Annex 2 – Oxfordshire Greenhouse Gas Emissions: Annual Report

Executive Summary

1. This report summarises the latest greenhouse gas emissions data for Oxfordshire (published by the Department for Energy Security and Net Zero in June 2024).
2. Sources in Oxfordshire accounted for 4,063.9 $ktCO_2e$ in 2022 (latest available data), equivalent to 5.5 tCO_2e per person, above the national average (5.1 tCO_2e).
3. Transport was the highest emitting sector, accounting for over one third (38%) of all emissions, with the domestic sector accounting for just under a quarter of emissions (23%).
4. This represents a slight increase in transport emissions and a slight decrease in domestic emissions compared to 2021.
5. Overall trends however show a steady decrease in emissions over time, with countywide emissions in 2022 37% lower than the baseline year (2008).
6. The Oxfordshire Net Zero Route Map and Action Plan (ONZRMAP) has provided five-yearly countywide carbon budgets which map the county's total emissions under the 'Oxfordshire Leading the Way' trajectory to net zero in 2050. The ONZRMAP indicates an annual average reduction of 9% will be needed between 2021 and 2025 to stay within the five-year cumulative budget. For the first time, Oxfordshire's emissions have not met the trajectory necessary to adhere to the carbon budgets. However, since 2021 the county has been following the English emissions trajectory.

Introduction

7. The Future Oxfordshire Partnership (FOP) Net Zero Route Map and Action Plan, published in 2023[1], sets a pathway for the county to achieve net zero by 2050 (with intermediate emission reduction milestones at 2025, 2030 and 2040). The Route Map is based on the 'Oxfordshire leading the way' scenario set out in the Pathways to Zero Carbon Oxfordshire (PaZCO) report published by the University of Oxford in 2021[2].
8. To track progress toward the net zero emissions target FOP members agreed to receive an annual summary of area-based greenhouse gas emissions data for Oxfordshire by sector.
9. This report presents the latest data (2022) on emissions by local authority area published by the Department for Energy Security and Net Zero in June 2024, assesses trends over time and progress toward the countywide emission reduction targets[3].

Countywide Emissions by Sector

10. The latest greenhouse gas emissions data published by the Department for Energy Security and Net Zero (DESNZ)[4] show that 4,063.9 kilotonnes of greenhouse gases

[1] Net Zero Route Map & Action Plan (City Science, 2023)
[2] Pathways to a Zero Carbon Oxfordshire (Environmental Change Institute, 2021)
[3] The emissions baseline and modelling in the Net Zero Route Map and Action Plan is based on earlier releases of the DESNZ dataset. As the data series is subject to revision with each new release (as data sources and methodologies improve), figures on past emissions in this update report may differ from those in the City Science report.
[4] All data and figures in this report are sourced from the UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2022 (published June 2024) unless otherwise stated.

(expressed as kilotonnes of CO_2 equivalent, $ktCO2e$[5]) were emitted from sources in Oxfordshire during 2022, equivalent to 5.5 tCO_2e per person.

- Emissions per person were above the average across England (5.1 tCO_2e) and the South East region (4.4 tCO_2e).

- Transport was the highest emitting sector Figure 1, accounting for over one third (38%) of all emissions. The highest proportion of transport emissions was from vehicles travelling on A roads across the county Figure 2

- The domestic sector accounted for just under one quarter of total emissions (23%), with the greatest proportion of emissions (59%) from use of gas.

11. A breakdown of emissions by broad sector is provided in Figure 1, whilst Figure 2 provides further detail on emissions by source.

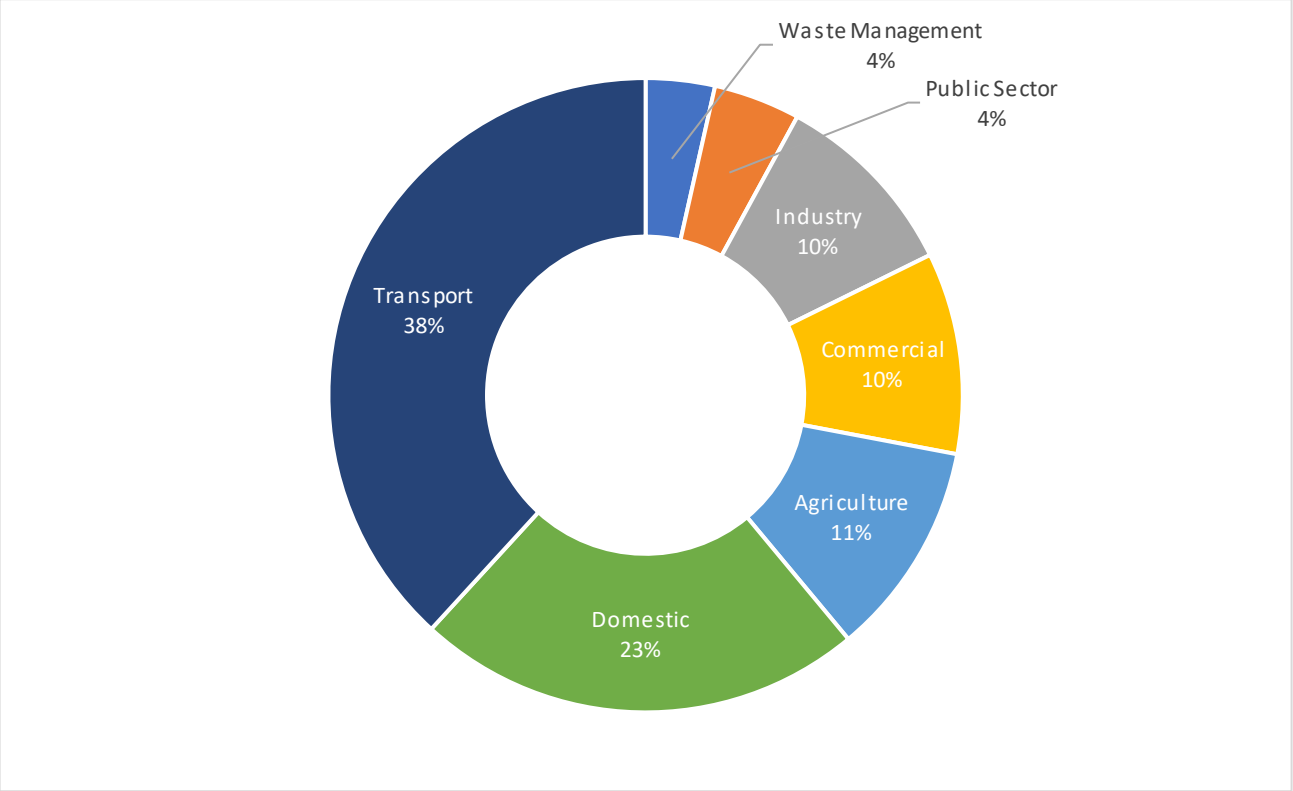

Figure 1: Oxfordshire greenhouse gas emissions by sector (2022)

[5] The 2024 release includes data for carbon dioxide, nitrous oxide and methane by local authority area, all figures used in this section (unless otherwise stated) are for total greenhouse gas emissions expressed as carbon dioxide equivalents CO_2e. Across Oxfordshire, carbon dioxide accounts for 86% of the total emissions, nitrous oxide 5% and methane 9%. Datasets published in 2021 or earlier cover carbon dioxide emissions only.

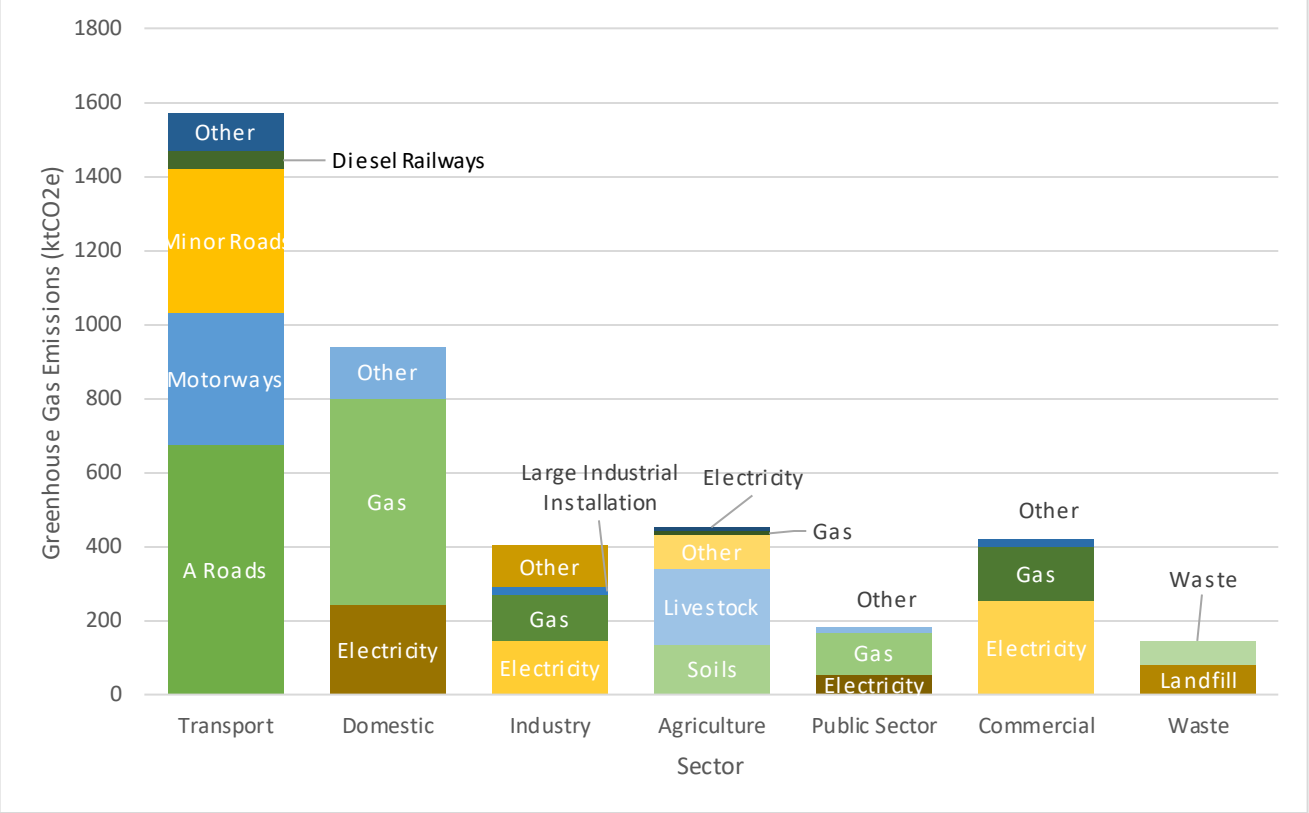

Figure 2: Oxfordshire emissions by sector and source (2022)

Countywide Emissions Over Time – Comparison with Previous Years

12. For this update we have looked back at emissions data for the past four years – 2019 to 2022 – with a view to distinguishing the widespread impact of the Covid-19 pandemic and the subsequent rebound on emissions from overall trends. These impacts are reflected across most UK local authority areas.

13. In Oxfordshire, emissions from transport showed the greatest reduction from 2019 to 2022 (14% lower). Transport emissions have increased by 11% compared to 2020, which is unsurprising given the impact of the Covid-19 lockdowns, but has only increased by 1% compared to 2021.
14. Emissions have either decreased or stayed the same in all sectors between 2019 and 2022:

- Other than transport, the greatest decreases since 2019 are from waste management and domestic emissions (12% and 10% respectively).

- Public sector emissions have showed no overall change since 2019, although there has been a decrease in emissions (2%) between 2021 and 2022.

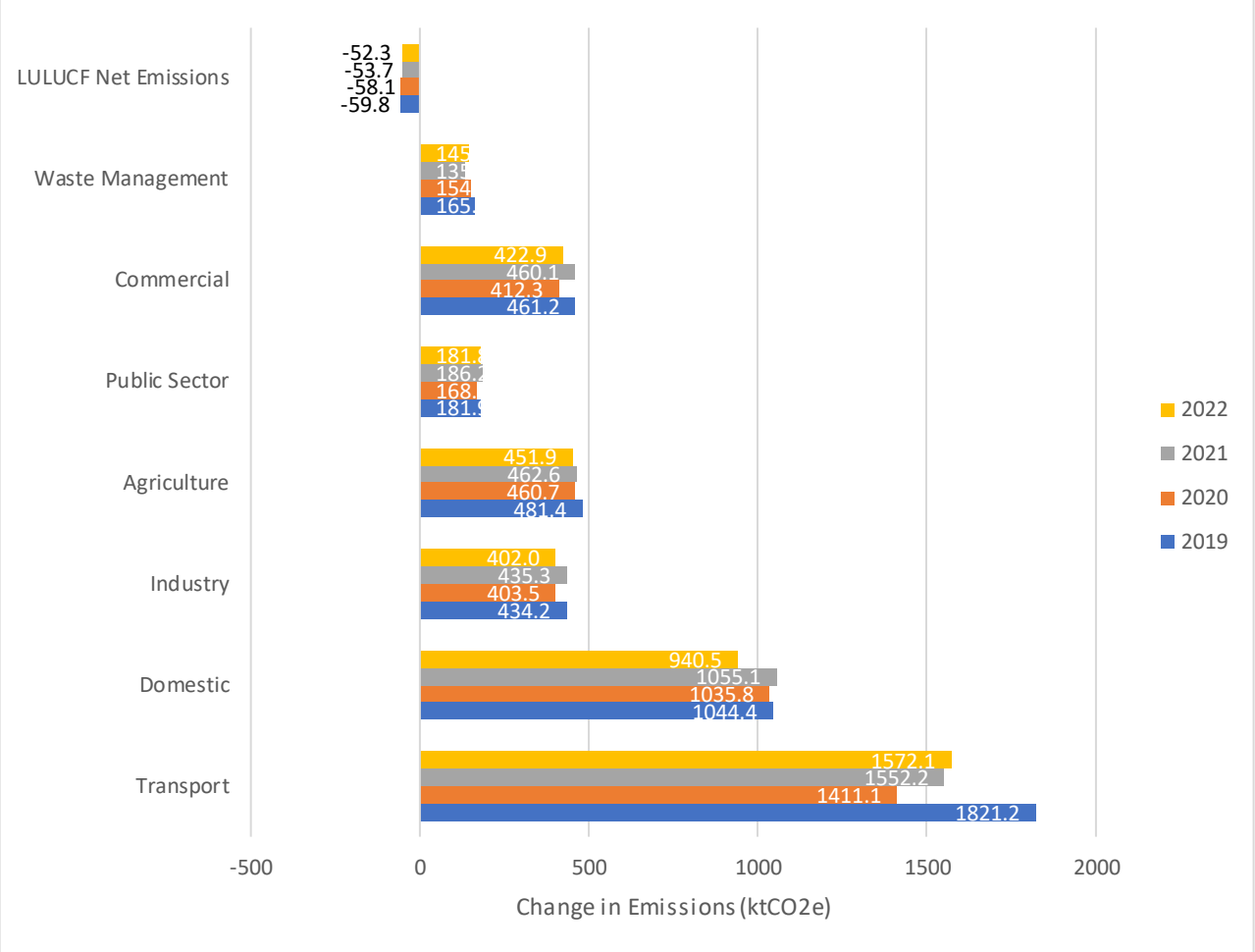

Figure 3: Change in Oxfordshire emissions over time by sector (ktCO2e)

Countywide Emissions Over Time – Comparison Against Baseline

15. Whilst the Route Map and Action Plan uses 2020 as the base year, previously adopted countywide targets have measured progress against a 2008 baseline. The following section provides a summary of changes over this time period.

16. Total greenhouse gas emissions from sources in Oxfordshire have fallen by just over one third (37%) since 2008. Emission reductions are seen across all sectors (Figure 4, Figure 5 and Figure 6) including:

- 69% reduction from waste management sources
- 58% reduction from the commercial sector
- 42% reduction from the domestic sector, which is a greater reduction than that of 2021 and largely driven by grid decarbonisation affecting electricity emissions.
- A 15% reduction of emissions from transport, although emissions have continued to increase since the Covid-19 pandemic in 2020.

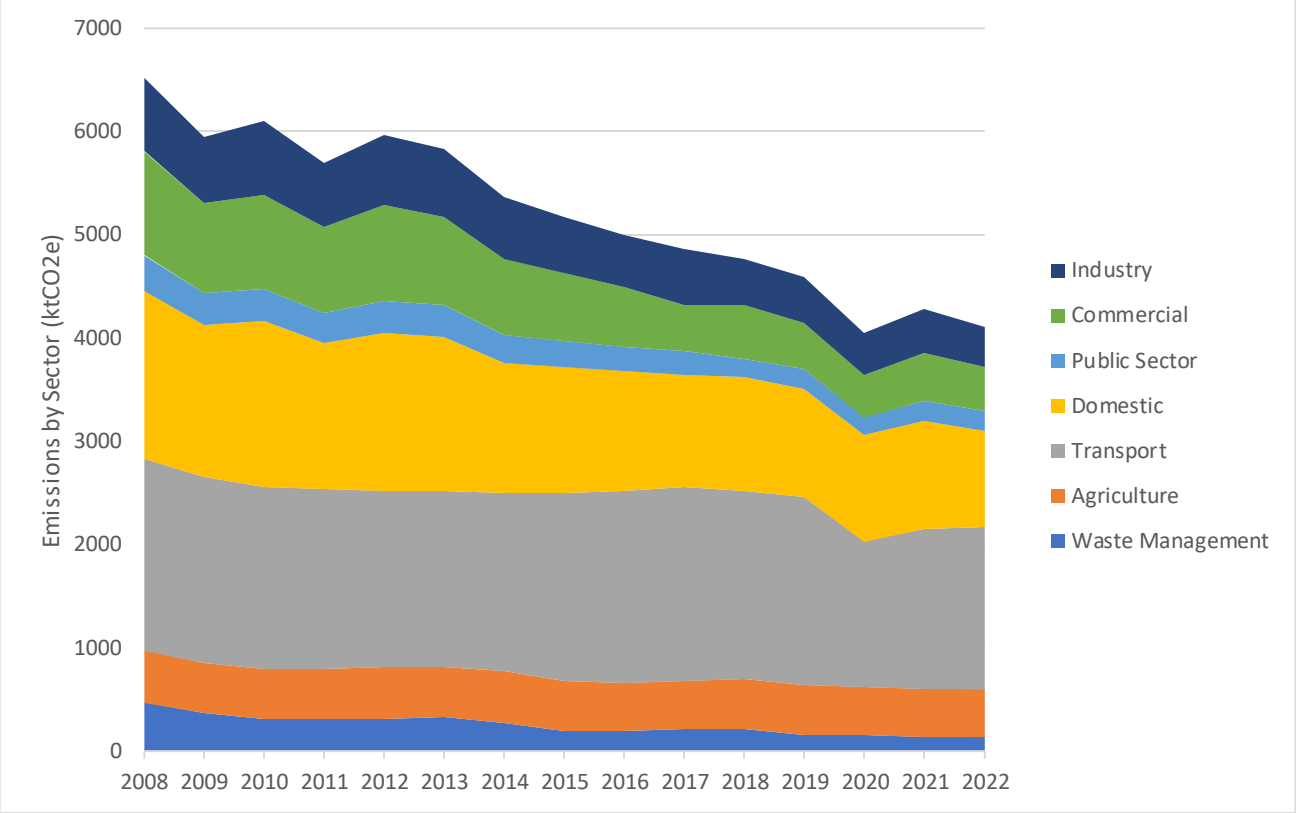

Figure 4: Greenhouse gas emission by sector from 2008 to 2022

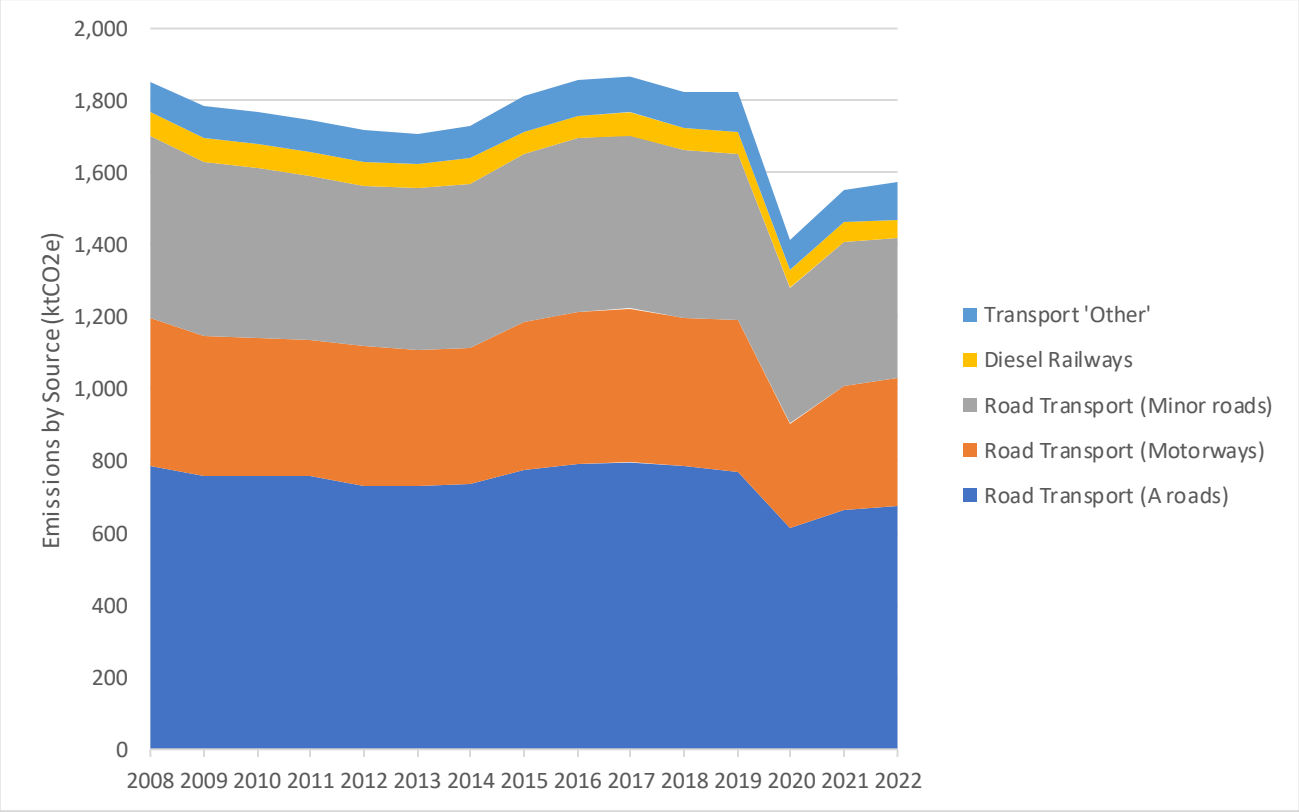

Figure 5: Transport emissions by source[6] 2008 to 2022

[6] Excludes aviation emissions

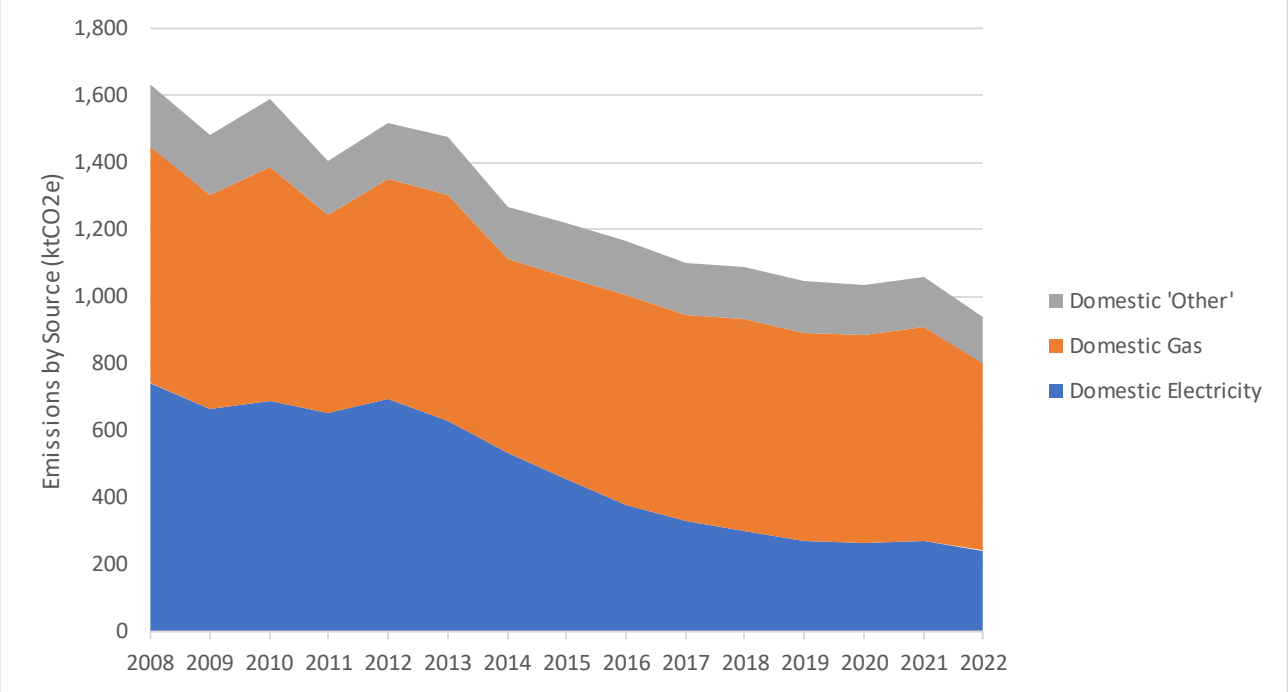

Figure 6: Domestic emissions by source 2008 to 2022

Monitoring Progress Towards Net Zero – Carbon Budgets

17. To inform progress toward the county's net zero target, the Oxfordshire Net Zero Route Map and Action Plan (ONZRMAP) has provided five-yearly countywide carbon budgets (starting from 2021 and ending in 2050), based on combined projected emissions of carbon dioxide across the industrial, commercial, domestic and transport sectors[7] (Figure 7).

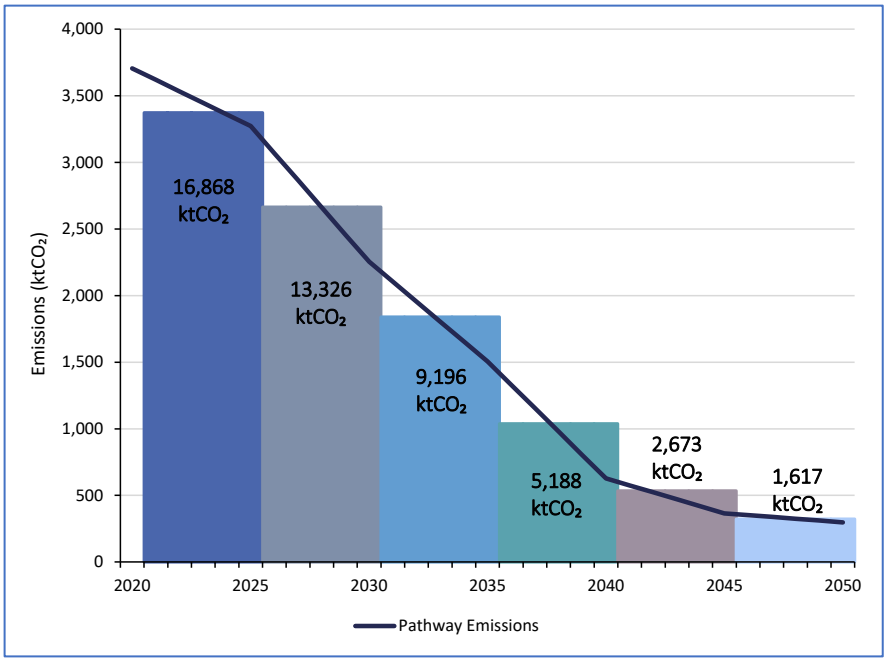

Figure 7: Oxfordshire Five Yearly Carbon Budgets

[7] NB: The budgets only include CO2 emissions, the dataset presented in the previous section includes emissions of nitrous oxides and methane.

18. The carbon budgets are the maximum quantity of cumulative emissions which can be emitted within the five-year period that will not exceed the projected pathway and provide a useful tool to monitor progress.

19. These budgets were set under the 'Oxfordshire Leading the Way' scenario, which combined widespread cultural and behavioural change with high deployment of new local electricity generation. This is an ambitious pathway that goes beyond national commitments, and the carbon budgets reflect this level of ambition.

20. A total of 3,413 kt CO_2 was emitted from these sectors in 2022, accounting for 20.2% of the 2021-2025 budget. The ONZRMAP indicates an annual average reduction of 9% will be needed between 2021 and 2025 to stay within the 5 year cumulative budget, with an annual average carbon budget of 3,374 kt CO_2 for the first budget period. Between 2021 and 2022 CO_2 emissions decreased by 5%, compared to the 9% necessary to be consistent with the ONZRMAP budget.

21. Since the COVID-19 pandemic, emissions have rebounded, and have not decreased at the rate necessary to stay within the carbon budgets outlined in the ONZRMAP. However, further analysis has shown that Oxfordshire is still within the carbon budget set by the Climate Change Committee, and extrapolation of historic CO_2 emissions data suggests that the county may recover its position in relation to the ONZRMAP carbon budgets later in this budget period. A comparison with other local authorities in England with a similar profile to Oxfordshire shows that the changes in annual emissions within the county is consistent with these comparator authorities.

22. There are also external factors which have affected Oxfordshire's carbon emissions, such as the carbon intensity of the grid. This increased up to 2021 due to the proportion of gas and coal in the fuel mix, but has been decreasing since this point.

23. Data on emissions is currently limited, as DESNZ reporting runs two years behind, however this trajectory will be updated in future reports to understand the full implications on Oxfordshire's progress towards net zero.

Taking Action to Decarbonise

24. Decarbonisation across the county is informed by the actions set out in the ONZRMAP, including vehicle electrification, retrofit, development of a Local Area Energy Plan and carbon sequestration.

25. More ambitious government policy is required in many areas to support the continued decarbonisation of transport, buildings and other areas which are largely outside of the control of the county.

26. There has been some progress from the new government, including lifting the de facto ban on onshore wind generation, consultations on planning reform, the launch of Great British Energy, and the announcement of the Warm Homes – Local Grant to address energy performance and heating of low-income households in England.

Emissions by District – Overall Emissions

27. The greenhouse gas emissions data provides a breakdown of the emissions for each of the five districts within Oxfordshire. This section addresses the overall emissions from each district, as well as a breakdown by sector and source.

28. Figure 8 shows the breakdown of emissions from each district. West Oxfordshire has the lowest overall emissions at 596 kt CO_2e, and Cherwell has the highest at 1,162.9 kt CO_2e due to the presence of the M40 within the district.

29. These results are reflected in the emissions per capita (Figure 9), with per capita emissions lowest in Oxford City (3.7 kt CO_2e) and highest in Cherwell (7.1 ktCO_2e).

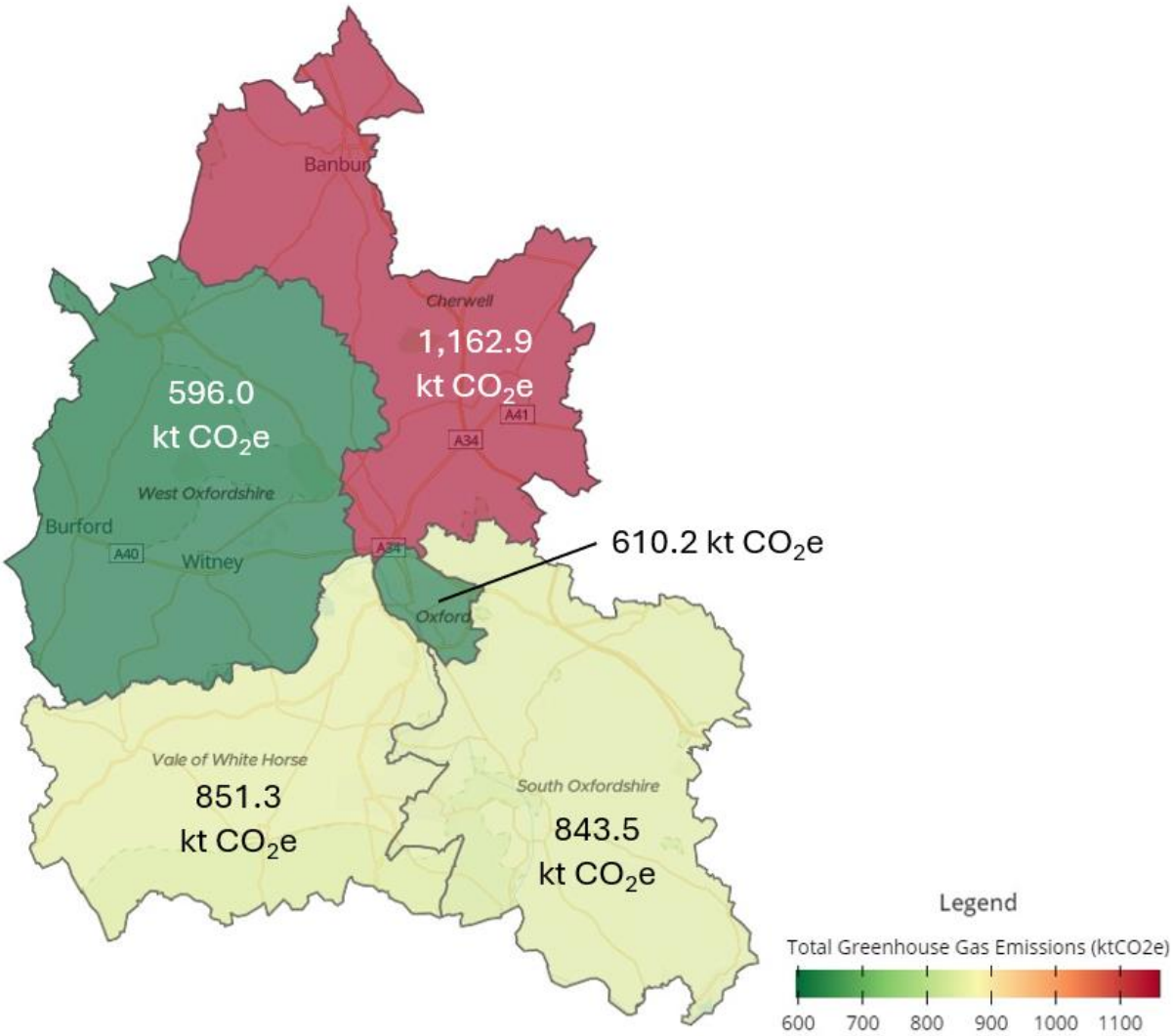

Figure 8: Overall Greenhouse Gas Emissions by District (2022)

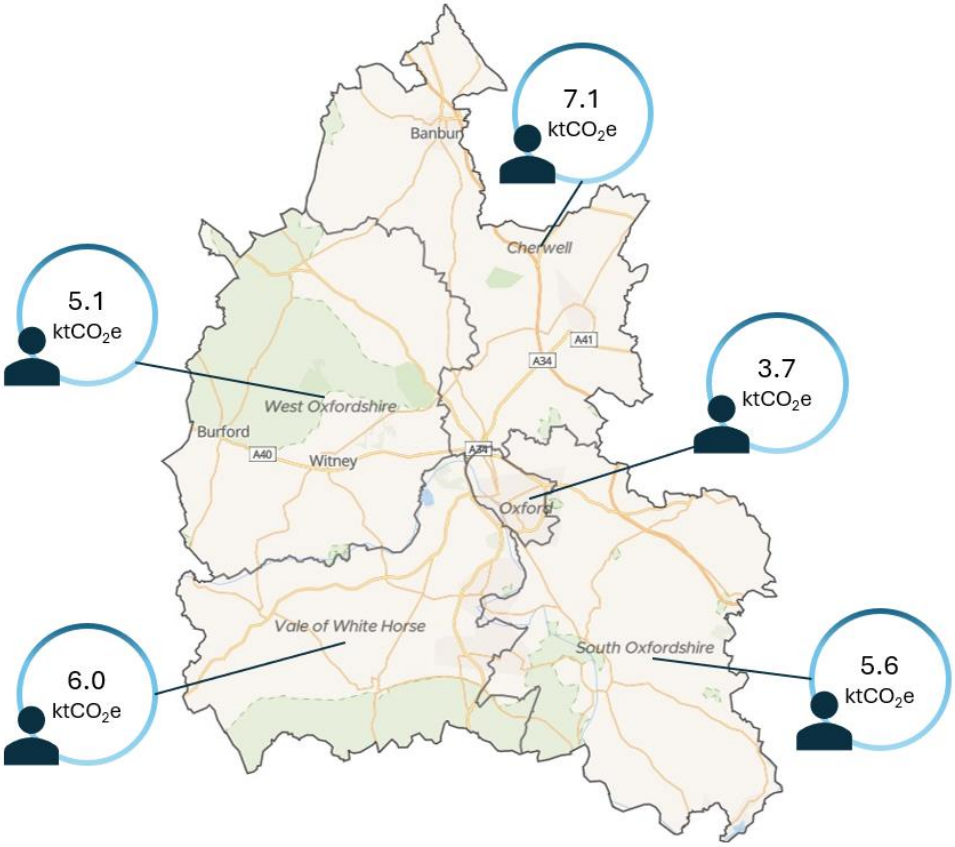

Figure 9: Per Capita Emissions by District (2022)

30. Figure 10 shows the change in emissions within each district from 2019 to 2022. Emissions have fallen in all five districts; the greatest decrease in emissions was seen in South Oxfordshire (12% decrease) followed by Cherwell (11%). The smallest decrease is in Oxford City (8%). Much of the decrease in emissions is likely to be driven by grid decarbonisation and electrification of fleets and services.

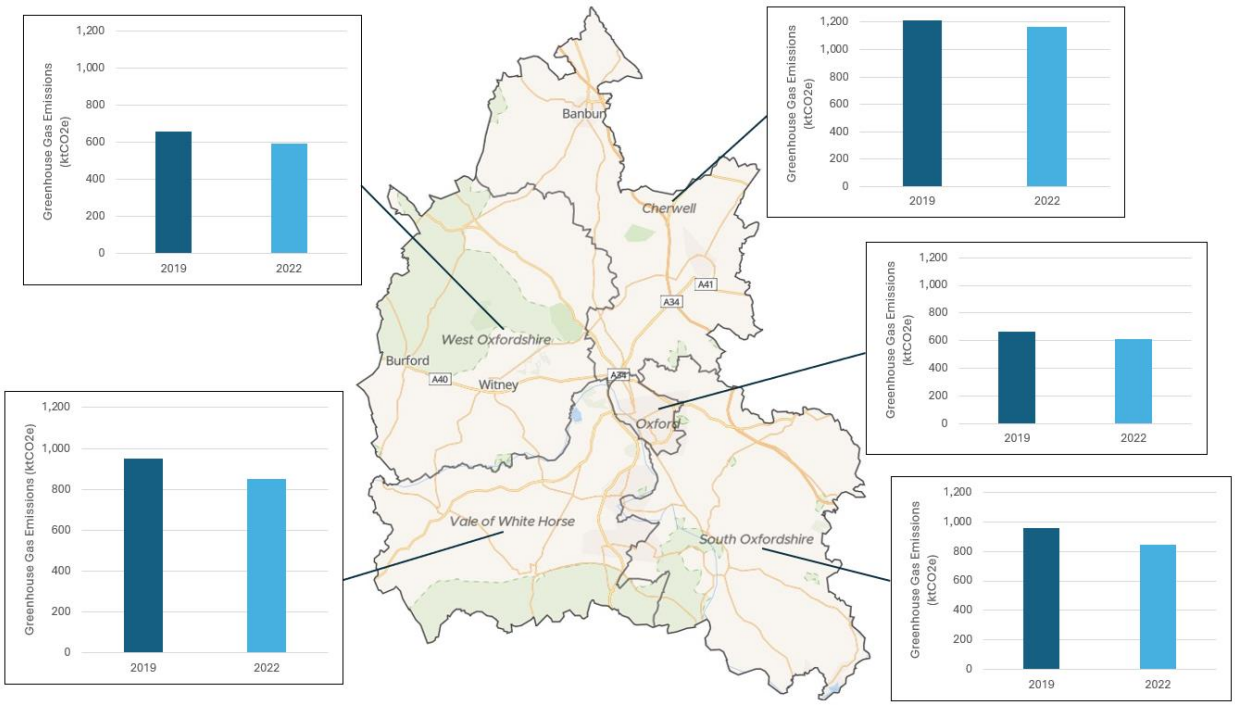

Figure 10: Change in Greenhouse Gas Emissions from 2021 to 2022 by District

Emissions by District – Source and Sector

31. This section provides an overview of district emissions by source and sector. Full results for each district are provided in Annex 1.

32. Figure 11 shows the proportion of emissions from each of the seven sectors. Transport comprises the majority of emissions in three districts; Cherwell (48%), Vale of White Horse (42%) and South Oxfordshire (41%). The M40 and the A34 run through these districts and contribute significantly to the overall emissions from transport. Domestic emissions make up the second largest proportion in all districts (between 18 and 27%) followed by agriculture in every district other than Oxford City where commercial sources produce 22% of emissions. This reflects the different economic composition of the districts, with a greater focus on agricultural activity in rural areas.

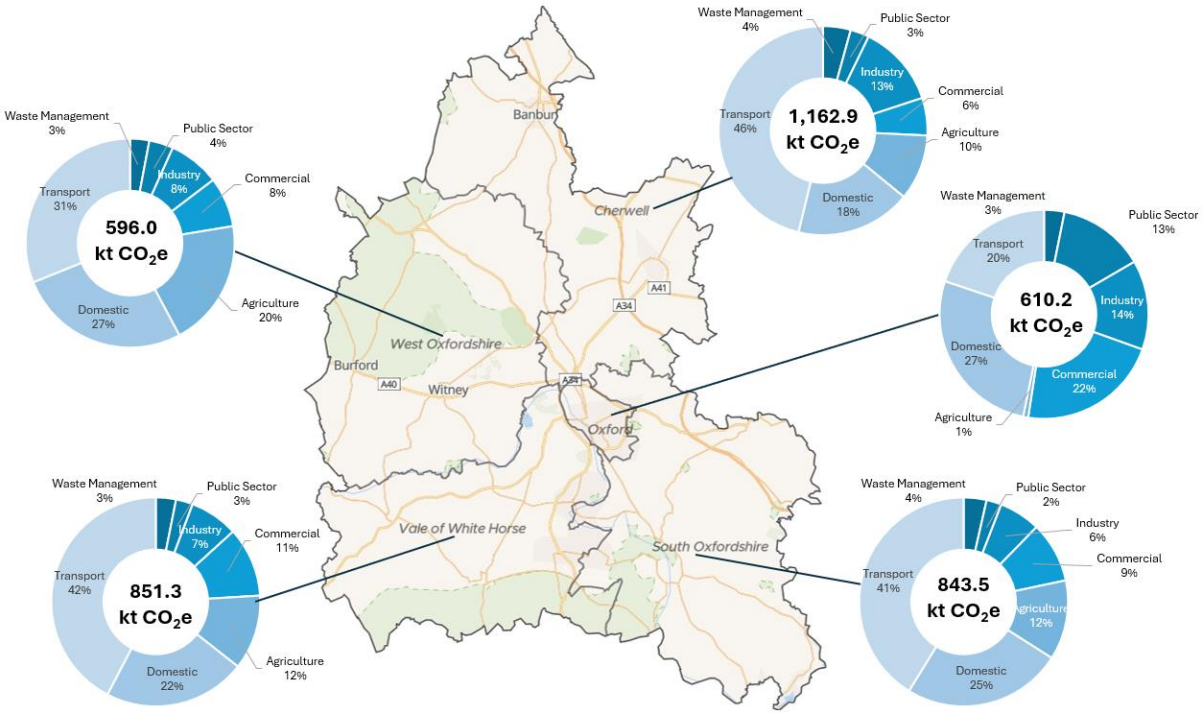

Figure 11: District Emissions by Sector (2022)

33. The greatest variation in emissions sources across the county is in transport, where the proportion of emissions from A-roads and motorways varies significantly between districts. Within the domestic sector, Oxford City has the highest proportion of emissions from gas. For the industrial sector, South Oxfordshire is the only district where electricity is responsible for the majority of sectoral emissions.

Emissions by District – Emissions Over Time

34. Since 2008, there has been a reduction in emissions across all sectors and all districts, other than agriculture in Oxford City (although the absolute difference in emissions is just 1.8ktCO2e).

35. Table 1 shows the reduction in emissions since the baseline year (2008), and a full breakdown of emissions is provided in Annex 2. Waste management has seen the greatest reduction in emissions over time (although this only accounts for a small proportion of emissions overall), followed by emissions from commercial sources. Industrial emissions reductions have the greatest variation between districts (40%).

	West Oxfordshire	Vale of White Horse	City	Cherwell	South Oxfordshire
Waste Management	-76%	-70%	-82%	-54%	-68%
Agriculture	-12%	-12%	59%	-16%	-2%
Transport	-17%	-12%	-24%	-13%	-17%
Domestic	-43%	-41%	-45%	-41%	-42%
Public Sector	-36%	-49%	-52%	-25%	-49%
Commercial	-53%	-54%	-59%	-58%	-63%
Industry	-41%	-47%	-19%	-45%	-59%

Table 1: Percentage reduction in emissions between 2008 and 2022 by district and sector

Conclusion

36. Sources in Oxfordshire accounted for 4,063.9 kt CO2e in 2022 (latest available data), 4% lower than in 2021 and 10% lower than in 2019 – there has been a recovery in most sectors since the 2020 Covid-19 pandemic but efforts to decarbonise have resulted in a decrease in emissions in most sectors since 2021.

37. Emissions have fallen by 37% since 2008 (the baseline year for the countywide target).

38. Transport and waste management are the only sectors which have seen an increase in emissions since 2021.

Annex:
1 – District Emissions by Source
2 – Change in District Emissions Over Time

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Annex 1: District Emissions by Source

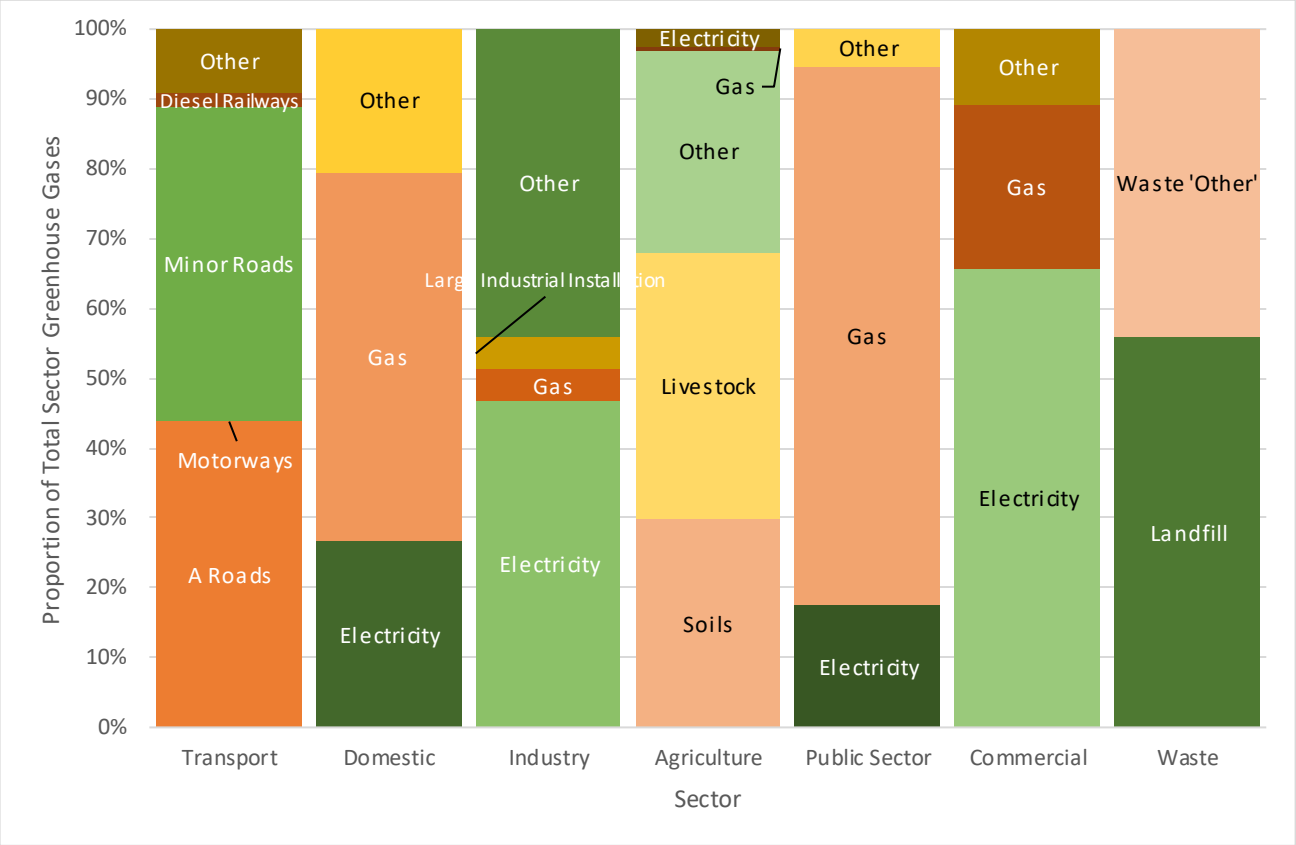

Figure 12: District emissions by sector and source (West Oxfordshire)

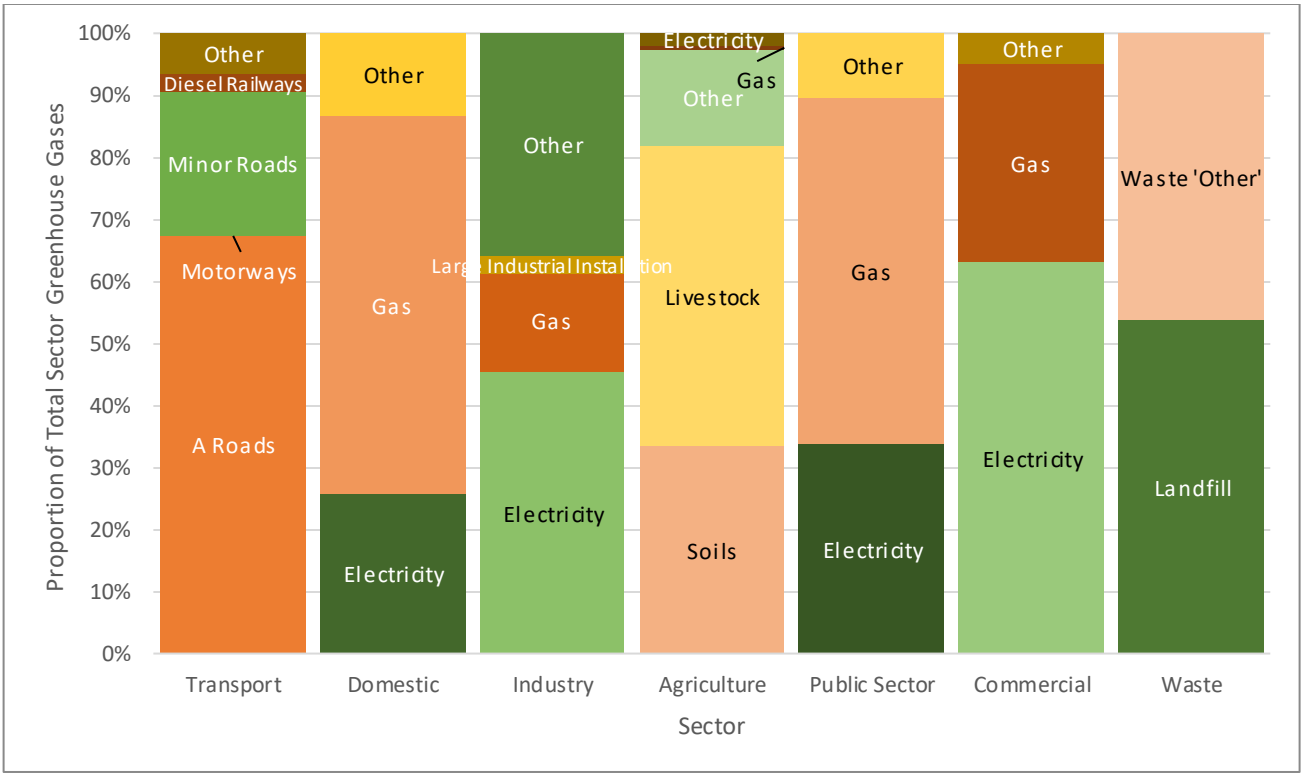

Figure 13: District emissions by sector and source (Vale of White Horse)

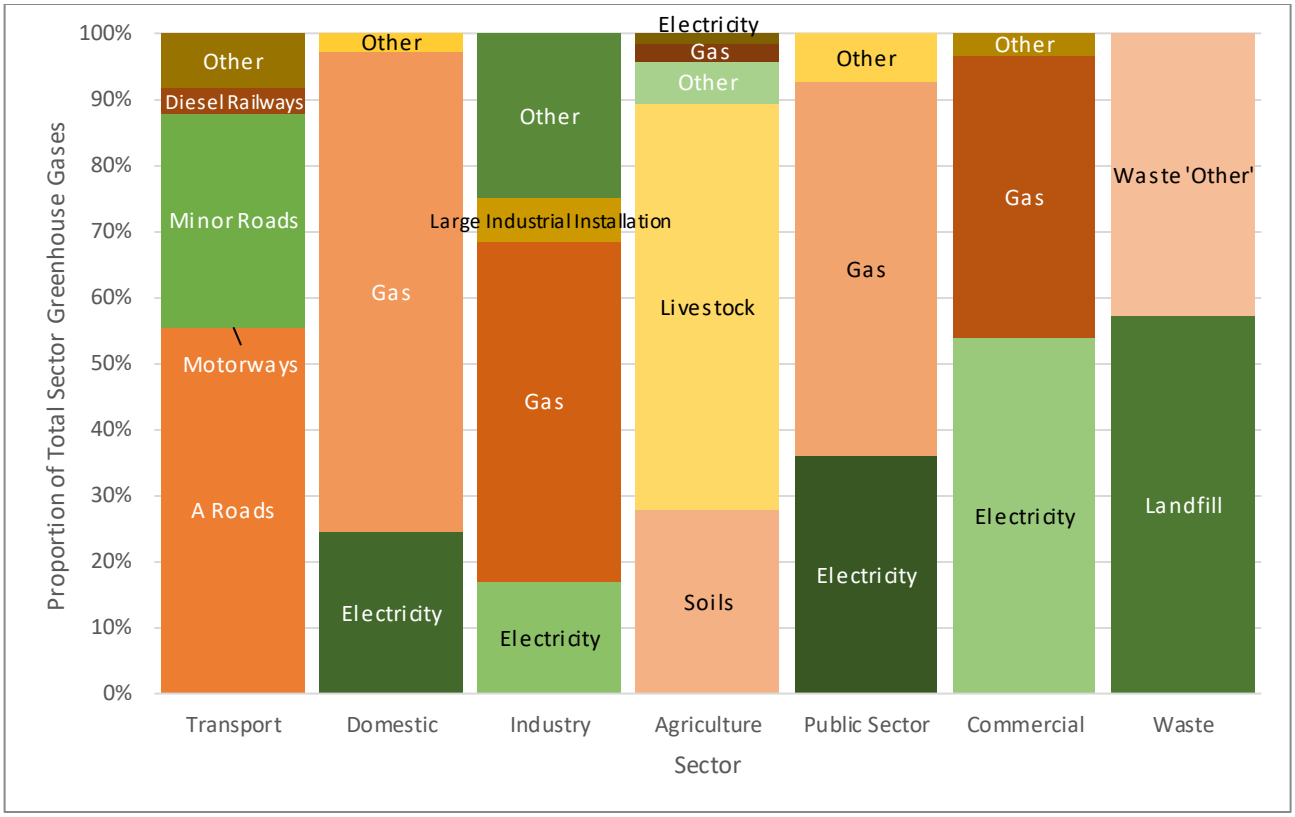

Figure 14: District emissions by sector and source (Oxford City)

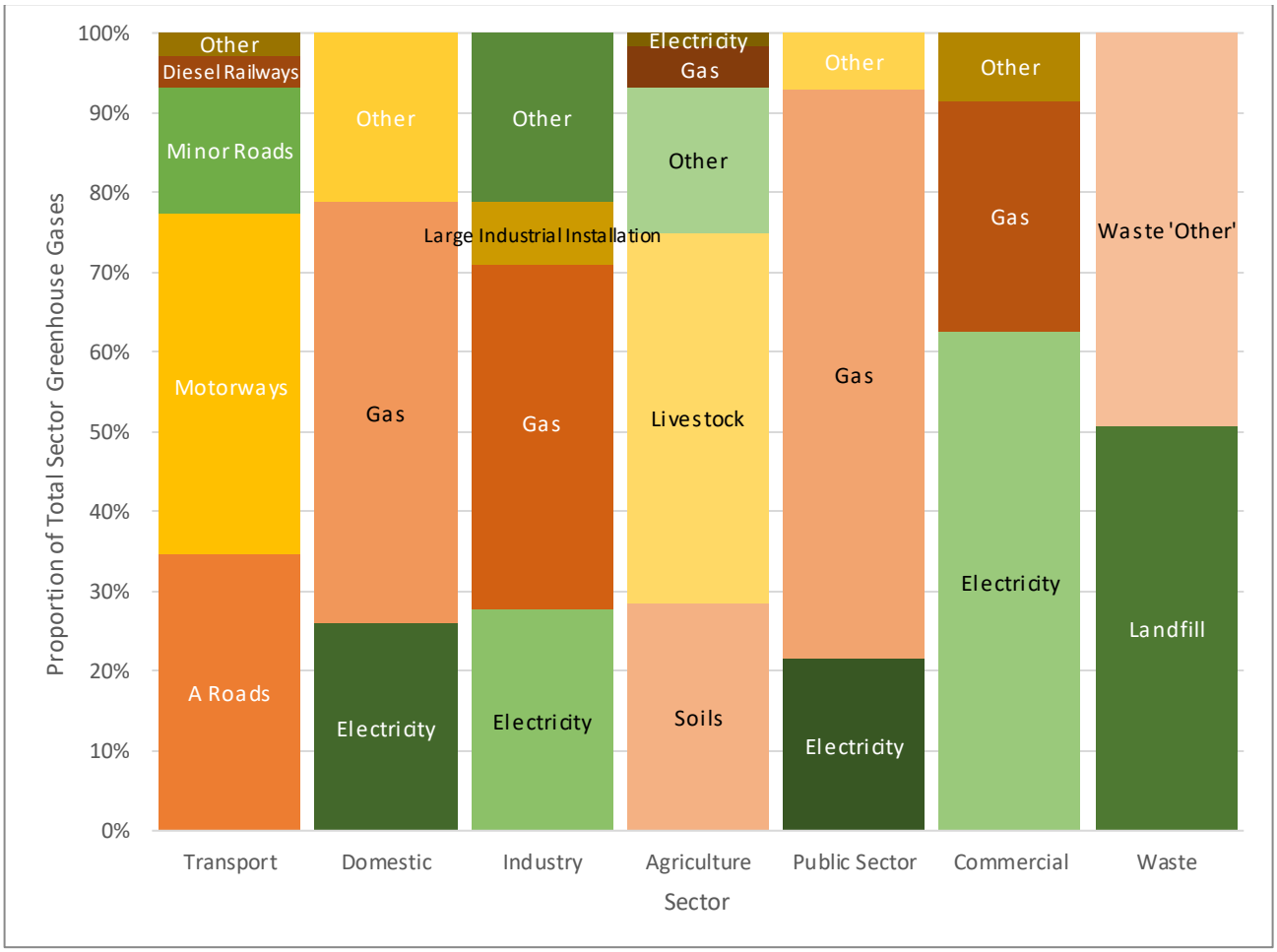

Figure 15: District emissions by sector and source (Cherwell)

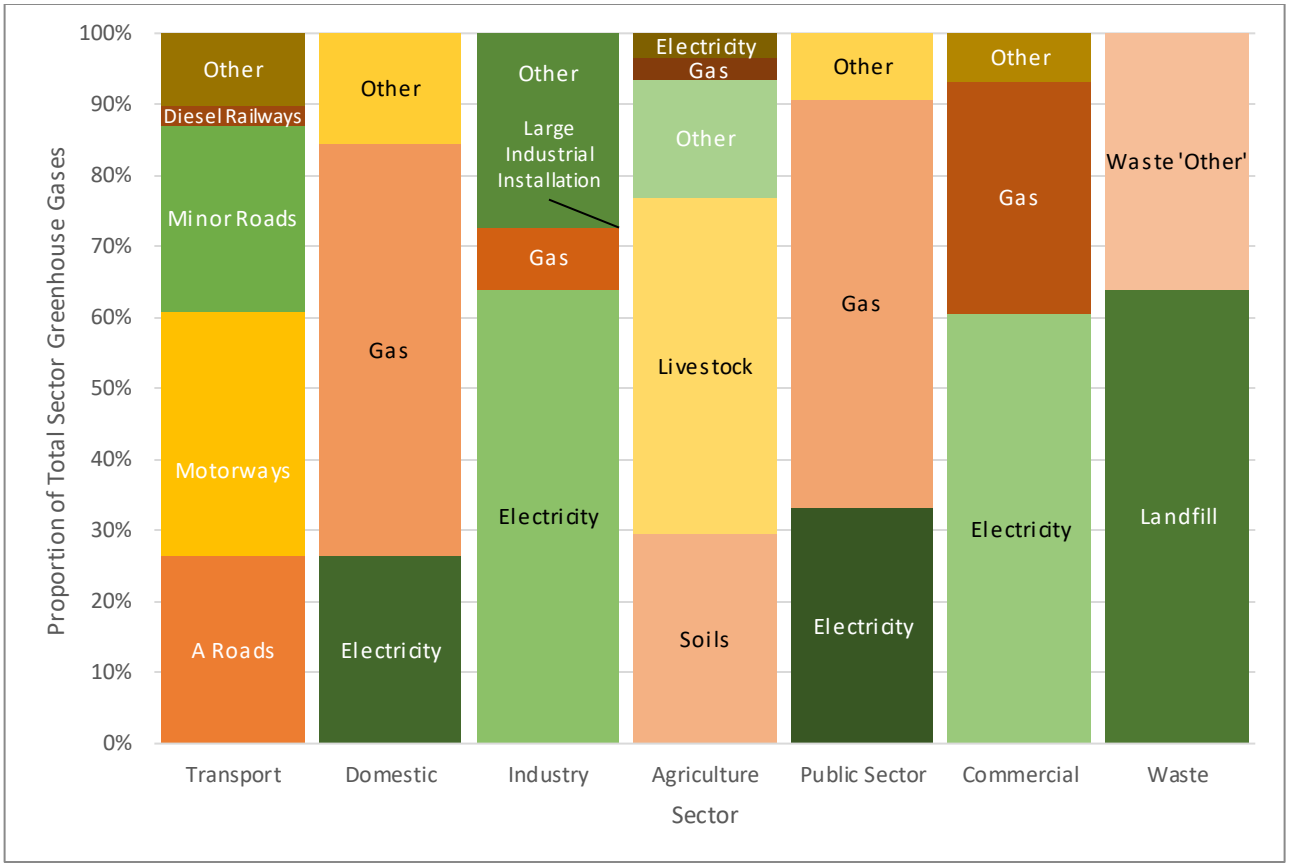

Figure 16: District emissions by sector and source (South Oxfordshire)

Annex 2: Change in District Emissions Over Time

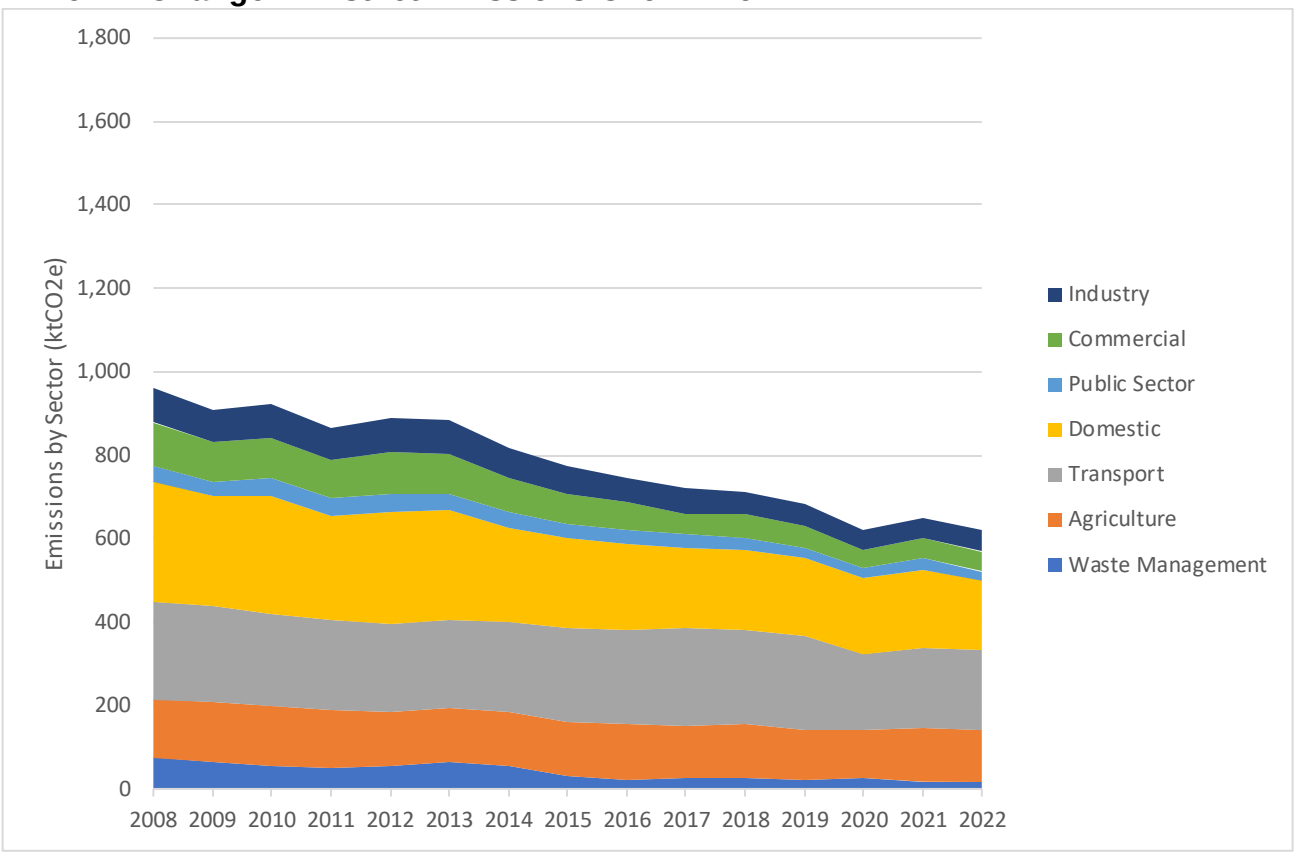

Figure 17: District emissions by sector 2008 - 2022 (West Oxfordshire)

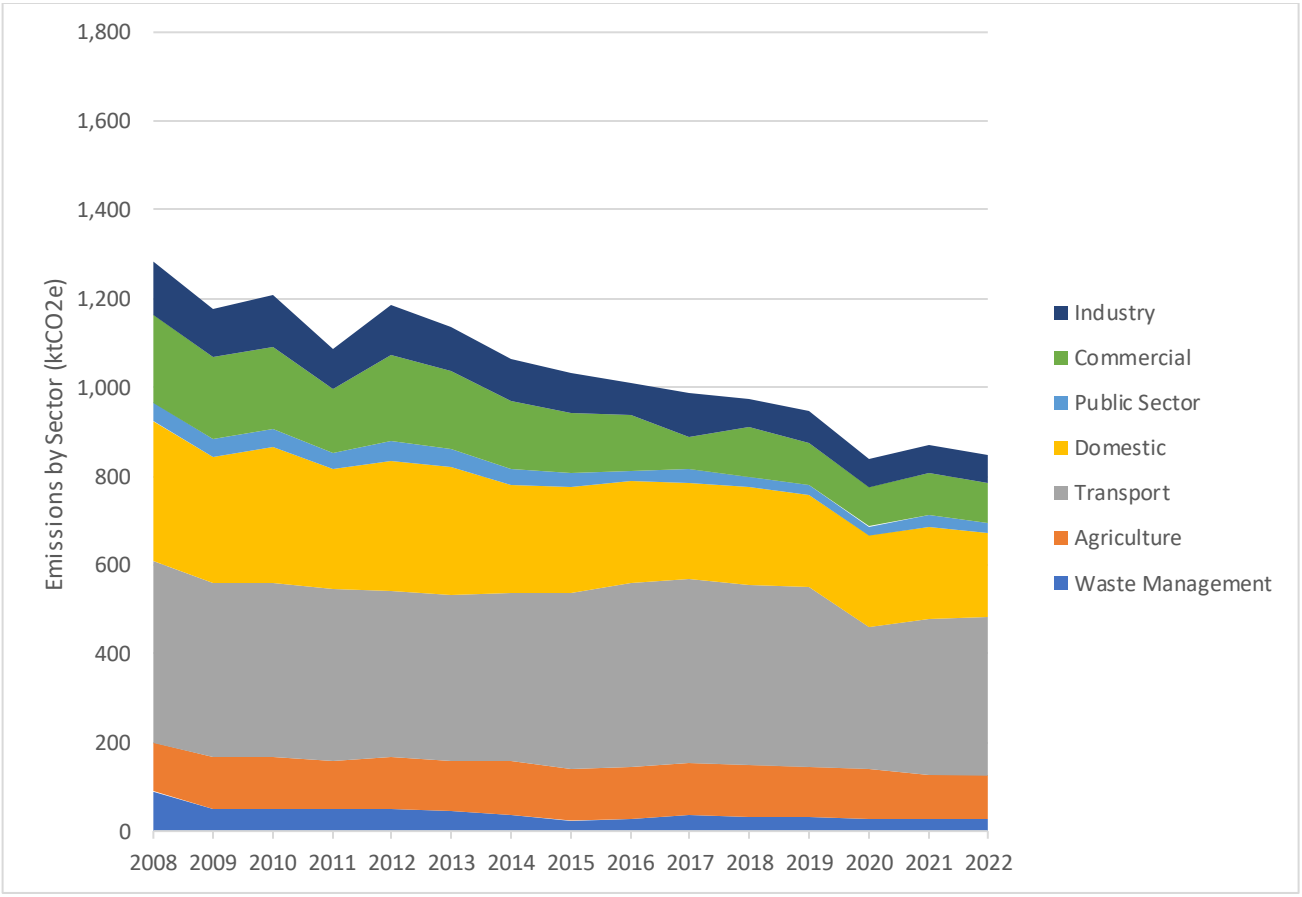

Figure 18: District emissions by sector 2008 - 2022 (Vale of White Horse)

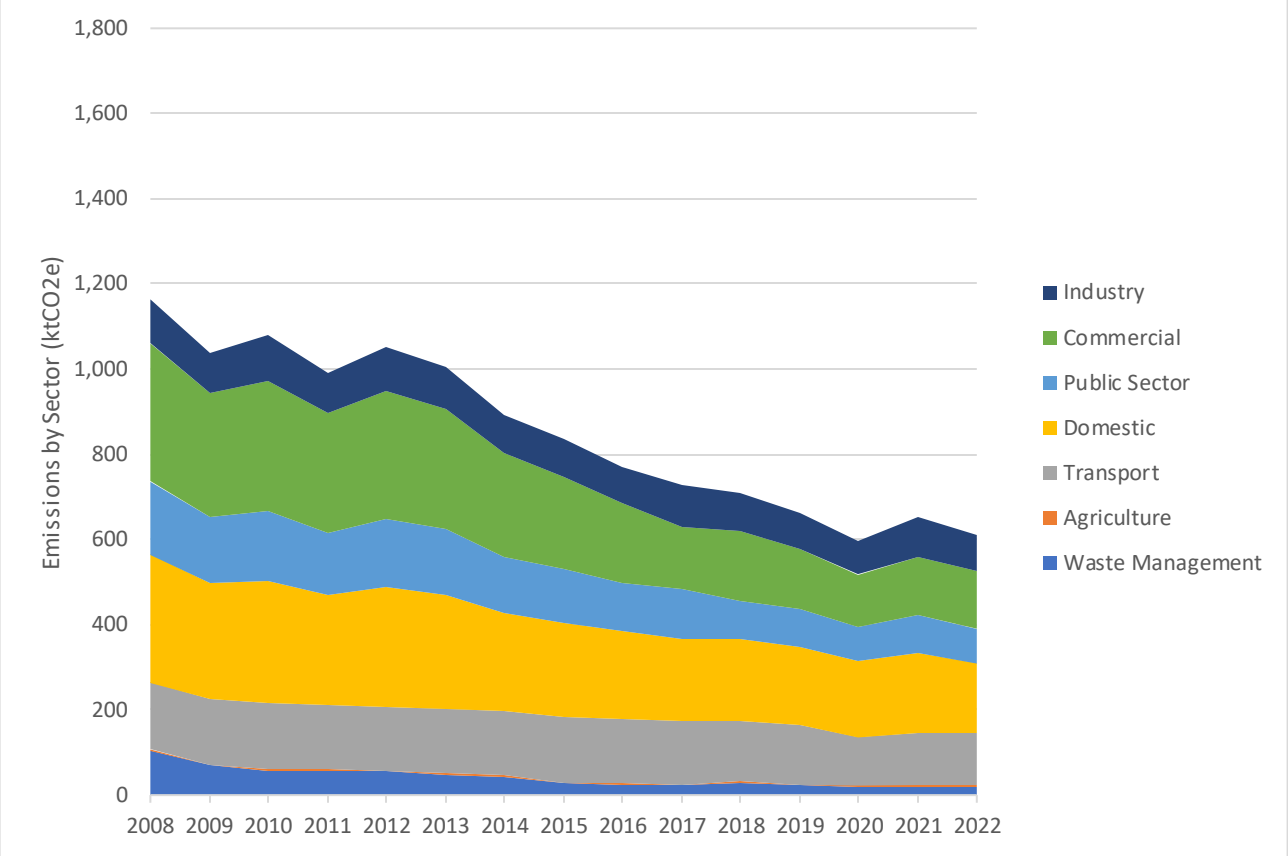

Figure 19: District emissions by sector 2008 - 2022 (Oxford City)

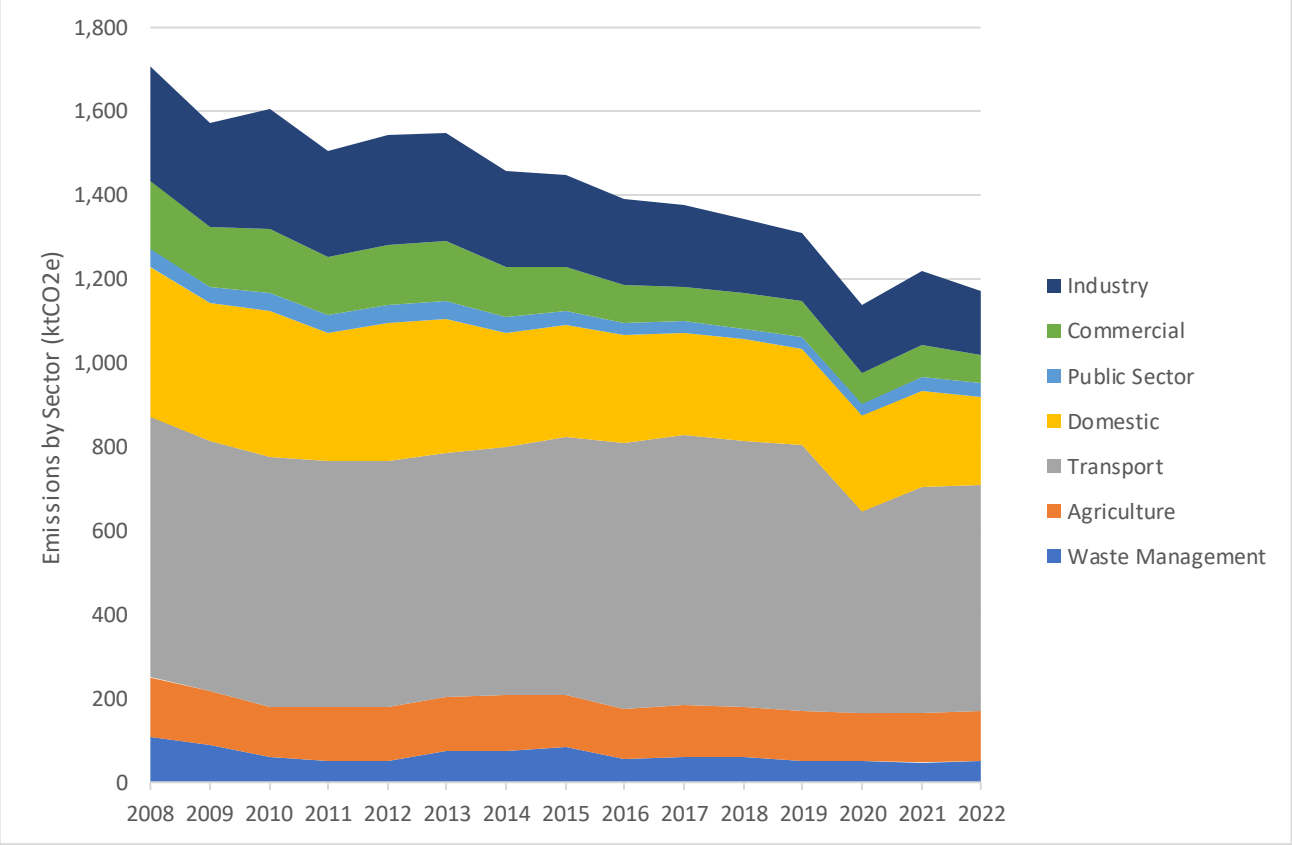

Figure 20: District emissions by sector 2008 - 2022 (Cherwell)

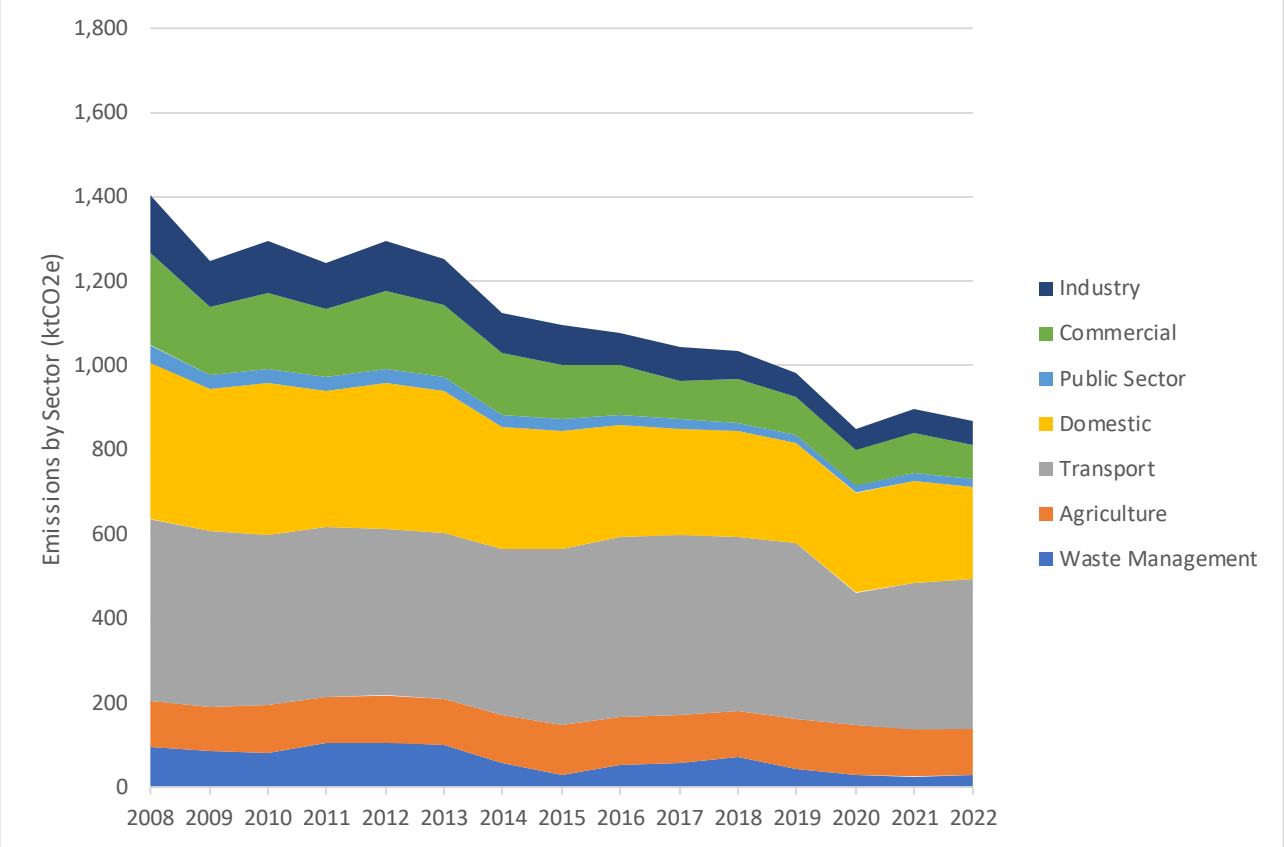

Figure 21: District emissions by sector 2008 - 2022 (South Oxfordshire)