Forest of Dean
DISTRICT COUNCIL

CLIMATE ACTION for Forest of Dean

Forest of Dean District Carbon Dioxide Emissions Report 2005 – 2019

October 2021

Contents

Executive Summary

This report contains a summary of the estimated carbon dioxide (CO_2) emissions for the Forest of Dean District in 2019 (April 2019 to March 2020), and compares how emissions have changed between 2005 and 2019. To estimate emissions, this report uses data from the Department for Business, Energy & Industrial Strategy's (BEIS) *UK Local Authority and Regional Carbon Dioxide Emissions National Statistics: 2005 to 2019*, published in June 2021.

In 2019, total estimated net CO_2 emissions for the Forest of Dean district were 438.9 kilo tonnes (kt), which equates to 5.1 tonnes of CO_2 emissions per capita. This is equal to the Gloucestershire average but higher than the average for the South West region (4.6 tonnes). Between 2018 and 2019, total net CO_2 emissions fell by 17.3 kt CO_2 (3.8%), showing that the district is making progress towards the Council's goal of carbon neutrality by 2030. However, it is still far short of what will be required to achieve the 2030 goal - an average annual reduction of 39.9 kt CO_2 (9.1% annual reduction on 2019 total).

Emissions from transport remain a major challenge to the district, and represent by far the largest proportion of total CO_2 emissions from energy in the district (37.7%). Almost all of this came from road transport (93.1%). Transport emissions have remained stubbornly high since 2005, having recorded the smallest reduction of all sectors (9.4%). This was also the case most recently between 2018 and 2019 (1.4% fall). The challenge, is further highlighted by the fact that emissions from minor road transport has actually increased by 18.1% since 2005, a trend that continued between 2018 and 2019, when there was an increase of 2.2%.

Another significant challenge will be reducing emissions from gas consumption across the district, which since 2005 has seen significant increases across commercial, domestic, industry and public sectors, and makes up the largest proportion of emissions for the latter three sectors.

Whilst all sectors have seen a fall in net emissions since 2005, it is important to highlight that across all of them, the largest percentage reduction in emissions came from electricity consumption. Although this is a welcome trend, it is likely mainly the result of increases in the proportion of national grid supplied electricity coming from renewable energy generation, rather than actions taken within the district.

Other areas that have seen increases in emissions and therefore requiring further attention include large industrial installations (5.2% increase since 2018, 4.4% increase since 2005), agriculture (7.1% increase since 2018) and cropland ((21.1% increase since 2005).

Unsurprisingly, given the natural landscape of the district, land use, land use change and forestry contributed a net gain in carbon storage, removing an estimated 8.5% of the emissions produced by other sectors in 2019. Despite this, net carbon sequestration was

0.2% lower than in 2018, with sequestration from forest falling and emissions from settlements increasing.

On a positive note, both the public and commercial sectors have seen their emissions fall by more than half since 2005, although it should be pointed out that they are the two smallest sectors within the district.

It is important to note that this report covers CO_2 emissions only, and therefore potentially large sources of other greenhouse gases such as methane (CH_4) emissions from livestock and nitrous oxide (N_2O) emissions from manure management have not been included.

Key recommendations for the Council:

- Prioritise actions that will help reduce emissions from road transport in the district, such as through the provision of cycling and walking infrastructure, investment and planning policy that facilitates the uptake of electric vehicles and access to local amenities, and lobbying of the County Council and national Government for increased public transport provision.

- Establish a positive planning policy framework for maximising the use of renewables within new developments, and facilitating opportunities for the deployment of larger scale renewable power and heat generation within the district.

- Explore and identify ways that the Council can help facilitate an increase in the retrofit of existing buildings across the district in order to reduce heating demand and accelerate the transition away from gas fired heating systems to low carbon ones.

- Identify ways of supporting industry to use renewable energy to substitute for fossil fuels.

- Identify ways of supporting the implementation of carbon sequestering (and ecologically regenerative) land management and farming practices in the district.

Introduction

This report contains a summary of the estimated carbon dioxide (CO_2) emissions for the Forest of Dean District in 2019 (April 2019 to March 2020), and compares how emissions have changed between 2005 and 2019.

To estimate emissions, this report uses data from the Department for Business, Energy & Industrial Strategy's (BEIS) *UK Local Authority and Regional Carbon Dioxide Emissions National Statistics: 2005 to 2019*, published in June 2021. The estimates calculated by BEIS are to help those working on local or regional indicators and inventories as part of their efforts to reduce CO_2 emissions. On their own, however, they cannot give all the information necessary to plan and monitor the progress of all local emissions reduction initiatives; this may require additional monitoring at the local level. It is also important to note that the BEIS dataset represents CO_2 only, and does not include emissions of other greenhouse gases (GHG), such as nitrous oxide (N_2O) and methane (CH_4).

Other methods exist for estimating district-wide emissions, namely the SCATTER Tool, developed by Anthesis in partnership with BEIS, Nottingham City Council and The Tyndall Centre for Climate Change Research. SCATTER is a local authority focussed emissions tool, built to help create low-carbon local authorities. It provides local authorities and city regions the opportunity to standardise their greenhouse gas reporting and align it to the Accounting and Reporting Standard developed by the Greenhouse Gas Protocol - the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories, as accepted by CDP and the Global Covenant of Mayors. Unlike the BEIS dataset, it also includes emissions factors for other GHGs, rather than CO_2 only. The outputs from SCATTER also include sub-sectors not covered by BEIS, for example, solid waste disposal, wastewater management, aviation, and livestock.

Despite these advantages over the BEIS dataset, unlike the former, SCATTER has limited functionality for comparing emissions totals across multiple years. The BEIS dataset on the other hand allows comparisons all the way back to 2005. SCATTER's potential use for cross-year comparison is further impaired by annual changes to the methods used to calculate emissions for various sub-sectors. Furthermore, outputs from the SCATTER Tool have a 3 year lag, for example, the 2021 report is based on data from 2018/19, whereas data for 2019/2020 was used in the BEIS data set. Therefore, despite its limitations, this report solely relies upon the BEIS dataset to illustrate the district's current position and past progress in reducing GHG emissions.

More detailed information about the BEIS local authority CO_2 emissions dataset, including full data tables and methodology, can be accessed at: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019.

For more information about SCATTER and to request its full methodology, visit http://SCATTERcities.com.

District Carbon Dioxide Emissions in 2005-2019

Overview

Total estimated net CO_2 emissions for the Forest of Dean district were 438.9 kilo tonnes (kt) in 2019, which equates to 5.1 tonnes of CO_2 emissions per capita. To put this into context, CO_2 emissions per capita compared for Gloucestershire were also 5.1 tonnes, and 4.6 tonnes for the South West region. It is estimated that for the UK to achieve 80% reduction in emissions by 2050, per capita emissions would have to be 2 tonnes by 2050. The Government target is now to achieve net zero by 2050, so on this basis, per capita emissions are required to be less than 2 tonnes by 2050.

At 37.7%, the largest proportion of the district's emissions from energy came from the transport sector (186.7 kt CO_2), whilst industry made up the next largest proportion at 28% (134.2 kt CO_2) followed by domestic at 27% (129.6 kt CO_2) (Figures 1 and 2). Land use, land use change, and forestry (LULUCF) contributed a net gain in carbon storage, sequestering (removing) an estimated 8.5% (40.8 kt CO_2) of the emissions from energy produced by other sectors.

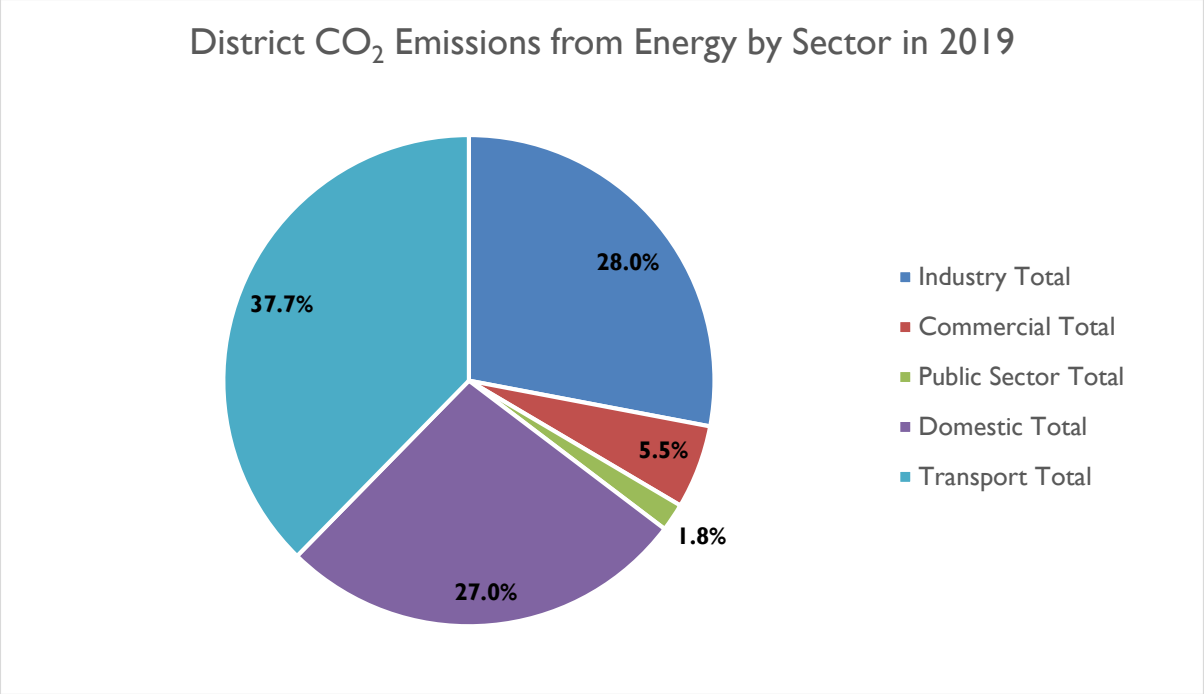


Figure 1: Estimated CO_2 emissions from energy in the Forest of Dean district in 2019 by sector.

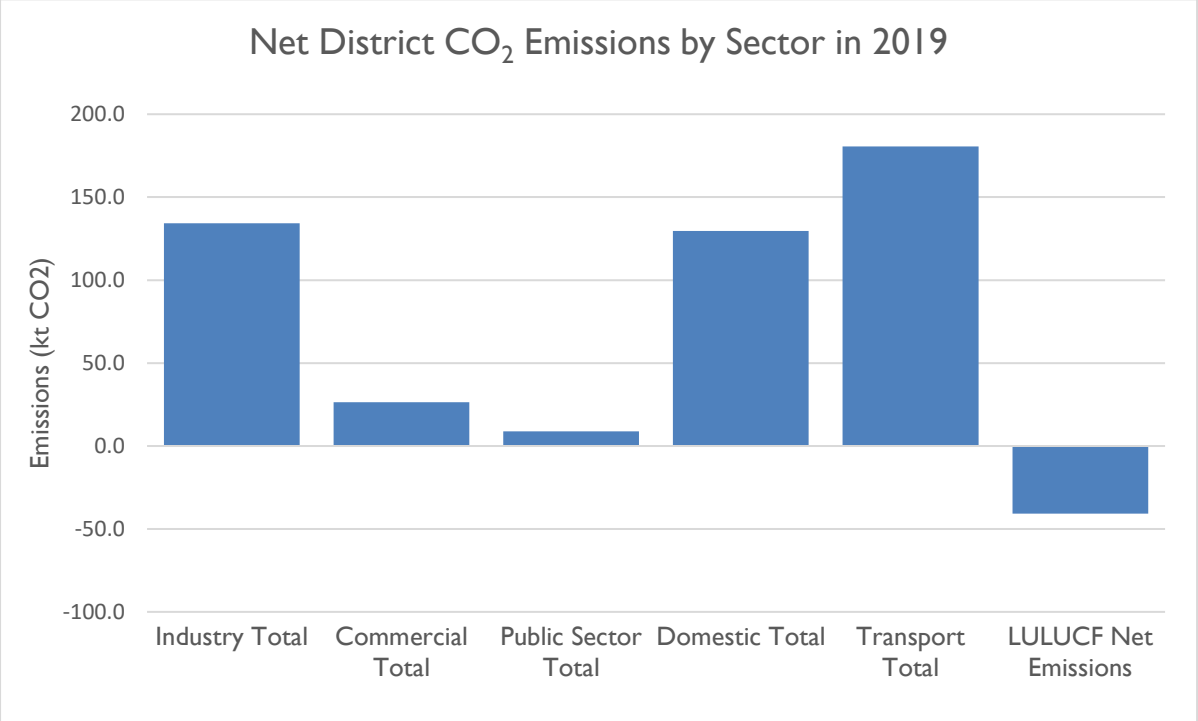


Figure 2: Estimated net CO_2 emissions produced in the Forest of Dean district in 2019 by each sector.

Since 2018, total net emissions have fallen by 17.3 kt CO_2 (3.8%) (Figure 3), with the largest percentage reduction coming from industry (6.7%), followed closely by the commercial sector (6.6%). There were smaller reductions in emissions from the public sector (3.3%), domestic (2.3%) and transport (1.4%). However, net carbon sequestration from LULUCF reduced by 0.2%.

Since 2005 (baseline year), total emissions have fallen by 212 kt CO_2 (32.6%), with the largest percentage reduction coming from the public sector (56.6%), followed closely by the commercial sector (51.5%). There have been smaller percentage reductions in emissions from domestic (39.9%), industry (29.4%) and transport (9.4%). Net carbon storage from LULUCF has increased by 41.5%.

On average since 2005, there has been a 2.7% year-on-year reduction in total emissions in the district. This has resulted in an average emissions reduction rate of 15.1 Kt CO_2 per year. If the district's emissions were to continue to fall at this rate, carbon neutrality would be achieved in approximately 2049 – 19 years beyond Forest of Dean District Council's target of 2030.

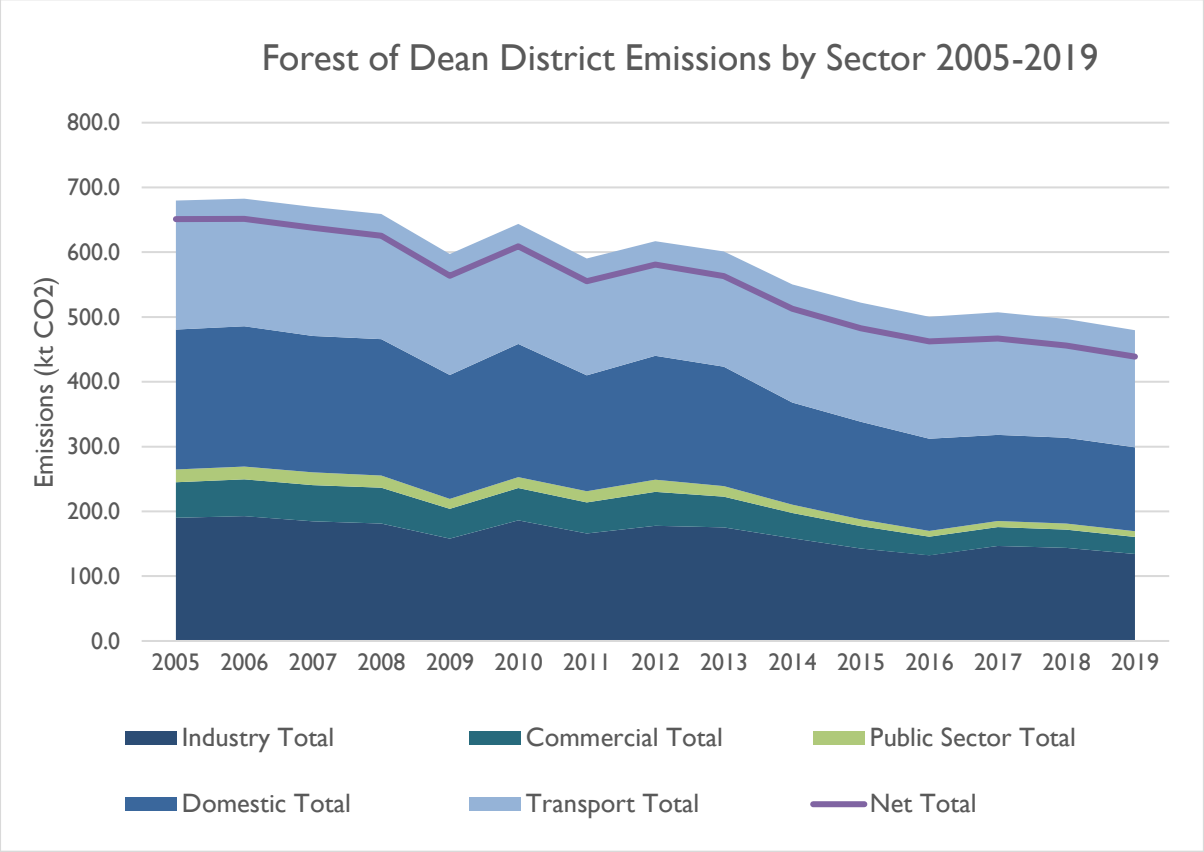


Figure 3: Estimated CO_2 emissions produced by each sector in the Forest of Dean district between 2005 and 2019.

Industry

In 2019, emissions from industry within the Forest of Dean district were 134.2 kt CO_2. At 37.4%, the largest proportion of industry emissions came from gas consumption (50.3 kt CO_2) (Figure 4), whilst electricity consumption made up 22.4% (30.1 kt CO_2) and consumption of other fuels 25.1% (33.6 kt CO_2).

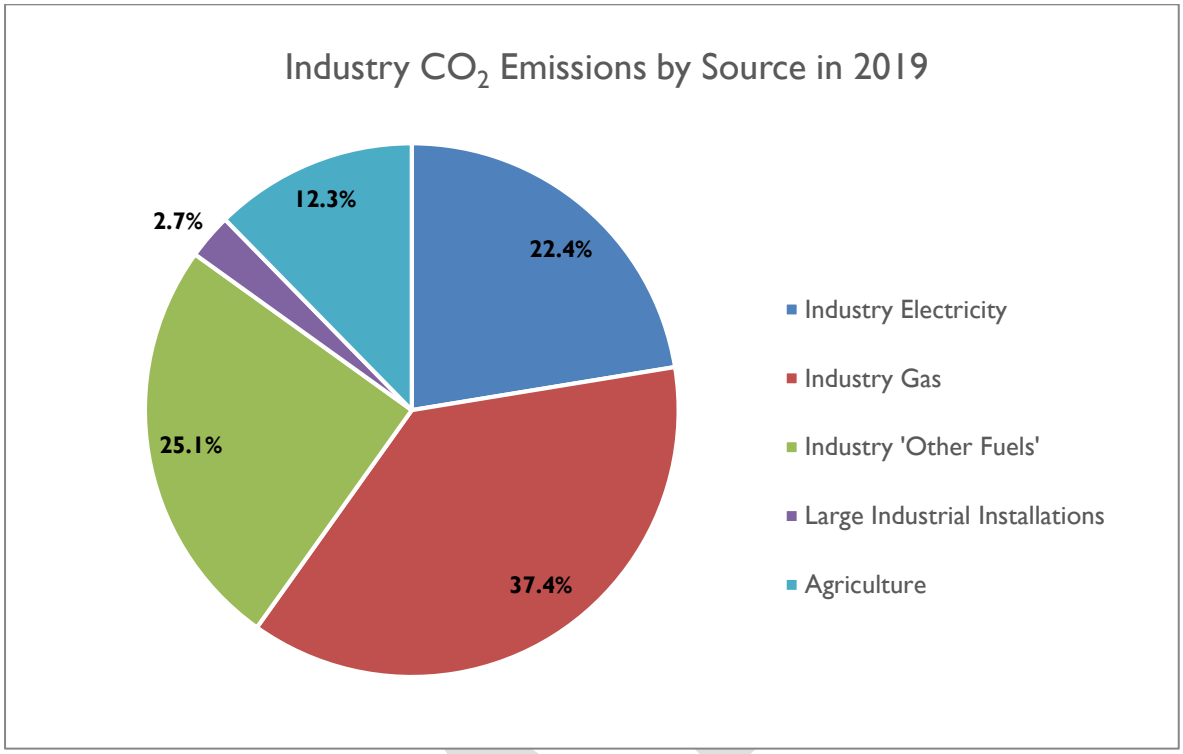


Figure 4: Estimated industry CO_2 emissions by source in the Forest of Dean district in 2019. Note: agriculture includes emissions from both gas and electricity and is not disaggregated.

Since 2018, emissions from industry have fallen by 9.6 kt CO_2 (6.7%) (Figure 5), with the largest percentage reduction coming from electricity consumption (17.5%). There were smaller percentage reductions from gas consumption (7.4%) and consumption of other fuels (1.2%); however there was an increase in emissions from both large industrial installations (5.2%) and agriculture (7.1%).

Since 2005 (baseline year), emissions from industry have fallen by 56.2 kt CO_2 (29.4%), with the largest percentage reduction coming from electricity consumption (66.2%). There were smaller percentage reductions from the consumption of other fuels (15.9%) and agriculture (3.7%); however there was an increase in emissions from both gas consumption (24.3%) and large industrial installations (4.4%).

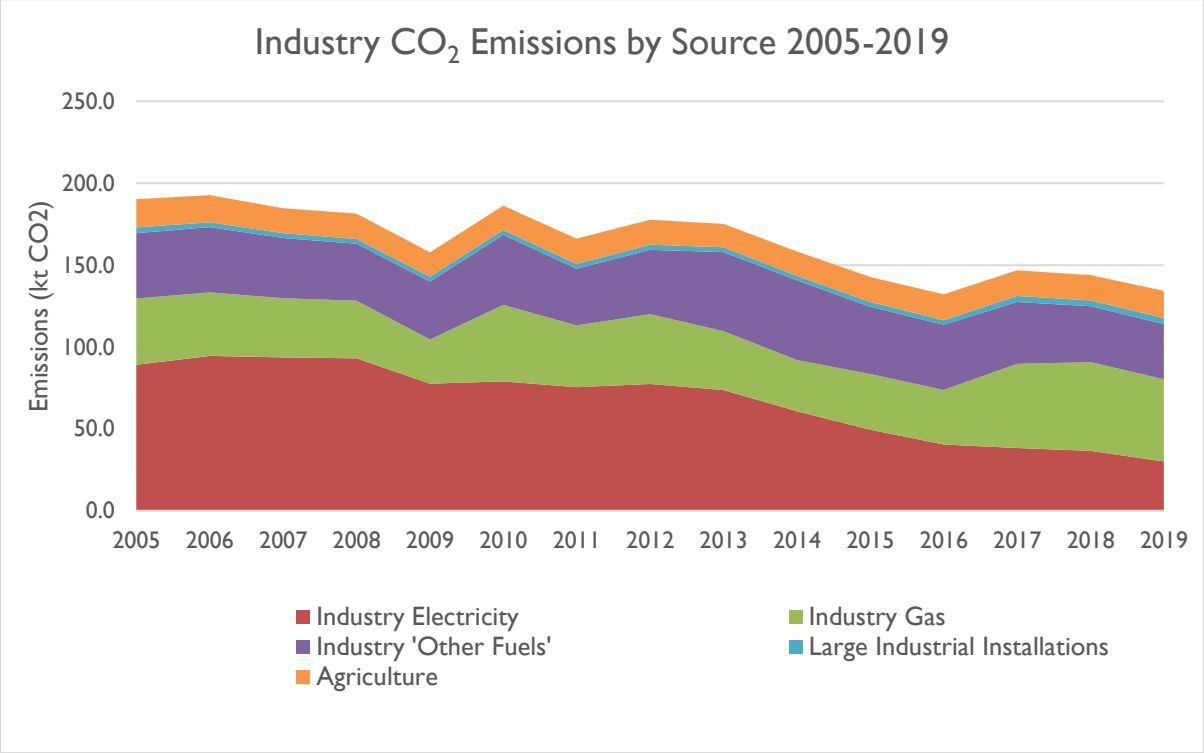


Figure 5: Estimated industry CO_2 emissions by source in the Forest of Dean district between 2005 and 2019.

Commercial Sector

In 2019, emissions from the commercial sector within the Forest of Dean district were 26.4 kt CO_2. At 66.7%, the largest proportion of commercial sector emissions came from electricity consumption (17.6 kt CO_2) (Figure 6), whilst gas consumption made up 29.5% (7.8 kt CO_2) and consumption of other fuels 3.8% (1.0 kt CO_2).

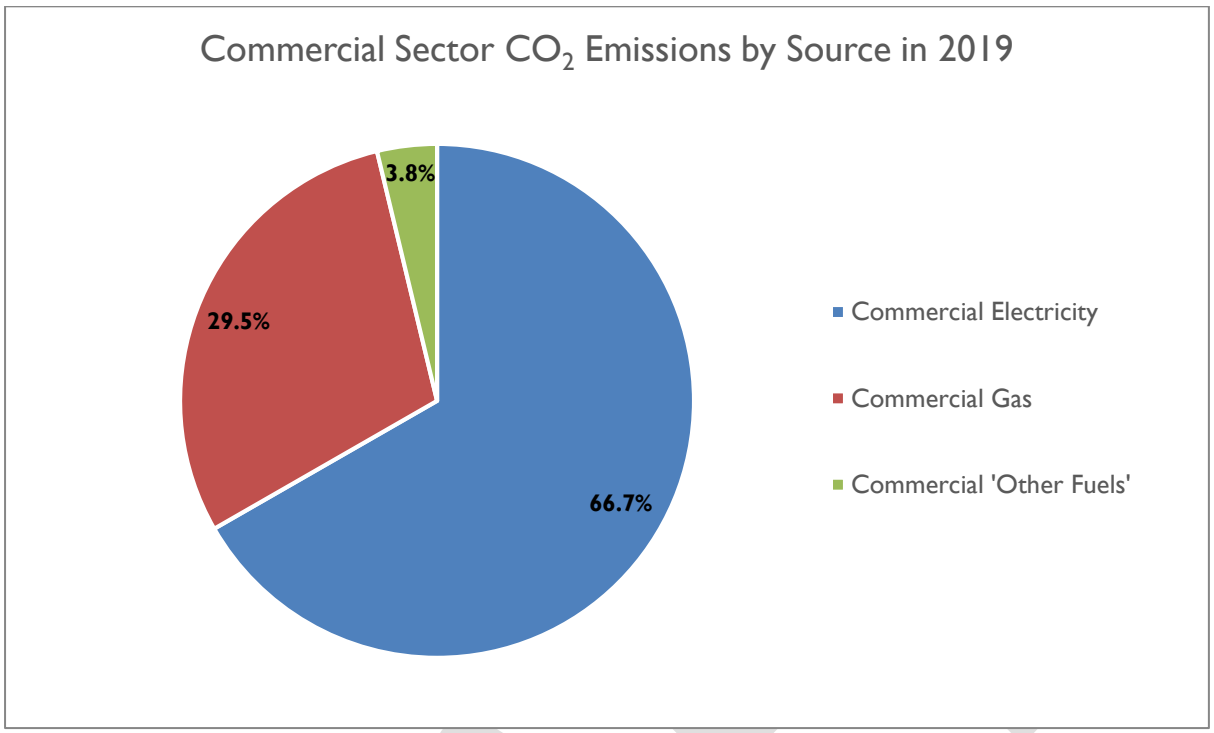


Figure 6: Estimated commercial sector CO_2 emissions by source in the Forest of Dean district in 2019.

Since 2018, emissions from the commercial sector have fallen by 1.9 kt CO_2 (6.6%) (Figure 7), with the largest percentage reduction coming from commercial electricity consumption (14%). There was a smaller percentage reduction from consumption of other fuels (9%); however there was an increase in emissions from commercial gas consumption (16%).

Since 2005 (baseline year), emissions from the commercial sector have fallen by 28.1 kt CO_2 (51.5%), with the largest percentage reduction coming from commercial electricity consumption (62.4%). There was a smaller percentage reduction from consumption of other fuels (35.2%); however there was an increase in emissions from commercial gas consumption (27.2%).

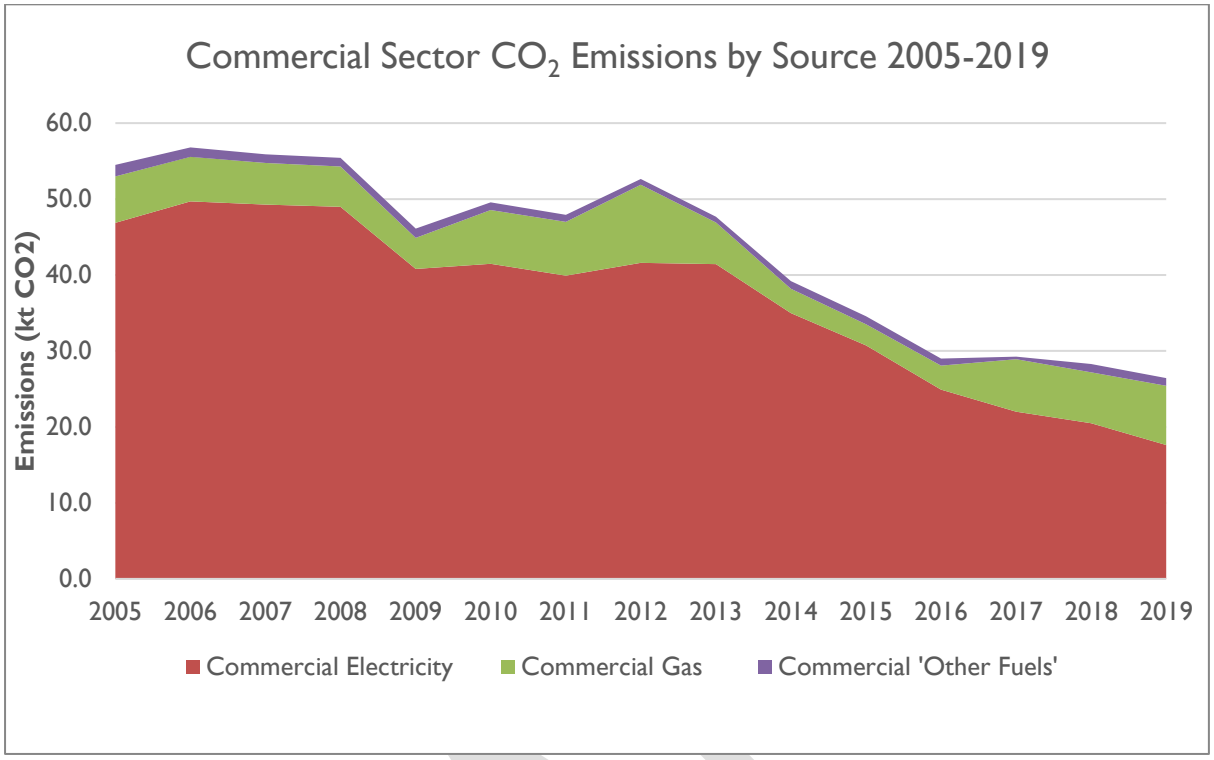


Figure 7: Estimated commercial sector CO_2 emissions by source in the Forest of Dean district between 2005 and 2019.

Public Sector

In 2019, emissions from the public sector within the Forest of Dean district were 8.8 kt CO_2. At 47.1%, the largest proportion of public sector emissions came from gas consumption (4.1 kt CO_2) (Figure 8), followed closely by electricity consumption at 45% (4.0 kt CO_2). Consumption of other fuels made up 7.9% (0.7 kt CO_2).

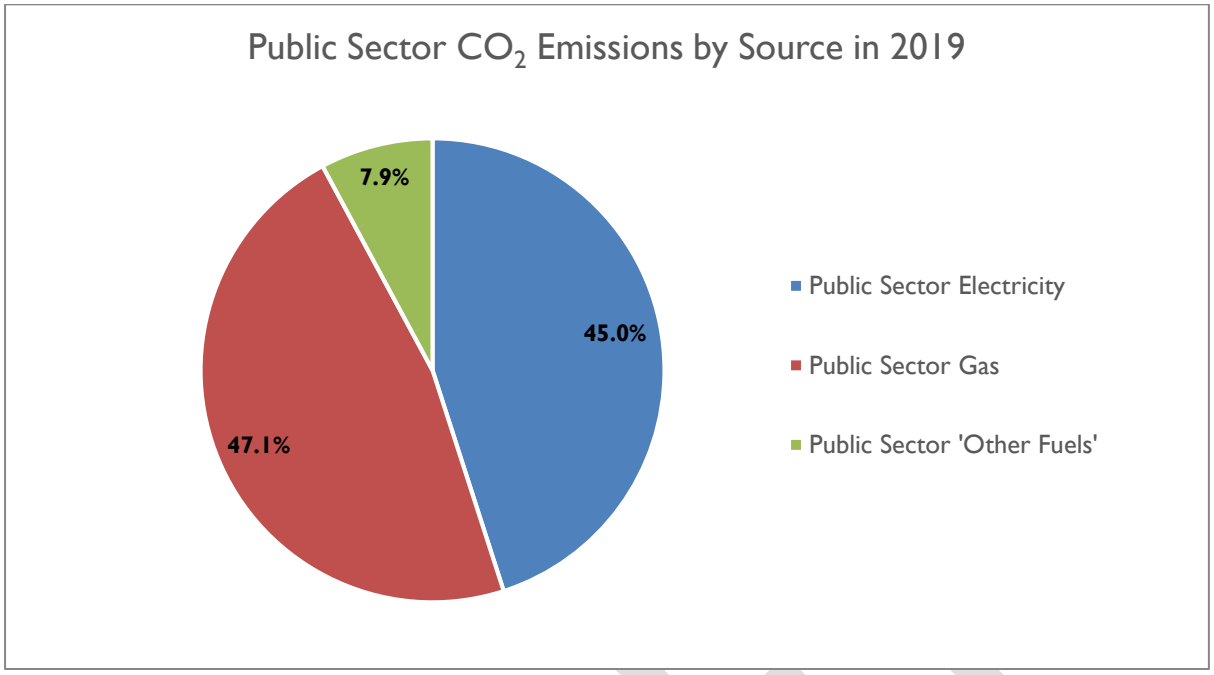


Figure 8: Estimated public sector CO_2 emissions by source in the Forest of Dean district in 2019.

Since 2018, emissions from the public sector have fallen by 0.3 kt CO_2 (3.3%) (Figure 9), with the largest percentage reduction coming from consumption of other fuels (13.9%), followed closely by electricity consumption (12.1%). However, there was an increase in emissions from public sector gas consumption (9.5%).

Since 2005 (baseline year), emissions from the public sector have fallen by 11.6 kt CO_2 (56.6%). The largest percentage reduction came from consumption of other fuels (84.5%), followed by electricity consumption (67.2%). However, there was an increase in emissions from public sector gas consumption (11.3%).

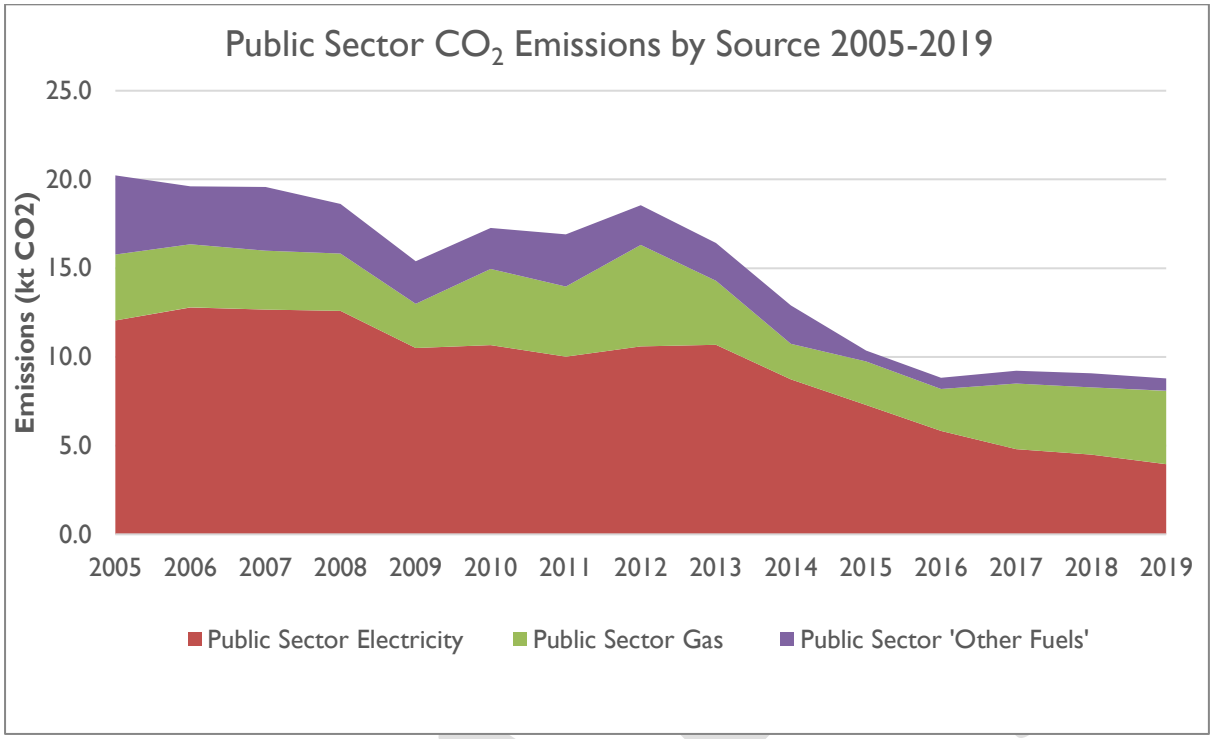


Figure 9: Estimated public sector CO_2 emissions by source in the Forest of Dean district between 2005 and 2019.

Domestic

In 2019, domestic emissions within the Forest of Dean district were 129.6 kt CO_2. At 42%, the largest proportion of domestic emissions came from gas consumption (54.4 kt CO_2) (Figure 10). Consumption of other fuels made up 30.8% (39.9 kt CO_2) and electricity consumption made up 27.2% (35.2 kt CO_2).

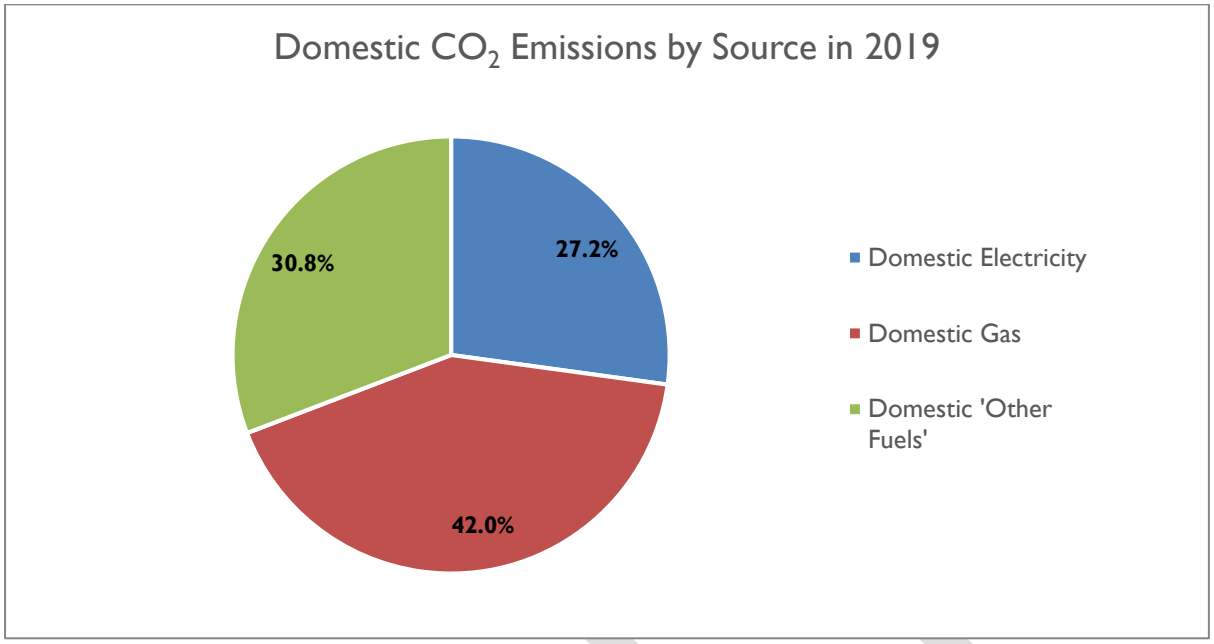


Figure 10: Estimated domestic CO_2 emissions by source in the Forest of Dean district in 2019.

Since 2018, domestic emissions have fallen by 3.1 kt CO_2 (2.3%) (Figure 11), with the largest percentage reduction coming from electricity consumption (10.6%). However, there was an increase in emissions from gas consumption (1.8%) and consumption of other fuels (0.3%).

Since 2005 (baseline year), domestic emissions have fallen by 85.8 kt CO_2 (39.9%). The largest percentage reduction came from electricity consumption (65.1%), followed by consumption of other fuels (20.6%) and gas consumption (15.1%).

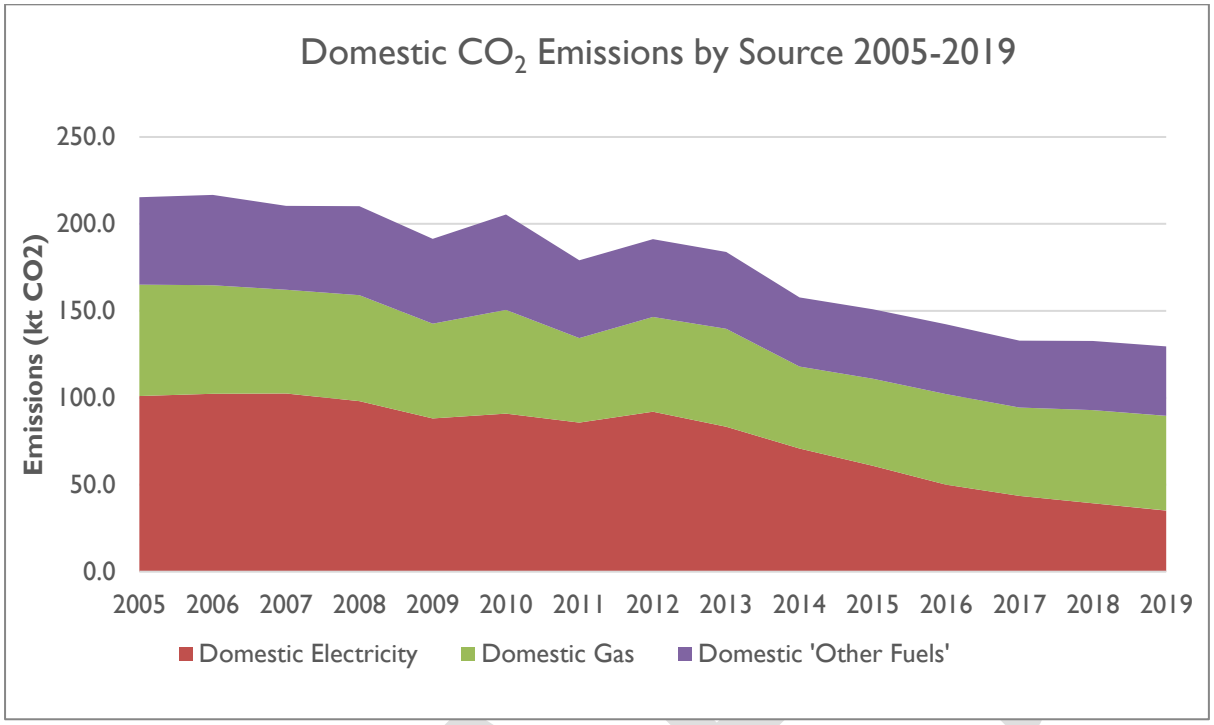


Figure 11: Estimated domestic CO_2 emissions by source in the Forest of Dean district between 2005 and 2019.

In 2019 12.7% of households in the Forest of Dean district were reported to be in fuel poverty (BEIS, 2021); compared to 11.7% in 2018. According to the 2019 Gloucestershire Energy Strategy, 39% of homes are not connected to the gas network, with the district identified as an ideal location for testing 'fossil free heating zones'.

Transport

In 2019, emissions from transport within the Forest of Dean district were 180.7 kt CO_2. At 93.1%, a significant majority of transport emissions came from road transport (168.2 kt CO_2) (Figure 12), whilst railway diesel consumption made up 6.4% (11.6 kt CO_2) and other transport 0.5% (0.9 kt CO_2). When disaggregated for road type, the largest proportion of road transport emissions came from vehicles using minor roads (46.2%).

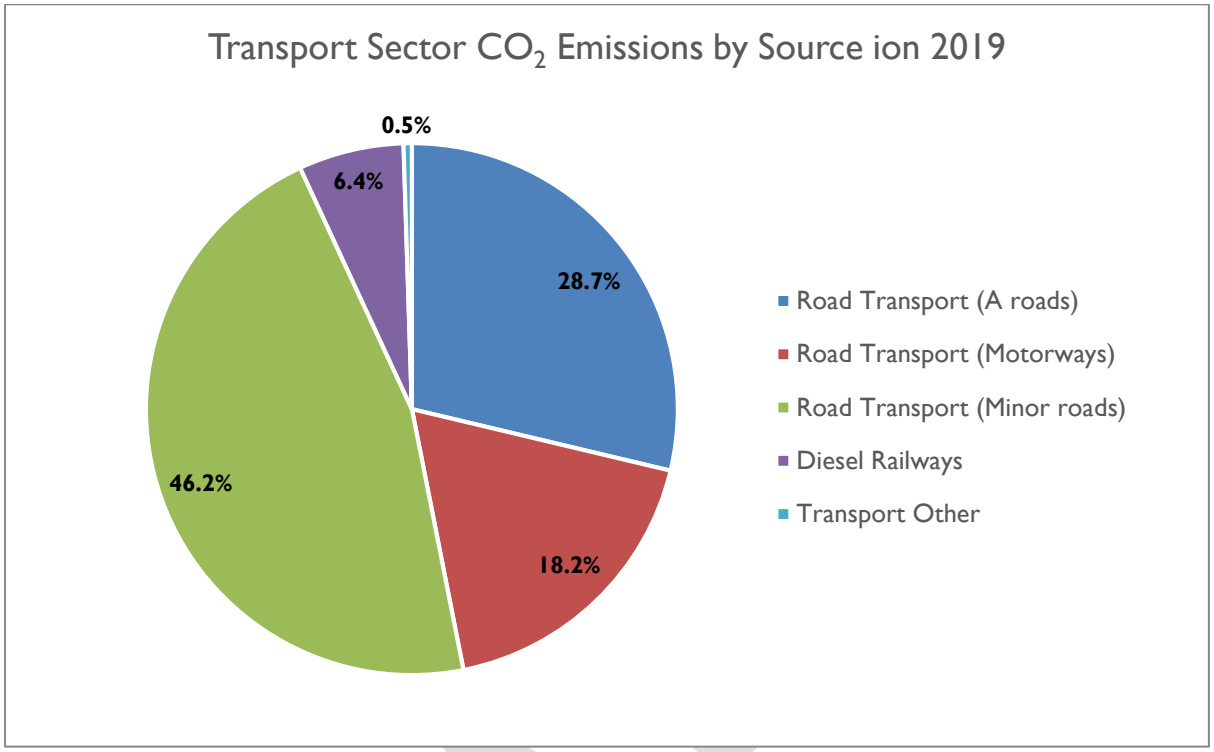


Figure 12: Estimated transport sector CO_2 emissions by source in the Forest of Dean district in 2019.

Since 2018, emissions from transport have fallen by 2.5 kt CO_2 (1.4%) (Figure 13), with the largest percentage reduction coming from motorway transport (4.9%), closely followed by A road transport industry (4.2%). There was a smaller percentage reduction from railway diesel consumption (2.9%); however there was an increase in emissions from both minor road transport (2.2%) and other transport (2.1%).

Since 2005 (baseline year), emissions from transport have fallen by 18.6 kt CO_2 (9.4%), with the largest percentage reduction coming from A road transport (27%). There were smaller percentage reductions from railway diesel consumption (22.8%), motorway transport (20.8%) and other transport (13.5%); however there was an increase in emissions minor road transport (18.1%). Whilst there was a modest fall in emissions between 2007 and 2012, emissions then consistently increased again until 2017, since when they have again started to fall. Despite this recent decrease, emissions from transport have remained stubbornly high since 2005.

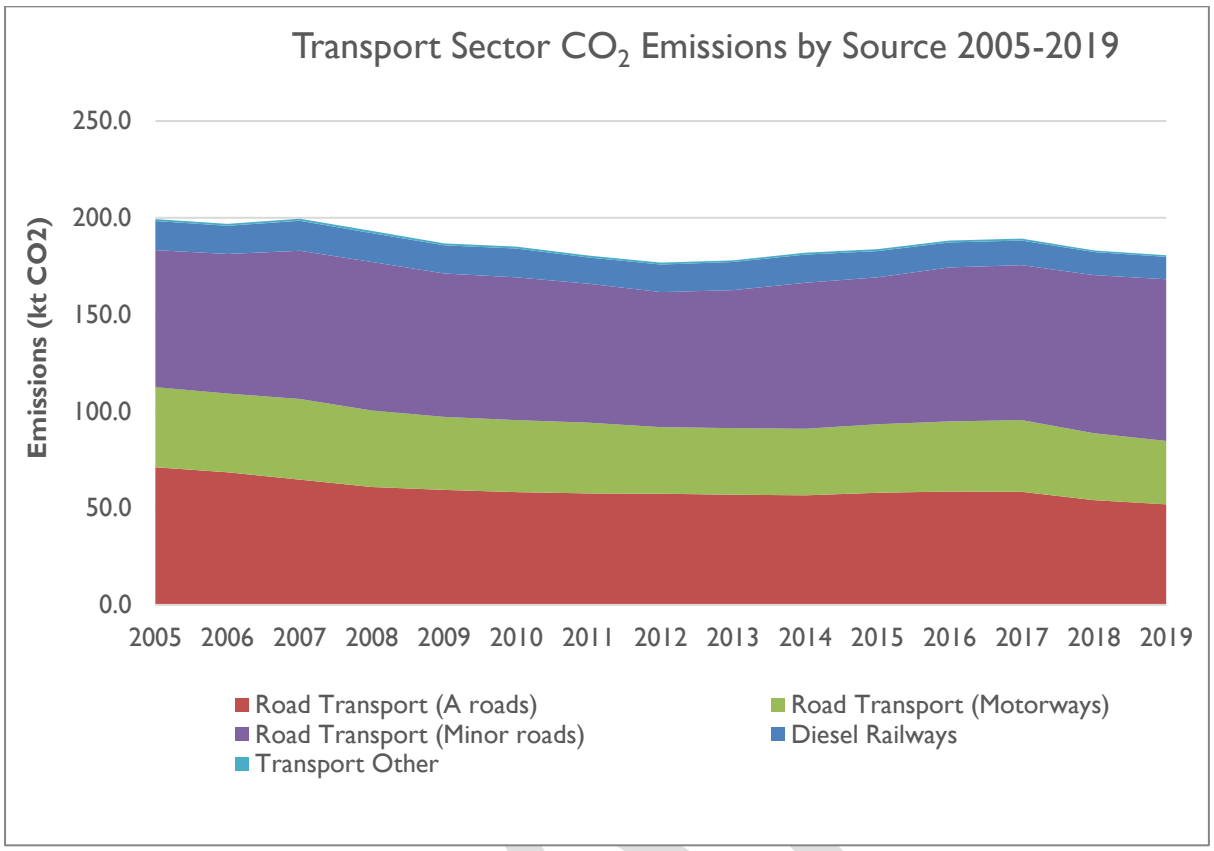


Figure 13: Estimated transport sector CO_2 emissions by source in the Forest of Dean district between 2005 and 2019.

Land Use, Land Use Change and Forestry (LULUCF)

In 2019, net emissions from LULUCF within the Forest of Dean district were -40.8 kt CO_2, meaning that more CO_2 was sequestered (removed) from the atmosphere than was emitted. The Forest of Dean district's net carbon sink contributed 27.7% of Gloucestershire's total net sink from LULUCF of 147.23 kt CO_2).

LULUCF emissions are distributed across six classes identified by the IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006): forest, cropland, wetlands, settlements, grasslands and harvested wood products.

Forest in the district offset the most emissions, sequestering an estimated 50.7 kt CO_2 (net), whilst grassland sequestered 23.9 kt CO_2 (net) (Figure 14). Cropland on the other hand was responsible for net emissions of 17.8 kt CO_2 and settlements were responsible for 16 kt CO_2.

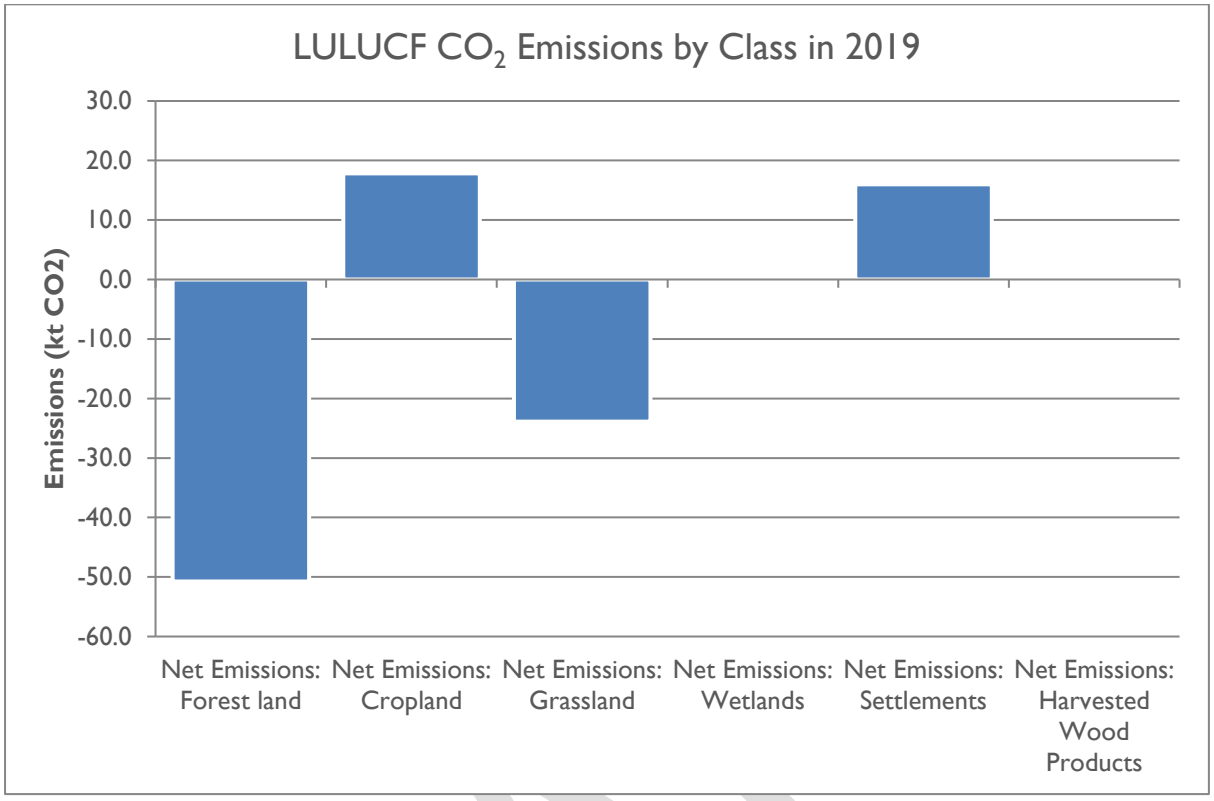


Figure 14: Estimated net LULUCF CO_2 emissions by class in the Forest of Dean district in 2019.

Since 2018, net emissions from LULUCF have increased by 0.1 kt CO_2 (0.2%) (Figure 15), meaning that although more CO_2 was still sequestered than emitted in 2019, this was less so than the previous year. This was mainly a result of a 0.5% fall in the amount of CO_2 sequestered by forest (net) and a 0.7% increase in net emissions from settlements. CO_2 sequestered by grassland increased by 0.6% (net) and net emissions from cropland fell by 0.7%.

Since 2005 (baseline year), net emissions from LULUCF have fallen by 12 kt CO_2 (41.5%), or conversely, net CO_2 sequestration has increased by the same amount. Net sequestration has increased from forest (11.4%), grassland (22.1%) settlements (16.8%), whilst net emissions from cropland have increased (21.1%).

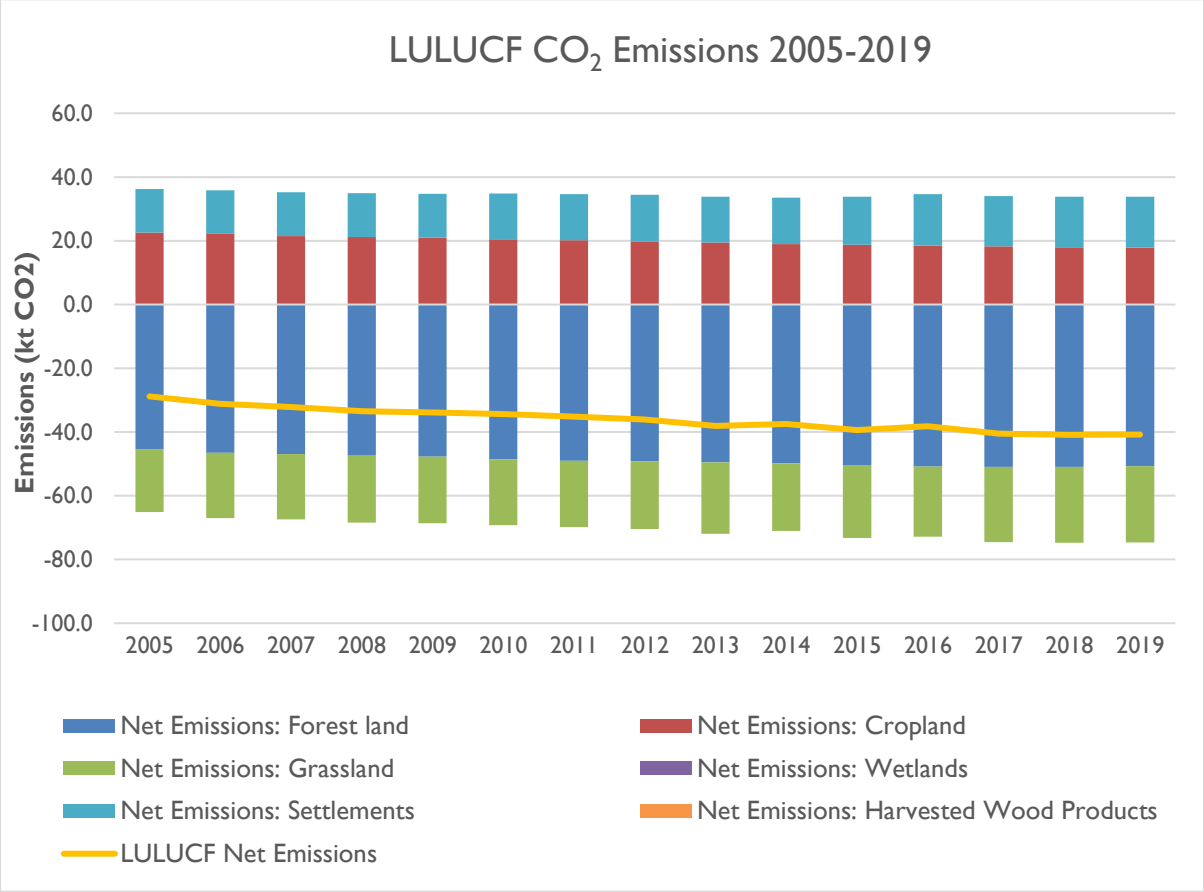
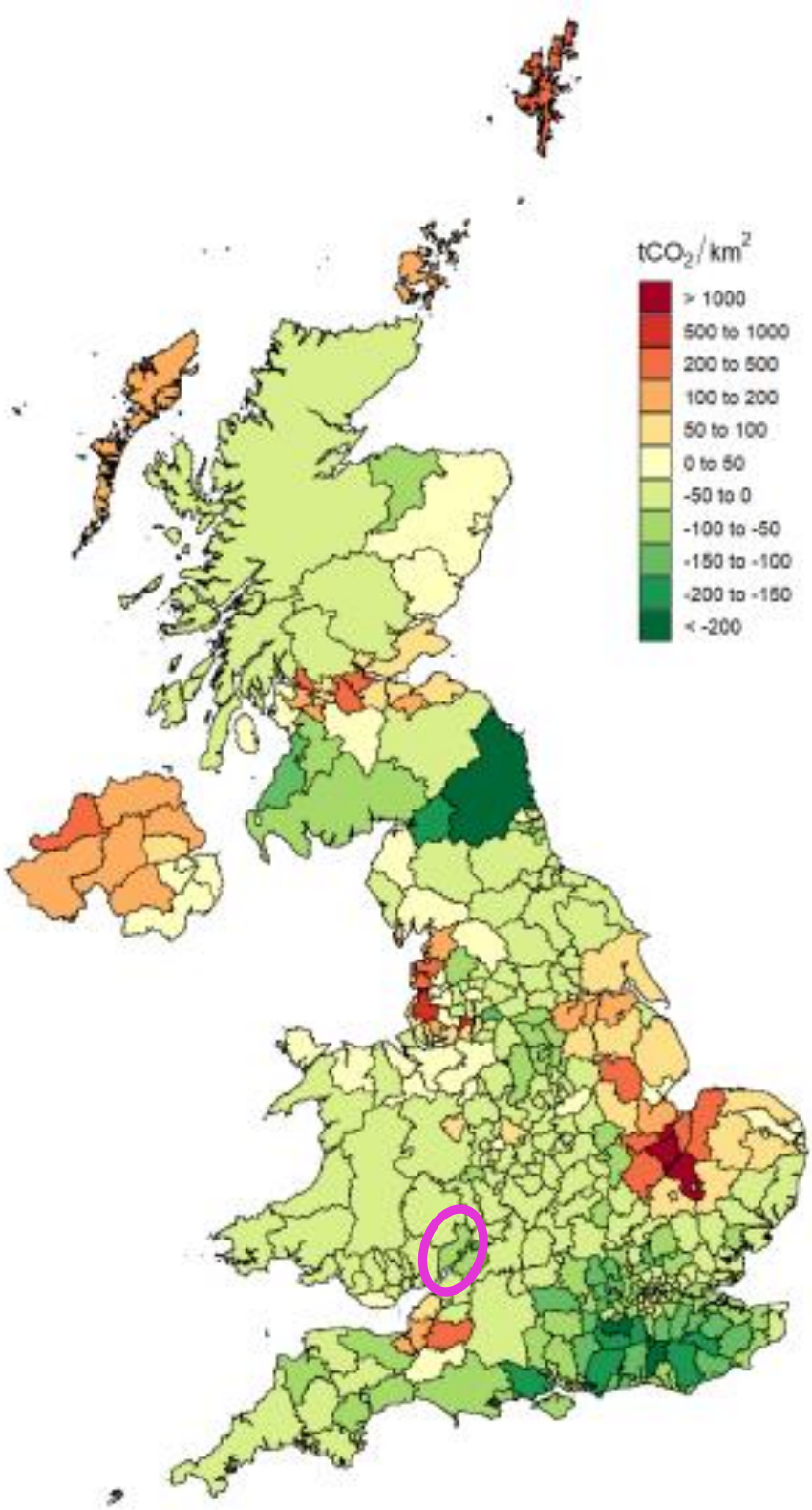


Figure 15: Estimated LULUCF CO_2 emissions by class in the Forest of Dean district between 2005 and 2019.

More information on how emissions from LULUCF have been calculated can be accessed here:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/996062/lulucf-local-authority-mapping-report-2019.pdf

The map on the next page maps CO_2 emissions or removals from LULUCF per local authority area (tCO2/km2) in 2019.


tCO2 / km2
> 1000
500 to 1000
200 to 500
100 to 200
50 to 100
0 to 50
-50 to 0
-100 to -50
-150 to -100
-200 to -150
< -200

Analysis

The 3.8% fall in total net CO_2 emissions between 2018 and 2019 shows that the district is making progress towards the Council's goal of carbon neutrality by 2030. Although this fall (17.3 kt CO_2) is greater than the average annual reduction since 2005 (15.1 kt CO_2 pa), it is still far short of what will be required to achieve the 2030 goal - an average annual reduction of 39.9 kt CO_2 (9.1% annual reduction on 2019 total).

The transport sector is still by far the largest contributor of CO_2 emissions in the district, being responsible for 37.7% of the districts total emissions from energy. Almost all of this came from road transport (93.1%). Transport emissions have remained stubbornly high since 2005, having recorded the smallest reduction of all sectors (9.4%). This was also the case most recently between 2018 and 2019 (1.4% fall). It is therefore clear that reducing emissions from transport represents a considerable challenge, and one which Forest of Dean District Council should prioritise for attention. This is further highlighted by the fact that emissions from minor road transport has actually increased by 18.1% since 2005, a trend that continued between 2018 and 2019, when there was an increase of 2.2%. Transport emissions could be reduced through the provision of cycling and walking infrastructure, investment and planning policy that facilitates the uptake of electric vehicles and access to local amenities, and lobbying of the County Council and national Government for increased public transport provision.

Another significant challenge will be reducing emissions from gas consumption across the district, which since 2005 has seen significant increases across commercial, domestic, industry and public sectors, and makes up the largest proportion of emissions for the latter three sectors. The transition away from gas fired heating systems to low carbon systems and the mass retrofit of both domestic, commercial and public sector buildings will need to be accelerated if this trend is to be reversed and carbon neutrality achieved by 2030. The Council could help achieve this through establishing a positive planning policy framework for maximising the use of renewables within new developments, and facilitating opportunities for the deployment of larger scale renewable heat (and power) generation within the district. It could also explore and identify ways it can help facilitate an increase in the retrofit of existing buildings.

Whilst all sectors have seen a fall in emissions since 2005, it is important to highlight that across all sectors, the largest percentage reduction in emissions came from electricity consumption. Although this a welcome trend; rather than actions taken by people and businesses in the district, this is likely mainly the result of increases in the proportion of national grid supplied electricity coming from renewable energy generation, with generation from the latter increasing 5 fold and the amount from fossil fuels down by 59% since 2010 (BEIS, 2021). The actions outlined in the previous paragraph would help increase the amount of renewable electricity generated in the district

Other areas that have seen increases in emissions and therefore requiring further attention include large industrial installations (5.2% increase since 2018, 4.4% increase since 2005), agriculture (7.1% increase since 2018) and cropland ((21.1% increase since 2005). The former demonstrates the need to decouple industry growth from carbon emissions, and the Council could assist with this by finding ways to support industry to use renewable energy to substitute for fossil fuels used during industrial installations. Increased emissions from agriculture and cropland highlight the need to encourage the implementation of carbon sequestering land management and ecologically regenerative farming practices in the district, especially given the positive causal relationship between soil carbon sequestration and soil health.

Unsurprisingly, given the natural landscape of the district, LULUCF contributed a net gain in carbon storage, removing an estimated 8.5% of the emissions produced by other sectors in 2019. Despite this, net carbon sequestration was 0.2% lower than in 2018, with sequestration from forest falling and emissions from settlements increasing, This highlights the need for further effort to not only maintain, but increase natural carbon storage within the district.

On a positive note, both the public and commercial sectors have seen their emissions fall by more than half since 2005, although it should be pointed out that they are the two smallest sectors within the district.

It is important to emphasise that this analysis covers CO_2 emissions only, and does not incorporate emissions of other GHGs. Therefore, potentially large sources of methane (CH_4) emissions from livestock and nitrous oxide (N_2O) emissions from manure management have not been included in this report. Although the global warming potential of these latter two gases is much lower than that of CO_2, given the predominantly rural context of the Forest of Dean district, they are still likely to represent a significant amount of CO_2 equivalent emissions. This demonstrated by the SCATTER Tool estimating that in 2017, methane emissions from livestock in the district was 94.5 kt CO_2e (Appendix B).

Appendices

Appendix 1: BEIS CO_2 emissions data

BEIS CO_2 emissions data for the Forest of Dean district for 2019/20 (UK Local Authority and Regional Carbon Dioxide Emissions National Statistics: 2005 to 2019, 2021)

Year	Industry Electricity	Industry Gas	Industry 'Other Fuels'	Large Industrial Installations	Agriculture	**Industry Total**	Commercial Electricity	Commercial Gas	Commercial 'Other Fuels'	**Commercial Total**	Public Sector Electricity	Public Sector Gas	Public Sector 'Other Fuels'	**Public Sector Total**	Domestic Electricity	Domestic Gas	Domestic 'Other Fuels'	**Domestic Total**	Road Transport (A roads)	Road Transport (Motorways)	Road Transport (Minor roads)	Diesel Railways	Transport Other	**Transport Total**	Net Emissions: Forestland	Net Emissions: Cropland	Net Emissions: Grassland	Net Emissions: Wetlands	Net Emissions: Settlements	Net Emissions: Harvested Wood Products	**LULUCF Net Emissions**	**Net Total**
2005	89.1	40.4	40.0	3.5	17.2	**190.2**	46.9	6.1	1.5	**54.5**	12.1	3.7	4.5	**20.2**	101.0	64.2	50.3	**215.4**	71.1	41.5	70.7	15.0	1.1	**199.3**	-45.6	22.6	-19.6	0.0	13.7	0.0	**-28.8**	**650.9**
2006	94.5	38.7	39.9	2.9	16.6	**192.7**	49.7	5.9	1.2	**56.8**	12.8	3.6	3.3	**19.6**	102.4	62.3	52.0	**216.7**	68.5	40.7	72.0	14.5	1.1	**196.9**	-46.6	22.2	-20.5	0.0	13.7	0.0	**-31.2**	**651.5**
2007	93.7	36.1	36.8	2.9	15.2	**184.7**	49.3	5.5	1.1	**55.9**	12.7	3.3	3.6	**19.6**	102.5	59.6	48.3	**210.5**	64.7	41.7	76.6	15.5	1.1	**199.5**	-47.0	21.5	-20.4	0.0	13.7	0.0	**-32.1**	**638.0**
2008	93.1	35.2	34.8	2.9	15.4	**181.4**	49.0	5.3	1.1	**55.4**	12.6	3.2	2.8	**18.6**	98.0	60.9	51.3	**210.3**	60.9	39.5	76.8	14.9	1.1	**193.2**	-47.5	21.2	-20.9	0.0	13.7	0.0	**-33.5**	**625.4**
2009	77.6	27.0	35.3	2.9	15.0	**157.8**	40.8	4.1	1.2	**46.1**	10.5	2.5	2.4	**15.4**	88.2	54.3	48.8	**191.4**	59.4	37.8	74.0	14.6	1.0	**186.8**	-47.7	21.0	-20.8	0.0	13.8	0.0	**-33.8**	**563.7**
2010	78.9	46.7	42.9	2.9	14.9	**186.3**	41.5	7.1	1.0	**49.6**	10.7	4.3	2.3	**17.3**	90.8	59.7	54.9	**205.5**	58.2	37.3	73.8	14.8	1.0	**185.1**	-48.5	20.5	-20.7	0.0	14.3	0.0	**-34.4**	**609.3**
2011	75.4	37.9	34.5	3.0	15.4	**166.1**	39.9	7.1	0.9	**47.9**	10.0	3.9	2.9	**16.9**	85.8	48.5	44.8	**179.1**	57.6	36.5	71.7	13.6	1.0	**180.4**	-49.1	20.1	-20.7	0.0	14.5	0.0	**-35.2**	**555.2**
2012	77.4	42.7	39.2	3.1	15.3	**177.6**	41.6	10.3	0.8	**52.7**	10.6	5.7	2.2	**18.5**	91.9	54.6	44.7	**191.2**	57.4	34.4	69.8	14.2	1.0	**176.8**	-49.1	19.8	-21.3	0.0	14.6	0.0	**-36.1**	**580.8**
2013	73.6	36.1	48.2	2.9	14.3	**175.1**	41.4	5.5	0.8	**47.7**	10.7	3.6	2.1	**16.4**	83.3	56.3	44.3	**184.0**	56.9	34.3	71.4	14.4	1.0	**178.1**	-49.6	19.4	-22.3	0.0	14.4	0.0	**-38.1**	**563.2**
2014	60.8	31.3	48.6	2.6	15.0	**158.4**	35.0	3.2	1.0	**39.2**	8.7	2.0	2.2	**12.9**	70.7	47.2	39.7	**157.7**	56.6	34.5	75.3	14.6	1.0	**182.0**	-49.8	19.0	-21.2	0.0	14.5	0.0	**-37.5**	**512.7**
2015	49.4	34.0	41.0	2.9	15.3	**142.7**	30.7	2.8	1.1	**34.6**	7.3	2.5	0.6	**10.4**	60.9	50.1	39.9	**150.9**	57.9	35.4	75.9	13.6	1.0	**183.7**	-50.5	18.7	-22.7	0.0	15.1	0.0	**-39.4**	**482.8**
2016	40.5	33.3	39.7	2.8	15.8	**132.1**	24.9	3.2	0.9	**29.0**	5.8	2.4	0.6	**8.8**	50.1	52.0	40.3	**142.4**	58.5	36.3	79.6	12.9	0.9	**188.3**	-50.9	18.5	-22.0	0.0	16.1	0.0	**-38.2**	**462.4**
2017	38.3	51.4	37.8	3.6	15.7	**146.7**	22.0	6.9	0.3	**29.3**	4.8	3.7	0.7	**9.2**	43.5	50.9	38.5	**132.9**	58.4	37.0	80.2	12.7	0.9	**189.2**	-51.0	18.3	-23.6	0.0	15.8	0.0	**-40.5**	**466.8**
2018	36.5	54.3	34.1	3.5	15.5	**143.8**	20.5	6.7	1.1	**28.3**	4.5	3.8	0.8	**9.1**	39.4	53.5	39.8	**132.7**	54.2	34.5	81.7	11.9	0.9	**183.2**	-51.0	18.0	-23.7	0.0	15.9	0.0	**-40.9**	**456.2**
2019	30.1	50.3	33.6	3.7	16.6	**134.2**	17.6	7.8	1.0	**26.4**	4.0	4.1	0.7	**8.8**	35.2	54.4	39.9	**129.6**	51.9	32.8	83.5	11.6	0.9	**180.7**	-50.7	17.8	-23.9	0.0	16.0	0.0	**-40.8**	**438.9**

Appendix 2: SCATTER GHG inventory for the Forest of Dean district for 2018/19

Sector	Sub-sector	Total tCO_2e			
		DIRECT	INDIRECT	OTHER	TOTAL
Stationary energy	Residential buildings	87,479.91	47,357.79	24,294.57	159,132.27
	Commercial buildings & facilities	17,708.76	30,469.60	7,458.89	55,637.25
	Institutional buildings & facilities	13,992.75	6,615.76	3,009.76	23,618.28
	Industrial buildings & facilities	67,471.16	37,193.45	18,146.15	122,810.76
	Agriculture	11,583.44	2.33	2,732.11	14,317.89
	Fugitive emissions	12,229.88	0.00	0.00	12,229.88
Transportation	On-road	153,728.73	IE	30,046.88	183,775.61
	Rail	10,521.40	IE	2,476.27	12,997.67
	Waterborne navigation	0.00	IE	0.00	0.00
	Aviation	NO	IE	44,576.24	44,576.24
	Off-road	1,537.29	0.00	NE	1,537.29
Waste	Solid waste disposal	22,632.04	0.00	IE	22,632.04
	Biological treatment	NO	0.00	IE	0.00
	Incineration and open burning	NO	0.00	IE	0.00
	Wastewater	5,094.39	0.00	NO	5,094.39
Industrial Processes and Product Use (IPPU)	Industrial process	31,952.62	0.00	0.00	31,952.62
	Product use	0.00	0.00	NE	0.00
Agriculture, Forestry and Other Land Use (AFOLU)	Livestock	94,565.49	0.00	0.00	94,565.49
	Land use	-37,179.78	0.00	0.00	-37,179.78
	Other AFOLU	NE	0.00	0.00	0.00
Generation of grid-supplied energy	Electricity-only generation	0.00	0.00	0.00	0.00
	CHP generation	0.00	0.00	0.00	0.00
	Heat/cold generation	NO	0.00	0.00	0.00
	Local renewable generation	3.36	0.00	0.00	3.36

Notation keys:
NO: Not Occuring
IE: Integrated Elsewhere
NE: Not Estimated
C: Confidential

Colour keys:
Green: Required
Blue: Optional
Grey: Not Applicable