshire schools, where purchased through ESPO.	Gas usage data.	High
Buildings – maintained schools	Electricity used at Cambridgeshire schools, where purchased through ESPO.	Electricity usage data.	High
Buildings – maintained schools	Oil and LPG used for heating at some Cambridgeshire schools. Other heating fuels not purchased through ESPO.	Heating fuels usage data provided by the schools.	Medium
Transport	Travel in CCC pool cars. Travel in hire cars.	Data from mileage reports and invoices. Based on miles travelled and type of car where known.	High
Transport	Social and education transport in own fleet.	Data from fuel usage.	High

Area	Activity	Methodology / Data source	Accuracy / Confidence level
Transport	Social and education transport by contractors (including home to school transport).	Estimated based on known number of journeys made, estimated distances, and assumed vehicle types for each supplier.	Medium
Transport	Social and education transport by volunteer drivers.	Mileage claims	Medium
Transport	Highways maintenance vehicles and gritting fleet.	Data from fuel usage.	High
Transport	Employee travel on CCC business in own vehicles	Data from miles claimed on employee expenses system.	High
Transport	Travel by public transport incl flights, trains, buses and taxis, where known	Currently only have partial data on this. Some train and bus travel estimated from spend.	Low
Transport	Hotel stays on CCC business	Currently only have partial data on this. Estimated from spend.	Low
Transport	Employee home to work commuting	Estimated based on staff travel survey carried out in October 2022.	Low
Waste	Waste produced from CCC sites – general waste, recycling and confidential paper waste	Data from waste transfer notes / invoices.	High
Waste	Disposal / treatment of Cambridgeshire waste (as the statutory waste authority)	Based on waste volumes collected by all the City and District Councils in Cambridgeshire, and from all the Household Waste Recycling Centres, and proportions of waste recycled, composted and landfilled. Emissions calculated mainly using custom carbon calculator developed with the Local Government Association and University College London.	Medium
Purchased goods and services	Construction and buildings works – major capital projects, minor works and energy projects	Inventory of each material used and quantity (tonnes) data from project information and/or capital works contractors (where available).	Medium
Purchased goods and services	Highways works	Data provided by our highways contractors for the works they did on our behalf.	Medium

Exclusions

The following activities have been excluded from this carbon footprint calculation:

Table 6: Exclusions

Area	Activity	Reason for exclusion
Buildings and utilities	Energy used at other sites outside of CCC control e.g. space in a shared building, third party premises, and CCC-owned sites let to commercial or private tenants. (other than those mentioned as included above)	We do not have access to this data.
Buildings and utilities	Biomass	There are currently no biomass facilities at any CCC sites or maintained schools.
Schools	Energy used at those schools that do not purchase energy through ESPO and have not provided data directly.	We do not have access to this data.
Schools	All data for Academy schools.	These schools are outside of Council control.
Transport	Subsidised public bus routes	No longer responsibility of CCC. This is now the C&P Combined Authority.
Transport	Travel by public transport other than that included in scope above.	We do not have access to this data.
Transport	Other travel by third parties, contractors and suppliers (other than those mentioned in scope)	We do not have access to this data.
Waste	Other waste streams from CCC sites not mentioned in scope above	We do not have access to this data.
Waste	Collection and transport of Cambridgeshire household waste	This is not CCC's responsibility. (City/District Councils do this.)
Agriculture	County farms / rural estates	Available methodologies to estimate emissions would have very low levels of confidence / accuracy. Working to improve this in future.
Land use, land use change and forestry (LULUCF)	Area of land used as cropland, grassland, wetlands, forestland and settlements	Available methodologies to estimate emissions would have very low levels of confidence / accuracy. Working to improve this in future.
Purchased goods and services	All other goods and services purchased or used by CCC not accounted for elsewhere	Only spend data available. No accurate method available to convert spend to emissions.
All	All other activities not mentioned in scope above.	No known GHG emissions other than those already listed.

3. Cambridgeshire's Area Carbon Footprint

The carbon footprint of the geographical area of Cambridgeshire comprises GHG emissions from commercial and industrial sources, domestic homes, transport, agriculture, waste and land use. The vast majority of this is outside of the control of the Council.

We have used the data published by the UK Government Department for Energy Security and Net Zero (DESNZ) on GHG emissions by local authority area to identify the carbon footprint of the geographical area of Cambridgeshire.

3.1 Latest GHG emissions data for Cambridgeshire

The Government publishes detailed data at a local authority (district) level, on emissions of certain greenhouse gases. Prior to 2019, this dataset only included carbon dioxide (CO_2), which accounts for around 80% of nationwide GHG emissions. In recent years, the dataset has been expanded to include emissions of methane (CH_4) and nitrous oxide (N_2O) as well. This means that about 97% of all GHG emissions are now included. F-gases (the missing 3%) are still not included (these are included in the UK-wide statistics but no breakdown by local authority area is available). The inclusion of CH_4 and N_2O means that emissions from the agriculture and waste sectors are now more fully accounted for.

2021 is the most recent year of data currently available at the time of writing, since there is a two-year time lag in this dataset being published. In 2021, the total GHG emissions (CO_2, CH_4 and N_2O) for the geographical area of Cambridgeshire were **6.78 million tonnes CO_2e**. Transport was the highest emitting sector in the county, accounting for 27% of emissions, followed by land use, land use change and forestry (LULUCF), at 23%, illustrated below.

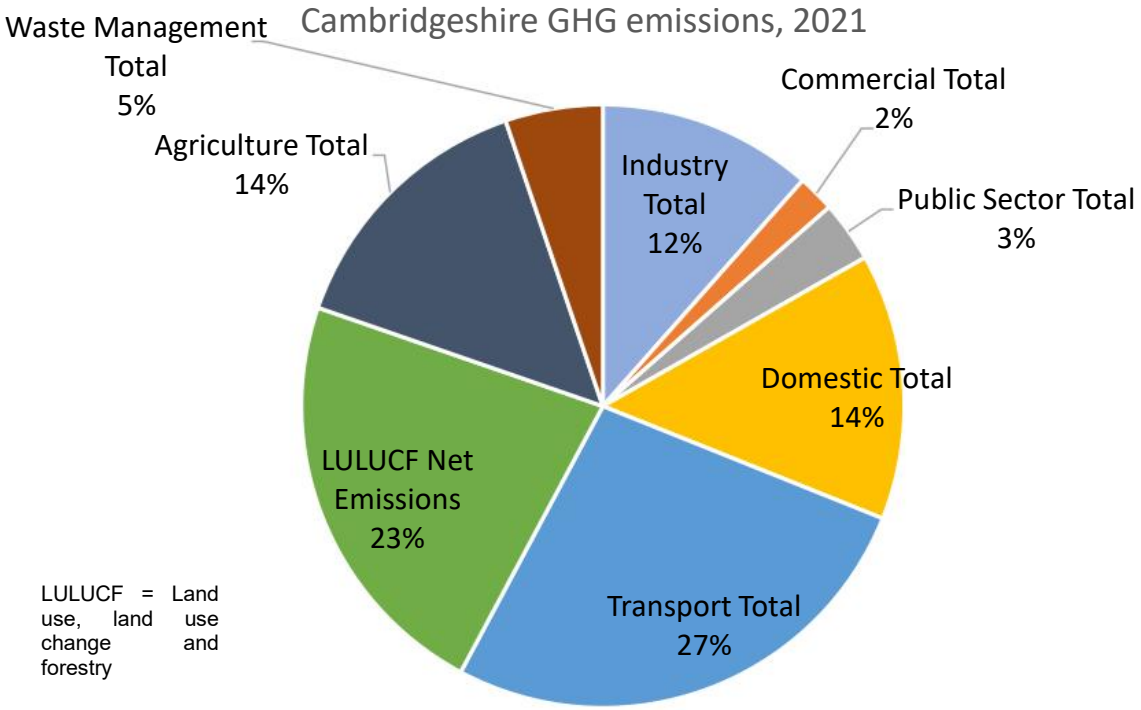

Figure 15

These emissions are broken down into sub-sectors as illustrated in Figure 16 below. This shows that most of the transport emissions are from A roads, most of the LULUCF emissions are from cropland, and most of the domestic emissions are from gas use.

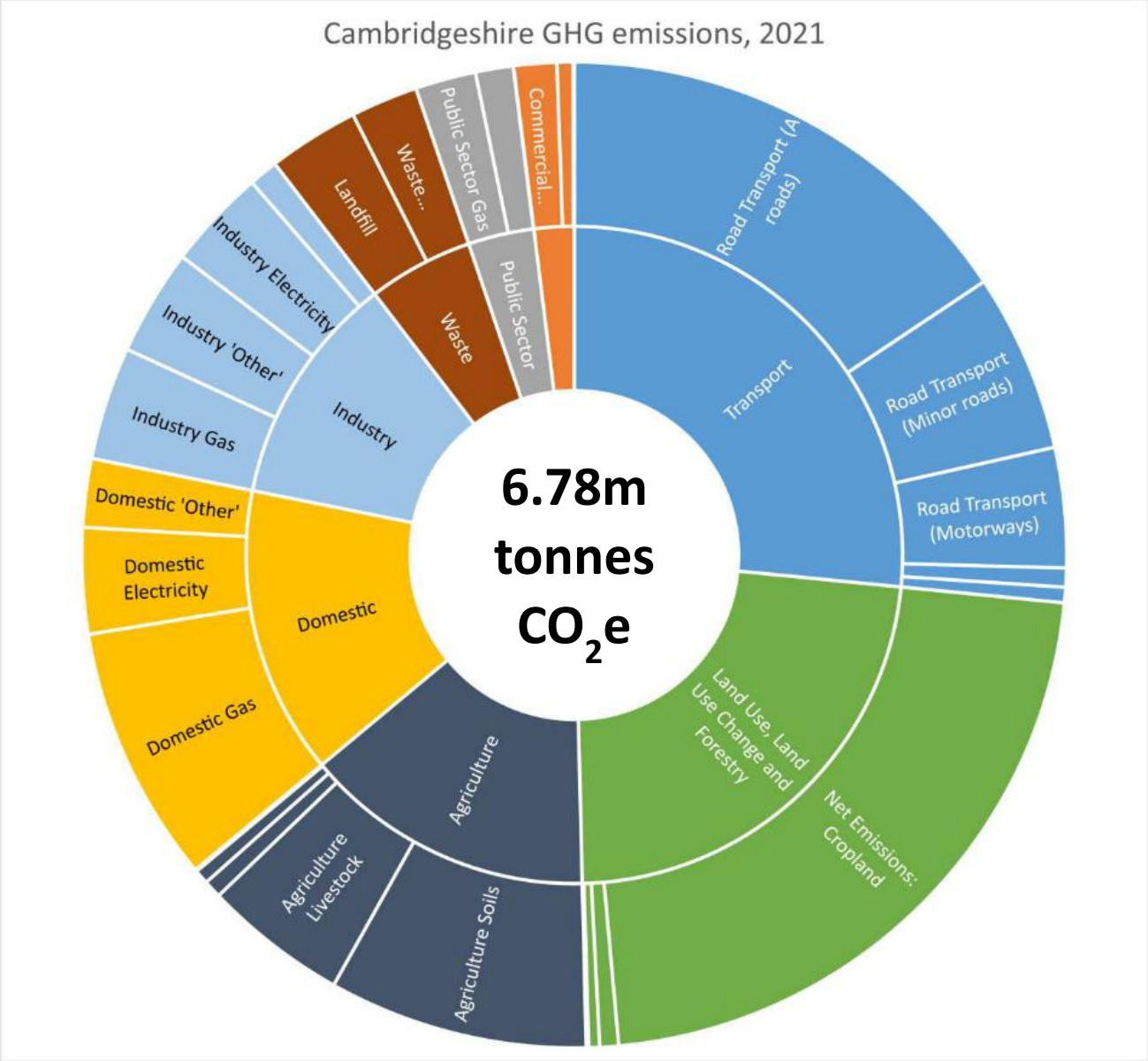

Figure 16

Figure 17 below shows a breakdown of the county's GHG emissions by sector and District. This illustrates some of the differences between the different parts of the county. For example, there is a higher share of LULUCF emissions in East Cambridgeshire and Fenland, due to the peatland areas there. Huntingdonshire and South Cambridgeshire have higher emissions from the transport sector, due to the major roads in those areas such as the A1. The city of Cambridge has a smaller footprint due to being a smaller size and more urban area.

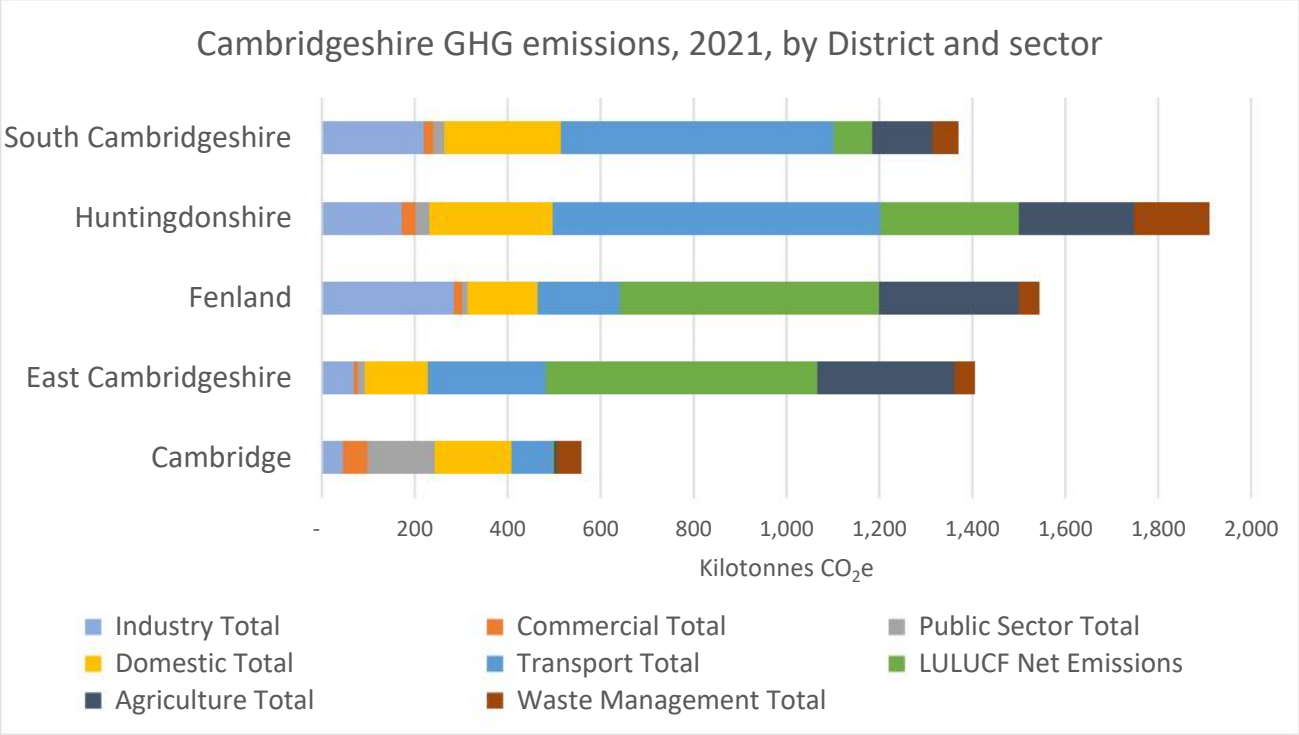

Figure 17

Cambridgeshire's emissions per person in the population are around 10 tonnes CO_2e in a year, which is higher than the UK average of around 6 tonnes, due to being mainly a rural area and the larger emissions from land use, agriculture and transport in our county. However, in the city of Cambridge, emissions per person are lower than average, at 3.8 tonnes CO_2e per person, due to the higher population density there. This is illustrated in Figure 18 below.

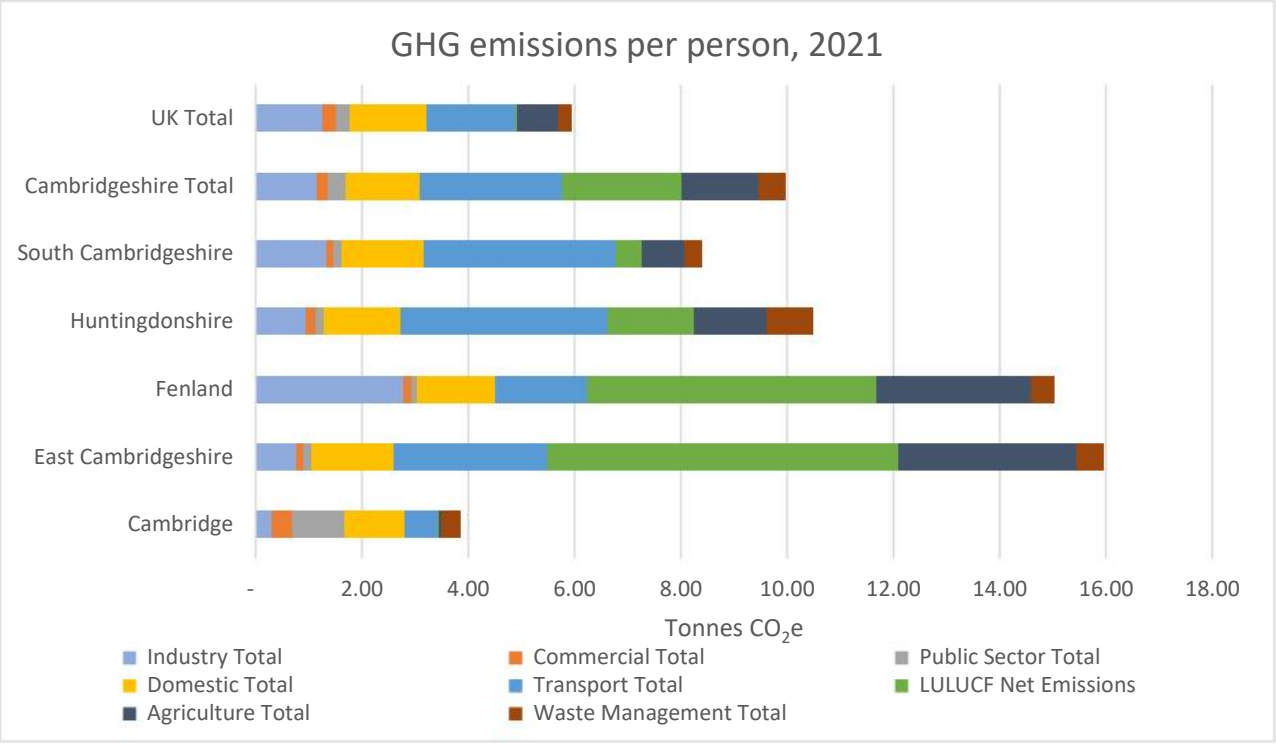

Figure 18

3.2 Change in Cambridgeshire's GHG emissions from 2005 to 2021

There has been a **25% reduction in Cambridgeshire's GHG emissions between 2005 and 2021**. In 2005 the total emissions from the county were around 9 million tonnes CO_2e and they have now reduced to 6.78m.

Emissions reductions have not occurred equally across all sectors though, with some changing much more than others. Since 2005, commercial emissions have fallen by a huge 82%, industrial by 43%, and domestic by 36%, but transport emissions have fallen by only 1.6% in those 16 years.

Despite the gradual reduction in total emissions over the years, in 2021 there was a **6.1% increase** compared to 2020. This is because 2020 was the year that the global COVID-19 pandemic hit, and many of the reductions in that year were therefore due to reduced transport and business activity as a result of the UK-wide lockdowns during that year. In 2021, activity, and emissions, have began to return to more normal levels, with the 2021 total being 0.9% lower than it was in 2019 before the pandemic. This sharp reduction in 2020 followed by an increase in 2021 is in line with the picture across the UK.

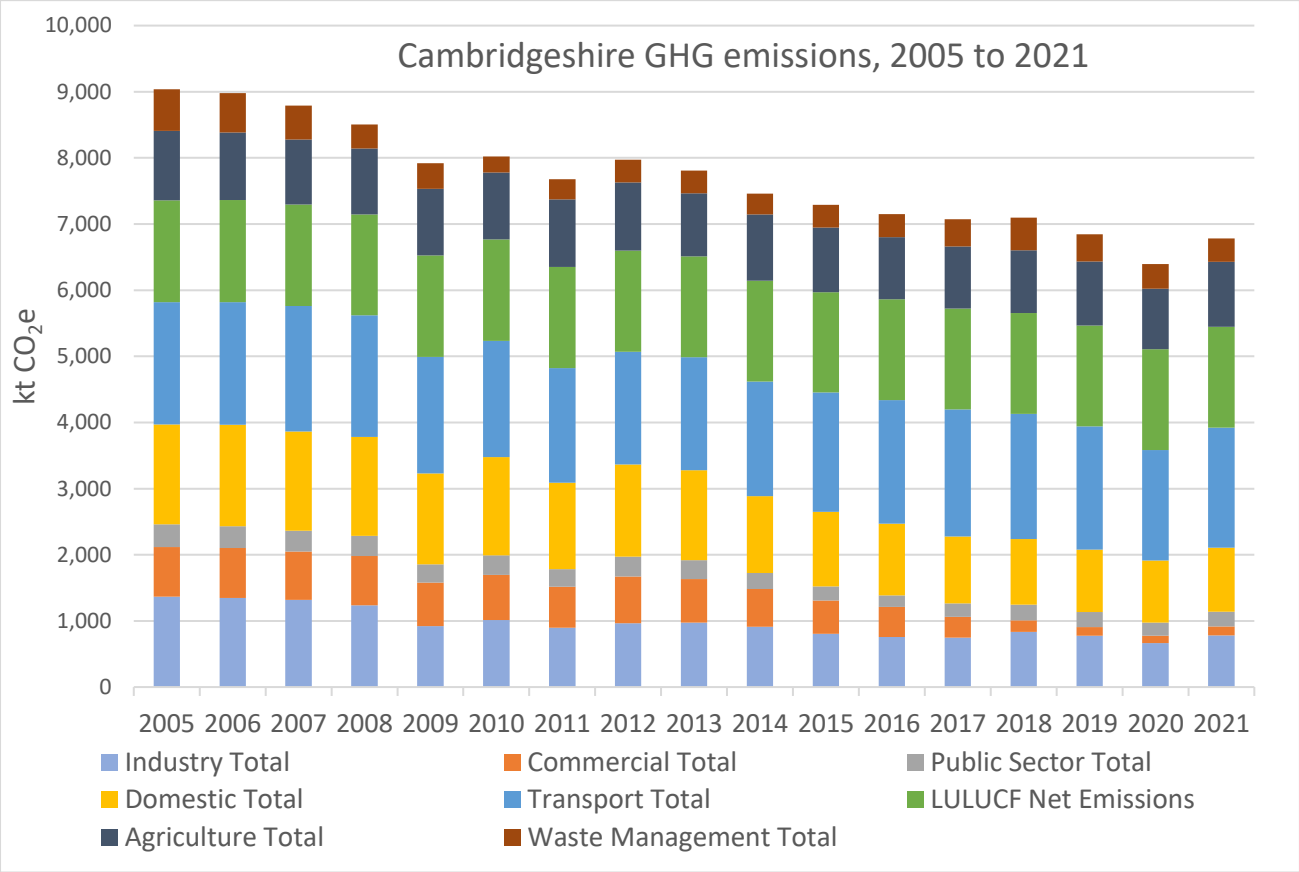

Figure 19

Aside from LULUCF, the trend in Cambridgeshire is reflective of the national trend: emissions are slowly and steadily declining over the last few years, due mainly to the decarbonisation of the electricity grid.

3.3 Note on Land Use, Land Use Change and Forestry (LULUCF)

Land use, land use change and forestry (LULUCF) emissions can be caused by drainage and management of organic soils (peatland), land use change on mineral soils (soil disturbance, change in amount of biomass decomposition), biomass burning (wildfires), deforestation or peat extraction.

However, LULUCF is a carbon *sink* in some areas (absorbing more GHGs than emitted), due to forest growth, grassland (mineral soil) land use change, or rewetting / restoration of peatland.

LULUCF emissions are higher in Cambridgeshire than most of the UK, due to the large areas of peatland drained for agriculture, where the wasted peat loses carbon from the soil as CO_2. This is shown in the red and orange areas of the map below. However, LULUCF is a net sink in many other regions of the UK (the blue areas of the map below), where CO_2 is removed from the atmosphere through forest growth and conversion of cropland to grassland.

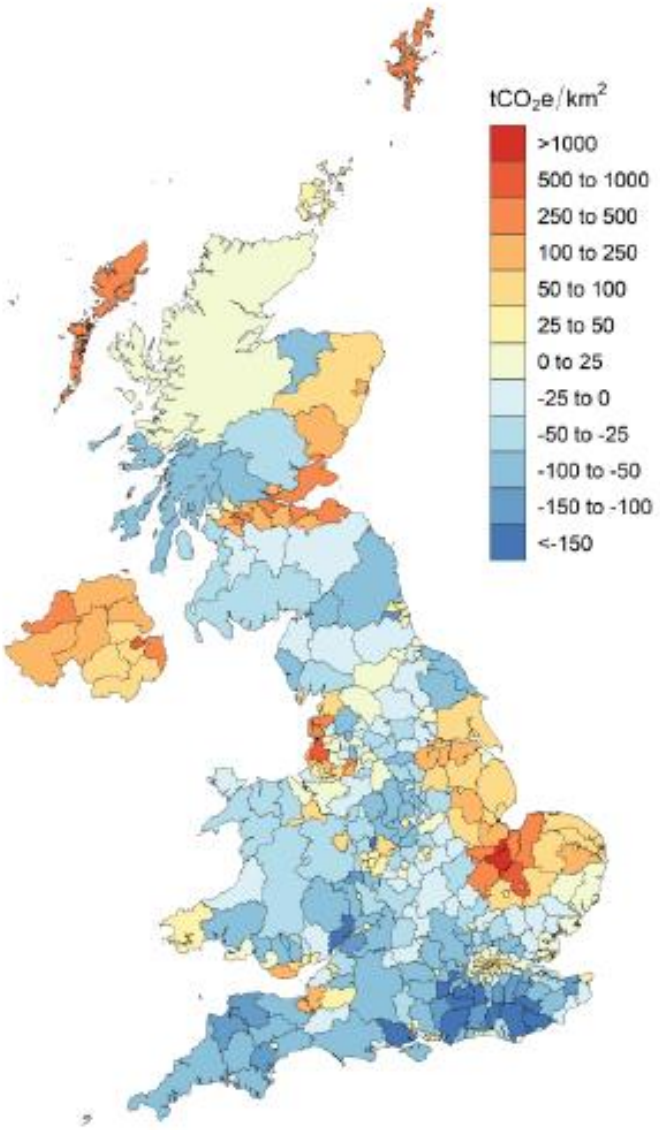

Figure 20: Emissions or removals of GHGs from land use, land-use change and forestry per local authority area (tCO_2e/km^2) in 2021. Image from DESNZ.

4. Glossary

Expression	Meaning
Carbon	Used as abbreviation for carbon dioxide or carbon dioxide equivalent
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent: A standard unit for measuring carbon footprints. It expresses the impact of each different greenhouse gas in terms of the amount of CO_2 that would create the same amount of warming, using GWPs.
GHG	Greenhouse gas: a gas that absorbs and emits radiant energy within the thermal infrared range. Greenhouse gases cause the greenhouse effect.
Greenhouse effect	The heating of the earth's surface caused by solar radiation trapped by atmospheric gases (rather like a greenhouse roof).
GWP	Global Warming Potential: this is a measure of how efficient a chemical is at trapping heat in the atmosphere relative to carbon dioxide. For example, methane has a GWP of 34 and nitrous oxide has a GWP of 298. (Intergovernmental Panel on Climate Change, 2014) By definition, CO_2 has a GWP value of 1. Quantities of GHGs are multiplied by their GWP to give results in units of carbon dioxide equivalent (CO_2e).
Kt	kilotonne = 1000 metric tonnes
LULUCF	Land Use, Land use change and forestry.
Net zero	Achieving an overall balance between emissions produced and emissions taken out of the atmosphere. This can take place on different scales and is sometimes achieved through offsetting.
Offset	An action intended to compensate for GHG emissions by an equivalent quantity of reductions elsewhere or removals.
Sequestration	The long-term removal, capture or sequestration of carbon dioxide from the atmosphere to slow or reverse atmospheric CO_2 pollution and to mitigate or reverse global warming.
WTT – Well to tank	The emissions associated with extracting, refining and transporting fuels to the point of purchase.
Zero carbon	No emissions of GHGs at all

5. Further information

Please visit https://www.cambridgeshire.gov.uk/climate-change